

## Poster Presentations

### **Abstracts 1 - 56**

## ABSTRACT 1

### **AORTIC VALVE REPLACEMENT UNDER SELECTIVE CEREBRAL PERFUSION FOR THE CALCIFIED PORCELAIN AORTA**

Authors name; Hiroshi Baba, Yoshiyuki Nishimura, Yasuhide Okawa

#### **Background**

Aortic valve replacement in patients with a calcified porcelain ascending aorta poses technical challenges. The purpose of this study was to examine operative strategies.

#### **Methods**

In 5 patients with an average age of 72.2 years, we performed aortic valve replacement under selective cerebral perfusion and the internal occlusion technique using a balloon catheter. Selective cerebral perfusion was obtained by combining the right axillary artery and the left common carotid artery at moderate hypothermia (25C). Traditional aortic cross clamping and circulatory arrest were avoided with internal occlusion, cerebral perfusion, and femoral artery cannulation.

#### **Results**

Three patients had concomitant procedures as follows: CABG (2 patients) and MVR (1 patient). Mean duration of operation was 352±83 minutes and mean duration of CPB was 181±56 minutes. All 5 patients underwent successful operation without neurological complications, however, one patient died suddenly with prosthetic valve thrombosis on the 11th postoperative day.

#### **Conclusion**

These techniques prevent prolonged hypothermic circulatory arrest and neurological complications. Aortic valve replacement using selective cerebral perfusion and internal occlusion technique are the preferred strategies when dealing with the calcified porcelain aorta.

## ABSTRACT 2

**VALIDATION OF FLOW QUANTIFICATION USING A FLUORESCENCE IMAGING SYSTEM FOR INTRAOPERATIVE CORONARY ARTERY BYPASS GRAFT ASSESSMENT.**

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**Objective**

CABG patency assessment using intraoperative fluorescence imaging (IFI) provides qualitative images. Quantification of flow would permit objective evaluation. We devised a flow quantification method based on the hypothesis that the frame count (number of image frames), taken from baseline to peak in fluorescence intensity correlates with flow volume.

**Methods**

Porcine blood was circulated in 2mm and 3mm silastic tubes at known flow volumes using a roller pump. Blood containing a specified amount of indocyanine green (ICG) dye was added and the fluorescent images obtained with the IFI system (SPYTM Novadaq, Canada) frame counts were analysed using Matlab software. We also assessed flow in 15 right internal thoracic artery (RITA) to left anterior descending artery (LAD) grafts intraoperatively using IFI and compared it to flows obtained with transit time flowmetry.

**Results**

Laboratory frame count measurements demonstrated a consistently reproducible non-linear inverse correlation with flow volume in 2mm and 3mm tubes ( $r = -0.92$  and  $-0.87$ ,  $p < 0.01$ ). The intraoperative RITA to LAD graft measurements showed similar relationship ( $r = -0.75$ ,  $p < 0.01$ ).

**Conclusion:** There is a strong inverse correlation between frame count and flow volume. Similar trends observed in laboratory and clinical settings indicate its potential for practical application in the assessment of coronary artery bypass graft flow.

Please note: Attachment of Graph was not possible.

## ABSTRACT 3

**TRANSIT-TIME FLOW MEASUREMENTS IN ARTERIAL AND VENOUS CONDUITS USED IN OFF-PUMP AND ON-PUMP CORONARY ARTERY BYPASS GRAFTING (CABG).**

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**Objective:**

Despite profound differences in the neurohumoral milieu in patients undergoing on-pump CABG (ONCABG) and off-pump CABG (OPCABG) it is not known if or how this might affect graft blood flow. Some studies have reported lower graft flow rates in OPCABG.

**Methods:**

We prospectively studied intraoperative transit-time flow measurements (TTFM) (Medistim BF 2004, Norway) in patients undergoing OPCABG and ONCABG using internal mammary artery (IMA), radial artery (RA) and long saphenous vein (LSV) conduits by a single surgeon. The mean graft flow and mean arterial pressure were recorded for all the conduits immediately prior to closure.

**Results:**

We recorded the TTFM of 174 conduits in 60 patients of whom 47 (78%) patients had OPCABG and 13 (22%) had ONCABG.

	IMA	RA	LSV	IMAvsLSV	RAvsLSV
TOTAL Number of grafts	94	37	43		
Mean graft flow(SD)	28(19)	30(23)	58(39)	<0.001*	<0.001*
Mean Art pressure(SD)	75(12)	75(12)	71(11)	0.08	0.2
OPCABG Number of grafts	77	33	18		
Mean graft flow(SD)	28(17)	29(23)	56(42)	0.02*	0.03*
Mean Art pressure(SD)	76(13)	76(12)	72(12)	0.3	0.3
ONCABG Number of grafts	17	4	25		
Mean graft flow(SD)	32(28)	42(18)	59(37)	0.01*	0.2
Mean Art pressure(SD)	68(9)	60(8)	70(11)	0.2	0.3
p value MEAN GRAFT FLOW	0.6	0.2	0.8	OPCABG vs ONCABG	

**Conclusions:** We found no difference in the graft flow rates of IMA, RA and LSV conduits between OPCABG and ONCABG. However, there was a significant increase in LSV graft flows compared to IMA and RA graft flows in both OPCABG and ONCABG.

## ABSTRACT 4

**SUBJECTIVE PERCEPTION OF MECHANICAL HEART VALVE SOUNDS:  
NOT ONLY THE AMPLITUDE MATTERS.**

B. Meuris, W. Flameng.

Many studies have investigated the subjective perception of mechanical valve sounds and the effect on patients' quality of life. Most studies however focus exclusively on the amplitude of measured valve sounds. We combined amplitude measurements with a technique of averaged autopower spectral analysis, in order to identify valve resonance frequencies.

Serial acoustic measurements were performed in 6 patients with a mechanical valve in aortic position (3 St-Jude Medical and 3 ATS valves). Averaged autopower spectral analysis was performed (calculated as the averaged amplitude of the Fourier transformation of selected small time windows around openings- and closing-clicks, thereby minimizing the important variabilities in frequency content of consecutive valve clicks).

In patients with a St-Jude Medical valve, resonance frequencies were localized in the middle of the audible spectrum (around 8500, 10250 and 14750 Hz). Patients with ATS valves on the contrary showed resonance frequencies around 16750, 18400 and 20250 Hz, which is at the upper extreme of the audible sound spectrum. Previous studies have suggested a "more silent" behavior of ATS valves, with lower measured signal amplitudes. Based on our results, we believe that the difference in resonance frequencies with very high, practically inaudible frequencies in ATS valves, also contributes to the lower degree of subjective perception

## ABSTRACT 5

**DOES OFF-PUMP TECHNIQUE IMPROVE OUTCOME OF CABG FOLLOWING ACUTE MYOCARDIAL INFARCTION?**

Osama Benhameid, Jon Afilala, Kapil Sharma, J F Morin, Elham Rahme, Youssef Toubouti, and Hani Shennib.

**Objective:**

Recent reports have suggested that off-pump CABG technique is beneficial for revascularization early after acute myocardial infarction. However, such reports do not account for improvement in antiplatelet and other adjacent medical therapy. We report a single institution's current experience with CABG after AMI, and examine whether off-pump (OPCAB) techniques impact outcome in these patients.

**Methods:**

We retrospectively reviewed all CABG procedures performed within 1 month from AMI between Jan 1998 and Jan 2003 (192 patients). Multivariable analysis was performed on all patients where factors related to mortality were measured. Case matching was subsequently implemented between standard CABG and OPCAB patients.

**Results:**

192 patients that underwent CABG fulfilled our study criteria (mean age 62+10.8y; female 23%; Parsonnet score 9.4+10.7; cardiogenic shock 6%; IABP 6%; failed PTCA 6%; OPCAB 20.8%. In-hospital mortality was determined to be 9%. Multiple logistic regression demonstrated a significant relationship ( $p < 0.05$ ) between mortality and EF < 35%, Parsonnet score > 10, and surgery within 7 days of AMI. OPCAB did not statistically impact outcome ( $p > 0.05$ ) in multivariate analysis and this finding was preserved when 32 patients were case matched to standard CABG patients (case matched mortality: OPCAB 0% Vs standard CABG 3.1%;  $p > 0.05$ ).

**Conclusions:**

We conclude that despite recent advances in the medical management of AMI, CABG carried out within the first week continues to carry a high mortality. Also, poor ejection fraction and an elevated Parsonnet score predict mortality. We report that OPCAB technique does not seem to influence outcome in patients with recent AMI.

## ABSTRACT 6

**ROBOTIC SUTURING OF CORONARY ARTERY BYPASS GRAFTS THROUGH STERNOTOMY; AN IMPORTANT STEP TOWARDS TOTALLY ENDOSCOPIC PROCEDURES**

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**Background:**

We report our experience with robotic suturing of left internal mammary artery (LIMA) to the left anterior descending artery (LAD) through sternotomy. Results are compared with those achieved in TECAB.

**Patients and Methods:**

From October 2001 to November 2003 46 patients received a robotically sutured LIMA graft to the LAD system using the daVinci™ Telemanipulation system. 22 anastomoses were performed through sternotomy in combination with grafts to other target vessels, 24 anastomoses were performed as a single procedure in a totally endoscopic fashion. All anastomoses were carried out on the arrested heart.

**Results:**

The following differences in intra- and postoperative outcome were noted between sternotomy and TECAB patients: LIMA-target vessel anastomotic time (min) 29 (18-43) vs. 34 (23-60)  $p=0.034$ , ventilation time (h) 10 (0-90) vs. 9 (0-59)  $p=ns$ , ICU stay (h) 20 (12-138) vs. 24 (11-88)  $p=ns$ . There was no hospital mortality and all patients in both groups were free from angina 3 months postoperatively.

**Conclusion:**

Robotic suturing of left internal mammary artery bypass grafts to the left anterior descending artery system through sternotomy can be performed accurately and faster than endoscopically. The procedure is safe and can be recommended as an intermediate step for the development of TECAB.

## ABSTRACT 7

**CHARACTER AND CONSEQUENCES OF SURGICAL PROBLEMS  
IN ROBOTICALLY ASSISTED TOTALLY ENDOSCOPIC CABG**

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**Background:**

Robotic technology is a prerequisite for performance of totally endoscopic coronary artery bypass grafting (TECAB). During an implementation phase of TECAB surgeon related technical problems may be encountered. It was the aim of this study to assess the incidence of these problems and to describe clinical results associated with technical errors.

**Patients and Methods:**

From 10/2001 to 11/2003 27 patients, received robotically assisted totally endoscopic LIMA grafts to LAD system using the daVinci™ telemanipulation system. All patients underwent remote access CPB perfusion through groin access and all anastomoses were performed on the arrested heart.

**Results:**

Technical problems occurred in 14/27 patients (52%): bleeding from a porthole in 3(11%), LIMA damage in 3(11%), epicardial lesion in 1(4%), remote access perfusion problems in 7(26%), bleeding from the anastomosis in 3(11%), proximal target vessel occlusion in 1(4%). There was no hospital mortality. The following differences were noted between patients with surgical difficulties and those without: ventilation time(h) 14(0-278) vs. 6(0-26)  $p=0.038$ , ICU stay(h) 44(16-282) vs. 20(11-70)  $p=ns$ , hospital stay (days) 9(6-15) vs. 7(4-13)  $p=ns$ .

**Conclusion**

We conclude that surgical problems during TECAB translate into prolonged postoperative ventilation time. ICU stay and hospital stay, however, are less affected by the occurrence of such difficulties.

## ABSTRACT 8

**QUALITY OF LIFE IMPROVEMENT AFTER ROBOTIC TOTALLY ENDO-SCOPIC CORONARY ARTERY BYPASS GRAFTING**

N. Bonaros, A. Öhlinger, T. Schachner, M. Danzmayr, G. Friedrich, G. Laufer, J. Bonatti

**Background.** The aim of the study was to compare the early and mid-term postoperative outcome in terms of quality of life in patients undergoing robotic Totally Endoscopic Coronary Artery Bypass (TECAB) or robotically assisted-sternotomy CABG.

**Methods.** 17 patients who underwent a TECAB procedure were compared to 34 patients who underwent robotically assisted CABG via sternotomy. Postoperative quality of life was assessed in telephone interviews 6 months postoperatively using the SF-36 questionnaire and additional questions assessing everyday activities. Results. TECAB patients were discharged earlier compared to sternotomy patients ( $6.8 \pm 1.7$  vs.  $8.8 \pm 1.7$ ,  $p < 0.05$ ). There was a significant improvement of the general health status, and the physical, mental, and social health in both groups postoperatively. No difference was observed between the groups 6 months after the operation. Restoration of daily activities, however, took place earlier in the TECAB group.

Activity	TECAB	Sternotomy
Shower	$3.3 \pm 1.3$	$8.3 \pm 4.9$ *
Housework	$17.2 \pm 10.4$	$31.3 \pm 21.7$ *
Gardening	$19.4 \pm 11.2$	$47.2 \pm 34.2$ *
Car driving	$15.9 \pm 8.3$	$43.9 \pm 39.3$ *
Shopping	$16.1 \pm 8.6$	$38.6 \pm 31.7$ *
Walking outdoor	$6.19 \pm 4.3$	$15.5 \pm 10.2$ *
Jogging	$38.3 \pm 21.5$	$74.7 \pm 91.6$ *

\* $p < 0.05$

**Conclusions.** TECAB and sternotomy-CABG patients undergo a significant improvement of the quality of life after the procedure. Avoidance of full sternotomy leads to a shorter rehabilitation phase and a more rapid restoration of daily activities.

## ABSTRACT 9

### **ENDOSCOPIC RADIAL ARTERY HARVESTING: INITIAL EXPERIENCE AT A SINGLE INSTITUTION**

Luca Caprili, Tomaso Bottio, Cosimo Guglielmi, Gino Gerosa

**Objective:** The use of radial artery as a by pass conduit has reached widely acceptance, nevertheless frequent cases of temporary early numbness in the lateral forearm of patients have been described.

**Methods:** Between May 2003 and September 2003, 20 patients undergoing coronary artery bypass were randomly assigned to endoscopic harvesting of radial artery (Group I= n 10 pts) or to the conventional open technique (Group II = n 10 pts). Group I: the artery was endoscopically removed through a 3 cm incision just proximal to the radial styloid prominence (Cardiovation Endoscopic System) Group II: the artery was harvested through a standard incision.

**Results:** In both groups there were no intraoperative complications. Group I: there were 2 cases of early postoperative dorsal thenar paresthesias (20%). All patient but 1 in Group II suffered from this early complication (90%). Group II: 2 cases of subcutaneous hemathoma (20%).

**Conclusions:** Harvesting of the radial artery using an endoscopic system can be performed safely with improved esthetics and patient satisfaction. Minor neurologic complications appears to be more infrequent with the endoscopic technique than with the open one. The increasing cost of the procedure using the endoscopic technique appears to be justified by patients appreciation.

## ABSTRACT 10

**IT IS POSSIBLE TO REVASCULARIZE WHOLE MYOCARDIUM WITH IN SITU BILATERAL INTERNAL THORACIC ARTERY**

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**Background:** In order to achieve total arterial revascularization with in situ ITA for patients having three vessel disease we create a new technique. The RITA was routed anterior to the aorta to graft the left anterior descending (LAD), and LITA was used to graft starting from distal right coronary artery (RCA) to the circumflex (Cx) branches.

**Methods:** Between september 2001 and october 2003 we have operated 15 patients. 9 coronary angiography performed in 7 patients, mean 3.6 months. **Results:** Total 54 (mean 3.6) arterial anastomoses were performed, 43 (mean 2.8) of which were sequential. The mean period of follow up was 9.9 months (Ranges between 1 to 25 months). There were no peroperative or postoperative mortality, all the patients were in NYHA Class 1.

**Conclusion:** In situ use of bilayeral ITA in three vessel disease is safe, and succesful in selected patients. Short term results are favorable.

## ABSTRACT 11

**TOTAL ARTERIAL REVASCULARIZATION FOR MULTIPLE VESSEL CORONARY ARTERY DISEASE – WITH OR WITHOUT CARDIOPULMONARY BYPASS**

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We analyzed perioperative data and early clinical results of 325 patients in who total arterial revascularization was performed either with (182) or without (143) cardiopulmonary bypass (CPB). Groups were similar from the demographic and comorbidity point of view.

**Perioperative data:**

	Off Pump (n=143)	On Pump (n=182)	
Grafts per patient	2.4±0.7	2.7±0.8	p<0.001
LITA	141 (99%)	181 (99%)	NS
RITA	43 (30%)	68 (46%)	NS
RA	114 (80%)	158 (87%)	NS
Side-to-side anastomoses	48/385 (14%)	80/493 (16%)	NS
Y grafts	60 (42%)	67 (37%)	NS

**Early clinical results:**

	Off Pump (n=143)	On Pump (n=182)	
Death	0	3 (1.6%)	NS
Perioperative MI	5 (3.5%)	10 (5.5%)	NS
Troponin I [ng/ml] median	0.58 median	0.39	NS
Stroke	2 (1.4%)	3 (1.6%)	NS
IPPV time	9±3.9h	10±5.5h	NS
IABP	4 (2.8%)	6 (3.2%)	NS
Adrenaline	3 (2.1%)	23 (13%)	P=0.001
Dopamine	35 (24%)	176 (97%)	P<0.001

Total arterial revascularization for multiple vessel coronary artery disease may be performed safely without CPB. We observed the tendency to somewhat smoother postoperative course e.g. less need for inotropic support in off-pump group.

## ABSTRACT 12

**FULL STERNOTOMY THROUGH A MINIMAL SKIN INCISION PROVIDES A COSMETIC RESULT WITHOUT COMPLICATIONS**

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**PURPOSE:** Patients request less invasive procedures with more cosmetic outcomes. The partial upper-half sternotomy, the partial lower-half sternotomy, the sub-mammary and transxiphoid approach all result in cosmetic outcomes. Each approach has limitations and drawbacks. Conflicting data over whether or not partial sternotomies have any beneficial effect on postoperative pulmonary function would lead one to believe that the major benefit from using a partial sternotomy is cosmetic. This paper describes the surgical approach of a full sternotomy through a minimal skin incision that fully exposes the heart and its structures.

**MATERIALS & METHODS:** 53 patients undergoing open heart surgery using a full sternotomy through a minimal skin incision were reviewed for complications. Variables studied were insulin dependent diabetes, thoracic artery use, return to the operating room, incidence of blood transfusion and obesity. Patient values were compared to the Society for Thoracic Surgeons' database.

**SUMMARY:** All patient data point reviewed compared favorably to the STS database data. Average length of incision was 16.5 cm.

**CONCLUSIONS:** Full sternotomy through a minimal skin incision results in a cosmetic outcome, and provides full access to all the structures of the heart. It can be performed safely, and without complications.

## ABSTRACT 13

### THE 3F BERN STENTLESS AORTIC VALVE CONDUIT

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3F Therapeutics, Inc., Lake Forest, CA, USA

#### **Objective:**

The 3F aortic prosthesis is a new biological stentless valve. It has a tubular design and is fabricated from three equal leaflets of equine pericardium. This valve was implanted in a specially designed tubular pericardial graft with aortic valve sinuses for aortic root replacement. We present the first animal results and hemodynamic performance of the 3F Bern Stentless Aortic Valve Conduit.

#### **Methods:**

In an acute pig model (60kg) aortic root replacement was performed with the 3F Bern Stentless Aortic Valve Conduit by means of routine CPB. After implantation the animals were weaned from CPB and transoesophageal echocardiography (TEE) was performed.

#### **Results:**

Aortic clamp time was below 60mins in both animals. Due to the special design of the new conduit where the leaflets are only attached to the tubular graft with three commissural tabs at the sinotubular junction, implantation of the coronary buttons is simplified and practically not restricted by the valve commissures. Mean systolic gradient was 6 and 8 mmHg. The valves appeared symmetrically perfect and no aortic valve regurgitation was found.

#### **Conclusion:**

The 3 F Bern Stentless Aortic Valve Conduit shows excellent performance and hemodynamic results in an acute animal model. Due to the new valve and conduit design, implantation technique especially for the coronary buttons is simplified comparing to other biological aortic root grafts.

## ABSTRACT 14

**IMPLEMENTATION OF THE ST. JUDE SYMMETRY AORTIC CONNECTOR: FIRST CLINICAL EXPERIENCE IN REDO AND OFF-PUMP CABG**

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**Background:** Clamping of the aorta to perform the proximal vein anastomosis is a potential risk factor in redo and off-pump CABG. Automatic anastomotic devices have been designed to avoid these hazards. We report our initial experience using the St. Jude Symmetry Bypass System Aortic Connector in redo and off-pump surgery.

**Methods:** After initial implementation of the anastomotic device in routine CABG, 17 proximal vein anastomoses in redo-CABG and off-pump procedures were performed by means of the aortic connector. We evaluated the handling and feasibility in these special procedures, postoperative patency was controlled by means of multi-slice computed tomography (MSCT), 3D-reconstruction inclusive.

**Results:** All but one (due to an extreme wall thickness) anastomoses were deployed successfully and very rapid. Hemostasis was instantaneous. Just one square centimetre of the aorta ascendens had to be dissected in redo-procedures. There were no intraoperative or postoperative complications related to the device. All but one investigated vein grafts were patent in MSCT examination 5 to 8 days postoperatively.

**Conclusion:** These initial experiences indicates the feasibility and reliability of the connector system. Aortic side clamping can be avoided, aortic manipulation associated with the risk of embolism can be minimized. Performance of proximal vein anastomoses in redo and off-pump CABG may be less parlous and faster using this anastomotic device.

## ABSTRACT 15

**DESIGN AND IMPLEMENTATION OF A CLINICAL PATHWAY FOR AORTOCORONARY BYPASS SURGERY – COMPUTER ASSISTED PROCESS MODELING**

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**Introduction:** Flat-rate reimbursement and the coming adoption of the DRG system place increasing economic pressures on many hospitals and hospital departments. This study was designed to evaluate how the implementation of a clinical pathway combined with corresponding cost analysis measures would affect the profit margin in coronary artery bypass surgery and how economic reserves could be uncovered.

**Method:** In order to design the clinical pathway for CABG, both a retrospective (by analyzing medical records) and a prospective approach (by following cases of uncomplicated aortocoronary bypass procedures) were taken. Software for business process analysis, modeling, and simulation was utilized to implement the pathway. Type of cost / cost center data and figures from the departmental accounting department constituted the basis of path cost calculations.

Variances such as comorbidities and complications were separately documented.

**Results:** Transparent delineation of the treatment course and the associated expenses resulted in a positive profit margin for G-DRG F06B. Implementation of a clinical pathway improved physicians' documentation, both qualitatively as well as quantitatively (e.g. with respect to the number of co-diagnoses entered). The effects of modifications within the pathway on the length of stay and the treatment costs were revealed with the aid of computer-assisted process simulation.

**Conclusions:** Performing process analysis by implementing a clinical pathway with process cost assessment (pathway cost analysis) represents a useful method for establishing cost-profit accounting. The clinical pathway leads to improved documentation quality, which can ensure that profits will be maintained.

Design and implementation of a clinical pathway allows optimal preparation for the demands of the new DRG based financing system.

Assessing the correlation between treatment quality and treatment costs will necessitate additional studies which can be based on these initial results.

## ABSTRACT 16

**DETERMINATION OF OPTIMAL CONDITIONS OF ISOLATED LUNG PERFUSION FOR THE TREATMENT OF LUNG METASTASES.**

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Despite favourable experimental results and an encouraging early experience in humans, isolated lung perfusion (ILP) for treatment of metastases is still not established clinically. The complexity of the procedure as well as poor knowledge regarding the technical details of lung perfusion represent major limitations. In a novel in-vivo pig model the impact of different perfusion conditions throughout ILP on the functional and morphological integrity of the lung was evaluated systematically.

Following ILP of the left lung for 40 min the right lung was excluded from perfusion and ventilation. Survival of the animal was dependent on only the previously perfused left lung. Hemodynamics, ventilation and gas exchange were monitored on-line for 6 hours. Influence of perfusion temperature was evaluated using groups with normothermic ( $t=38,0^{\circ}\text{C}$ ), mild ( $t=40,0^{\circ}\text{C}$ ) or moderate hyperthermic perfusion ( $t=41,5^{\circ}\text{C}$ ). Significance of perfusion pressure was tested using a low ( $<25\text{mmHg}$ ) and high pressure group ( $\geq 25\text{mmHg}$ ). Dosage limits of cisplatin were analyzed for 150 mg/m<sup>2</sup> as well as 300 mg/m<sup>2</sup> alone and in combination with hyperthermia. Results were compared to those of a sham-operated control group. All groups consisted of at least five animals.

ILP resulted in slight impairment regarding the most monitored parameters compared to the Sham-group. Mild and moderate hyperthermia had a beneficial effect on the pulmonary vascular resistance (PVR). High pressure perfusion was deleterious on PVR, lung compliance as well as histological score of lung injury. Gas exchange parameters of the cisplatin groups demonstrated a trend to dose related functional impairment. Histological evaluation of acute lung injury confirmed a dose depending damage of lung tissue. The hyperthermic ILP with cisplatin led to an improvement of gas exchange parameters and a significant reduction of morphological lung damage.

ILP was proven to be a safe and reproducible procedure in this in-vivo pig model. Furthermore this model seems to be very suitable to determine optimal conditions for ILP. The promising results of this study might be used for initiation of clinical trials as an alternative treatment in patients with a very poor prognosis.

## ABSTRACT 17

**IMPROVED OUTCOMES WITH PORT ACCESS MITRAL REPAIR**

Authors: Goldman,S.M .;Ferdinand,F.D.; Sutter,F.P.

**Objective:** Mitral valve repair is the accepted treatment of mitral regurgitation. The ideal surgical approach, whether conventional or minimally invasive, has remained controversial. We report an experience using Port Access and video assisted technology.

**Methods:** From January 1, 2000 through June 30, 2003, 151 patients under went isolated mitral valve repair by a single surgeon. Ten of these patients had the addition of a radio frequency Maze procedure. One hundred and thirty three (88.1%) of these operations were performed using Port Access with or with out video assistance. The results were compared with the STS National Adult Cardiac Surgery Database for 2002. There we no significant differences in demographics.

**Results:** There were no operative deaths and no thirty day mortality, vs. 1.5% mortality in the STS group. The Port Access group had 8 (6%) patients return to the operating room for bleeding. No patent returned to the OR for valve dysfunction, other cardiac or non cardiac reasons. There were no occurrences of deep wound infection, permanent stroke, renal failure, or prolonged ventilation. The STS group had 7.1% returns for any re-operations, 0.2% deep wound infections, 1.2% permanent stroke, 2.5% renal failure, 5% prolonged ventilation. The mean length of stay for the Port Access group was 5.56 days (total) and 5.12 (post op) vs. the STS group which was 8.0 (total) and 6.9 (post op).

**Conclusions:** Port Access mitral valve repair is a superior surgical approach. Mortality, morbidity and length of stay are significantly improved when compared to the STS National Adult Cardiac Surgery Database.

## ABSTRACT 18

**THE EFFECT OF DILTIAZEM SUPPLEMENTED TEPID CARDIOPLEGIA ON REPERFUSION INJURY**

Authors: Yaliniz H., Tokcan A., Ulus T., Kisacikoglu B., Salih OK., Topcuoglu MS., Poyrazoglu H., Zeren H., Alhan C.

**OBJECTIVE :** The present study was designed to assess whether diltiazem given with tepid induction and terminal isothermic blood cardioplegia enhances myocardial protection. Myocardial isoenzyme creatine kinase (CK-MB) assays and ultra-structural changes in myocardial specimens were indicators of injury.

**METHODS:** Forty patients undergoing coronary artery bypass surgery were randomly divided into two similar groups. Both groups received antegrade tepid (28°C) blood cardioplegia with terminal isothermic cardioplegia. In the diltiazem group 150+150 microg/kg diltiazem was added to both induction and terminal cardioplegic infusions. In both groups venous blood samples were collected just before anesthesia (preoperative) and at the 3rd, 6th, 18th, 24th, 48th, 96th hours postoperatively for CK-MB enzyme assays. Transmural myocardial biopsies were obtained from the left ventricular free wall. In both groups the first specimen was obtained 20 minutes after application of cross clamp (ischemic period) and 30 minutes after reperfusion. Ultrastructural changes in mitochondria were classified according to the semiquantitative grading system (mitochondrial score) on scale 0-3 introduced by Flemming et al. in 1980.

**RESULTS :** The differences in preoperative CK-MB enzyme levels in both groups were not significant. Highest CK-MB levels were 35.11±11.6 ng/ml in the diltiazem group and 52.56 ± 22.9 ng/ml in the control group (p<0.05). The mitochondrial scores during ischemic periods for control and diltiazem groups were respectively 1.97±0.43 and 1.56±0.31 and the difference was significant (p<0.05).

In the control group mitochondrial scores for ischemic and reperfusion periods were respectively 1.97±0.43 and 2.31±0.24 and the difference was significant (p<0.05). However, the same scores for the diltiazem group were respectively 1.56±0.31 and 1.40±0.50 and the difference was nonsignificant (p>0.05).

**CONCLUSION :** Diltiazem added to tepid induction and terminal isothermic blood cardioplegia can enhance myocardial protection.

## ABSTRACT 19

**OFF PUMP CABG IN PATIENTS WITH ADVANCED CIRRHOSIS**

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**Purpose.** Patients with cirrhosis who undergo cardiac surgery with cardiopulmonary bypass are known to have high morbidity and mortality rates. Off pump CABG may improve postoperative clinical outcome in such patients.

**Material and Methods.** Four patients with Child-Pugh class B cirrhosis underwent coronary artery bypass grafting without cardiopulmonary bypass (OPCAB). The causes of cirrhosis were viral hepatitis in 3 and unknown in 1. The mean age at surgery was  $71\pm 9$  years (58-80 years). Their postoperative clinical results and peri-operative care were assessed.

**Results.** All patients underwent OPCAB through a mediansternotomy, and the mean number of distal anastomoses and the mean duration of myocardial ischemia were  $1.8\pm 0.9$  and  $33\pm 15$  minutes, respectively. Two of 4 patients (50%) had postoperative major complications, including renal dysfunction, recurrent ascites, and low cardiac output syndrome due to complete atrioventricular block. Intravenous administration of atrial natriuretic peptide was effective in one patient with renal dysfunction and ascites. None of 4 patients died in this study.

**Conclusion.** Although the incidence of major complications was high, patients with Child-Pugh class B cirrhosis tolerated OPCAB satisfactorily. Although our results are not conclusive, OPCAB can be an alternative therapeutic strategy for patients with advanced cirrhosis requiring surgical revascularization.

## ABSTRACT 20

**FORCE SENSORS MAY PROVIDE TACTILE FEEDBACK TO ROBOTIC ARMS**

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2. Physical Electronics Laboratory, ETH Zurich

**Background**

Robotic arms lack the tactile feedback that the surgeon uses so intuitively, while operating conventionally. While operating through keyhole approaches using robotic interphase, identifying the coronary or the mammary artery could be critical. We used tactile sensors to study the force exerted by various structures on the heart.

**Methods**

A commercial 1-axis force sensor was positioned on the coronary artery, vein and the adjacent ventricular myocardium in a pig beating heart model (Figure 1). Electrocardiogram and blood pressure synchronized force signals orthogonal to the heart surface were recorded. Using data processing, the traces from the artery and the vein were synchronized with ECG landmarks and compared.

**Results**

The force sensor detects various phases of the arterial pulse. While the peak force exerted by the coronary artery and the vein is around 170 milli Newtons, the mean force subtended by the artery and the vein during the phase of low coronary flow are  $-50 \pm 10$  mN and  $-200 \pm 10$  mN respectively. This difference is perceptible and remains constant over multiple cardiac cycles. The slope of force exerted by the artery and vein are  $-1.0 \pm 0.3$  N/s and  $0.5 \pm 0.1$  N/s respectively. .

**Conclusions**

Force measurements using tactile sensors in conjunction with online data processing, indicate a possibility of being able to discern the course of a coronary artery or mammary artery. Further refinements in sensors may open new avenues of their use in detecting an intramyocardial coronary artery, as also the site of coronary occlusion.

ABSTRACT 21

**ENDOVASCULAR APPROACH TO BYPASS REDO CONVENTIONAL AORTIC SURGERY**

Authors: Gabriele Iannelli, Luigi Di Tommaso, Mario Monaco, Raffaele Smimmo, Federico Piscione, Nicola Spampinato

Reoperations for thoracic and abdominal aortic aneurysms or pseudoaneurysms increase conventional surgical risk: an endovascular approach has been considered.

From January 2000 to July 2003, 49 patients (pts) underwent endovascular surgery for thoracic and abdominal aneurysms. Four of them, with an history of previous conventional aortic surgery, developed a new aneurysmal pathology of the aorta. Two patients showed a contained rupture of a pseudo-aneurysm at the proximal anastomosis of an infrarenal aorto-aortic bypass. Both pts received an endovascular procedure achieved by a transfemoral approach: the first one with an aorto-monoiliac stent graft system and a femoro-femoral bypass; the second one with a bifurcated endograft.

In the thoracic group, the first pt, with mitral valve and ascending aorta replaced because of Marfan syndrome, showed five years later a descending aortic aneurysm treated with a stent graft. The last one, with an aorto-bifemoral bypass because of obstruction of the aortic bifurcation, showed six years later a distal arch aneurysm treated with endograft achieved by a branch of the previous bypass. No major complications or deaths occurred in these pts.

We propose the endovascular approach as a suitable back-up option in redo-aortic surgery.

## ABSTRACT 22

**INITIAL EXPERIENCE OF THE SYMMETRY BYPASS SYSTEM IN JAPANESE PATIENT**

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**Purpose:** To report a short-term results of Symmetry Bypass System Aortic Connector (St Jude Medical Inc.) with surgical inventions.

**Material and methods:** From June 2002 to May 2003, 37 Aortic connector (AC) was used in 71 Off-pump CABG (OPCAB) cases. Mean age was  $76\pm 6$  years and mean bypass graft was  $2.7\pm 0.8$  per case. Target arteries of the AC were RCA-18, D1-3, OM-2, and Cx.-17. Sizes of AC were 4.5-5.0mm -15, 5.0-5.5mm -14, and 5.5-6.0mm -8. Intra-operative direct aortic echography was performed in all cases to detect a safe anastomosis site. After AC was deployed, saphenous vein graft (SVG) was attached onto the myocardial surface by fibrin glue with natural routing to avoid kinking. Results: Intra-operative flow through the SVG was  $39\pm 24$ ml/min. Graft occlusion within two months was observed in 2 out of 37 AC. No thrombo-embolic complication was occurred. No operative death was counted.

**Conclusions:** Short-term results of AC for OPCAB were satisfactory in Japanese patient.

## ABSTRACT 23

### USEFULNESS OF ON-PUMP BEATING AORTIC VALVE REPLACEMENT FOR HIGH-RISK PATIENTS

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Tetsuji Kawata, Takashi Ueda,

**Background:** Recently, on-pump beating valvular surgery has been reported. We applied this technique for high-risk patients with severe AR.

**Case 1:** 37-year-old. He was suffering from acute aortic valve endocarditis with the annular abscess. Preoperative BNP was over 2000 pg/mL. Preoperative SpO<sub>2</sub> was 61% under mechanical ventilation.

**Case 2:** 72-year-old. He underwent CABG previously. The LITA-LAD and SVG-OM were patent.

**Case 3:** 28-year-old. He underwent aortic valve-sparing operation for Marfan syndrome.

**Surgical procedure and result:** In all cases, under a full median sternotomy, total normothermic cardiopulmonary bypass between the aorta and both venae cava was established. In case 2, the dissection and proximal control of the patent grafts was not performed. Coronary perfusion catheter was inserted into the CS directly. Using the retrograde continuous coronary perfusion with the normothermic oxygenated blood under the aortic clamp, cardiac beating was maintained. Perfusion flow (300-800 mL/min) was regulated to keep sinus rhythm beating and intra-coronary sinus pressure below 120 mmHg. In all cases, uneventful AVR under normal sinus rhythm was performed and postoperative recovery was satisfactory.

**Conclusion:** We believe that on-pump beating AVR can be one of the options to these high-risk patients.

## ABSTRACT 24

**ENDOSCOPIC PERFORMANCE IN A NON-SURGICAL TRAINING MODEL USING FOUR DIFFERENT VISUALIZATION SYSTEMS**

Arndt-H Kiessling, Frank Isgro, Udo Weisse, Markus Blome, Andreas Lehmann, Werner Saggau

**Objective:**

Endoscopic visualization is crucial, especially in the field of minimally invasive- or robotic surgery. We compared four different optical systems in a non-surgical training model.

**Methods:**

80 medical untrained staff members with no endoscopic experience were enrolled to perform two skill tests, object-pick-up and spatial orientation in a trainer box. The study participants were randomly assigned to four groups. Group 1: Storz 2D system; Group 2: Storz 3D tricam system; Group 3: Vista SCC with Crystaleyes stereographics; Group 4: Smith Nephew Digital 3 chip Dyonics ED3. Polarization glasses were necessary for 3D impressions.

**Results:**

The time needed to complete the initial, linear skill tests was similar using 2D or 3D conditions. The fastest completion of the spatial skill test was performed in group 4. For both tests, the average performance time decreased significantly for the second attempt regardless of which system was used. The participants of group 2 and 4 described the best resolution and depth perception followed by group 3 and the 2D team.

**Conclusions:**

The Smith Nephew digital 3D showed the best 3D-visualization results. The device is limited by weight and endoscopic diameter (12mm) compared to Storz and Vista

## ABSTRACT 25

### REMAINING CORONARY ARTERY MOTIONS WITH FIVE DIFFERENT STABILIZATION TECHNIQUES

Arndt-H Kiessling, Frank Isgro, Udo Weisse, Markus Blome, Kai-U. Kretz, Werner Saggau

**Objective:** The ventilator assisted model for offpump surgery (VAMOS) use hearts of meat production animals (pigs) in which tracheotomy tubes are inserted both in aortic and pulmonal position and connected to a standard respirator. "Air beats" triggered by the frequency of the respirator occur in the ventilated heart.

**Methods:** Five different stabilizers ( with suction: Medtronic Octopus 3 and 4, Guidant Vortex; without suction: Origin, Computermotion Atlas) were placed on the LAD region of the pig heart consequently and quality of stabilization measured by video control analysis. For analysis, relative remaining motion (RRM) of the target area was compared.

**Results:** Vertical RRM were nearly identical in the five groups. The suction based products trended toward better performance without reaching significant differences. Horizontal RRM were pronounced in the pressure alone devices with a statistical difference in favor of the suction device. The Guidant Vortex had the best stabilization results without reaching a significant level compare to the Medtronic products.

**Conclusion:** Stabilizers with suction foets showed the best results in vertical- and horizontal reduction of heart motions. VAMOS is an useful and non-expensive tool for valid and safe quality control of new cardiac surgical devices.

## ABSTRACT 26

**OFF-PUMP CABG REVEALS LESS PRONOUNCED EFFECTS THAN ASPECT ON MARKERS OF CONTACT ACTIVATION, INFLAMMATORY RESPONSE, COAGULATION AND CEREBRAL ISCHEMIA COMPARED TO ON PUMP**

Frank Isgro, Arndt-H.Kiessling, Markus Blome, Ohmed Assaf, Udo Weisse, Werner Saggau

**Objectives:** Off-pump coronary artery bypass (OPCAB) is still not widely introduced. The pathophysiological mechanisms on which the improved outcome is based are not clearly identified.

**Methods:** We investigated in 10 patients undergoing off-pump coronary revascularisation intra- and postoperatively the change in markers of contact activation (FXII, C3a), coagulation (FXIII, Fab 1/2), inflammatory response (Elastase, IL6, Procalcitonin), astroglial damage (S-100b, MMST) and myocardial ischemia (CK, CK-MB, TropT) and compared the data with 10 on-pump CABG patients.

**Results:** Most interestingly we found no group differences in FXII, which plays a major role in contact activation after exposition of blood to foreign surfaces of the extracorporeal circuit. C3a activation showed only weak statistical difference. Coagulation- and cerebral markers remained nearly unaffected with at least a more concise increase of Fab 1/2 after on-pump surgery. Inflammatory response could not be detected by IL6, but Elastase rised moderately in on-pump patients. As expected, myocardial ischemia markers were significant lower in OPCAB patients.

**Conclusion:** Focus on this study was not the potential improvement of clinical results in patients after off-pump revascularisation, but tried to question the pathophysiological correlate. Considering the fundamental differentiation of the groups with the missing extracorporeal circuit and its proved biochemical consequences, the nearly not existing statistical differences are difficult to explain.

## ABSTRACT 27

**VI. KOLESOV: FOUR PARAGRAPHS FROM THE TEACHINGS  
On the occasion of 100 birthday jubilee of V.I.Kolesov**

Evgenii V. Kolesov, MD

**Objective.**

To familiarize some overlooked pages from the vast scientific legacy of V.I.Kolesov.

**Material and methods.**

**1.** V.I.Kolesov used facilitated distal coronary end-to-end anastomosis with one-shot and very good developed staplers. The background for such approach based on the fact that anastomoses of end-to-side type often provoke proximal occlusion of the coronary arteries in the site of stenosis and actually are transformed in the end-to-end type. In case of total primary occlusion there is a strong reason to apply end-to-end anastomosis below the occlusion. The procedure answers the principals of MIDCABG and gives way for endoscopic and robotic techniques.

**2.** V.I.Kolesov patented new operation – retrograde IMA-coronary artery anastomosis. The idea is to connect peripheral stump of IMA after its standard harvesting with a distal portion of the coronary system. The arterial pressure in the stump must be higher than in the target coronary artery. This operation was profoundly studied experimentally and had been used in the restricted cohort of patients. It is expedient to stretch the studies of this operation.

**3.** V.I.Kolesov installed routine preoperative control of IMAs by means of simple hemiselective method: standard coronarography was finished by installing of the coronary catheter in the subclavian artery and a portion of contrast media was injected. Knowledge of the real condition of potential grafts was basic for precise planning of the procedures.

**4.** Among control tests V.I.Kolesov proposed epicardial ECG for checking and monitoring of myocardial ischemia in the area supplied by the target coronary artery. Sensitivity of this simple method is very high: changes of ischemic signs are registered in seconds. The epiECG electrodes treated the same way as pacemaker electrodes and serve to control the ischemic situation during 2-3 postoperative days.

**Conclusion.**

Scientific doctrines of V.I.Kolesov contains important proposals for the practical usage and further development.

## ABSTRACT 28

**STENTGRAFT IMPLANTATION IN THORACIC AORTA – ACTUAL RESULTS AND EUROSCORE RISK STRATIFICATION SCALE.**

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**OBJECTIVE:** Aim of the study was to compare the actual complications and mortality rate with risk predicted by EUROSCORE risk stratification scale.

**MATERIALS AND METHODS:** Since January 2002 17 patients were proposed an endovascular treatment of descending thoracic aorta. In the group there were 2 women and 15 men, mean age was  $53,2 \pm 14$  years. Five patients were treated due to chronic posttraumatic aneurysm, four were with atheromatous aneurysm, six with dissection (Type B Stanford), one with intramural hematoma, one with aneurysm that developed 28 years after treatment of coarctation of aorta. Patients' risk of complication was calculated using an EUROSCORE risk scale.

**RESULTS:** All patients were successfully discharged from hospital after  $9 \pm 2$  days (procedure time  $2,5 \pm 0,4$  h). One patient had stentgraft displacement, that was treated with additional stentgraft implantation. There were no neurologic complications. All the patients were in high or medium risk according to EUROSCORE.

**CONCLUSION:** EVAR is mini invasive procedure that offer low mortality and risk of serious complications, allows for short hospital stay of the patient.

## ABSTRACT 29

**STRAIN RATE IMAGING FOR QUANTITATION OF MYOCARDIAL CONTRACTILE IMPROVEMENT AFTER SURGICAL VENTRICULAR RESTORATION (SVR) MODO MENICANTI IN POSTINFARCTED PATIENTS:**

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SVR has been proved an effective surgical procedure in heart failure patients with anterior akinesia/dyskinesia. This technique, by reshaping the ventricle, reducing volumes, reorienting myocardial fibers and subsequently by decreasing wall stress improves both regional and global functional echo indices. Ultrasound strain rate is the only available bedside imaging technique, which can quantify regional LV wall function by measuring the magnitude and rate of myocardial fibers deformation. Twenty heart failure patients (2F, 58±6 y, NYHA I-IV, EF-34±8 % EDVI- 109±35 ml/m<sup>2</sup>, ESVI- 73±32 ml/m<sup>2</sup> ) with dominant anterior akinesia underwent LV restoration using a calibrated Mannequin <sup>TM</sup> . Early (up to 10 days ) LV assessment was performed by using apical transthoracic echo. In this serious of patients the clinical results were very encouraging: 19 pts survived early postoperative period. Echo indices were as follow: EF - 43±6% , EDVI- 61±10 ml/m<sup>2</sup> , ESVI- 35 ±7 ml/m<sup>2</sup> The mean systolic strain rate(- 0.48 vs- 0.70 Hz, p=0.001) for the lateral wall increased as well as systolic strain (-0.05 vs -0.09,p=0.004) for the intraventricular septum. Using an ultrasound strain rate indices, it is now possible to measure recovery of the myocardial contractile function and document early beneficial effects of LV reshaping and volume reduction.

## ABSTRACT 30

**STRUCTURAL ALLOGRAFT FOR THORACIC SPINAL IMPALEMENT INJURY—CASE REPORT**

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A 69-year-old man presented to the emergency department after a bilateral thoracic impalement injury. The patient fell into a construction site while riding a bicycle. A 1.5-cm diameter steel rod was impaling the patient through the right chest. The steel rod was cut on the scene, and he was brought to the hospital immediately. After left tube thoracostomy was placed, exploration of the right chest was carried on which revealed the projectile passed the right chest, right upper lobe and the thoracic vertebral body. Under direct vision the steel rod was removed, some dark red blood gush out from the defect of the vertebral body. Because persisted oozing from the bone marrow of the vertebrae, we used a segment of an ulnar bone allograft to impact the defect.

The patient was repositioned, and a left posterolateral thoracotomy was performed. In the left chest, the allograft was seated well in the vertebral body and a laceration in the left lower lobe was noted. We speculated that the steel rod passed through the vertebral body, displaced the descending aorta forward, and into the left lower lobe. Tetanus prophylaxis was administered as well as intraoperative broad-spectrum antibiotics were continued for 1 week. At 3 years follow-up, he was well and the computed tomographic scan showed the structural allograft kept the vertebral body free from collapse.

## ABSTRACT 31

**MICROPOROUS POLYSACCHARIDE HEMOSPHERES, A PLANT BASED TOPICAL HEMOSTATIC AGENT, FOR BLEEDING CONTROL OF THE STERNUM**

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**Introduction:** Profuse bleeding after sternotomy is routinely controlled with bone-wax (BW). Unfortunately, bone-wax may cause non-union of the sternum and infections. Microporous Polysaccharide Hemospheres (MPH), a resorbable plant based hemostatic agent, offers a novel technique to control sternal bleeding during cardiac operations. This study evaluates the efficacy and safety of MPH as a topical hemostyptic first time in human use.

**Methods:** Eighty patients with beating heart revascularisation were included in this prospective randomized trial. In 40 patients (pts; group-MPH) the MPH (Arista<sup>TM</sup>, Medafor Inc., Minneapolis, MN) was applied directly after sternotomy. The other 40 pts (group-BW) were treated with standard use of BW. The two groups did not differ in demographic and intraoperative data (age: 68.5±6.4 vs. 67.6±7.6years; grafts: 2.9±0.6 vs. 3.2±0.8). All patients were operated with an activated-clotting-time of >350 sec and Protamine was given after revascularisation was completed.

**Results:** Satisfactory bleeding control of the sternum was achieved in 37 pts (93%) with MPH and in 39 pts (98%) with BW. Application of BW was rated easier, but destruction of sternal spongiosa in osteoporotic bone was more common using BW ( $p < 0.05$ ). The intraoperative decrease of Hemoglobin (Hb) was not significant (n.s.) between the groups (MPH: Hbpreop 13.0±1.3mg/dl to Hbpostop 10.5±1.5mg/dl vs. BW: Hbpreop 12.9±1.6mg/dl to Hbpostop 9.9±1.6mg/dl). Autologous transfusion (cell-saver) (MPH: 194±150ml vs BW: 268±245ml), allogenic blood-units (MPH: 2 pts vs. BW: 3 pts) and postoperative blood loss (MPH: 880±460ml vs BW: 830±520ml) did not differ significantly. We observed no allergic reaction, no reoperation due to graft failure and no death in either group. There was one resternotomy due to sternal instability in each group. Only in group-BW two wound-healing problems occurred (n.s.).

**Conclusion:** MPH can be applied safely and effectively and can replace bone wax.

## ABSTRACT 32

**MESOTHELIOMA SEEDING RISK IN EXTRACORPOREAL CIRCULATION**

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To valuate the cytological permeability, we tested 5 bubbles trap filters with 30 minutes of pleural and peritoneal effusion circulation with mesothelial 40-45m cells suspension.

Fifty reservoir and bubbles trap, 38m filters, of patients with story of cancer resections, were cytologically examined after a mean of 106 minutes (52-150) of E.C.C. at a mean temperature of 320 C (28-35).

**RESULTS**

The cytological test permeability, demonstrated large presence of cells in post-filtration fluids.

All "in vivo" cases had no evidence of cancer cytology in filters, but in 42 cases, mesothelial cells were observed in filters. In 36 of them, pleural space opening was recorded during surgical manoeuvres. Only in 8 cases pleural-pericardial space contamination was demonstrated.

In 3 cases, in reservoir filters, presence of normal epithelial or glandular agglomerate was observed.

In 1 case presence of a mesothelial agglomerate was observed in bubble trap. A 40m cell couldn't be classified.

**CONCLUSION**

Cells with diameter larger than filter pores can pierce the filter barrier. We didn't observe cancer cells in filters, but the mesothelial not filterable cells, demonstrate the possibility of tumour, like mesothelioma, seeding. The beating heart surgery avoiding extracorporeal circulation is oncologically superior.

## ABSTRACT 33

**LEFT VENTRICULAR RESTORATION / REMODELLING**

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**Objective.** Left ventricular remodelling after myocardial infarction is recognized as an early adaptive mechanism that later results in adverse physiologic changes. Ventricular restoration is aimed at altering the volume and shape changes that follow myocardial infarction. The methods to achieve the elliptical, shape are not well defined.

**Methods.** We present the rationale and techniques for returning the globular remodeled ventricle to a more elliptical shape.

We report a small series of 15 patients who underwent revascularization & left ventricular reconstruction using surgical anterior ventricular endocardial restoration (SAVER) or inferior or inferolateral wall restoration. 6 of the patients required mitral valve repair concomitantly. The patients requiring mitral valve repair were divided into 2 categories, one with leaflet and chordal deformity needing internal repair and the other with annular dilatation, which were given posterior basal stabilization. All cases were treated by merit and 8 cases were operated on a perfused beating heart, 5 required cardioplegic arrest and 2 had surgery on a beating heart which was a mixture of posterior basal stabilization and external inferior wall plication using a modified stabilizer

**Results.** One patient died following inferior wall restoration and a concomitant mitral valve repair and CABG. 6 patients required IABP. Postoperatively ejection fraction increased from  $20.7\% \pm 8.3\%$  to  $30\% \pm 7.5\%$  and left ventricular end systolic volume decreased from  $115 \pm 68$  to  $70 \pm 38$  ml/sq.

**Conclusions.** Correct assessment of ventricular volumes and correction of mitral valve function is essential for good outcomes in left ventricular restoration procedures. Surgical approach can vary on the merits of individual cases

## ABSTRACT 34

**INTRA-OPERATIVE FLOWMETERY OF GRAFTED VESSELS**

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In this trial with intra-operative flow metery of grafted vessels in 20 and 60 min. after weaning of CPB mid-term patency of these grafted vessels had been evaluated. There was a prospective trial on 580 consecutive CAD's patient who underwent CABG operation in 60 month period.

Mean grafted vessels was 3.2 / patient, mean arterial grafts (except IMA) was 0.8 / patient. All patients were followed up to 1 year in 1, 3, 6 and 12 month period with ECG and echocardiography and 72% of patients underwent angiographic examination in 6 and 12 month post-op.

Grafted vessels were divided in 3 groups in flow metery:

Group A: Blood flow > 60 ml/min (excellent)

Group B: Blood flow = 20 – 60 ml/min (acceptable)

Group C: Blood flow < 20 ml/min (undesirable)

And over ally more than 1800 grafts have been evaluated with fellow metric study. The result of this trial shows with high confidence that intra-op flow metery in 20 and 60 min. post-weaning of CPB is an easy, inexpensive and safe method of assumption of graft patency in early and mid-term post-op and if an important grafted vessel has undesirable (Group C) blood flow, it needs to revise and correct in the first operation,

## ABSTRACT 35

**EVOLUTION OF OFF PUMP CABG IN NATIONAL HEART INSTITUTE**

Mohamed AHMED-NASR, Imbaba. Cairo. Egypt

**Background:** Indications of OPCABG have become increasingly common during the last three years in National Heart Institute. Philosophy of vascularization of calperate vessels taken from cardiologists has greatly increased indications of OPCABG. Rationale of OPCABG, type of patients and results of both OPCABG and classic CABG done during years 2000, 2001 and 2002 in National Heart Institute are shown in this study

**Methods:** During the 3 years a total number of 1754 CABG were done by the surgical team of NHI, 798 in year 2000, 494 in 2001 and 462 in 2002. Out of the 798 cases done in 2000, 663 (83%) were classic CABG and 135 (16.9%) OPCABG. Out of the 494 cases of 2001, 316 (63.9%) were classic CABG and 178 (36%) were OPCABG. Out of the 462 cases of 2002, 204 (44.1%) were classic and 258 (55.8%) were OPCABG. The mean EF of OPCABG pts was 22% while it was 42% of classic CABG pts. The mean age was 65 years of OPCABG pts while it was 55 of classic CABG pts. Unstable angina was present in all groups. Presence of recent infarction (less than 48 hours) was 26% in OPCABG pts and not present in classic CABG pts. Renal insufficiency was present in 58 pts (12%) of OPCABG pts and was not present in classic CABG pts. COPD (lung disease) present in 106 pts out of the 1754 (6%) but did not have impact on OPCABG indication. Carotid arteries lesions were present in 403 out of 1754 (23%) 166 OPCABG pts and 237 Classic CABG pts. None of the 1754 pts had any pre operative neurological lesion

**Surgery:** OPCABG year 2000 135 OPCABG 135 had LIMA on LAD; 46 had LIMA on LAD + SVG on RCA. Year 2001 178 OPCABG 178 had LIMA on LAD; 86 had LIMA on LAD + SVG on RCA; 34 had LIMA on LAD + SVG on RCA + SVG on D1 or 2. Year 2002 258 OPCABG 258 had LIMA on LAD; 166 had LIMA on LAD + SVG on RCA; only 8 pts had LIMA on LAD + SVG on PDA or an OM branch while 144 pts had LIMA on LAD + SVG on RCA + D1 or D2. Classic CABG had a mean number of 3 grafts per patient

**Results:** Total mortality 102 pts out of 1754 pts (5.8%). Total mortality of OPCABG pts 3 out of 598 (0.5%) Total mortality of classic CABG 99 out of 1156 (8.5%). Cause of mortality in OPCABG one case of severe post operative vasodilatation and 2 from renal failure. Per operative infarction 109 pts out of 1754 pts 8 pts out of 598 OPCABG (1.3%) and 101 out of 1156 classic CABG (8.7%).

Post operative freedom from angina( 3months follow up ) 502 out of 598 (83,9%) in OPCABG pts and 956pts out of 1156of classic CABG (82,6%) Post operative neurological complications 2 cases of the OPCABG series out of 598 ( 0,3%) and 52 pts out of the 1156 classic CABG (4,5%). Mean hospital stay 6 days for OPCABG and 12 days for classic CABG. ICU stay 24 hours for OPCABG and 36 hours for classic CABG . Cost of classic CABG to OPCABG is debatable

**Conclusion** Indications of OPCABG has greatly increased with growing team experience. It allowed rapid recovery in indicated patients and permitted extension of indications of CABG to high risk patients with low ejection fraction and renal insufficiency. With improvement of techniques facilitating exposure and stabilization of posterior arteries indications of greatly extend leaving classic CABG for patients with diffuse lesions necessitating endarterectomy

## ABSTRACT 36

**THERMO WRAP TECHNOLOGY FOR NORMOTHERMIA: EFFECTS ON IMMUNE RESPONSE REGULATION AND MYOCARDIAL INJURY DURING OPCAB**

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**Background:** Perioperative hypothermia is associated with impaired immune function. We assessed the effects of maintaining normothermia using Thermo wrap technology on immune function and its effects on myocardium during OPCAB surgery as assessed by Cytokines and Troponin I levels, in a multiple center study.

**Methods:** Ninety patients undergoing OPCAB surgery were randomized into two groups and warmed perioperatively with Allon Thermo-wrap technology (AT, n=60) or convective warmed air technologies, routinely used (RTC, n=30). AT used patients' rectal (core) temperature values to maintain water temperature in a circulating garment at 37°C. Patients temperature, cardiac Troponin I (cTn-I) and interleukin (IL)-6, -8 and -10 levels were assessed perioperatively.

**Results:** IL levels were higher than baseline levels in both groups at the end of surgery ( $P < 0.001$ ) while only IL-6 levels found higher in the RTC group at that point. Both groups' cytokines levels correlated with the duration of the procedure. cTn-I levels were elevated during the entire perioperative period, suggesting some degree of myocardial damage: they correlated with IL-6 levels but did not correlated with IL-8 or IL-10. There was no correlation between the levels of any investigated cytokine and CI or SVR.

**Conclusions:** Significant alteration of the immune regulation was observed in OPCAB surgery as expressed by elevation of the investigated cytokines. The clear and significant correlation between IL-6 and cTn-I suggests a direct damaging effect of IL-6 on the myocardium. Maintenance of normothermia using Thermo-wrap technology throughout the entire perioperative period showed reduced levels of IL-6, suggesting enhanced immune response to stress and lesser direct damaging effect on the myocardium.

## ABSTRACT 37

**BENEFITS FROM ON vs. OFF-PUMP CORONARY BYPASS SURGERY - EXPERIENCE FROM OVER 1000 PATIENTS.**

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**BACKGROUND:** Off-pump (OPCAB) technique has brought a new input to decrease the number of complications after coronary surgery. The aim of our study was to evaluate the outcome after surgery and incidence of postoperative complications using OPCAB and classic CABG technique.

**METHODS:** There were investigated 1038 consecutive patients who underwent direct myocardial revascularization without CPB and 1669 patients operated with CPB in period from March 2001 to October 2003. Patient mortality and 20 variables representing patient characteristics, comorbid conditions and complications were analyzed. The EuroScore table was compared to estimate mortality rate. Patients were divided into three groups (LM disease, EF<35%, elderly patients) and were also analyzed as a whole material.

ABSTRACT 38

**A NEW METHOD TO DIAGNOSE CORONARY ARTERY DISEASES WITH THE 16-MSCT**

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**Objective:** Multi-Slice-CT (MSCT) is a promising technique although the spatial reconstruction has remained limited to assess coronary stenoses. Aim of this study was to establish a new method in evaluating of MSCT-Images.

**Methods:** The new method is illustrated on one patient scheduled for coronary artery bypass grafting (CABG). ECG-gated 16-slice MSCT with 0.375sec rotation time (16x0.75mm collimation) performed with breath hold technique.

In order to evaluate stenoses coronaries were reconstructed in two planes at 90° angle with a multiplane reconstruction (MRT). For better orientation longitudinal and transverse section of the coronary was performed in volume rendering mode (VRT) which allowed orthograde view to the lumen.

**Results:** Total examination time was 15min with a scan time of 35sec. Heart rate during scanning was 68/min. All stenoses were detected in MSCT on the same location with 86% accuracy compared to invasive angiography. Plaques were classified in soft and hard calcified lesions in MSCT.

**Conclusion:** This new method is a valid possibility to evaluate MSCT examinations at the state-of-the-art

## ABSTRACT 39

**RECOVERY OF LEFT ATRIAL MECHANICAL FUNCTION AFTER EFFECTIVE SURGICAL MICROWAVE ABLATION OF CHRONIC ATRIAL FIBRILLATION IN PATIENTS UNDERWENT MITRAL VALVE OPERATION-ONE YEAR EXPERIENCE.**

D.Puszczewicz, M.Zembala, R.Przybylski, T.Kukulski, R.Lenarczyk, Z.Kalarus

**Background**

Microwave ablation /MA/ has been established as safe and efficient procedure for the treatment of chronic AF /cAF/ in patients/pts/ with mitral valve disease /MVD/.Restoring of sinus rhythm is of major importance in pts with additional mitral valve disease but the time and predictors of recovery atrial transport function are unknown.

**Material and methods**

We prospectively analyzed our group of 12 male /57,1%/ and 9 female /42,9%/. To examine the serial changes in atrial transport function after microwave ablation out of 21 pts who underwent MA, 15 pts were assessed by transthoracic Doppler echocardiography 1,6, 12 months after surgery. The atrial filling fraction, peak A/E velocity ratio and A wave velocity were determined from the flow velocity spectra across the mitral and the tricuspid valves.

**Results**

The left atrial /LA/ transport function recovered in 10 pts /71,4%/, and right atrial /RA/ in 12 pts /85,7%/ up to 30 days post surgery. After 6 months mechanical function were observed in 78,5% and 92,8% pts respectively. One patient died due to acute endocarditis after 2 months. There were no changes in atrial function after 1 year.

**Conclusions**

Surgical MA restore atrial transport function but in different time after operation. The only predictor correlate with recovery of LA transport function was LA diameter over 6.1 cm.

ABSTRACT 40

**EARLY CLINICAL OUTCOME IN PATIENTS WITH AND WITHOUT SEVERE CONCOMITANT DISEASES UNDERGOING ARTERIAL OFF-PUMP REVASCULARIZATION**

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**Objective:** The clinical outcome of patients with (group A) or without (group B) severe concomitant diseases undergoing complete arterial off-pump revascularization was investigated.

**Methods:** From January 1997 to November 2003 a total of 487 consecutive patients were treated with complete arterial off-pump revascularization. In all patients coronary revascularization was performed with a reusable stabilizer and in 'aortic non-touch technique' using single (n=344, 71%) or double (n=143, 29%) internal mammary arteries as in-situ, sequential, or t-grafts. 270 patients (55%), mean age 68.6 +/- 9.4 (25-90) had concomitant diseases (group A) such as renal impairment (n=71), diabetes mellitus (n=91), peripheral arterial vascular disease (n=57), calcification of the ascending aorta (n=35), central neurological diseases (n=61), or others. Group B patients (n=217), mean age 62.5 +/- 9.6 (35-88) had no concomitant diseases.

**Results:** All operative procedures were performed without intraoperative complications. Conversion to on-pump surgery was necessary in 1.9% (5 cases of group A). Group A vs B respectively, mean number of grafts was 1.7 +/- 0.8 vs 1.6 +/- 0.6, thirty-day mortality 0.7% vs 0.0%, postoperative morbidity such as renal failure 0.7% vs 0.0%, stroke 0% vs 0.5%, myocardial infarction 0.4% vs 0.5%, re-exploration 2.2% vs 3.2%, transfusion 13.3% vs 7.4%, atrial fibrillation 6.3% vs 5.1%, or re-intubation 3.3% vs 0.0%. Mean ICU stay was 2.0 +/- 3.4 vs 1.2 +/- 0.8 days, and hospital stay was 9.7 +/- 5.0 vs 7.3 +/- 2.1 days.

**Conclusion:** Arterial off-pump revascularization can be performed in patients with and without severe concomitant diseases with excellent early results.

## ABSTRACT 41

**PORT ACCESS IN MINIMALLY INVASIVE CARDIAC SURGERY.**

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**Introduction:** Peripheral access cardiopulmonary bypass (CPB) and endoclamping of the aorta are prerequisites for performance of minimal access or totally endoscopic cardiac surgery on the arrested heart. Our experience with the ESTECH™; remote access perfusion (RAP) cannula in arrested heart totally endoscopic coronary bypass grafting (AHTECAB) and ASD repair via mini – thoracotomy and totally endoscopic ASD repair is presented.

**Patients and Methods:** Remote access CPB was performed in 30 patients (17 male), aged 56 (21-70) years using the ESTECH™ RAP cannula. Operations were 20 AHTECAB, 5 ASD repair via minithoracotomy, and 5 robotically assisted totally endoscopic ASD repairs. Intraoperatively the patients were monitored by TEE and bilateral radial artery lines for correct placement of the balloon in the ascending aorta.

**Results:** We experienced neither vascular perforation nor dissection of the aorta. Full CPB was achieved in all patients. Fluoroscopic visualisation of the guide wire was necessary in 2/30 cases, due to location in a supraaortic branch. Once the aortic occlusion balloon was placed, repositioning was required in none of our cases. In one AHTECAB case rupture of the balloon occurred before starting the anastomosis. The cannula was replaced and the AHTECAB could be finished without complications.

In one patient inguinal wound infection occurred which could successfully be revised surgically. No perioperative myocardial ischemia, stroke or critical leg ischemia occurred and there was no hospital death.

**Conclusions:** CPB and cardiac arrest can adequately be performed via a femoral access in minimally invasive cardiac surgery using the ESTECH™ RAP system. Intense preoperative patient evaluation and intraoperative monitoring are absolute prerequisites for safe application of the technique.

ABSTRACT 42

**ADULT PATENT DUCTUS ARTERIOSUS: SUCCESSFUL SURGICAL THERAPY IN A RARE PRESENTATION OF A MISSED FINDING**

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Delayed clinical presentation of PDA in adults is very rare. Clinical Presentation in adults consists of either aortic or pulmonary valve endocarditis. In this case, a 34 year old with known history of rheumatic heart disease in childhood and chronic heart failure for 5 years presented with acute heart failure and no evidence of PDA on prior echocardiography . Blood cultures grew staph epidermidis and echocardiography exhibited infective endocarditis of both aortic and pulmonary valves in the context of large and severely inflamed PDA.

Cardiopulmonary bypass was utilized to interrupt the PDA from within pulmonary artery because of inability to ligate the severely inflamed and calcified PDA prior to bypass. Combined pulmonary and aortic valve replacements and high dose inotropic support was performed. Dialysis was utilized for renal failure. Patient recovered and was discharged 10 days postoperatively. 6 months later the patient is asymptomatic and renal failure recovered. The history and surgical management is discussed with an updated review of the literature.

## ABSTRACT 43

**CORONARY ARTERY REVASCULARISATION IN NONAGENERIANS – OWN EXPERIENCE.**

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**OBJECTIVE.**

We analyzed results of cardiac revascularization in nonagenarians referred for CABG in our institution.

**MATERIAL and METHODS.**

28 pts. ( 25M/3F), mean age 84.5 years, who underwent surgical revascularization between in years 2001-2002 were evaluated. Status of procedure was emergency in 4 pts. (14.3%), and urgent in 21 pts. Pre-operative NYHA functional class 3 or 4 was found in 24 pts. (85.7%). Average Euroscore was 9.5 points. LITA were used for LAD grafting in 15 cases, and the average number of grafts were 3.2 (range 2-5) per patient. Extracorporeal circulation was used in all cases. Early and late mortality, respiratory problems, low cardiac output, cardiac arrhythmias, neurological complications, renal insufficiency, return of ischemia and functional class before and after the procedure were a matter of analysis.

**RESULTS.**

Follow-up was 24 months. 2 early deaths occurred (7.1%) – both were due to MOF caused by a low cardiac output. Low cardiac output syndrome was successfully treated in another 15 pts (IABP was used in 3 pts. Exertion of angina was observed only in 1 pt. 18 pts. (64.3%) were in NYHA class 2, and 4 (14.3% ) in class 3. Actuarial survival was 92.9% during 1st and 85.7% during 2nd year after surgery.

**CONCLUSIONS.**

Despite slightly higher risk, results of myocardial revascularization in nonagenarians are acceptable.

## ABSTRACT 44

**AWAKE SURGERY; OFF-PUMP BYPASS GRAFTING**

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**Background:** Myocardial revascularisation in awake settings has his own benefits such are: avoidance of extracorporeal circulation; unnecessarily of general anaesthesia, endotracheal intubations and mechanical ventilation, with a complete off-pump revascularization.

**Material and methods:** During last year in a high epidural analgo-anaesthesia, we operated 7pts (3female, 4male). The epidural catheter was placed between Th1-Th2 inter-vertebral space, according a method of resistance and a getting a drop

Main target was somato-sensory and motor block with a 20ml 0.25% Bupivacain and 100 µgr. Fentanyl, 5ml/min. Pts pain had been measured by visual analgo-scale.

**Results:** Complete sternotomy was performed in 7 pts, 1 pt was intubated after sternotomy due to analog pain index >7, a temporary haemodynamic instability. All pts get LITA-LAD bypass grafting in a off-pump technique, (mean time of bypassing-  $8.7 \pm 3.4$ min; mean time of op.duration-  $45.5 \pm 12.7$ min) In 2pts we entered left pleural spaces. One patient left the operating room by walk. Drains were pull out first post op. day in all pts. In hospital stay 2,5 days

**Conclusion:** Awake surgery ensures rrespiratory and haemodynamic stability with a decreased stress, good pre and postoperative analgesia, quick and effective recovery with early mobilisation and better economic side with an excellent clinical outcome.

## ABSTRACT 45

**THYROID EMBOLIZATION: A MINIMALLY INVASIVE APPROACH FOR PATIENTS UNDER ANTICOAGULATION**

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**Purpose:** Percutaneous bilateral chemo embolization to prevent bleeding complication of thyroidectomy in a patient under anticoagulation.

**Method:** A 48 year old man with implantable LVAD (terminal cardiomyopathy), AICD (survivor of sudden death) and amiodarone treatment (ventricular arrhythmias Lown IV), presented acute amiodarone induced thyrotoxicosis (AIT) (TSH < 0.05 mU/l, FT4 = 94.6 pmol/l, FT3 = 8.7 pmol/l). Thyroidectomy was not considered because of the high bleeding risk under combined oral anticoagulation and anti-platelet therapy (mandatory under LVAD). Transfemoral embolization of the superior and inferior thyroid artery in a one-stage procedure was performed under local anesthesia.

**Results:** AIT could successfully be controlled by percutaneous embolization, but hormonal substitution had to be started three weeks postoperative. CT scan performed before discharge confirmed on-going regression of the hyperplastic thyroid gland.

**Conclusion:** AIT can be a particularly difficult management problem in patients under anticoagulation. Percutaneous thyroid artery embolization seems to be a valuable treatment option in such patients. Moreover, it can be performed under local anesthesia, which could be a further advantage in critically ill patients.

ABSTRACT 46

**CHRONIC ULTRASTRUCTURAL EFFECTS OF TEMPORARY INTRALUMINAL SHUNTS IN A PORCINE OPCAB- MODEL.**

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Supported by the "Deutsche Forschungsgemeinschaft" AL-562/1-1

**Objective:** Temporary intraluminal shunts (TILS) are routinely used in off-pump revascularisation in order to facilitate the anastomosis while maintaining myocardial blood supply. Whereas tourniquet-occlusion can cause vessel wall trauma, potentially adverse effects of TILS on the coronary intima have not been evaluated yet. This chronic large animal study investigated acute and chronic ultrastructural effects of TILS on the vessel wall.

**Methods:** Four groups of acute and chronic pigs with either tourniquet-occlusion (TOUR) or TILS (40kg; acute: n=12; chronic: n=20) were analysed. Animals underwent median sternotomy, heparine (150 U/kg) administration, and left anterior descending artery (LAD) exposure. In groups TOUR the LAD was temporarily occluded (10min) with a tourniquet. In groups TILS a silicone shunt (1,5 mm diameter, 12 mm length) was placed in the LAD over 10 min, removed, and the insertion repaired. Thirty minutes after reperfusion all acute animals were sacrificed while chronic animals were extubated, kept for 3 months, and then sacrificed. LAD regions of occlusion or placement of the TILS olives were examined histopathologically by scanning (SEM) and transmission electron microscopy (TEM) by a blinded pathologist.

**Results:** In both acute and chronic investigations TILS exhibited significantly less morphological damage than TOUR. In the acute phase significant more "loss of cell junction" ( $p=0.037$ ), "loss of endothelium" ( $p=0.032$ ), and "intimal edema" ( $p=0.037$ ) in TOUR than in TILS was observed. Three months later, characteristic features with a changed pattern were detected: "Vacuolisation of the cell" ( $p=0.03$ ), "loss of cell- junction" ( $p=0.048$ ) and "remove of basal- membrane" ( $p=0.042$ ) as well as "extensive loss of endothel" ( $p=0.003$ ) in TOUR compared to TILS.

**Conclusion:** Intimal lesions occur with both manoeuvres early and late. However, tourniquet occlusion exhibited injuries significantly more often and more severe. Therefore, acute and chronic intimal integrity of the coronary vessel may be better preserved utilizing TILS and may thus have a positive impact on the extent of de-novo stenosis and long-term prognosis of the revascularised region.

## ABSTRACT 47

**A RARE PRESENTATION OF CARDIAC HYDATID CYST: STROKE AND ACUTE AORTIC OCCLUSION**

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Cardiac involvement in hydatid disease is relatively uncommon, occurring in only 0.05 %-2 % of all echinococcosis (hydatid) infestations.

A 16-year-old boy without significant medical history was admitted .Due to acute completed right hemiparesis with aphasia. Magnetic Resonance(MR) investigation disclosed ischemic infarct on the territory of middle cerebral artery. Two-dimensional echocardiography revealed a 5x5 cm cavitory lesion with a 3x3 cm echogenic solid, spheric, free mass floating in the cavity at apico-posterior wall of the left ventricle.Chest roentgenogram revealed normal lungs and cardiac silhouette.Abdominal ultrasonography showed multiple cystic lesions in the liver.

The operation was performed through a median sternotomy and cardiopulmonary bypass was initiated.During the exploration the prominent,ivory,pericystic fibrous tissue was identified at the apico-posterior wall of the left ventricle and incised. A 5x5 cm cavity was entered.Absence of germinative membrane ,which was seen in echocardiography the day before ,was striking .There was a hole in 1x1,5 cm diameter at the base of the cavity. The germinative membrane was also not present in the left ventricle which was inspected through the widened hole between two cavities. This opening was closed with separate pledgeted sutures. The pericystic layer was sutured with pledgeted horizontal mattress stitches to obliterate the cavity.

Following termination of cardiopulmonary bypass both femoral pulses could not be palpated. Doppler investigation on the operating table revealed distal abdominal aortic occlusion at the level of renal arteries to the bifurcation.Through laparotomy,aortotomy was performed, and the germinative membrane enucleated. Aortotomy was closed with running sutures. The hydatid cysts in the liver were left in situ for a second-stage operation. After the operation, all peripheral pulses were present .

Postoperative course was uneventful. Albandazole treatment (10 mg/kg/day) was continued postoperatively.

In conclusion ruptured cardiac hydatid cyst should be considered in young patients with stroke or having a peripheral or pulmonary embolism especially come from areas echinococcosis endemic.

## ABSTRACT 48

**RIGHT VENTRICULAR TEAR ON STERNAL REENTRY: A SIMPLE SOLUTION TO A COMPLEX PROBLEM**

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CMC Parly 2 , Institution Saint Joseph

Right ventricle tear during cardiac surgery re-operations is a dreadful complication. It places the surgeon in a difficult situation, being faced with a cataclysmal haemorrhage without the possibility to maintain the patients haemodynamic. Initial circulatory arrest technique under femoro-femoral extra-corporal circulation was proposed but if it is systematically used, its disadvantages regarding morbi-mortality become widely greater than the advantages it provides. Initial sternotomy is therefore recommended by most surgeon teams. To face up to the exceptional complication, most often fatal, of right ventricle tear we propose a simple but effective technique.

**Method:** During the right ventricle anterior wall tear which can reach the tricuspid, any dissection attempt to control aorta and right atrium cordis is impossible due to haemorrhage, pressure decrease and adherences. The only solution is to connect a femoro-femoral extra-corporal circulation in emergencies, but time is often limited.

We propose, based on two successful experiences, to pass 3 steel wires firmly grasping the skin and intercostal spaces, to bring closer the sternal sides after having tightened up the wires. This operation provides immediate haemostasis and allows the patient to be placed under regulated hypothermia, before any attempt of sternal reintroduction on circulatory arrest.

**Comments:** The problem of the sternal reintroduction was approached many times in literature. Many tools were developed to diminish risks, such as systematic pre-operative scan (1), preliminary retrosternal endoscopic dissections (2), O'Brian's "direct vision sternotomy". The multiplicity of these means shows that all problems are not yet resolved. All authors agree to avoid resorting to previous femoro-femoral cannulation in order to limit inguinal access, long-time extra-corporal circulation and hypothermia problems. Right ventricle major wounds are exceptional, or even totally absent from the series of 546 O'Brian's resternotomies, versus 4 in Follies' series (4) on 610 re-operations. If the essential problem is to avoid them, with a meticulous pre-operative analysis of the anatomic risk and a peri-operative dissection meeting strict principles, the method we are describing allows us to save a hopeless situation at first sight.

ABSTRACT 49

**REMOVAL OF A FLOATING AORTIC ARCH THROMBUS ORIGINATING FROM THE AORTIC CANNULATION SITE IN A HEART TRANSPLANT PATIENT AFTER ECMO EXPLANTATION**

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We report on a case of successful removal of a floating aortic arch thrombus originating from the ECMO(extracorporeal membrane oxygenator)cannulation site in a patient after heart transplantation. A 66 year old male underwent orthotopic heart transplantation for DCM(dilated cardiomyopathy). Intraoperatively right heart failure occurred and a venoarterial ECMO was implanted. On postoperative day 6 the right ventricle showed satisfactory recovery with the ECMO assisting 1l/min. Following stopping of the ECMO due to a clotted oxygenator the system was removed. The next day TEE(transesophageal echocardiography) showed a floating mass in the descending aorta originating from the mid aortic arch. The decision to remove the suspected thrombus under deep hypothermic cardiac arrest was made. After opening the arch the thrombus was found adherent to the origin of the left carotid artery. Additionally a local dissection at the initial cannulation site became apparent. The 14cm long thrombus was removed, the dissected aortic layers were resected and the aorta reconstructed using a 7x2.5cm bovine pericardial patch. Postoperatively the patient showed neither neurologic deficits nor further cardiac complications. The presence of pedunculated thrombi in the thoracic aorta is rare and the optimal treatment remains undefined. In this case we were able to demonstrate that aortic thrombectomy can be performed safely even short after recovery from right heart failure after transplantation.

## ABSTRACT 50

**COMPLEX CARDIAC SURGERY FOR JEHOVAH'S WITNESS**

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Cardiac surgery in Jehovah's Witness patients continues to be challenging because of refusal of blood products. A 62 kg. 55 year old woman, with severe aortic stenosis and triple vessel coronary artery disease, on hemodialysis for 9 years, with congestive heart failure, an ejection fraction of 35%, and pulmonary hypertension, refused blood for heart surgery. Her initial hemoglobin was 80 (hematocrit 23) and after 83 days of daily erythropoietin Eprex (10,000 units for 49 days, 20,000 units for 34 days), rose to 133 (hematocrit 41). Aortic valve replacement and 3 vessel CABG (2 arteries one vein) was then performed successfully. Total chest tube loss was 420 ml. Hemoglobin was 115 (hct 35), immediately post-op and 102 (hct32) at discharge (11 days). Three years later, she is free of cardiac symptoms. The cost above usual heart surgery expenses was erythropoietin USD \$12,000, Aprotinin \$800, Tisseel \$400 and cell saver \$150 equaling a total extra cost of \$13,350.00. This an example of how patients with complex cardiac problems and strict religious refusal of blood products can be prepared preoperatively to undergo cardiac surgery successfully.

## ABSTRACT 51

**DISSECTION OF AN ANOMALOUS SYSTEMIC ARTERY TO THE LUNG**

&gt;

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**CASE HISTORY:** 29 year old lady of African origin presented at 20 weeks of gestation with haemoptysis and mild central chest pain after a long airline journey. Initial investigations including Doppler scan of the lower limbs and Ventilation/Perfusion scan were normal. Bronchoscopy showed no signs of endobronchial lesions. Contrast enhanced Computed Tomography Scan revealed consolidation of the posterior basal right lower lobe segment supplied by an anomalous artery of abdominal aortic origin, the appearances consistent with pulmonary sequestration.

The patient had several episodes of haemoptysis and the dilemma arose of subjecting her to right lower lobectomy or adopting an expectant policy. The patient was admitted for close observation up until delivery and fortunately had no further episodes. At 36 weeks of gestation, she delivered a healthy baby by elective Caesarean section to avoid the risk of increased haemoptysis due to raised pressure dynamics during bearing down. At 3 months post partum, the patient successfully underwent a Video Assisted Thoracic (VAT) right lower lobectomy with uneventful recovery. She has remained asymptomatic since then. The histopathological examination of the right lower lobe revealed a substantial 5 mm arterial vessel running at the lower end of the pulmonary ligament and feeding a normal right basal lung segment. There was no evidence of pulmonary sequestration as perceived earlier.

**DISCUSSION:** Systemic arterial supply to normal lung segments is a relatively rare congenital abnormality of the pulmonary blood supply. The condition may be asymptomatic and the common complications are pulmonary hypertension of the affected segments due to long-standing shunt. Haemodynamic changes characterising the gravid state along with hormone-induced changes, such as intimal hyperplasia and altered organisation of the media are well-known to predispose to the risk of dissection in systemic arteries. However, in our extensive literature search we have not found any case reported on dissection of this rare aberrant artery, or its coexistence with pregnancy. The particular challenge and management dilemma in this case was due to its presentation during pregnancy. Surgical management in the pregnancy posed the risk of intra-operative spontaneous premature labour whereas conservative management risked threatened intrapartum maternal decompensation, and the risk of increased haemoptysis due to raised pressure dynamics during bearing down.

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## ABSTRACT 52

### CLINICAL CASE REPORT

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44 Yrs old male with previous MI underwent cardiac catheterization for work up of his coronary disease. Angiogram revealed 99% lesion of distal Left main coronary artery. Patient started developing chest pain. An urgent Intra-aortic balloon pump was inserted. Patient developed cardiac arrest. Angiogram revealed acute thrombosis of distal left main artery. ACLS protocol was initiated. At the end of 25 minutes of CPR he was still in cardiac arrest/ ventricular fibrillation. A catheter was forced through thrombosed vessel and angioplasty of the left main coronary vessel was performed. He became relatively stable. He was transferred to OR and urgent four vessel coronary artery bypass grafting was performed. He was extubated on POD#1, IABP was taken out on POD # 1. He had no neurological deficit and he was discharged home on POD # 6 without any complication

## ABSTRACT 53

**THROMBOSIS OF A MECHANICAL VALVE PROSTHESIS AS A COMPLICATION OF ANTICOAGULATION WITH LOW-MOLECULAR WEIGHT HEPARIN**

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The anticoagulant capacity of low-molecular-weight heparin (LMWH) has been established; however, there are no studies documenting its safety and efficacy in patients with prosthetic heart valves. We report the failure of transient use of LMWH to prevent prosthetic valve thrombosis. A 59 year old man who had undergone combined coronary artery bypass and mitral valve replacement with a St.Jude valve was administered LMWH instead of warfarin temporarily while he underwent diagnostic studies for a gastrointestinal disorder. Five months following valve replacement he developed the acute onset of left-sided weakness. Subsequent evaluation revealed immobility of one leaflet of the mechanical prosthesis. Employing a right thoracotomy, femorofemoral bypass, hypothermia, and ventricular fibrillation, the prosthetic mitral valve was found to be obstructed by thrombus located at the delicate hinge point of one leaflet. A successful thrombectomy was performed and anticoagulation with warfarin resumed. He recovered uneventfully and remains well 4 months after re-operation. Substitutes for warfarin anticoagulation in patients with mechanical valves need to be thoroughly evaluated on the basis of evidence of effectiveness and data documenting the variable susceptibility to thrombosis by different designs of valve prostheses.

## ABSTRACT 54

**DECREASING LEFT VENTRICULAR WALL TENSION TO FACILITATE OFF PUMP CORONARY BYPASS GRAFT**

Fernando M. Jara M.D., Jean Kalush CTA, Venkat Kilaru M.D.

Department of Cardiac Surgery and Anesthesiology, McLaren Regional Medical Center

Decreasing left ventricular wall tension facilitates off pump coronary artery bypass graft by allowing easier displacement of the heart specially while doing the posterior coronary arteries.

**Material and Methods:**

Twenty patients undergoing off pump bypass graft were studied before and 20 minutes after the infusion of 3ug/kg/min of dolbutamine while the patients were anesthetized and endoscopic harvesting procedures were performed for conduits. All patients had the following measurements taken by TEE: end systolic left ventricular diameter, end systolic left ventricular posterior wall thickness(mm) using M mode and the end systolic left ventricular pressure obtained from the femoral arterial line at dicrotic notch.

Left ventricular wall tension is directly proportional to left ventricular radius and intracavitary pressure and indirectly proportional to left ventricular thickness (Laplace Law). Left ventricular wall tension was measured using the following formula .

Left Ventricular Wall Stress (dynes/cm<sup>2</sup>)= Pressure x Radius  
2x Thickness

**Results:**

Left ventricular wall tension was decreased by 22.72%, Heart rate was increased by 10.69% and mean blood pressure decreased by 8.22%. These changes allowed for easy access of all coronary arteries.

**Conclusions:**

Dilated bradycardic ventricles are common and not the exception in today's practice. The use of dolbutamine as stated in this protocol allows for enough decrease in wall tension to facilitate easy access to all coronaries decreasing the incidence of conversions.

## ABSTRACT 55

**RECOVERY FROM SEVERE ISCHEMIC CARDIOMYOPATHY BY LEFT VENTRICULAR RESTORATION AND SIMULTANEOUS LVAS IMPLANTATION**

Osamu Monta, Yuji Miyamoto, Yoshiki Sawa, Norihide Fukushima, Goro Matsumiya, Shigeru Miyagawa, Hiroki Hata, Hikaru Matsuda

Department of Surgery, Osaka University Graduate School of Medicine, Japan

Surgical restoration of dysfunctioning left ventricle is known to be a useful option for treatment of patients with ischemic cardiomyopathy (ICM). However, this strategy carries high operative risks in cases complicated with cardiogenic shock requiring massive inotropes on mechanical support or multi-organ failure. We performed left ventricular restoration and mitral valve repair combined with simultaneous implantation of left ventricular assist system (LVAS). One patient, who required massive inotropic support and was complicated with renal and liver dysfunction, underwent this procedure. His end-organ function recovered quickly and gradual improvement of LV function was observed. LVAS off test showed improved LVEF (pre-LVAS 25% >37%) and LVAS was successfully explanted after 86 days of the support. This novel procedure can be a useful option for patients with severe ischemic LV dysfunction and may improve the results of LV restoration therapy.

ABSTRACT 55A

**VALVULOPLASTY FOR ANTERIOR MITRAL LEAFLET PROLAPSE  
DUE TO INFECTIVE ENDOCARDITIS**

Hiroki Hata, Yuji Miyamoto, Yoshiki Sawa, Goro Matsumiya, Hikaru Matsuda

Department of Cardiovascular Surgery, Osaka University Graduate School of  
Medicine, Osaka, Japan

We present two cases of successful repair of anterior mitral leaflet (AML) prolapse causing severe mitral regurgitation due to infective endocarditis. The operation was performed after treatment with intravenous antibiotics for more than 6 weeks. Vegetation was attached to the postero-medial side of the AML in the both cases, therefore, a similar technique was used. AML was triangularly resected with a part of strut chordae. Then the corresponding area of the posterior mitral leaflet (PML) was quadrangularly resected with rough zone chordae and sutured to the defect of the AML (flip over). In one case, a large triangular defect of the AML remained, so trimmed auto-pericardium was fitted and sutured. In the other, the edge of AML cusp was primarily approximated first, then the segment of PML was secondary transferred. The posterior annulus was plicated and the free edge of the PML was closed and sutured. Finally the annuloplasty ring was placed. There are neither relapse of mitral regurgitation nor infective endocarditis after the operations. These operations are to be shown in VIDEO.

Wednesday, March 10, 2004

4: 30 – 5: 30 PM Fontaine Room

## **Mini-Oral Presentations**

Imaging and Supporting Cardiac Techniques

**Abstracts 56 - 65**

WEDNESDAY  
AFTERNOON

## ABSTRACT 56

### 16-MSCT VERSUS CORONARY ANGIOGRAPHY IN A SURGICAL VIEW

J Grünenfelder, A. R. Plass, A. K Häussler, B. Baumert, S. Wildermuth,  
M. Lachat, G. Zund, M. Turina

Department of Cardiac and Vascular Surgery, University Hospital of Zurich

**Objective:** Coronary angiography is the gold standard in the diagnostic for coronary artery disease. 16-Multi-Slice-CT (MSCT) facilitates an alternative depiction of coronary vessel stenoses.

**Methods:** Preoperative exams including coronary angiography and MSCT of 15 patients. Two blinded surgical readers investigated independently both diagnostic modalities regarding location, severness and morphology of the stenoses. 4 main branches with a diameter > 1.5mm were rated in both procedures.

**Results:** Heart rate of 60 – 70/ min was required for good image quality. Scan time was 30'' + 7''. Accuracy for LM, LAD, RCX and RCA was 80%, 74%, 100% and 83%. Investigators detected coronary stenoses with sensitivity of 95% and specificity of 99.5%. Plaques classification in 15/64 soft and 49/64 hard lesions. Spatial reconstruction of the images improved the evaluation. In 3/15 cases appraisalment of the distal RIVA was not possible.

**Conclusion:** 16-MSCT is no equal alternative diagnostic tool in present. But it should be a serious diagnostic tool for coronary vessels disease accordant to the development especially of the software.

## ABSTRACT 57

**PREOPERATIVE ASSESSMENT OF CARDIAC STRUCTURES WITH NOVEL MULTIDETECTOR ROW SPIRAL COMPUTED TOMOGRAPHY FOR PATIENTS UNDERGOING RE-OPERATION HEART SURGERY.**

R. Mohr, G. Aviram, R. Sharony, A. Kramer, N. Neshet, D. Loberman, Y. Ben-Gal, G. Uretzky.

**Background:** Repeat coronary artery bypass grafting (CABG) is associated with an increased risk of injury to old conduits and cardiac structures. We used multidetector computed tomography (MDCT) for preoperative assessment of cardiac and graft anatomy.

**Methods:** Four patients, candidates for repeat CABG, underwent retrospective-gated CT angiography with a new 16-slice MDCT.

**Results:** Scans were completed within one breath-hold. There were 3 patent LIMA grafts, one RIMA graft (in situ, cross midline), 8 patent SVGs and 6 occluded SVGs. All conduits and their patency were successfully assessed. Precise relation of the grafts to the expected mid-sternotomy line, aortic cannulation, cross-clamp site, and distances between the grafts and the RV to the sternum were measured. The 3D reconstructions demonstrated the exact anatomy of the heart, including the grafts' course, and allowed planning of axillary or femoral cannulation, sternotomy technique and aortic cross-clamp site. During the operation, the 3D CT images helped anticipating hidden grafts. Based on the CT images, the operative approach was modified in two patients.

**Conclusions:** Multidetector computed tomography is a new noninvasive tool for preoperative assessment of complex cardiac anatomy. This novel CT scan is feasible, allows superb resolution and localization of the heart and bypass grafts, and may improve the safety of re-operative heart surgery.

ABSTRACT 58

**CARDIOSONIX QUANTIX OR: EARLY EXPERIENCE WITH AN ANGLE-INDEPENDENT DOPPLER BLOOD FLOW TECHNOLOGY IN CABG SURGERY**

Reuthebuch O, Gruenenfelder J, Goeser C, Turina M, Zuend G

**Objective:** To assess feasibility of a new quality control device in coronary artery bypass grafting (CABG) and to compare with standard transit-time technique.

**Method:** Between May and November 2003 in 37 consecutive patients flow was assessed in 90 Grafts. Subsequent to grafting, Cardiosonix (C) handle was placed on graft or coronary to have blood flow velocity, velocity profile and vessel diameter calculated via a dual-beam ultrasound transducer and a digital pulse wave Doppler. Data were displayed on screen and compared with successive flow measurement using the Medistim (M) transit-time technique.

**Results:** Set-up and handling was simple. No vessel isolation needed. One probe matched all vessel diameters. Mean arterial pressure was  $71 \pm 6$  mmHg, mean heart rate  $90 \pm 7$  beats/min. Pulsatile Index (PI) was  $4.3 \pm 2.1$  (C) vs  $2.4 \pm 0.8$  (M) ( $p=ns$ ) and flow (ml/min)  $49 \pm 25.7$  vs  $47 \pm 21.8$  ( $p=ns$ ) respectively. However assessment of flow in posterior grafts was cumbersome due to inflexible and long-handled probe.

**Conclusion:** The Cardiosonix system allows simple, accurate and direct quantitative flow measurements in grafts.

## ABSTRACT 59

**NOVADAQ SPY™: INTRAOPERATIVE ASSESSMENT OF MYOCARDIAL PERFUSION IN OFF-PUMP (OPCAB)**

A. K. Haeussler, O. Reuthebuch, A. Plass, G. Zund, M. Turina

Clinic for Cardio-vascular Surgery, University Hospital Zürich, Rämistrasse 100, CH-8091 Zürich, Switzerland

**Objects:** OPCAB grafting is supposed to be less invasive than on-pump myocardial revascularisation, however it is a demanding technique. Aim of the study was to assess intraoperative flow and quality control using the Indocyanine Green (ICG) based Spy™ (Novadaq, Canada) imaging system.

**Methods:** The study included 53 patients (14 f/ 39 m) with a total of 155 grafts (67 arteries/ 88 veins). After iv injection of dye run off in bypass graft as well as extended opacification of myocardium was captured with a CCD camera. Each image took 1.25-2.5 mg of ICG. Data were correlated with postoperative laboratories (CK, CK-MB, Trop.T) and ECG changes (ST-elevation, new Q).

**Results:** No side effects were noted. Course of coronaries could be assessed in obese patients as well as in redo-cases. 5/155 grafts could not be controlled due to posterior course of coronary. 9/155 grafts had to be revised due to constriction (n=6), graft torsion (n=1) and graft dissection (n=2). Regarding enzyme levels and EKG changes no perioperative myocardial damage could be detected.

**Conclusion:** The Spy™ system appears to be a valid technique for quality control in OPCAB surgery without the need for X-ray exposure of staff and patient. Setup is simple and quality of images striking.

## ABSTRACT 60

**EVALUATION OF THE MYOCARDIAL FLOW RESERVE USING PHARMACOLOGICAL STRESS TL-201 SPECT; IS THERE A DIFFERENCE BETWEEN TOTAL ARTERIAL OFF-PUMP CORONARY ARTERY BYPASS AND CONVENTIONAL CORONARY ARTERY BYPASS?**

Jae Won Lee, Sang Wan Ryu, Hyun Song, Kyung Sun Kim, Yu Jung Yang\*, Dae Hyeuk Moon\*

Thoracic and Cardiovascular Surgery and Nuclear Medicine(\*), ASAN Medical Center Seoul, Korea

**Background.** The advantage of total arterial off-pump CAB (OBCAB) over traditional on-pump CAB using one ITA and veins (CCAB) in terms of myocardial flow reserve is not studied. We studied them using TI-201 perfusion SPECT.

**Methods.** Between 1997 and 2001, 152 patients were recruited from our database (OPCAB, n=100; CCAB, n=52,). All patients underwent pharmacological stress TI-201 perfusion SPECT at 3-12 months after bypass surgery. Myocardial perfusion was analyzed semiquantitatively using a five-point scoring system in a 20-segment model (0=normal to 4=absent uptake). Summed stress (SSS), rest (SRS), and difference score (SDS) of whole myocardium as well as average scores (ASS, ARS, ADS) of individual wall (anterior, septal, lateral and inferior) were compared by student t-test as well as by repeated measure ANOVA with Bonferoni correction.

**Results.** SSS, SRS, SDS of OPCAB vs CCAB were  $6.86 \pm 0.72$  vs  $7.17 \pm 0.92$ ,  $3.95 \pm 0.57$  vs  $3.75 \pm 0.73$ ,  $2.91 \pm 0.47$  vs  $3.42 \pm 0.74$  ( $p > 0.05$ ). However, lateral wall showed lower scores in OPCAB (ASS: 0.18 vs 0.41,  $p = 0.015$ ; ARS: 0.12 vs 0.20,  $p = 0.168$ ; ADS: 0.06 vs 0.21,  $p = 0.031$ ). Septal wall resulted in higher scores in OPCAB (ASS: 0.33 vs 0.12,  $p = 0.003$ ; ARS: 0.18 vs 0.07,  $p = 0.037$ ; ADS: 0.14 vs 0.04,  $p = 0.030$ ). Anterior and inferior wall were not different between the two groups.

**Conclusions.** OPCAB showed similar outcome. The better result of lateral wall may be the effect of radial arterial grafting over vein. And the same myocardial reserve in inferior wall between the two groups needs further study. There was no deleterious effect of off-pump over on-pump CAB.

## ABSTRACT 61

**THE CentriMag®: A NEW OPTIMIZED CENTRIFUGAL BLOOD PUMP WITH LEVITATING IMPELLER**

1 Mueller JP, 1 Reuthebuch O, 1 Kuenzli A, 2 Dasse K, 2 Kent S, 1 Zuend G, 1 Turina MI, 1 Lachat ML

1 Clinic for Cardiovascular Surgery, University Hospital Zurich, Switzerland;  
2 Levitronix/Pharos LLC, Waltham MA, USA/Zurich, Switzerland

**PURPOSE:** Blood pumps are routinely used for circulatory-and/or pulmonary support. However, blood trauma and/or pump failure remain severe drawbacks of currently available pump models. This study evaluates the first clinical application of a new totally bearingless centrifugal blood pump (CentriMag®).

**MATERIAL/METHOD:** The centrifugal pump consisting of an electromagnetic suspended impeller was used as cardiopulmonary blood pump during beating heart CABG procedures in 11 patients (mean weight: 77.4 kg). A bolus of 150 IE of heparin/kg body-weight was applied and ACT maintained around 180-250 sec. during extracorporeal circulation. Pump-induced blood trauma was evaluated by measurements of PFH, LDH, Hct, total bilirubin and thrombocyte levels.

**RESULTS:** Mean pump flow was 3.3 L/min. and mean pressure gradient through the oxygenator was 69 mmHg. No pump-dysfunction occurred during an average application-time of 105 min. Inspection of the pump housings showed no internal thrombus formations, despite of low-dosis heparinization. Only slight hemolysis was observed with mean PFH levels of 1.96 mmol/L, LDH 460 U/L, Hct 33%, total bilirubin 25 µmol/L, and thrombocytes of  $191 \times 10^3/\mu\text{L}$ .

**CONCLUSIONS:** The bearingless CentriMag® blood pump is a safe and reliable new device that produces only minimal hemolysis. It seems to be suited for long-term evaluation as ECMO-system or ventricle assist device.

## ABSTRACT 62

**INTERMITTENT PRESSURE ELEVATION OF THE CORONARY VENOUS SYSTEM AS METHOD TO PROTECT ISCHEMIC MYOCARDIUM**

W. Mohl MD PhD, I. Kajgana MSc ,B. Syeda MD, G. Weigel MD, P. Pichler MD, L. Kharbout MSc. F. Rattay PhD  
Department of Cardiothoracic Surgery University of Vienna  
Vienna Austria

**Background:** Beating heart surgery leaves myocardial areas underperfused and rendered ischemic during brief coronary artery occlusions. This effect of iatrogenic myocardial ischemia counteracts positive trends in OPCAB surgery. In a recent meta-analysis in experimental myocardial infarction, intermittent coronary sinus occlusion (ICSO) without active retroperfusion proved valid to significantly salvage ischemic myocardium. Furthermore this beneficial effect was closely related to the achieved coronary sinus pressure during intermittent occlusions. Moreover there was evidence that this beneficial effect can be optimised, using coronary venous pressure data. We have developed a coronary venous pressure controlled closed loop pump that auto regulates and optimises redistribution of venous flow towards deprived myocardium (PICSO).

The aim of this study was to evaluate optimisation criteria investigating coronary venous flow data during PICSO.

**Methods:** Intermittent coronary sinus occlusion was performed in 12 adult anesthetized sheep during occlusion of the LAD. In addition to coronary sinus pressure (CSP) recordings a Transonic flow probe was placed around the great cardiac vein adjacent to the site of LAD occlusion. Venous flow measurements in the GCV via continuous wave Doppler sonography were performed. Comparison between different cycles was performed with ANOVA, followed by Tukey's post hoc test for comparison between all cycle groups.

**Results:** During CS occlusion and in accordance to the pressure rise in the venous circulation a retrograde GCV flow directed towards the ischemic myocardium occurred. After reopening of the CS a tremendous flow increase in antegrade flow was observed. Antegrade flow was significantly higher compared to retrograde flow ( $p < 0.007$ ) due to acute collateralisation of the ischemic area. Individual optimal cycles could be observed both for antegrade as well as retrograde flow ( $p < 0.00001$ ).

**Conclusion:** These results confirm our assumption that optimising the cycle length for coronary venous pressure elevation improves GCV flow and via the acute recruitment of collaterals also the effectiveness of coronary sinus interventions. We propose that, Because of the ease of this intervention, PICSO will be capable to protect myocardial performance during beating heart surgery even without active retroperfusion.

ABSTRACT 64

**MINIMIZED EXTRAKORPOREAL SYSTEMS: LIMITATION AND RISKS**

Kaluza M, Wippermann J, Liebing K, Stock U, Wahlers T  
Friedrich Schiller University Jena Department of Cardiothoracic and Vascular  
Surgery, Jena, Germany

**Objectives:** Minimized extracorporeal systems (MES) drain venous blood directly into the arterial pump. The aim of this study was to analyze limitations and risks in using 2 different MES.

**Methods:** 34 CORx systems and 14 DeltaStream systems were applied in arrested heart CABG surgery. Suction blood was processed by cell saver. Vent blood was drained in Group1 directly to the venous line and in Group2 to a cardiotomy reservoir.

**Results:** Air aspiration into the left ventricle was seen in 3 patients caused by high negative pressures in the right atrium and transfer over a persistent foramen ovale. In 25% of all cases cardiac luxation reduced pump flow and MAP. For hemodynamic stabilisation in 30% of all patients with increased suction (>1000ml) a repetitive replacement of priming solution was necessary. Venous or vent line air aspiration was observed in 25% (Group1) and 5% (Group2). This resulted in air in the arterial part (Group1) and micro foam in the pump head (Group2).

**Conclusion:** Three limitation factors in use of MES were identified in this study: 1. Luxation of the heart; 2. Venous air aspiration and 3. Priming replacement for bleeding. Left heart air aspiration must be further on investigated.

## ABSTRACT 65

**CLINICAL EVALUATION OF A NEW CONDENSED CPB CIRCUIT FOR ADULT CARDIAC SURGERY: A PROSPECTIVE RANDOMIZED CLINICAL TRIAL.**

Erik J. Fransen, Youri M. Ganushchak, Dick S. de Jong, Paul M. Roekaerts, Wim A. Buurman, Jos G. Maessen

**Objectives:** CPB is known to be related to SIRS after cardiac surgery. This single-center prospectively randomized clinical trial was conducted to evaluate a recently introduced reduced volume CPB system that is coated with the biopassive X-coating.

**Methods:** 22 patients were prospectively randomized to undergo CABG either with a heparin-coated CPB system (control, n=11), or with an X-coated reduced volume perfusion system (MiniXsystem, n=11). We examined activation of the complement system (C3bc and C4bc), activation of neutrophils (BPI), the acute phase response (interleukin (IL)-6, and acute phase proteins (LBP, AGP, and CRP)), myocardial tissue injury (troponin-t), hemolysis (free hemoglobin (Hb)), and clinical outcome parameters.

**Results:** Preoperative risk profiles were identical for both patient groups. All patients went through the procedure without major complications. Statistical differences between groups were found at the end of pump support and 15 minutes after the administration of protamin for BPI and free Hb ( $p < 0.01$  for both markers), and upon arrival on the cardiothoracic intensive care unit (free Hb)( $p < 0.05$ ), all markers being higher in the control group. Complement activation products, the acute phase response, troponin-t release, and clinical outcome parameters all were identical in both patient groups.

**Conclusions:** Performing CABG with the use of CPB, the activation of neutrophils can be significantly reduced by the use of the presently evaluated MiniXsystem. In addition, the use of this MiniXsystem results in significantly less hemolysis during pump support.



Wednesday, March 10, 2004

5: 30 – 6:30 PM Imperial I

**Fireside Chat Clinical Practice Rounds  
- 2 Themes -**

Theme I: Complications in Cardiac Surgery

**Abstracts 66 - 72**

## ABSTRACT 66

**ASPIRIN RESISTANCE INCREASES THE RISK OF EARLY VEIN GRAFT THROMBOSIS AFTER OFF-PUMP BYPASS**

Authors: Robert S Poston,MD, Charles White,MD, Junyan Gu, MD, PhD, K Read, A Lee, James Gammie, MD, Bartley P. Griffith, MD

**Objective:** Patients referred for OPCAB have often failed an aspirin (ASA) medical regimen. OPCAB patients might have an increased incidence of ASA resistance that places them at risk for early failure of vein bypass grafts.

**Methods:** 48 OPCAB patients with 90 venous bypass grafts given ASA perioperatively were prospectively investigated. Conduit quality was assessed by venous PAI-1, tissue factor, tPA and thrombomodulin expression on histochemistry and ELISA and by blood flow parameters analyzed after completion of grafting. Thrombelastography™ (MA>50% with arachidonic acid vs. kaolin), and whole blood aggregometry (>50% platelet response to 1 vs. 5mcg/ml collagen) determined ASA resistance perioperatively. Early graft patency was determined on POD#5 using EKG gated, multichannel CT coronary angiography (CTA).

**Results:** Eight of 48 patients had early vein graft thrombosis. ASA resistance (per TEG and aggregometry) was seen in 2 patients preoperatively; neither developed graft thrombosis. However, new onset ASA resistance developed postoperatively in 22 patients. Early graft failure by CTA was seen in 7 of these 22 resistant patients compared to 1 of the remaining 26 patients with normal ASA sensitivity ( $p<0.04$ , Fischer exact test).

**Conclusions:** ASA resistance was common after OPCAB and increased early vein graft thrombosis, potentially due to the technical difficulty and hypercoagulability associated with this technique.

ABSTRACT 67

**PREDICTORS OF ADULT RESPIRATORY DISTRESS SYNDROME IN CORONARY ARTERY BYPASSGRAFT SURGERY**

Phillip Brown, Michael Mack, Marc Katz, Salvatore Battaglia, Lynn Tarkington, April Simon, Steven Culler, Edmund Becker, Emory University, Atlanta, GA, HCA, Inc., Nashville, TN, Cardiac Data Solutions, Inc., Atlanta, GA

**Background:** ARDS is a devastating complication of CABG surgery.

**Methods:** Using the HCA Casemix database, which includes all consecutive admissions to HCA hospitals, 57,563 CABG patients admitted from 1/1/2000 – 3/31/2003, were analyzed. Patient characteristics, procedural variables, and complications were identified using ICD9 codes.

**Results:** Over the study period, 6.1% of CABG patients had ARDS with ARDS patients being 2.1 years older (67.3 yo vs. 65.4 yo;  $p < 0.001$ ). CABG patients with ARDS have significantly worse outcomes than non-ARDS patients with their rates of mortality, ARF, neurologic complications, and post-op infections all more than four times greater than non-ARDS patients. Logistic regression results demonstrated that there are significant predictors of ARDS (table).

**Conclusions:** Development of ARDS following CABG is associated with other adverse events, especially mortality and ARF. Significant predictors of ARDS have been identified. Awareness of these factors and aggressive treatment could impact the incidence and adverse effects associated with ARDS.

Significant Predictors of ARDS in CABG

Odds	Ratio	p Value
AMI	1.24	<0.001
Cardiogenic Shock	2.75	<0.001
CHF	2.07	<0.001
Valvular Disease	1.35	<0.001
CP Bypass Pump Use	1.38	<0.001
Re-Operation	2.17	<0.001
Single Vessel Bypass	1.17	0.004
Chronic Liver Disease	3.28	<0.001
COPD	2.68	<0.001
CVD	1.17	<0.001

## ABSTRACT 68

**DYSESTHESIA OF THE DORSUM OF THE HAND AFTER ENDOSCOPIC RADIAL ARTERY HARVESTING . Experience with 100 cases.**

Fernando M. Jara, M.D., Jean Kalush, CTA.

The radial artery is an attractive conduit in today's push for total arterial revascularization. The traditional harvesting of this artery requires a long incision cosmetically not well accepted by the majority of patients. Endoscopic harvesting is technically more challenging, however it is becoming an accepted procedure. Experience with 100 cases is presented.

**Methods:**

100 Patients who underwent endoscopic harvesting using Cardioversions RAD06A endoscopic device and the Harmonic Scalpel Curved Shears. through a one inch incision at the level of the wrist and the use of Endoloop "0" ethibond for ligation of the proximal end. Patients were follow up at 3 weeks after discharge, 5 and 8 months postoperative.

**Results:**

At 3 weeks after discharge 8 patients had small seromas that required no treatment, 3 patients had cellulitis at the incision site, they responded well to oral antibiotics for 5 days, 56 patients complained of an abnormal sensation in the dorsum of the hand usually involving the thumb and index finger, sometimes described as numbness, tingling or sensations of pain.

At 5 months postoperative 47 patients still had some complaints as described above, and at 8 months 16 patients reported the feeling unchanged, 25 claimed it was better and in 4 patients the feeling was gone, 2 patients were not available for follow-up.

**Conclusions:**

The superficial branch of the radial nerve appears to be responsible for these symptoms, possibly due to stretching of the tissues due to the size of the endoscopic device. Although satisfaction is high from this procedure compared with the open technique we found this to be a significant complication that the patients should be made aware of, further improvement in instrumentation is warranted.

ABSTRACT 69

**ARE HIGHER CREATININE LEVELS A PREDICTOR OF MORTALITY AMONG PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY?**

Marc Katz<sup>2</sup>, J. James Zocco<sup>2</sup>, Richard Reynolds<sup>2</sup>, Timothy Wolfgang<sup>2</sup>, April Simon<sup>3</sup>, Edmund Becker<sup>1</sup>, Steven D. Culler<sup>1</sup>  
 1Emory University, Atlanta, Georgia, United States; 2Henrico Doctors Hospital, Richmond, VA, United States; 3Cardiac Data Solutions Inc, Atlanta, GA, United States

WEDNESDAY  
 AFTERNOON

**Background:** Preoperative serum creatinine of > 2.0 mg/dL has been associated with increased risk of mortality among patients undergoing CABG Surgery. This study examines the relationship between preoperative serum creatinine levels and mortality rates among patients undergoing CABG Surgery in community hospitals.

**Methods:** A retrospective analysis was conducted on 1,453 consecutive patients who underwent CABG Surgery only in one of four community hospitals in Virginia using an STS database between January 2001 and June 2003. The primary variables of interest were the operative and predicted mortality rates. Chi-squared test was used to determine if mortality rates were higher among patients with higher serum creatinine levels.

**Results:** The unadjusted operative and predicted mortality rates range between 0.6% and 3.1% among patients with a preoperative serum creatinine level < 2.0 mg/dL, Both mortality rates are significantly higher as a patient’s preoperative serum creatinine levels increase above 2.0 mg/dl (see table).

	<1.2	1.3-2.0	2.1-3.0	3.1-4.0	> 4.0
<b>Patients</b>	1065	345	219	12	
<b>Operative Mortality</b>	1.3%	0.6%	19.1%	33.3%	16.7%
<b>Predicted Mortality</b>	2.3%	3.1%	9.4%	7.7%	9.3%

**Mortality Rates by Selected Creatinine Levels**

**Conclusions:** Future research needs to examine if CABG surgery can be safely delayed on patients with a preoperative serum creatinine levels above 2.0mg/dL.

ABSTRACT 70

**THE EFFICACY OF PREOPERATIVE BRAIN MAGNETIC RESONANCE ANGIOGRAPHY IN PREVENTING STROKE IN CORONARY ARTERY BYPASS GRAFTING PATIENTS**

Hyun Song, Seong Sik Kang, Sang Pil Kim, Suk Jung Choo, Jae Won Lee, Meong Gun Song, Joon Beom Seo, Sun Uck Kwon

Asan medical center, Seoul, Korea

**Purpose:** Stroke prevention after CABG remains elusive. Preoperative knowledge of the cerebral arterial obstructive status may reduce stroke by allowing execution of appropriate intra-operative counter measures. The diagnostic yield of cerebral arterial disease in CABG patients through Magnetic Resonance Angiography (MRA) was compared with that of Transcranial Doppler ultrasonography (TCD) and Carotid Duplex(CD).

**Material and methods :** From May 2003 to November 2003, randomly selected CABG patients (n=100, mean age  $62.9 \pm 8.32$  years), received preoperative MRA(N=100), TCD(N=53) and CD(N=35).

**Results:** On MRA parenchymal lesions were observed in 44%, extracranial cerebral artery stenosis in 29%, and intracranial stenosis in 10%. TCD showed false positive results in 20.4% and false negative in 50%. CD showed false negative in 14.3% and false positive in 66.7% when compared to MRA. No difference in prevalence of cerebral artery stenosis among age groups (age  $\geq 65$  vs. age  $< 65$ ,  $P < 0.05$ ) was observed. Two patients underwent preoperative carotid artery stent insertion. All patients showed complete postoperative mental recovery within 8 hours without neurologic deficits.

**Conclusions:** MRA is a more accurate and reliable method for evaluating cerebral artery obstructive lesions than TCD and CD. Knowledge of cerebral artery lesions beforehand may reduce stroke by way of implementing appropriate measures such as stenting or increasing intraoperative blood pressure.

ABSTRACT 71

**OPTIMIZING INTRAOPERATIVE CEREBRAL OXYGEN DELIVERY USING NON-INVASIVE CEREBRAL OXIMETRY DECREASES THE INCIDENCE OF STROKE FOR CARDIAC SURGICAL PATIENTS**

Scott Goldman, M.D.

Division of Thoracic and Cardiovascular Surgery, Main Line Health Heart Center - The Lankenau Hospital and Institute for Medical Research, Wynnewood, PA 19096, USA.

A recent study demonstrated that almost 75% of strokes after coronary artery revascularization surgery occur in patients classified preoperatively as low to medium risk. Thus, despite the use of risk classification, the majority of strokes can occur when not expected. We hypothesized that optimization of cerebral oxygen delivery variables using noninvasive cerebral oximetry could reduce the incidence of stroke.

Cerebral oximetry was used by all surgeons to monitor cerebral oxygen saturation in all cardiac surgery patients beginning January 1, 2002 until June 30, 2003 (18 months, treatment group). Cerebral oxygen delivery was optimized during surgery by modifying oxygen delivery and consumption variables to maintain oximetry values at or near the patient's pre-induction baseline. Stroke was defined according to STS guidelines. The incidence of stroke in the treatment group was compared to that for patients undergoing cardiac surgery between July 1, 2000 and December 31, 2001 (18 months, control group) before cerebral oximetry was incorporated.

Age and gender distribution were similar in the two groups. The table provides stroke data for all cardiac surgeries as well as CABG only and MVR only surgeries. The total N and the number and percentage of strokes in each group are shown and percentages are compared to the expected incidence derived from STS statistics.

The patient group undergoing CABG procedures with optimized cerebral oxygen delivery utilizing cerebral oximetry monitoring demonstrated a significant decrease in the incidence of stroke. The group with MVR only also demonstrated a lower stroke rate but larger numbers are needed to show significance.

Control	July 00 to Dec 01		Treatment Jan 02 to June 03	
Category	N	Strokes (%) STS %	N	Strokes (%) STS %
All Cases	1245	25 (2.01%) NA	1034	9 (0.87%)* NA
CABG only	832	12 (1.44%) 1.60%	664	4 (0.60%)* 1.40%
MVR only	53	1 (1.89%) 1.20%	64	0 (0%) <sup>†</sup> 1.20%

\* P<0.001 compared to control patients † P = 0.052 compared to control patients

Reference: Likosky DS et al., Ann Thor Surg 2003;76:428-35.

WEDNESDAY AFTERNOON

## ABSTRACT 72

**INTRA AORTIC FILTRATION – PARTICULATE EMBOLI ARE CAPTURED DURING AORTIC CROSS-CLAMPING.**

Christenson JT, Vala D, Sierra J, Kalangos A.

Department of Cardiovascular Surgery, University Hospital of Geneva, Geneva, Switzerland.

**Objectives :** Particulate emboli play a significant role in the development of complications after cardiac surgery. Use of an intra-aortic filter during aortic declamping is safe and has shown efficacy by reducing the incidence of embolic complications. Since aortic cross-clamping is another potential risky period for embolization we have evaluated particulate emboli release during aortic cross-clamping.

**Material and Methods:** In 15 consecutive patients undergoing cardiac surgery two intra-aortic filters (Embol-X, Edwards Lifesciences, Irvine, CA) were used separately. Filter A was inserted during aortic cross-clamping (15 minutes) and Filter B during aortic declamping (15 minutes). All filters underwent histopathological examination at an independent institution.

**Results:** Particulate emboli were identified in all (100%) filters. Both Filter A and B contained macroscopic particles, primarily fibrous atheroma (10/15, 67% in both groups). Average number of particulates was  $7.1 \pm 2.6$  (Filter A) and  $6.7 \pm 2.6$  (Filter B), regardless of epiaortic scanning and transesophageal echocardiography findings. In 10/15 patients a greater number of particulates were found in Filter A compared with B. No complications to the use of the filter were identified.

**Conclusion:** There is a high risk for embolization at aortic cross-clamping. Intra-aortic filtration is therefore recommended to be employed prior to aortic cross-clamping.

Wednesday, March 10, 2004

5:30 – 6:30 PM Imperial I

**Fireside Chat Clinical Practice Rounds  
- 2 Themes -**

Theme II: Optimizing Operative Techniques

**Abstracts 73 - 80**

WEDNESDAY  
AFTERNOON

ABSTRACT 73

**A NEW ATRAUMATIC TRANSTHORACIC AORTIC CLAMP FOR ENDO-SCOPIC MITRAL VALVE SURGERY.**

Olivier Jegaden, Fadi Farhat, Stephane Aubert, Pascale Blanc.  
Louis Pradel Hospital, Claude Bernard University, LYON, FRANCE.

The authors report their first experience with a new atraumatic transthoracic aortic clamp (Portaclamp) in endoscopic mitral valve surgery.

In November 2003, 6 patients (4 females and 2 males, mean age 56 years) underwent endoscopic mitral valve surgery using Portaclamp. Portaclamp is based upon two jaws and a mandrel locking system. Through a 11 mm thoracic port, a guidewire is introduced in the transverse sinus and then positioned around the aorta and the pulmonary artery trunk; the two jaws are set up on the guidewire and then are led to the aorta. One stiche is placed on the ascending aorta for antegrade cardioplegia delivery. Under femoral-femoral CPB, aortic clamping is obtained by pushing the mandrel locking system around the two jaws. The entire procedure is performed through a 5 cm working port located in the right inframammary groove in the 4th intercostal space, and using endoscopic approach. Five patients had valve repair and one valve replacement. Aortic clamp time was 88 min and CPB time was 140 min. The clamp was easy to use in all cases without failure of the system. All patients were discharged well in the week following the procedure.

According to this preliminary experience, Portaclamp is safe and effective. In comparison with other techniques previously used, it avoids the vascular risk of the endo-aortic balloon clamping and pulmonary artery injury with a transthoracic metallic clamp.

## ABSTRACT 74

**INTEGRATED APPROACH FOR MYOCARDIAL PROTECTION IN COMBINED VALVE REPLACEMENT AND SURGICAL REVASCULARIZATION**

Achintya Moulick, MCh, Deepak Puri, MCh, Rajeev Kumar, MCh, Ajeet Jain, MCh, Bishnu Prasad Panigrahi, MD, Manoranjan Sahoo, MD

Department of Thoracic and Cardiovascular Surgery, Department of Cardiac Anesthesia, Fortis Heart Institute and Multi-Speciality Hospital, Mohali, Punjab, India

**Background.** Combined surgical revascularization and valve replacement is associated with significant morbidity and mortality due to prolonged aortic cross clamp and cardiopulmonary bypass times. We successfully combined virtues of off pump revascularization with conventional on pump valve replacement for better myocardial protection.

**Methods.** Between April 2002 to May 2003 twelve patients (age range 42 to 68 years) have undergone surgery by this approach. These had mitral valve replacement (5), aortic valve replacement (3), double valve replacement (4) with surgical revascularization.

After standard median sternotomy and aortocaval cannulation distal saphenous vein and radial artery anastomosis was performed off pump on empty beating heart. Each graft was perfused from the pump with help of a multiport maintaining a mean pressure above the mean pressure of the pump. Aorta was then cross-clamped and heart arrested with adenosine followed by intermittent antegrade and continuous retrograde and graft cold blood cardioplegia. After valve replacement by standard technique cross clamp was released and LIMA to LAD anastomosis done on empty beating heart.

**Results.** Mean cross clamp time was 104 minutes for DVR and 41 minutes for single valve replacement. Mean CPB time was 198 minutes and mean no. of grafts were 3.7. Postoperative mean ventilation time was 640 minutes and ICU/ hospital stay 3/8 days. There was no significant morbidity and no mortality.

**Conclusions.** Excellent myocardial protection can be achieved with our integrated approach, performing distal anastomosis on empty beating heart to reduce the aortic cross clamp time in combined surgical revascularisation and valve replacement procedures

## ABSTRACT 75

**MODIFIED BLOOD CARDIOPLEGIA STRATEGY FOR PROLONGED MYOCARDIAL ISCHEMIA TIME**

Thorsten Wahlers, MD, Justus T. Strauch, MD, Ulrich F.W. Franke, MD  
Department of Cardiothoracic and Vascular Surgery, Friedrich-Schiller-University  
Jena, Germany

**Background:** Current blood cardioplegia strategies imply stringent application schemes. We investigated in a prospective open protocol an approach using semi-continuous retrograde blood cardioplegia in complex cardiac procedures.

**Methods:** Since 2000, 150 patients underwent cardiovascular procedures with myocardial ischemia time of more than 90 minutes. Myocardial protection was performed using retrograde cold Buckberg's solution (RCB). The previous protocol was modified into a repetitive low-flow application of RCB whenever no limitations were given by the surgical procedure. Patients were divided into groups according to ischemia time.

Group-A (n=87)	Group-B (n=29)	Group-C (n=34)
ischemia 90-110min	ischemia 111-130min	ischemia >130min
Procedure (%)		
isol., combined valve	69	38
Bentall, ascending, arch	31	42
David / Ross / Homograft	-	20
RCB-volume (cc)	4020±1220	5420±2270
RCB-duration (min)	20±9	30±12
		36±11

**Results:** In-hospital mortality was 4.6% (n=4), 6.9% (n=2) and 5.9% (n=2) for groups A, B and C respectively. Cardiac related deaths occurred in 3 cases (2% of 150 pts). The postoperative Troponin-levels (TnI) correlated with myocardial ischemia time (PK 0.78) resulting in significantly higher TnI levels in group C (p=0.03).

**Conclusion:** Our modified new technique of RCB provides favourable clinical outcome even in highly complex cardiothoracic procedures with prolonged myocardial ischemia time.

## ABSTRACT 76

**EARLY REGIONAL ASSESSMENT OF LV MASS REGRESSION AND FUNCTION AFTER STENTLESS VALVE REPLACEMENT-COMPARATIVE RANDOMIZED STUDY**

M.J.Jasinski, M.Kolowca, P.Ulbrych, A.Szafranek, J.Baron, S.Wos

Early regional performance and hypertrophy regression after stentless aortic valve replacement is still incompletely characterized

We compared early postoperative changes of segmental thickness and function after stentless and stented Aortic valve replacement as assessed by cardiac magnetic resonance (CMR)

In 16 patients randomly assigned to stented – (Mosaic™ 8 patients) and stentless- (Freestyle™ 8 patients) four parallel short- axis images at the level of apex (slice 4), midventricular (2-3) and mitral valve (slice 1) were obtained with 1.5 T CMR scanner (Magnetom Sonata, Siemens) before and one month after operation. Cine images were obtained using a echo gradient sequence. Left ventricle mass was calculated as the difference between the left ventricular end-diastolic volume (LVEDV) at the epicardial and endocardial borders multiplied by a myocardium density factor (1.05) Each slice was divided into eight segments- octants: from anterior- octantI-II to septal: octant V- VIII. There was total of 32 segments encompassing entire heart. From each of these elements end diastolic thickness and systolic function (fractional thickening) were calculated.

In stentless valves significant reduction of septal octants thickness (bold italics) on the midventricular slice was noted (tab.). There was no difference in regional systolic function – segments thickening.

In stented valves no significant segmental thickness changes were observed

	octantV	octantVI	octantVII	octantVIII	p
slice1	3,5(5)	2,5(4,1)	3,6(5,5)	3,7(5,1)	0,1
slice2	4,3(9,1)	6,2(11,1)	6,2(11)	6,1(10)	0,2
slice3	5,3(5,1)	5,1(4,7)	4,1(3,9)	3,9(4,6)	0,04
slice4	1,2(3,4)	-0,1(2,7)	0,2(4,5)	-2,6(1,7)	0,4
p	0,04	0,008	0,05	0,05	

In stentless valves there is early postoperative thickness reduction of septal segments on the midventricular level. However, this does not coincide with changes in segmental function

ABSTRACT 77

**HARMONIC SCALPEL FOR PERICARDECTOMY: NOVEL APPROACH FOR AN OLD CARDIAC DILEMMA**

Gabriele Di Luozzo, M.D., John Schor, M.D., Ernest Traad, M.D., Donald Williams, M.D., Roger Carrillo, M.D., Mount Sinai Medical Center, Miami Beach, FL.

**Purpose:** Pericardiectomy for constrictive or calcific pericarditis is a technical challenge because of dense adhesions to the ventricles and epicardial vessels. The procedure is fraught with the possibility of urgent cardiopulmonary bypass from excessive bleeding or cardiac laceration. We propose the use of the harmonic scalpel to perform the adhesiolysis with less bleeding and cardiac trauma.

**Method:** A retrospective review of seven pericardiectomies using a hand-held harmonic scalpel (Ethicon) over the past 2 years was performed. Requirements for blood products, the need for cardiopulmonary bypass, and mortality were compared to historical controls.

**Results:** Four of the patients underwent pericardiectomy alone and three patients underwent pericardiectomy plus additional cardiac procedures. The 30-day mortality was zero. No patient required blood transfusions or urgent cardiopulmonary bypass for bleeding. No patient developed malignant arrhythmias.

**Conclusions:** The use of the harmonic scalpel is a safe and efficient technique for pericardiectomy. The adhesiolysis is less treacherous because of the bloodless operative field; moreover, the harmonic scalpel is not arrhythmogenic.

## ABSTRACT 78

**OBLIQUE GROIN INCISION FOR ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSM**

Daniel Watson,MD, Gary Ansel,MD, Lori Wiseman, and Thomas Tan  
from Riverside Methodist Hospital in Columbus, Ohio.

**Purpose:**

Groin incision for access of the femoral artery is necessary for stent graft repair of abdominal aortic aneurysm (AAA). However, lymphatic and infectious complications can occur during wound healing after surgery. Traditionally a vertical incision is used but a new oblique incision technique has the potential to reduce complications. We report our results from AAA stent repairs performed via oblique incisions at our center for a 33-month period.

**Methods:**

Data for 134 consecutive patients undergoing elective asymptomatic infrarenal AAA stent repair by two cardiovascular surgeons at a single center from July 1, 2000 to March 31, 2003 were gathered for analysis. Wound complication percentages for infections, paresthesias, sepsis, and seroma were calculated.

**Results:**

Of 134 patients, a total of 278 incisions were made. Reasons for extra incisions included "improving catheter entry angle" (5), "tunneling for vascular tapes" (3), and "initial approach too low" (2). The percentages are, however, calculated on a per patient basis. 30-day analysis revealed a 0% infection rate, 4.7% incidence of paresthesias, 2.38% rate of wound seroma, and 0% wound sepsis.

**Conclusion:**

Due to the non-existent infection rate and low wound complication rate, our data supports the use of oblique groin incision for asymptomatic infrarenal AAA stent repair.

## ABSTRACT 79

**FEASIBILITY OF PLANTARIS AND PALMARIS TENDON HARVESTING FOR MITRAL VALVE ANNULUS RECONSTRUCTION**

1. J H Shuhaiber MD\*. University of Illinois. Department of Surgery. Chicago, IL 60612; 2. G A Dumanian MD . Northwestern University . Department of Plastic and Hand surgery . Chicago , IL; \* *principal investigator and corresponding author*

**Background and objectives:** Autogenous tissue for heart valve repair is limited to pericardium and fascia lata. Prosthetic annuloplasty rings remain expensive. No previous cadaveric study has been documented regarding auto-transplantation of tendons. We performed an anatomical study on human hearts to determine the surgical technique and feasibility for annulus reconstruction for both atrioventricular valves utilizing a tendon.

**Methods:** The plantaris and palmaris tendon were harvested from cadaver human body ( n=7)and prepared in the dissecting room. Percutaneous tendon harvesting for reconstruction of the cadaveric mitral valve annulus was done . Comparative gross morphological assessment to pericardium was performed. Comparative metric dimensions to flexible prosthetic rings were also performed.

**Results:** Plantaris and palmaris tendon tissue is more resilient than pericardium. The preparation and use of plantaris tendon for annuloplasty is feasible in human hearts. The anatomical reconstruction of the annulus with autogenous tissue using the plantaris tendon is morphologically efficacious. This flexible tendon allows for improved atrioventricular continuity. Complete ( n=5 ) annuloplasty of mitral valve and partial annuloplasty of the mitral valve ( n=2 ) was performed. The metric dimensions of the tendons are similar to prosthetic rings. We demonstrate the anatomical reconstruction with digital photography.

**Conclusion:** Plantaris and palmaris tendons are a suitable unrecognized autogenous tissue that can be harvested together with the saphenous vein or radial artery and utilized as alternative to pericardium or prosthetic annuloplasty rings. The tissue is readily available from the same patient with no extra cost. This anatomical experiment needs to be addressed to both adult and pediatric heart surgeons to increase their awareness of alternative donor tissue harvesting sites for annuloplasty.

## ABSTRACT 80

**AVERAGED AUTOPOWER SPECTRAL ANALYSIS OF MECHANICAL VALVE SOUNDS: A NEW TECHNIQUE FOR IN-VIVO EVALUATION OF VALVE FUNCTION.**

B. Meuris, W. Flameng.

The idea of detecting changes to the state of mechanical valves by acoustic analysis has been around for many years. We developed a measurement- and analysis technique that enables us to discriminate normal from abnormal valve function, using a combination of 'time-based' and 'frequency-based' parameters.

A 16-bit sound recording (sampling rate 44 kHz) is made, using optimized amplification and high-pass filtering. 'Time-based' parameters (timing of openings- and closing-clicks, presence of hinge noise, asynchronicity of openings- and closing-clicks, relative amplitude differences) are extracted from the signal using a custom-made computerized algorithm. 'Frequency-based' parameters are extracted from an averaged autoperpower spectrum. This spectrum is calculated as the averaged amplitude of the Fourier transformation of selected small time windows around openings- and closing-clicks, thereby minimizing the important variabilities in frequency content of consecutive valve clicks.

This technique was applied to different in vivo settings: (1) a sheep model of mechanical valve implantation (n=6); (2) serial clinical measurements in patients with normal functioning mechanical valves (n=6); (3) clinical measurements in patients presenting with mechanical valve dysfunction (n=3). The analysis provided a stable and reproducible result in normal mechanical valves. Clear abnormalities occurred in the analysis when valve dysfunction due to valve thrombosis or pannus overgrowth was present.



Wednesday, March 10, 2004

6:30 – 8:00 PM Imperial I

## Clinical Case Reports

**Abstracts 81 - 88**

WEDNESDAY  
AFTERNOON

ABSTRACT 81

**AORTIC HOMOGRAFT USE FOR INFECTIVE ENDOCARDITIS ASSOCIATED WITH A SCORPION STING**

Grayson Wheatley MD, Michael Wait MD, Michael Jessen MD. University of Texas Southwestern, Dallas, Texas, USA

No prior reported cases exist of infective endocarditis (IE) resulting from scorpion stings. We report an unusual case of IE associated with a scorpion sting.

A 55-year-old male with a 23 mm Medtronic-Hall mechanical valve prosthesis suffered repeated scorpion stings. He developed skin lesions, intermittent fevers, and failed to improve with oral antibiotics. He underwent hospital admission and was started on intravenous antibiotics. Blood cultures grew group G streptococcus. Transesophageal echocardiogram revealed a prosthetic valve vegetation, a peri-valvular leak, and an annular abscess. Cardiac catheterization demonstrated an occluded right coronary artery. He underwent redo sternotomy, removal of the infected valve, and aortic root replacement with a 23 mm cryopreserved human cadaveric homograft and coronary artery bypass grafting of the posterior descending coronary artery with saphenous vein. His post-operative course was significant for the development of complete heart block. He received a 6 week course of Penicillin G, and underwent implantation of a permanent transvenous pacemaker. Subsequent echocardiograms have revealed no problems with his aortic homograft, and no evidence of recurrent infection.

## ABSTRACT 82

**AUTOTRANSPLANTATION AS A METHOD OF CHOICE FOR TREATMENT OF A GIANT LEFT ATRIUM**

Mitrev Z, Angusheva T, Vogt P\*

Center for Cardiosurgery, Special Hospital for Cardiosurgery "Fillip II", Skopje, Macedonia

\*Dept. of Cardiovascular Surgery, University Hospital, Giessen, Germany

We have described a case of a 54-year-old male with end-stage heart failure due to end-stage of the mitral valve insufficiency combined with a middle degree stenosis due to extremely dilated annuli a severe tricuspid insufficiency. Patient had enormous enlargement of left atrium (14x16cm) with interatrial septum aneurysmatically deformed, and significant mitral and tricuspid regurgitation (EF=30%, EDV=225ml, ESV=138ml). Previous data for rheumatic fever.

Using transthoracic echocardiography the enormous left atrium due to primary severe mitral stenosis and secondary insufficiency and tricuspid regurgitation has been visualized. Diagnosis was confirmed with transoesophageal echocardiography. Basic X-ray, showed extremely enlarged left atrium. The patient developed cardiac cachexia, and atrial fibrillation during last eleventh months. There were laboratory parameters for initial liver failure.

With aortotomy and complete heart excision, left atrium was large excised, in order to decrease its volume and reconstruct the interatrial septum. Mitral and tricuspid valve had been reconstructed. The heart was reimplanted. Operation underwent without any complications. Postoperatively patient was in sinus rhythm, left atrium was significantly decreased (6x4cm), valvular apparatus was competitive. Patient was 26 hours on assisted ventilation. Mobilized first postoperative day. Pericardial effusion and light liver failure appeared as a postoperative complications. After 5 months follow up there was significant improvement of patient's hemodynamics with normal left ventricular morphology and decreased volume (EF=47%, EDV=167ml, ESV=78ml), as was assessed by ultrasound. Pericardial effusion and liver failure has been completely recovered.

**Conclusion:** Autotransplantation seems to be an efficient method to reduce extreme LA dilatation. Eventually should be considered as a method of choice for patients with atrial fibrillation due to extremely enlarged left atrium. Further study and longer follow-up are required.

## ABSTRACT 83

**LEFT MAIN DISSECTION DURING CABG SURGERY**

Terea M. Kieser, Richard Kowalewski, Frank P. Spence  
Foothills Medical Center, University of Calgary. Alberta Canada

Dissection of the left main coronary artery during coronary artery bypass graft (CABG) surgery is a rare, potentially lethal complication, usually diagnosed at post-mortem. During the cross-clamp period of a 5 vessel CABG in a 74 year old hypertensive woman, retrograde dissection occurred in a diffusely diseased marginal artery when perfused with cardioplegia through a vein graft. The dissection extended to the left main, left anterior descending artery (LAD) and the posterior proximal ascending aorta. Transesophageal echo confirmed the left main dissection and showed antero-septal-lateral akinesis in a previously normally functioning LV. The heavily calcified proximal LAD was grafted with saphenous vein by carving an ellipse of the intimal wall. Normal LV function returned and the left main dissection was no longer apparent by echo. One year post-op, the patient is well with function class II angina. Cardiac catheterization showed normal LV function, patent grafts to the right coronary artery, proximal LAD, distal LAD (LITA) and an occluded sequential marginal graft. There is no previous documentation of a diagnosed and successfully treated left main dissection during CABG surgery.

## ABSTRACT 84

**PERCUTANEOUS STENTING OF THE VERTICAL VEIN PRIOR TO REPAIR OF OBSTRUCTED SUPRACARDIAC TOTAL ANOMALOUS PULMONARY VENOUS CONNECTION**

Jeff Myers, James Kyser, Iqbal Choudhury, Hani Hennein, Ernest Siwik  
Tulane Medical School and Rainbow Babies and Children's Hospital

**INTRODUCTION:** Total anomalous venous connection (TAPVC) with obstruction remains a difficult clinical problem and is often considered the last true surgical emergency in pediatric cardiac surgery. Advances in catheter technology and interventional procedures may present options for pre-operative stabilization of these neonates in conjunction with surgical repair

**CASE DESCRIPTION:** A newborn presented with hypoxia and low cardiac output. Initial echocardiography incorrectly identified the pulmonary venous confluence as the left atrium and TAPVC was ruled out. The patient was placed on ECMO with only a moderate improvement and a persistent metabolic acidosis. Subsequent ECHO showed supracardiac TAPVC with obstruction of the vertical vein. Due to continuing hemodynamic instability and unresolved questions regarding cardiac anatomy, the patient was taken to the cath lab. A percutaneous stent was placed in into the vertical vein (via the right atrium - SVC - innominate vein). The patient was then weaned from ECMO and underwent subsequent TAPVC repair without complications.

**DISCUSSION:** Approximately 40% of patients with TAPVC will have the supracardiac type and around 50% of those will be obstructed. The obstruction is frequently mechanical due to compression by adjacent structures. Hemodynamic instability remains a risk factor for a poor outcome. Newer generation stents in combination with surgical repair as we describe may allow pre-operative stabilization and improve outcomes.

ABSTRACT 85

**A ROSS PROCEDURE PATIENT FOLLOWS A ROUGH ROAD TO RECOVERY**

Charles Moore, Paraic Mulgrew - CHRISTUS Transplant Institute

**CLINICAL CASE REPORT:** Complications of AVR following a Ross Procedure resulted in a 39 Y/O M having an emergency heart bypass system, 2 separate ventricular assist devices (VADs), multiple cardiac surgeries and finally a cardiac transplant.

**CASE SUMMARY:** AVR Ross Procedure 8/17/01. CPS (ECMO) 8/17/01 and Abiomed LVAD. Relieved tamponade and Abiomed BVAD 8/19/01. Cardiac Cath - LM occlusion and ER CABx2, LIMA-LAD, SVG Cx 8/25/01. HeartMate LVAS-VE 8/29/01, Heart Transplant 11/2/01. Discharged home 12/3/01.

This case illustrates a full range of assist devices, combined with emergency CAB, multiple heart operations, ablation therapy for arrhythmias, complex management of multiple organ failure as well as control of gram positive and gram negative sepsis and fungal sepsis culminating in a heart transplant and modified immunosuppression therapy for successful long-term outcome. Difficult moral, ethical and financial issues will also be discussed

## ABSTRACT 86

**ATRIAL SEPTAL DEFECT REPAIR AFTER INCIDENTAL DISCOVERY WITH INTRAOPERATIVE TEE DURING A PLANNED LEFT VENTRICULAR ANEURYSM RESECTION AND RESTORATION**

Israel J. Jacobowitz, M.D., Mario F. Sabado, M.D., and John A. Carabello, D.O.,  
Maimonides Medical Center, Brooklyn, NY

This is a clinical case involving 77 y.o. male with known poor left ventricular function and CAD. He had multiple hospital admissions for exacerbation of heart failure and desaturations. His cardiac echo revealed global hypokinesis with an EF of 15%, moderate to severe mitral regurgitation, a left ventricular aneurysm, end systolic vol. of 163, and end diastolic vol. of 196. Intra operative TEE revealed a large ASD undetected on prior echo. Further evaluation suggested a bi-directional shunt. We proceeded in performing a double vessel aorto coronary bypass, left ventricular restoration, mitral valve repair, closure of ASD with pericardial patch and atrial fibrillation ablation. The entire procedure was performed with zero ischemic time. Post operatively the patients overall myocardial contractility improved with an EF of 31%, end systolic volume decreased to 111 and end diastolic volume decreased to 162. This case lends promise to addressing patients with poor left ventricular function and associated cardiac pathologies with surgical intervention.

## ABSTRACT 87

**CORONARY ARTERY BYPASS GRAFTING IN THE AWAKE PATIENT: COMBINED THORACIC EPIDURAL AND LUMBAR SUBARACHNOID BLOCK**

Lucchetti V, Moscariello C, Marino L, Mancusi R, Mango E, Angelini G  
Casa di Cura Montevergine, Avellino, Italy and Bristol Heart Institute, Bristol,  
United Kingdom

**Background** CABG on the beating heart is an established procedure. High thoracic epidural anaesthesia has recently been described to perform surgical revascularisation with arterial grafts in awake patients. However, in high risk patients it is not always possible to perform complete revascularisation using arterial conduits. A technique which combines thoracic epidural and lumbar subarachnoid block is described allowing harvesting of the saphenous vein and complete surgical revascularisation in awake patients.

**Method** Two patients aged 69 and 72 with several risk factors including diabetes, COPD and obesity, had a thoracic epidural catheter placed at T3/T4 level the night before surgery. On the day of surgery a lumbar subarachnoid block at L4/L5 level was also performed to obtain optimum analgesic level from T12 to S4.

**Results** Following median sternotomy, the first patient received a LIMA-LAD and a sequential saphenous vein to the PDA and circumflex. The second patient had a LIMA-LAD, a radial artery-OM and a saphenous vein-PDA. There were no perioperative complications and both patients were discharged home on day 5 postoperatively.

**Conclusion** The combination of thoracic epidural and lumbar subarachnoid block in the awake patient is feasible and safe to perform complete surgical revascularisation using arterial and venous grafts.

## ABSTRACT 88

**THE RIGHT INTERNAL THORACIC ARTERY AND RIGHT GASTROEPIPLOIC ARTERY – ALTERNATIVE SITES FOR PROXIMAL ANASTOMOSIS IN PATIENTS WITH ATHEROSCLEROTIC-CALCIFIED AORTA**

I. Herz, D. Loberman, G. Aviram, I. Shapira, C. Locker, R. Mohr, G. Uretzky.  
Tel Aviv Sourasky Medical Center, Tel Aviv, Israel.

Atherosclerotic or calcified ascending aorta is an important predictor of adverse cerebrovascular events. Avoiding aortic manipulation and clamping, the use of off-pump coronary artery bypass (OPCAB), with composite and in-situ arterial grafting, may reduce the risk of stroke-related to aortic atheroembolism. When the aorta is calcified and cannot serve as a safe site for proximal anastomosis, this anastomosis can be performed on the proximal segment of the right internal thoracic artery and right gastroepiploic artery.

Three such cases are described.

The first patient was referred for repeat operation five years after bilateral ITA grafting. His right ITA to the LAD was occluded. The radial artery was used for LAD revascularization with proximal anastomosis on the GEA.

In the second patient, COPD precluded the use of OPCAB with two ITAs. Revascularization was performed with left ITA to LAD and saphenous vein (SVG) to the PDA. Proximal SVG anastomosis was performed on the right ITA.

The third patient had repeat operation with patent left ITA to LAD. Free radial artery was connected to PDA and circumflex marginal. Proximal radial anastomosis was contracted on the proximal GEA. Postoperative graft patency was confirmed intraoperatively with flow measurements and postoperatively with control angiography or 16-slice coronary computed tomography with 16-slice multidetector.



Thursday, March 11, 2004  
8:00 – 8:30 AM East Ballroom

## **Featured Videos**

**Abstracts 89 - 92**

THURSDAY  
MORNING

ABSTRACT 89

**OFF PUMP CORONARY STENT REMOVAL AND  
ENDARTERECTOMY IN PATIENTS WITH IN-STENT RESTENOSIS**

Shuichiro Takanashi, MD, Toshihiro Fukui, MD, Yasuyuki Hosoda, MD  
Department of Cardiovascular Surgery, New Tokyo Hospital, Chiba, Japan

**AIM:** In-stent restenosis (ISR) has been one of the challenging problems for cardiologists. We describe one of surgical options, coronary stent removal and endarterectomy, in this complex setting.

**METHODS AND RESULTS:** Three consecutive patients who presented with angina and angiographically severe diffuse coronary lesion in stent were treated with coronary endarterectomy and stent removal concomitant with multivessel coronary bypass grafting. Target vessel was left anterior descending coronary artery (LAD) in all patients. Mean interval from latest intervention was  $4.3 \pm 2.0$  months. Mean incision length of LAD was  $58.3 \pm 11.1$  mm. In situ LIMA was grafted on-lay patch fashion. There were no death of the patients in the follow-up period. Angiographically, all LIMA on-laid as patches and LAD were patent and left ventricular functions were preserved.

**CONCLUSION:** We report our early experience of coronary stent removal and endarterectomy with on-lay patch of LIMA. Patients who have ISR of the left anterior descending coronary artery and are a high risk for CPB will benefit from this technique.

## ABSTRACT 90

**SEQUENTIAL SUBXYPHOID AND THORACOTOMY INCISIONS WITH GRAFT PULL THROUGH FOR TARGETED REDO MULTIVESSEL SURGICAL REVASCULARIZATION.**

Hani Shennib, and Osama Benhameid.

Division of Cardiothoracic Surgery, The Montreal General Hospital,  
Montreal, Quebec, Canada

We report on a technique for redo coronary artery bypass using sequential subxyphoid and left thoracotomy access and a vascular graft pull through for proximal anastomosis to the descending aorta. This technique can be used safely on the beating heart when previously implanted grafts to the anterior ventricular wall are patent or whenever resternotomy for redo multivessel coronary artery bypass is undesirable or contraindicated

ABSTRACT 91

**PERMANENT LEFT VENTRICULAR PACEMAKER IMPLANTATION  
IN A HEART FAILURE PATIENT DURING A COMPLEX OPEN  
HEART SURGERY PROCEDURE**

Peter Kleine, Omer Dzemali, Farhad Bakhtiary, Gerhard Wimmer-Greinecker, Anton Moritz

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A 54 year old female patient in NYHA class IV was admitted for repair of severe mitral insufficiency. Preoperative echocardiography demonstrated a dilated left ventricle with severe impairment of global contractility (EF 25%), septal dyskinesia and mitral annulus dilatation. The ECG demonstrated chronic atrial fibrillation and left bundle branch block with QRS-width of 175 ms.

The operative procedure was videotaped and included mitral anuloplasty using a Carpentier-Edwards classic ring 28 mm, atrial HF ablation, left ventricular remodelling with apical Teflon-armed U-stitches and implantation of a permanent DDD pacemaker (Ela Medical Talent AF) with one atrial and one left ventricular epicardial electrode.

The postoperative course was uneventful, the patient remained in sinus rhythm with permanent DDD pacing (QRS width 145 ms). Control echocardiography demonstrated resynchronized ventricular contraction with an EF of 35% and no residual mitral regurgitation. The patient was in NYHA class II with improved quality of life at a follow-up visit 3 months postoperatively.

Operations for advanced heart failure have to address all aspects of the disease (ventricular dilatation, mitral insufficiency and rhythm abnormalities) and should include modern technologies like permanent left ventricular pacing. With this multimodal approach, our patient significantly improved regarding NYHA classification and quality of life.

## ABSTRACT 92

**VALVE-SPARING OPERATION AND AORTIC ARCH REPLACEMENT USING "ELEPHANT TRUNK TECHNIQUE" IN A PATIENT WITH BICUSPID AORTIC VALVE AND TYPE B AORTIC DISSECTION.**

R. Di Bartolomeo, D. Pacini, C. Savini, E. Pilato

## TITLE:

Department of Cardiac Surgery, S.Orsola-Malpighi Hospital, Bologna, Italy

Bicuspid aortic valve is frequently associated with aortic dissection or aneurysm of the thoracic aorta. We present a case of aortic valve insufficiency in bicuspid aortic valve and dilatation of ascending aorta and aortic arch associated with type B aortic dissection.

The patient underwent valve sparing procedure and aortic arch replacement. CPB was instituted by means of femoral artery and right atrium cannulation. The circulation was arrested at 26°C and the ascending aorta opened. Two 15 Fr. cannulae were inserted in the innominate and left common carotid arteries and antegrade selective cerebral perfusion was instituted at a flow of 10 ml/kg/min. Crystalloid cardioplegia was delivered selectively into coronary ostia. The aorta was completely resected from the valve to the isthmus.

A segment of intimal flap was resected and the distal anastomosis was performed using the "elephant trunk technique". Then the supraortic vessels were reimplanted using the "en bloc technique".

The bicuspid aortic valve was repaired and the aortic root was replaced according to the "reimplantation technique".



Thursday, March 11, 2004

1:30 – 3:30 PM East Ballroom

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session I**

Innovative Technology for  
Surgical Revascularization

**Abstracts 93 - 103**

THURSDAY  
AFTERNOON

## ABSTRACT 93

**INITIAL EXPERIENCE OF AUTOMATED ANASTOMOTIC DISTAL DEVICE IN OFF-PUMP CABG**

Ki-Bong Kim, Kwang Ree Cho, Jae-Sung Choi, Eun Hee Ki  
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Seoul, Korea

**Background:** Recent progresses of the minimal invasive technology in the field of CABG bring the interest in anastomotic devices to facilitate coronary anastomosis. We evaluated the early anastomotic patency and clinical results of CorLink<sup>®</sup> Automated Anatomotic Device Distal (AADD) based on an elliptical nitinol ring with attached 8 pins.

**Method:** This study was performed as a part of multicenter, prospective, randomized, controlled study. Randomization of a distal anastomosis for non-dominant coronary artery was done prior to the anastomosis. We compared the results of patients using the AADD (Group I, n=11) with those of hand-sutured distal anastomosis (Group II, n=9).

**Results:** All the patients underwent OPCAB for multivessel coronary disease. In group I, distal anastomosis using the AADD was performed in 7 patients, and was failed in 4 patients. The grafts used for the AADD were right gastroepiploic artery in 4 patients, saphenous vein in 2 patients, and internal thoracic artery in 1 patient. The reasons for failure to use the AADD were flaring difficulty of the graft in 2 patients and small target coronary artery (< 1.5 mm in diameter) in 2 patients. The time required for distal anastomosis using the AADD was less than 3 minutes in all the patients. Coronary angiographies performed before discharge demonstrated widely patent graft in 6 patients and occlusion in 1 patient. There were no adverse events related to the use of the device. All the distal grafts for control were patent in group II. The time required for distal anastomosis in group II was 12 minutes in average.

**Conclusion:** Our initial experience demonstrates that the distal anastomosis using the AADD for arterial grafting in OPCAB has the advantage of shortening the actual suturing period and may provide a method for standardizing the anastomotic procedure.

## ABSTRACT 94

**FIRST CLINICAL EXPERIENCE WITH A NEW MAGNETIC DEVICE FOR DISTAL ANASTOMOSES**

Sandra Eifert<sup>1</sup>, Martin Oberhoffer<sup>1</sup>, Frank Christ<sup>2</sup>, Peter Boekstegers<sup>3</sup>, Bruno Reichart<sup>1</sup>, Calin Vicoli<sup>1</sup>

Departments of Cardiac Surgery<sup>1</sup>, Anaesthesiology<sup>2</sup> and Internal Medicine<sup>3</sup>, Ludwig Maximilians University, Munich, Germany

**Background.** Main goal of anastomotic devices is to improve patency of bypass surgery while reducing the invasive nature of conventional myocardial revascularization. We analyse our preliminary clinical experience with Ventrica Magnetic Vascular Positioner (MVP®), a distal anastomotic device.

**Methods and Patients.** A number of 19 distal anastomoses was performed in 13 patients (mean age 60 years, 11 men, 1 woman) by the Ventrica MVP®. Eleven left internal thoracic artery to left anterior descending coronary artery, six venous grafts (two to diagonal, two to marginal branches and two to right coronary artery) as well as one radial artery to marginal branch and one right internal thoracic artery to marginal branch were anastomosed using of this novel device. Mean diameter of the target vessels was 2.2 mm (1.5 to 2.5). In six 6 cases the 1.5 mm device and in 13 cases the 2 mm device was used. Mean time for anastomosis measured 17 (7 to 20) minutes.

**Results.** In all cases the use of the device was successful. Postoperative course was uneventful in all patients beside Dressler syndrome in one patient. Coronary angiography performed before discharge showed patent anastomoses in all patients except for one. In this case the occlusion occurred in a venous graft to right coronary artery. Native stenosis of target vessel was successfully dilated.

**Conclusions.** Distal anastomoses using the Ventrica MVP® were performed successfully in all cases. The device is safe, easy to handle and may improve the long-term results of myocardial revascularization. The Ventrica MVP® provides a constant anastomotic orifice, smooth surface and shows laminar flow.

## ABSTRACT 95

**CLAMPLESS ANASTOMOSIS: NOVEL DEVICE FOR CLAMPLESS PROXIMAL ANASTOMOSIS IN O.P.-C.A.B. SURGERY: THE IPAD™**

Baron L. Hamman, M.D.; Cory H. White

Clinical Cardiology Research Clinic, Baylor University Medical Center

**Background:**

The Clampless anastomosis of a vein to the ascending aorta is valuable in off pump-coronary artery bypass (O.P.-C.A.B.) surgery. There are many devices readily available for the easily created aorto-vein proximal anastomosis, but many of these require the implantation of a stent-like metallic object into the aorta, which is prone to early stenosis. The Coalescent® IPAD™ (Figure 1) enables creation of a compliant proximal vein anastomosis to the aorta without using a clamp or touching the intima, thereby reducing the risk of cerebral vascular emboli. Furthermore, the IPAD™ allows for a suture or a clip-like apparatus to be used, thereby discontinuing the elevated risk of early stenosis, but with the O.P.-C.A.B. benefits.

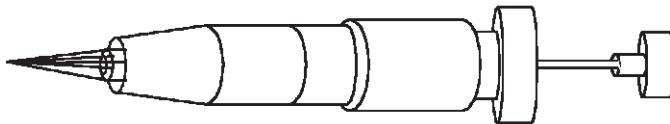


Figure 1. The IPAD™ Anastomotic Attaching Device

**Methods:**

IPAD™ created anastomoses were performed in patients having standard O.P.-C.A.B. surgery. The proximal anastomoses were created prior to the distal anastomoses by stabilizing the vein onto a hole cut into the ascending aorta with the IPAD™ cutting device, then attached the vein to the aorta with interrupted NiTiNOL U-CLIPS™ in between the legs of the parent mechanism. Patients were followed for two weeks to eight months post-operatively for signs of clinical complications.

**Results:**

There were 111 IPAD™ proximal anastomoses created in 76 patients having O.P.-C.A.B. (mean of 1.5 anastomoses per patient). Overall cutting device average size during this study is  $3.9 \pm 0.3$  mm, being slightly larger (~8%) than the vein average size of  $3.6 \pm 0.5$  mm, allowing for mobilization of the vein during and after creation, and the length of time to create the average anastomosis was 6.3 min.

Other figures are totaled below (Table 1). The average learning curves for the surgeons used in this study are depicted as well (Graph 1).

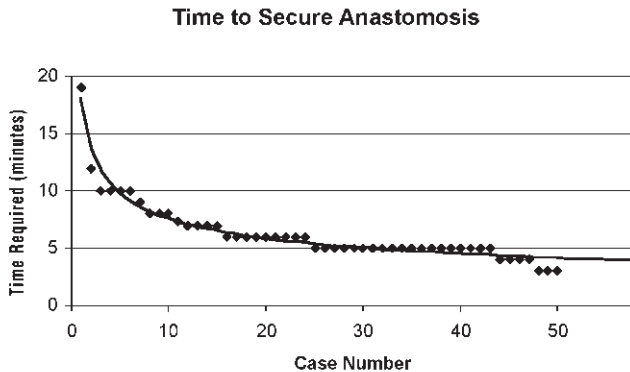
Table 1.

**IPAD™ Assisted Clampless U-Clip Proximal Vein-Aorta Anastomoses (n=111)**

<b>1. Measures</b>	Average	
Vein Size (Outer Diameter mm):	3.6 ± 0.5	
Size of Aortic Cutting Device (mm):	3.9 ± 0.3	
U-Clips Used Per Anastomosis:		
Primary- (Before IPAD removal)	6.8 ± 1.5	
Secondary- (After IPAD removal)	1.6 ± 1.8	
Total Per Anastomosis:	8.5 ± 3.0	
Blood Loss (mL):	10.6 ± 28.4	
Time to Load Vein (min):	2.0 ± 2.0	
Time to Secure Anastomosis (min):	6.3 ± 2.8	
<b>2. Subjective Findings</b>	Optimal	Sub-Optimal
Ease of Transfer:	91.3%	8.7%
Seal Quality:	90.3%	9.7%
Anastomosis Quality:	100%	0%

THURSDAY  
AFTERNOON

Graph 1. Mean Learning Curve of the Surgeons Over all 76 Cases



As can be seen, the learning curve does decrease over time and experience with the IPAD™ device. The required time initially begin at around 19 minutes (overall average of first cases) and fell to three minutes (last case average for all surgeons), around a 84% drop in time overall to secure anastomosis.

Following the procedures, no patients developed myocardial infarctions or claimed angina, suggesting patency of the vein grafts to be of high quality. Three patients (~4%) continued to have congestive heart failure, which was diagnosed pre-operatively, though the degree was suppressed from a mean of \_\_\_\_ to \_\_\_\_.

### Conclusion:

The IPAD™ is easily utilized as safe and effective in creating a clampless, compliant proximal anastomosis in O.P.-C.A.B. surgery. Implied patency suggests that the device is a useful adjunct for minimally invasive C.A.B.G. The IPAD™ may also assist in further decreasing aortic and venous angiitis resulting in acute pericarditis and may be useful in the asystole induced C.A.B.G. for that purpose. The device does have a learning curve, but the learning curve for the IPAD™ is closely related to that of any other anastomotic attaching device, just without the plethora of possible complications.

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## ABSTRACT 96

**CLINICAL EXPERIENCE WITH THE HEARTSTRING™ DEVICE FOR PROXIMAL ANASTOMOSES**

M.Oberhoffer, S.Eifert, M.Mueller, E. Kreuzer , S .Daebritz, P. Boekstegers, B. Wintersperger, B. Reichart, C.Vicol

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University Hospital Grosshadern, Munich, Germany

**Background:** New devices to perform proximal anastomoses have been introduced. We report on our initial experience with the Heartstring™ device, which allows conventional handsewn anastomoses without aortic side clamping thus reducing a recognized cause for embolic events.

**Patients and Methods:** Forty-eight patients (42 male, mean age  $64 \pm 10$  years) underwent CABG (coronary artery bypass grafting) using the Heartstring™ device. Operative data, neurologic complications and graft patency (by postoperative angiography or MSCT (multi-slice computed tomography) were documented.

**Results:** A total of 73 bypasses (64 veins and 9 radial arteries) was performed using the Heartstring™ device. Anastomotic time ranged from 5-15 min, 6 additional stitches for minor bleeding were necessary, 7 additional devices due to loading failure were used. Postoperatively stroke occurred in 1 patient who had undergone concomitant carotid thrombendarterectomy. In 32 patients pre-discharge-angiography or MSCT revealed patency at the proximal anastomotic site in 50/50 (100%) grafts and distal occlusion in 2 vein grafts.

**Conclusions:** The Heartstring™ device offers a safe, easy, quick and reproducible option to connect saphenous veins and radial arteries to the aorta without aortic side clamping. No foreign material other than Prolene™ is compromising the anastomosis. Early patency rate is excellent.

## ABSTRACT 97

**VIRCHOW'S TRIAD, BUT NOT USE OF AN AORTIC CONNECTOR DEVICE, PREDICTS VEIN GRAFT THROMBOSIS AFTER OFF-PUMP BYPASS**

Authors: Robert S Poston, MD, Charles White, MD, Junyan Gu, MD, PhD, K Read, A Lee, James Gammie, MD, James Brown, MD, Bartley P. Griffith, MD

**Objective:** Although vein grafts with a proximal anastomosis performed using an aortic connector device (ACD) might be at increased risk for early thrombosis, a causal relationship has not been established. Severe atherosclerosis that prompts use of these devices is often associated with conditions that increase the risk for graft thrombosis such as poor graft runoff, hypercoagulability and endothelial disease (i.e. Virchow's triad). We investigated whether an ACD increased the risk for early bypass graft failure after OPCAB beyond that predicted by an objective assessment of this important triad.

**Methods:** 50 OPCAB patients that received 92 venous bypass grafts (49 ACD, 43 hand sewn) were prospectively investigated. Blood flow: analyzed intraoperatively using transit time technology. Flow between 10-25cc/min was considered marginal and <10cc/min despite revision (n=2) led to exclusion from analysis. Coagulation: Hypercoagulability was defined by hyperfunctioning platelets on Thrombelastography™ (maximum amplitude, MA, >70mm), whole blood aggregometry (>15 ohms after 5mcl/ml collagen) or hemoSTATUS (channel 5 clot ratio>0.5) prior to OPCAB, at case completion, on postoperative day (POD) #1 or #3. Endothelium: A procoagulant endothelial phenotype was defined by an increased expression of PAI-1, tissue factor and reduced TPA, thrombomodulin in bypass vein segment homogenates/frozen sections. POD#5 graft patency was determined by EKG gated, multichannel CT coronary angiography (Phillips).

**Results:** No difference was seen in the early thrombosis rates of ACD (8.5%) vs. hand sewn (13.0%) vein grafts. Comparing the 7 patients with 8 thrombosed veins vs. 41 patients with 84 patent veins, no significant differences were seen in the incidences of marginal graft flow (85 vs.46% of grafts), hypercoagulability (100 vs.58% of patients) or procoagulant vein phenotype (71 vs. 48% of grafts). However, a combined abnormality in all three (i.e. Virchow's triad) was seen in 5 of the 7 patients with graft thrombosis vs. 9 of the 41 patients with all patent grafts (p<0.04, Fischer exact test). **Conclusions:** In this ongoing pilot study, only Virchow's triad predicted an increased incidence of early graft failure, not the use of an ACD. Active assessment of this triad offers the opportunity to manage risk and optimize the result of surgical coronary revascularization, particularly in those patients treated with an ACD.

## ABSTRACT 98

**MECHANICAL CONNECTORS IN OFF-PUMP CORONARY BYPASS SURGERY: SINGLE INSTITUTE EXPERIENCE**

Yousuf Mahomed, Palaniswamy Vijay, John W. Brown.  
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Recently, FDA has approved a mechanical connector for graft anastomosis in coronary artery bypass surgery. Our retrospective study reports the outcomes with the use of Symmetry Aortic Connector System (ACS, St.Jude Medical Inc.,St.Paul,MN).

Between 2001 and 2003, 111 patients (mean age:  $68\pm 1$  yrs; 83M/38F) undergoing off-pump coronary artery bypass grafting and with at least one ACS were included in this study. The follow-up data were obtained from medical records.

Pre-existing risk factors and preoperative medications were similar in all patients. The average grafts revascularized was  $3.1\pm 0.8$ . The total number of saphenous vein graft anastomoses was 207. Implementation of ACS was instantaneous with good anastomoses with adequate post-graft blood flow. Postoperatively, all patients received antithrombotic agents. Of 207 grafting, only 5(2.4%) showed at least 50% stenosis within 3months postoperatively. One-year follow-up showed 2 patients with acute MI, 1 with mild stroke and 1 death due to renal failure, and 97.6% of graft anastomoses were functional. None of the patients required reoperations.

Our experience with Symmetry aortic connector system use in vein graft anastomosis has been excellent and convenient without any post-operative complications. With the proper selection of sizes and loading of the connector system, this provides an attractive alternate choice for anastomosis

## ABSTRACT 99

### **GUIDANT HEARTSTRING:-INITIAL EXPERIENCE IN OPCAB SURGERY**

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Department of Cardiovascular-Surgery, University Hospital,  
Zurich, Switzerland

#### **PURPOSE:**

The aim of this study was to evaluate the feasibility of the HEARTSTRING hemostatic seal system for proximal anastomoses in OPCAB surgery without the need of aortic side clamping.

#### **MATERIAL and METHODS:**

Between May-November 2003, 50 proximal bypass anastomoses were performed with the HEARTSTRING device in 29 consecutive patients (21 man;8 women) with calcified aorta (assessed by transesophageal echocardiography/digital palpation). Mean age was 68+/-7years. A mean of 1.7 anastomoses per patient was performed. Bypass patency was assessed by intra-operative flow measurements. Neurological outcome was graded in 4 severities.

#### **RESULTS:**

Learning curve was completed after deployment of approximate 10 devices. Crack of the seal occurred in 8 cases prior to deployment. No conversion to conventional side clamping was needed. No stitching of the seal or wrapping of the suture around the seal stem was adverted. Slight diffuse bleeding occurred with arterial pressure under 65mmHg. Bypass-graft flow was 53.7+/-23.9 l/min. No perioperative ischemic events occurred, aswell as no postoperative neurological complications.

#### **CONCLUSIONS:**

Proximal bypass aortic anastomoses can be performed safely without side clamping using the HEARTSTRING hemostatic seal system. Anastomoses can be performed without remaining foreign material.

## ABSTRACT 100

**MAGNETIC VASCULAR PORT IN MIDCAB SURGERY**

U. Klima, M. Maringka, S. Kirschner, E. Bagaev, A. Haverich

**Introduction:** The MIDCAB procedure is a well established operative procedure. However it is technically demanding and is therefore somewhat under-utilised. New automatic anastomotic devices might facilitate anastomoses in small access beating heart surgery. We evaluated the clinical and angiographic outcome of patients undergoing a MIDCAB procedure with the Ventrica MVP® System. This system maintains a secure anastomosis by the magnetic coupling of two specially designed magnetic graft and target artery ports.

**Material and Method:** A Ventrica MVP System was used in 20 selected MIDCAB patients (12 male; mean age  $62.4 \pm 10.8$  yrs). The system consists of 6 magnetic clips, 3 clips forming a set. One magnetic clip set is positioned at the arteriotomy of the target artery and of the bypass graft using a pre-loaded delivery system. These ports then form an anastomosis by magnetic coupling. The MIDCAB operation was performed via a lateral minithoracotomy on the beating heart. Seventen procedures required no mechanical stabilization during the anastomosis. Three patients had an angiogram at the time of discharge and 12 patients 6 month after surgery.

**Results:** The mean anastomotic time was  $138.0 \pm 136.2$  secs. Ischemic time during the anastomosis was  $70.0 \pm 49.5$  secs. The total procedure time was  $124.4 \pm 14.4$  min. There were no in-hospital complications and no device-related adverse events. All 3 pre-discharge and 12 six months angiograms showed patent anastomoses. One graft showed TIMI III flow requiring PTCA and stenting of the native LAD.

**Conclusions:** The magnetic vascular port facilitates the MIDCAB procedure significantly and reduces the ischemic time during the anastomosis. Hence, this minimally invasive procedure has the potential to be an alternative to PTCA and stenting in proximal LAD stenosis and may expand the acceptance of hybrid procedures.

ABSTRACT 101

**FIRST CLINICAL EXPERIENCE WITH THE VSTENTT MYOCARDIAL IMPLANT A DEVICE FOR DIRECT LEFT VENTRICLE-TO-CORONARY ARTERY BYPASS**

Vicol C. (1), Eifert S. (1), Reichart B. (1), Raake P. (2), Hinkel R. (2), Christ F. (3), Boekstegers P. (2)

(1) Department of Cardiac Surgery, (2) Internal Medicine I and (3) Anaesthesiology of Großhadern Medical Center, Ludwig-Maximilians-University, Munich, Germany

**Objective:** Stent-based left ventricle-to-coronary artery bypass (VSTENTTM) is a newly developed, alternative surgical revascularization procedure (VCABTM). We present here our initial experience using these technique.

**Methods:** Over a 7-month period 12 patients (10 male and 2 female, mean age 60.9+/-12.8 years) underwent a VCABTM concomitant to coronary artery bypass surgery. Myocardial revascularization was performed on-pump and arrested heart in 4 cases, on-pump and beating heart in 6 cases and off-pump in 2 cases. Average number of coronary anastomoses per patient was 2.41+/-0.79(1-4). In all cases left internal thoracic artery-to-left anterior descending was used. In each case only one VSTENTTM was implanted. Target artery for the VCABTM was in 6 cases a diagonal and in 6 cases a marginal branch. Mean time of VCABTM was 23.08+/-4.60min(17-30min).

**Results:** We achieved an immediate procedural success in 11 of 12 cases as proved by intraoperative epicardial echocardiography. In one case VCABTM was not successful and conventional aorto-coronary bypass was performed for target vessel. One patient died on the second postoperative day. Autopsy demonstrated an open VSTENTTM. In one patient reexploration for bleeding, which was not VCABTM related was necessary. Angiography was performed in 10 patients 2 to 16 days (mean 8.8+/-4.68days) postoperatively showing an open VSTENTTM in 8 patients.

**Conclusions:** VCABTM is a safe procedure showing a in a short-term follow-up good results. VSTENTTM is a promising tool for myocardial revascularization, however long term patency and performance of the device has to be determined.

## ABSTRACT 102

**THE *CARDICA* C-PORT SYSTEM: A NEW TOOL FOR AUTOMATED DISTAL ANASTOMOSES: EARLY RESULTS FROM A CLINICAL TRIAL.**

Gummert JF, Matschke K, Demertzis S, Reichensperner H, Detter C, Kappert U, Anssar M, Siclari F, Opfermann U, Harringer W

**Objective:** Conventional distal anastomoses in CABG surgery require a high degree of technical expertise and good access to the target vessel. The C-Port system integrates in one tool all functions necessary to enable rapid automated distal coronary anastomosis. A compliant angled end-to-side anastomosis is created by automatically placing 8 individual clips and creating an arteriotomy with the push of a button. The goal of this prospective, non-randomized, controlled study is to determine the safety and efficacy of this system.

**Methods:** Five centers enrolled patients (pts) awaiting elective CABG surgery. Outcome variables were intraoperative device performance, incidence of device related adverse events and early (predischarge) angiographic graft patency.

**Results:** Of 52 eligible pts 8 were excluded due to inadequate vein size (n=4), cardiogenic shock (n=1) or inadequate coronary targets (n=3). Incomplete anastomosis were observed in 4 pts and were due to tissue interference (n=3) and severe disease of a coronary target (n=1). The C-Port was successfully deployed in 39 patients. In 1pt the device was removed due to low coronary blood flow and replaced with a hand-sewn anastomosis with no improvement in blood flow. An individual stitch was required at the toe and heal of the anastomosis in the majority of cases. 2 pts died of causes unrelated to the device. The average blood flow through the index graft was 43+ 20 ml/min. At this time predischarge angiographic follow-up is available in 32 pts. One device was placed in a coronary target with poor run-off resulting in graft thrombosis. Early patency rate is 98%.

**Conclusion:** C-Port system allows for an easy attachment of veins to a coronary vessel. The anastomosis can be performed safely within seconds in selected coronary arteries. Additional stitches at the toe and heal are necessary. Early angiographic patency is excellent and long-term efficacy remains to be determined.

## ABSTRACT 103

**USE OF BILATERAL INTERNAL MAMMARY ARTERY IN MULTIVESSEL CABG THROUGH SMALL ANTEROLATERAL THORACOTOMY (THORACAB) FACILITATED BY DA VINCI ROBOTIC SYSTEM.****Report of First 100 Cases.**

Sudhir P. Srivastava, MD; S. Gadasalli, MD; M. Agusala, MD; R. Naidu, MD; R. Kolluru, MD; J. Naidu, MD; M. Jones, MD; M. Shroff, MD; R. Barrera, PAC; S. Quismundo, RN; V. Srivastava, BA

**OBJECTIVE:**

Internal mammary arteries have been shown to offer longer graft patency in coronary artery bypass graft (CABG) surgery. Traditionally, full median sternotomy is required to harvest bilateral internal mammary arteries (BIMA). The author has evaluated the feasibility of harvesting BIMA through small port incisions using Da Vinci robotic assistance (Intuitive Surgical, Mountainview, CA)

**METHODS:**

From July 2002 to December 2003, 100 patients underwent ThoraCAB using da Vinci robotic assistance for harvesting of BIMA. There were 64 male and 36 female. The age range was 37 to 84 with a mean of  $66.6 \pm 9.96$  year. After induction of anesthesia, single lung ventilation was used. Three one-centimeter incisions were made in the third, fifth, and seventh intercostals spaces (IS) in the anterior axillary line. The camera was inserted in the fifth IS and the two instruments were inserted through the third and seventh IS. The mediastinal pleura was dissected off the chest wall and the right pleural cavity was entered. A zero degree camera was used harvest the right internal mammary artery (RIMA) in a completely skeletonized fashion. The left internal mammary artery (LIMA) was harvested in a completely skeletonized fashion using a 30-degree angled up camera. After administering heparin, the distal ends of BIMA were clipped and divided. In the cases where RIMA was to be used as a free graft, the proximal end was clipped using 5mm clips, divided and placed on the pericardium and retrieved after thoracotomy. A small anterolateral thoracotomy was done enlarging the camera port incision. In two patients, because of the quality and/or inadequate blood flow, BIMA could not be used. In 33 patients, RIMA was anastomosed directly to the coronary artery and in the remaining 65 patients, RIMA was used as a free graft after creating a T or end-to-end anastomoses to LIMA. Distal anastomoses were performed on a beating heart using Coalescent surgical U-clips (Coalescent Surgical, Sunnyvale, CA), a stabilizing device, and a suction device when necessary. In two patients (2%), distal

anastomoses were done with cardiopulmonary bypass (CPB) assistance on a beating heart. Intercostal nerve freezing was done using a cryoprobe. The I-Flow On Q-pump was used for local analgesia.

**RESULTS:** Planned arterial revascularization was completed in 98 patients. The number of arterial grafts ranged from one to four with a mean of  $2.55 \pm .80$  grafts per patient. There was no injury produced to BIMA during harvesting with robotic assistance. With the T or end-to-end anastomosis between RIMA and LIMA, all coronary arteries could be reached. There was no mortality, CVA, or wound infection. Five patients (5%) developed new onset atrial fibrillation. Three patients (3%) required exploration for postoperative bleeding. No sternal problems were noted. The postoperative length of stay ranged from one to twelve days with a mean of  $4.1 \pm 1.9$  days.

**CONCLUSION:** Da Vinci robotic system was found to be safe and effective. It allows the use of arterial conduits for multivessel ThoraCAB. Postoperative pain may be reduced with the use of cryo analgesia and On-Q pump for local analgesia.



Thursday, March 11, 2004

1:30 – 3:30 PM Versailles Gallerie

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session II**

Heart Failure; New Procedures & Devices

**Abstracts 104 - 113**

THURSDAY  
AFTERNOON

## ABSTRACT 104

## LEFT VENTRICULAR RECONSTRUCTION AND BYPASS GRAFTING IN END-STAGE ISCHEMIC HEART FAILURE ON BEATING-HEART SETTINGS

Mitrev Z, Anguseva T, Petrovski V, Jovanovska S  
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**Background:** In patients with severe coronary disease and poor left ventricular function, coronary bypass grafting and surgical remodelling are method of choice for delaying of heart transplantation. Avoidance of extracorporeal circulation has own benefits for preventing a multisystem immunologic reaction. The aim of this study was to evaluate the clinical results of CABG and left ventricle(LV) surgical remodelling in off-pump settings.

**Material and methods:** During last 3months on 7 strictly selective patients after bypass grafting we've done LV surgical reconstruction of the diskinctic area, with ventriculoplasty of the LV wall on beating-heart. Including criteria for this study were: severe coronary disease, enlargement of the LV, presence of the LV dyscinctic area. Excluding criteria were: presence of mitral regurgitation bigger than +2, extremely large left chamber discinctic area or technically bed position of the coronary occlusion

After medial sternotomy and standard grafting of LITA on LAD, we've performed radial artery as an additional graft for bypassing the second occluded coronary artery. On the border line with a normal myocardium we placed circularly suture. In the second step we pulled the suture, excluding the aneurysmatically changed myocardium. With over and over suture we made additionally fixation on such a way that normal geometrical form of the LV was still kept. With a TEE we examined LV before and post surgery.

**Results:** All pts get total arterial revascularisation with LITA on LAD(7pts), RA as a ";T graft"; on rpld (5pts) , or as "jump" on rms in 2 pts. LV plication of the anterior dyscinctic area was examined with a TEE : EDV/ESV was decreased from 220/168 on 170/100 with increasing of the EF from 20% on 32%postoperatively. CO/CI preoperatively were 2.9/1.8 with increasing on 4.6/2.9 postoperatively. IABP was applied on 2 pts preoperatively, 2nd postoperative day it was pull out. ICU data showed shorter intubating time (6.5h), no liver or kidney complications, less drainage and need for transfusion. Approximate in hospital stay was 6 days, with a NYHA class improvement from IV on II group.

Follow up period is 20days up to 3 months.

**Conclusion:** This combined surgery in off-pump settings allows safe restoration of the ventricular geometry, with better clinical outcome and rare postoperative complications.

## ABSTRACT 105

**SURGICAL TREATMENT OF HEART FAILURE**

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**Objective:** Patients with dilated cardiomyopathy (DCM) represent a huge remodeling of the fibrous skeleton of the heart with mitral and tricuspid annulus dilatation and consecutive mitral and tricuspid regurgitation. The aim of this study is to show hemodynamic and clinical improvement after Reductive Annuloplasty of Double (mitral and tricuspid) Orifices (RADO) in ischemic dilated cardiomyopathy (IsDCM) and primary dilated cardiomyopathy (PDCM).

**Methods:** There were 384 patients, mean age 52.8 years, 257 pts (67%) operated due to IDCM with ejection fraction (EF) under 30% and 127 pts (33%) due to PDCM. Mitral annuloplasty according to A. Carpentier, our own procedure of posterior semicircular mitral annuloplasty and implantation of bileaflet prosthesis No 27 were done in 49, 285 and 50 pts, respectively. In all cases our modified De Vega's tricuspid annuloplasty was performed. Myocardial revascularisation was done in all 257 pts with IsDCM.

**Results:** Postoperative 30-day mortality was 5.5% for the whole group, 7.0% for IsDCM and 2.4% for PDCM. Follow up survival was: for IsDCM at 5 years 61.5±4.0% and at 14 years 38.2±8.0%, and for PDCM at 5 years 43.9±5.6% and at 10 years 21.3±8.5%.

**Conclusion:** RADO corrects remodeling of the fibrous skeleton of the heart, changes spherical geometry of the left ventricle, improves hemodynamic action of the left and right ventricle and slows down progression of heart failure. We recommend RADO procedure as an important associated procedure in IsDCM and as a new surgical alternative in the early stage of PDCM, immediately after the first decompensation.

## ABSTRACT 106

**SURGICAL VENTRICULAR RESTORATION IN END-STAGE ISCHEMIC DILATED CARDIOMYOPATHY PATIENTS**

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SVR has generally been contraindicated in pts with EF<20, PA>70 mmHg and on inotropes. 11 pts with the above criteria after diureses were placed on milrinone and operated with SVR, CAB and correct associated lesions.

**PREOP DATA:** N 11 M/F 6/5 age 50-78 (mean 62.4). All pts: 3 NYHA III, EF<30; 8 NYHA IV, EF<20 had PA>70 and LV asynergy. 3 pts had recent MI with shock and MOF, 3 MR and 1 VSD, 4 DM and 5 morbid obesity.

**OR CHARACTERISTICS:** All intraop TEE and on milrinone with 7 IABP. All pts had CAB 1-5 (3.54 graft/pt). SVR (DOR) using Chase (TM) Medical mannequin. Preop ED vol 240-330cc decreased 110-130cc postop. 2 pts had MV repair and 1 VSD closure. 1 pt had microwave ablation with Fx inc. for AF.

**RESULTS:** 10/11 pts 91% were discharged home in 10-14 d. 1 death occurred in 78 AMI with shock 43 d later due to septic shock with hemodialysis.

**CONCLUSION:** End-stage dilated CM pts with EF<20 can be safely operated after meticulous preop preparations to decrease PA and increase CO using SVR, CAB and correct associated lesions. Mortality was 9% with improved hemodynamics and relief of HF in all survivors from 3-12 mos

## ABSTRACT 107

**TOTAL ARTERIAL REVASCULARISATION IN PATIENTS WITH END-STAGE HEART FAILURE**

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**Background:** Patients with terminal coronary artery disease (TCAD) in time developed ischemic dilative cardiomyopathy (ICD) and left ventricle aneurysm. The radial artery (RA) has been used extensively by us as a way of reducing the use of the saphenous vein. Flow in arterial grafts, in patients with TCAD, is adapted according to myocardial need for oxygen. The aim of this study was to determine survival and outcome in a patients with a TCAD, after total arterial revascularisation (TAR) and left ventricular (LV) reconstruction. **Materials and methods:** From 08/2001-09/2003, 91 pts with TCAD (NYHA class IV) underwent (TAR) and LV reconstruction. After preparation of left internal mammary (LIMA) as a main graft, and patient full heparinisation, radial artery (RA) was connected in LIMA's middle parts as a "T" graft. Then we started with extracorporeal circulation, LV aneurysm is resected, after which LIMA is anastomosed with LAD, and RA with other arteries in a jump fashion. We compared preoperative and postoperative echocardiographic, radioisotopic ventriculography, haemodynamic data and coronarographic findings.

**Results:** Left internal mammary artery (IMA) was used at 91 (100%), right IMA in 17 (18.6%), left radial artery as a T graft to LIMA in 61 (67%) pts, as a T-T anastomosis to RIMA in 1 patient and as a free graft in 21 (23.5%). Postoperative echocardiography and hemodynamic improvement was notified in all patients: EDV/ESV decreased for 40%/37.5%, EF increased from 20% on 35%. (confirmed with radionuclid viability assessment after 6 months). 35 (41.2%) pts get mitral and tricuspid annuli reconstruction. Early mortality rate was 6.6%. Control coronarography showed better arterial graft flow, and increased diameter of RA, compared with preoperatively.

**Conclusion:** TAR in combination with LV surgical reconstruction in patients with TCAD ensuring better myocardial flow according on myocardial demand, results with better clinical outcome. Good early angiographic results have been achieved by using radial artery in coronary surgery. Early and mid-term results are acceptable to choose this method as an alternative to transplantation.

## ABSTRACT 108

**SUCCESS OF ROBOTIC BI-VENTRICULAR PACING FOLLOWING OPEN HEART SURGERY: THE IMPORTANCE OF THE POSTERIOR APPROACH**

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**Background:** Robotically-assisted left ventricular epicardial lead implantation is a safe and effective technique for bi-ventricular pacing. Others have considered prior open heart surgery a contraindication to minimally-invasive lead placement. We report medium-term results with robotic epicardial lead placement in this group of patients.

**Methods:** 23 patients with congestive heart failure (NYHA Class  $3.5 \pm 0.5$ , mean LV ejection fraction  $12.3 \pm 6\%$ ) and a widened QRS ( $184 \pm 30$  msec) underwent robotic LV lead placement for bi-ventricular pacing. Group 1 consisted of 11 patients (48%) for whom this was an initial cardiac procedure. Group 2 included 12 patients (52%) who had prior cardiac surgery. Of these, 4 patients (17%) had undergone more than 1 prior open heart operation. Using robotic assistance, 2 epicardial leads were placed on the posterolateral surface of the LV as directed by intra-operative electrophysiologic mapping.

**Results:** Implant success rate was 100% in both groups. Ischemic cardiomyopathy was the etiology of heart failure in 18% of Group I and 92% of Group II patients. Mean age was  $63.8 \pm 13$  years for Group I and  $74.2 \pm 4$  years for Group II. Comparison of the two groups demonstrated no statistical difference in operative times ( $75 \pm 47.5$  vs  $55 \pm 7.7$  min,  $p=0.17$ ), R-wave measurements ( $17.5 \pm 9.6$  vs  $14.0 \pm 7.8$  V,  $p=0.38$ ), or ventricular thresholds ( $1.2 \pm 0.7$  vs  $0.94 \pm 0.45$  v,  $p=0.25$ ). Complications in Group I included one pneumonia and one intraoperative LV injury requiring conversion to mini-thoracotomy. In Group II, there was one episode of transient renal insufficiency and one patient experienced LV lead failure after several months. At an average follow-up of  $11.6 \pm 5.8$  months, 19 of 20 patients are alive and well. Threshold data obtained in follow-up remains equally stable in both groups ( $1.35 \pm 0.8$  vs  $1.1 \pm 0.7$  v,  $p=0.5$ ). In addition, 85% of patients report improved exercise tolerance with a mean NYHA Class of  $1.35 \pm 0.57$ .

**Conclusions:** Robotic LV epicardial leads remain stable and reliable over the medium term. Improved clinical response rates may be achieved with the site-directed implantation strategy that this technique affords. Robotic epicardial lead placement through the posterior approach is the procedure of choice for patients with prior heart surgery following failed coronary sinus cannulation.

## ABSTRACT 109

**CLINICAL EXPERIENCE WITH THE INCOR LVAD**

Christof Schmid, Tonny D.T. Tjan, Christian Etz, Christoph Schmidt, Frauke Janssen, Markus Rothenburger, Hans H. Scheld

The Incor (Berlin Heart AG, Germany) is a small (200g), implantable, magnetically accentuated axial flow pump designed for long-term left ventricular support.

The new device has been implanted in 15 consecutive patients (11 male, 4 female), 24-59 years old, suffering from dilative cardiomyopathy (n=3), end-stage ischemic heart disease (n=6), acute myocardial infarction (n=3), acute myocarditis (n=2) and Chagas disease (n=1). Four patients had prior open heart surgery. Implantation via cannulation of the left ventricular apex and the ascending aorta was urgent in 6 and on an emergency basis in 10 cases.

Early bleeding complications occurred in 2 cases only. No severe neurologic complications were seen, but transient neurologic symptoms developed in 4 patients. Two patients experienced systemic embolism. No definite pump stop occurred, however, thrombous related pump dysfunction developed in 3 patients (managed medically). Four patients were successfully transplanted after a support interval of 90 to 156 days (mean 115 ± 36 days), one patients could be weaned from the system after 171 days. The remaining 9 patients are still under support with excellent quality of life (25-314 days). No infectious complication were seen.

The Incor is a LVAD is an excellent axial flow pump. Its advantages include the small pump chamber and the virtual absence of device-related infections.

ABSTRACT 110

**VAD SUPPORTED CABG IN HEMODYNAMICALLY UNSTABLE PATIENTS.**

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**Purpose:** To review our experience in patients under going CABG utilizing VAD support.

**Methods:** Patients undergoing CABG with VAD support were reviewed for characteristics, surgical technique and outcomes.

**Results:** 3 patients, all male, mean age of 53 years were identified. Each required inotropes and 2 had an IABP pre-op. 1 patient had RCA occlusion with RV infarction ( pt 1 ), 1 had severe LM stenosis ( pt 2 ) and 1 LAD occlusion ( pt 3 ). All VAD's were placed without CPB. 1 RVAD was placed with PDA and LAD grafting ( pt 1 ). 1 LVAD was placed with LAD and OM grafting ( pt 2 ). 1 LVAD was placed for salvage ( pt 3 ). 48 hours later the patient was taken for LAD, OM and PDA grafting. 2 VAD's ( pts 1, 3 ) were explanted at 5 and 8 days. Post explant LVEF was 40 and 50 %. Patient 2 required heart transplantation at day 11. All patients were discharged. Complications included 1 re-operation for bleeding and 1 patient requiring transient hemodialysis.

**Conclusion:** VAD support for CABG in hemodynamically unstable patients is feasible and provides good circulatory support during cardiac manipulation. Subsequent ventricular unloading should allow for myocardial recovery and preservation of ventricular function. Delayed CABG may be appropriate when patient viability is questionable.

## ABSTRACT 111

**COMPARATIVE HEMODYNAMIC EFFICACY STUDY: NEW PERCUTANEOUS INTRACARDIAC PUMP VERSUS IABP**

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**Introduction:** Recently, a percutaneous version of the Impella 6.4mm intracardiac pump (ICP) was introduced. This percutaneous intracardiac pump (PICP) measures only 4 by 80mm, and can produce flows up to 2.5l/min. We anticipate that the indications for the PICP will neighbor those for IABP support. The PICP is currently in the process of a clinical safety/feasibility study. We studied the larger ICP at half its maximum performance level to obtain an estimate of the efficacy of the PICP.

**Methods:** Reversible acute mitral regurgitation (AMR) was created in calves (n=7) by mitral valve stenting. In each animal medium ICP assist was compared with standard IABP support.

**Results:** The ICP produced a flow of  $2.8 \pm 0.5$ l/min. Both assist systems (ICP/IABP) significantly improved cardiac output (+6%/+3%), diastolic coronary flow (+27%/+102%), and descending aortic pressure (+6%/+8%). Both devices decreased left atrial pressure (-11%/-7%) significantly, however, LV external work decreased non-significantly (-10%/-3%). Pulsatility was increased by IABP (+46%), and decreased by the ICP (-21%). Only the ICP increased ascending aortic pressure (+6%) and carotid flow (+15%) significantly.

**Conclusion:** In cardiogenic shock the PICP could provide an alternative to IABP or may perform synergistically when applied simultaneously

## ABSTRACT 112

**VENTRICULAR UNLOADING WITH PULSATILE EXTRACORPOREAL LIFE SUPPORT MAY BE OPTIMIZED THROUGH SYNCHRONIZATION**

Koen D Reesink, MSc, Loes DC Sauren, BSc, André L Dekker, PhD, Theo van der Nagel, Ervin Severdija, Cecile Soemers, MD, Gijs G Geskes, MD, Frederik H van der Veen, PhD, Jos G Maessen, MD PhD

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**Introduction:** We studied the synchronization aspect of a new pulsatile extracorporeal life support (P-ECLS) system. Specifically, the impact of pressure wave collision on LV function was addressed. P-ECLS may be more versatile in optimizing both cardiac and circulatory support than non-pulsatile systems.

**Methods:** Seven calves were fully instrumented and subjected to partial P-ECLS (1.9l/min). Asynchronous P-ECLS support was analyzed comparing diastolic (D) and systolic (S) arrival of the pump pulse at the aortic valve.

**Results:** (All  $p < 0.05$ ;) P-ECLS support improved cardiac output (+27%) and aortic pressure (+31%). Pulse arrival (D / S): LV output ( $4.0 \pm 2.8$  /  $3.0 \pm 2.6$  l/min), systolic LV pressure ( $92 \pm 25$  /  $107 \pm 27$  mmHg), end-systolic LV volume ( $73 \pm 37$  /  $80 \pm 40$  ml), left atrial pressure ( $8.3 \pm 2.7$  /  $8.8 \pm 2.8$  mmHg), and coronary flow ( $79 \pm 46$  /  $73 \pm 49$  ml/min). There was no significant difference in peripheral perfusion between D and S.

**Conclusion:** P-ECLS improves peripheral perfusion regardless of pump ejection timing. Arrival of the P-ECLS pulse during systole increases LV afterload and impedes ejection. The incidence of LV systolic impairment may be minimized through synchronization. Clinically, the relevance of non-synchronized P-ECLS will depend on which aspects of support/perfusion are prioritized.

## ABSTRACT 113

**ANALYSIS OF PLATELET FUNCTION DURING VAD SUPPORT WITH A PLATELET AGGREGATION PROFILER**

C. Etz, M. Rothenburger, A. Hoffmeier, F. Jansen, H.H. Scheld, C. Schmid

Inhibition of platelet function is important to prevent postoperative thromboembolism after LVAD and RVAD implantation. We prospectively investigated a platelet aggregation profiler (Mölab, Hilden, Germany) in 11 consecutive VAD patients (Berlin Heart Incor LVAD = 9, [additional] Thoratec RVAD = 2, MicroMed DeBakey LVAD = 1, pediatric Berlin Heart Excor LVAD = 1). Samples of platelets were activated with arachidonic acid, ADP and collagen. The respective coagulation graphs were plotted, and the endpoints noted. Baseline anticoagulation consisted of heparin (PTT 60-80 sec) or phenprocoumon (INR 2.5-3.5). Aspirin (0-300 mg) was added after removal of the drains if the arachidonic acid activation exceeded 30 %. Thereafter, clopidogrel (0-112 mg) was supplemented if the ADP activation exceeded 30 %. Initially, platelet aggregation was controlled before and after drug administration on a daily basis to adjust drug dosage best possible. Later, and in patients on ambulatory basis, there was an aggregation test only once a week. During a support interval of 4- 279 days (mean 73 days, total 802 days), we experienced no perioperative and no late bleeding ! Suspicion of cerebral thromboembolism occurred only in one patient who presented with transient ocular symptoms (PRIND). One further patient demonstrated pump features which presumably reflect thrombus formation at the inflow cannula, but is clinically doing well.

In conclusion, the platelet multifunction analyser seems to be an extremely helpful tool for surveillance of anticoagulation during long-term mechanical support.



Thursday, March 11, 2004

1:30 – 3:30 PM Fontaine Room

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session III**

Atrial Fibrillation and Arrhythmia Surgery

**Abstracts 114 - 121**

THURSDAY  
AFTERNOON

## ABSTRACT 114

**MONO- AND BIPOLAR RADIOFREQUENCY ABLATION SURGERY:  
3-YEARS EXPERIENCE IN 82 PATIENTS WITH PERMANENT ATRIAL  
FIBRILLATION**

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**Aim:** In our population permanent atrial fibrillation (pAF) is a serious concomitant problem in patients scheduled for open heart surgery. The high incidence necessitates reliable methods to treat pAF efficiently. We report our 3-years experience with a safe concept using mono- and bipolar radiofrequency (RF) ablation procedures.

**Methods:** 82 patients (mitral: n=53; aortic: n=22; aortic+mitral: n=1; CABG: n=6) underwent either monopolar (n=74) or recently bipolar (n=8) RF ablation procedures creating two encircling isolation lesions around the left and the right pulmonary veins (PVs) and a connection line between both. Amiodarone was given for 3 months after surgery.

**Results:** Hospital mortality was 2.4%. At follow-up 75% of the patients were in stable sinus rhythm (SR). Preoperative pAF-duration, etiology of heart disease and type of RF energy application were not predictive for the risk of persisting pAF after surgery. Whereas those patients (45 of 82) with small preoperative LA-diameters (<56mm) had SR in almost 90% of the cases, large preoperative LA-diameters ( $\geq$ 56mm; 37 of 82) were associated with a significant risk of persisting pAF ( $p<0.05$ ).

**Conclusion:** Particularly in cases with small preoperative LA-diameters isolation of the PVs using either mono- or bipolar RF ablation procedures in combination with amiodarone therapy represents a safe and efficient option to cure pAF in patients undergoing open heart surgery.

## ABSTRACT 115

**MID-TERM CLINICAL EXPERIENCE WITH MICROWAVE ABLATION OF ATRIAL FIBRILLATION**

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**Purpose-** Surgical management of atrial fibrillation (AF) patients using microwave energy ablation therapy.

**Methods-** Forty consecutive permanent AF patients (mean age: 68 years, range: 35-86 years) underwent microwave ablation prior to concomitant valvular repair or CABG. The ablation was performed endocardially in 18 patients and epicardially off pump in the remaining 22 patients. Patients were discharged on anti-arrhythmic drugs and anti-coagulant for 2 months. The anti-coagulant was discontinued after 9 weeks in the case of documented stable normal sinus rhythm (NSR).

**Results-** At a median follow-up of 250 days (range: 37-526 days), 89 % (16/18) of the endocardial ablation group and 86 % (18/21) of the off pump epicardial ablation group were in NSR. The combined success rate was of 87 % (34/39). We had one death in the endocardial ablation group which was not attributable to the microwave ablation.

**Conclusion-** Microwave was successfully and safely used for AF ablation. Based on our own promising results and experiences of others, all patients with a history of AF who are presenting for surgical treatment of other cardiac diseases can benefit from microwave ablation therapy. To minimize morbidity, after ruling out any left atrial appendage thrombosis the off-pump epicardial approach is recommended for most patients.

ABSTRACT 116

**FEASIBILITY OF EPICARDIAL ATRIAL ABLATION AND BEATING HEART CABG FOR ATRIAL FIBRILLATION AND CORONARY ARTERY DISEASE**

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**Background:** Preoperative atrial fibrillation (AF) is an independent risk factor for decreased survival after CABG, at both early and late follow-up. We hypothesized that epicardial left atrial ablation as a curative approach for AF is feasible when combined with beating heart CABG.

**Methods:** Eighteen consecutive patients (mean age 67 years) underwent combined epicardial left atrial ablation according to Kress and OPCAB. Exposure of pulmonary veins (PV) and posterior left atrium was achieved using an apical suction positioner on the beating heart. LVEF was < 35% in 5 patients (28%). AF was permanent in 13 patients (72%). Mean duration of AF was 5.5 years. Electrical isolation of left and right PVs was confirmed by intraoperative conduction block when pacing from the isolated segment at output 15 mA.

**Results:** Left atrial ablation was feasible off-pump on the beating heart in 10 patients (55%); in the remaining 8 patients, epicardial ablation was performed on-pump on the beating heart. In order to confirm electrical isolation of PVs, multiple applications of bipolar RF energy were required (average 2.3 ablations). There were no perioperative complications. All patients are alive at 3 months follow-up; 15 (83%) are in sinus rhythm.

**Conclusions:** Epicardial off-pump atrial ablation combined with OPCAB is only feasible in 55% of patients due to inadequate exposure of PVs and posterior left atrium and hemodynamic instability. Further experience is needed to fully evaluate the feasibility of this approach.

## ABSTRACT 117

**ISOLATION AND RADIOFREQUENCY ABLATION OF THE LEFT ATRIAL PULMONARY VEIN VIA MINIMALLY INVASIVE SURGERY FOR ATRIAL FIBRILLATION**

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**Background:** Ablation of the left atrium to isolate the pulmonary veins has been shown to interrupt electrical foci that may induce atrial fibrillation. The objective of this study was to evaluate the ability to perform a minimally invasive left atrial isolation utilizing the da Vinci Robotic Surgical System and a flexible microwave probe (Flex 10, AFx Inc.)

**Methods:** The Flex 10 probe was passed around the left atrium posterior to the SVC through the transverse sinus and back through the oblique sinus via a right chest approach with the da Vinci robotic system. Prior to ablation pacing outside the atrial cuff was confirmed. Ablation was then carried out on the beating heart and repeated (as needed) until pacing was no longer possible. Analysis included histologic and gross examination of the targeted area. Subjects included six canines.

**Results:** After the initial 3 trials, total operative time was reduced to about 1-1.5 hrs. Difficulty was largely in achieving a snug wrap around the ostia without inducing arrhythmia or hypotension. All animals survived the procedure.

**Conclusion:** A minimally invasive left atrial isolation procedure utilizing monopolar microwave energy utilizing the da Vinci surgical system is simple effective.

ABSTRACT 118

**EPICARDIAL MICROWAVE APPLICATION IN THE SURGERY OF CHRONIC ATRIAL FIBRILLATION**

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**Background:** The application of epicardial alternative energy in nonvalvular atrial fibrillation (NVAf) is a new horizon in maze operation. We have tested the hypothesis that epicardial microwave may have the same results with our standard cryosurgical maze.

**Materials and Methods:** Fourteen consecutive patients with chronic AF were operated upon with on-pump epicardial maze followed by routine cardiac surgery. Their results were compared with case controlled 14 patients from our maze database of 280 patients.

**Results:** There were no differences in age, sex, cardiothoracic ratio, and duration of AF. Pump time, intensive care unit and hospital stay showed no differences, although aortic crossclamp time was shortened from 110 to 65 minutes ( $p=0.011$ ). The recurrence rate after discharge was not different between two groups (14 vs. 15%,  $p = 0.841$ ).

**Conclusion:** Epicardial microwave application may be a good alternative to our traditional cryosurgical maze, especially for those patients without associated mitral disease.

## ABSTRACT 119

**IRRIGATED BIPOLAR RADIOFREQUENCY ABLATION -  
PRINCIPLES AND PRE-CLINICAL EVALUATION**

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Bipolar radiofrequency (RF) energy concentrates the current density between the electrodes, resulting in quick, narrow lesions. The Medtronic Cardioblate-BP System uses irrigated RF delivered via conductive saline to reduce the tissue/electrode impedance, therefore precluding the formation of interfacial microbubbles and allowing accurate monitoring of tissue properties to ensure lesion transmural. A proprietary power titration and impedance monitoring system delivers the appropriate energy to each lesion

Significant pre-clinical testing has demonstrated safety and efficacy of the BP System. Using a series of fiberoptic thermal probes, the temperature within bovine tissue was measured during 90 ablation cycles. Thermal spread was limited to within the width of the electrodes. Beyond this region, the temperature remained < 50C.

The device's malleable jaws allow the user to shape the electrodes to the desired configuration. Even when misaligned up to 4 mm, in vitro testing (n=72) has substantiated that 100% transmural is nonetheless achieved in smooth or trabeculated tissue. A separate investigation reproduced the full Maze-III lesion pattern in swine atria (n=11). After TTC staining, all 137 lesions were fully transmural.

A left atrial lesion pattern was created from the epicardial surface of the beating heart in 12 Hanford pigs. Pacing entrainment, ICE, and NOGA respectively assessed conduction block, hemodynamics, and electrophysiological parameters. All lesions were transmural along their entire course, there was no evidence of PV stenosis, and left atrial activation time was unchanged.

ABSTRACT 120

**TOTALLY ENDOSCOPIC EPICARDIAL PACEMAKER IMPLANTATION (TEEPI) IN PRIMARY AND RE-DO OPERATIONS**

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Biventricular pacing has gained increasing acceptance in advanced heart failure. One limitation is positioning of the left-ventricular electrode via the coronary sinus. We report the initial experience with a minimally-invasive approach of robotically enhanced direct placement of epicardial electrodes.

Between 06/2001 and 08/2003 nine patients underwent totally endoscopic placement of left-ventricular electrodes using the DaVinci surgical system. Six patients had previous CABG procedures. Three ports were inserted one intercostal space higher than in CABG procedures to avoid interference with the enlarged left ventricle. Following mapping, two screw-in electrodes (Medtronic Inc.) were placed in each patient.

Operation time was 85+-34 minutes, pacing thresholds were 1.3+-0.4 V, R-wave amplitudes 8.7+-3.4 mV. QRS width was shortened from 210+-44 ms to 165+-37 ms. One patient was converted to a lateral thoracotomy after laceration of the left ventricular wall. The postoperative course was uneventful in all patients, pacing parameters remained stable during follow-up with a significant increase in quality-of-life self assessment.

Totally endoscopic direct placement of left-ventricular epicardial electrodes for biventricular pacing is feasible even in redo operations. Main challenge is the massive enlargement of the left ventricle in these heart failure patients, which requires modification of port placement and cautious instrument manipulation.

## ABSTRACT 121

**A NEW DEVICE FOR OPTIMAL ISOLATION OF THE LEFT ATRIAL APPENDAGE FOR STROKE PREVENTION IN ATRIAL FIBRILLATION**

Marco A. Zenati, Mark Gartner, David Schwartzman, Atrial Arrhythmia Center, University of Pittsburgh Medical Center, Pittsburgh, PA, USA

**Background:** The left atrial appendage (LAA) appears to be a common source of cardioembolism in man. LAA resection/isolation may thus have clinical merit. We have developed a method for LAA isolation utilizing a beating heart, epicardial approach.

**Methods:** In 10 large healthy pigs access to the LAA was gained through a median sternotomy using a LV apical positioner. A tool specifically designed to atraumatically capture and permanently isolate/occlude the LAA at its base (junction with left atrial body) was used. Cardiac anatomy and mechanics were assessed before and after isolation using intracardiac echocardiography (ICE, AcuNav).

**Results:** LAA capture and deployment of the isolation tool was rapid (<10 minutes) and without complication. Echocardiography demonstrated complete LAA isolation at its ostium in all animals, without adverse effect on cardiac mechanics. Complete LAA isolation was corroborated by post-mortem anatomical assessment, performed acutely.

**Conclusions:** We have developed a method for optimal isolation of the LAA using an epicardial beating heart approach. Further development and assessment of this technique is warranted.

## ABSTRACT 121A

**MECHANICAL FUNCTION OF THE LEFT ATRIAL APPENDAGE FOLLOWING EPICARDIAL BIPOLAR RADIOFREQUENCY ABLATION**

Marco A. Zenati, David Schwartzman, Atrial Arrhythmia Center, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA.

**Background:** Beating-heart epicardial ablation is an emerging technique for cure of atrial fibrillation. In order to replicate electrophysiologically the Cox-Maze III pattern, ablation may be performed at the base of the left atrial appendage (LAA) without physically removing it. Our experience suggests that this might be dangerous.

**Methods:** In each of 5 large healthy pigs, electrical isolation of LAA at its base was achieved without atriotomy in a beating heart preparation with a single application of energy via a bipolar ablation device. LAA, pulmonary vein, transmitral Doppler velocities and electromechanical properties were measured immediately prior to and after ablation using intracardiac echocardiography (ICE, AcuNav) and electro-mechanical mapping (NOGA, Biosense Webster).

**Results:** There was a marked diminution of LAA peak flow velocity between pre ( $0.4 \pm 0.2$  m/sec) and post ( $0.1 \pm 0.08$  m/sec) ablation ( $p < .05$ ). There was no significant change in either pulmonary venous or transmitral velocity. NOGA-derived LAA local linear shortening was markedly diminished ( $8\% \pm 3\%$  pre vs  $2\% \pm 1\%$  post-ablation;  $p < .05$ ). ICE also demonstrated spontaneous echo contrast not seen before.

**Conclusions:** Electrical isolation of the LAA produces mechanical paralysis, dilatation, and blood stasis. It is reasonable to hypothesize that these changes would be clinically prothrombotic. If an electrically isolated LAA is not to be excised, its orifice should be carefully occluded.

Thursday, March 11, 2004

5:30 – 7:30 PM East Ballroom

## **An Evening with Biotechnology for Heart Disease**

**Abstracts 122 - 129**

THURSDAY  
AFTERNOON

## ABSTRACT 122

**REDUCED INFARCT SIZE AFTER INTRAMYOCARDIAL INJECTION OF MONONUCLEAR BONE MARROW CELLS IN CABG PATIENTS.**

Paschalis Tossios 1, Jochen Müller-Ehmsen 2, Detlef Moka 3, Christof Scheid 4, Udo Holtick 4, Nermin Ünal 2, Robert Schwinger 2, Uwe Mehlhorn 1

1 Department of Cardiothoracic Surgery, 2 Cardiology, 3 Nuclear Medicine and 4 Hematology, University of Cologne, Germany

**OBJECTIVES:** To investigate, if intramyocardial injection of mononuclear bone marrow cells combined with CABG surgery improves tissue regeneration in infarcted myocardium.

**METHODS:** We included elective CABG patients with a distinct akinetic infarct region after a myocardial infarction in this study. Prior to sternotomy, bone marrow was harvested by sternal puncture. Bone marrow cells were density separated and resuspended in 2 ml volume. At the end of CABG surgery 10 injections of 0.2 ml each were applied to the infarcted area. Global and regional perfusion and viability was evaluated by myocardial <sup>99m</sup>Tc-MIBI single-photon emission computed tomograph (SPECT) images and FDG-positron emission tomography (PET) in all study patients before and 3 months after the intervention.

**RESULTS:** Concomitant surgical revascularization and bone marrow cell injection was performed in 12 patients without major complications. The median total injected mononuclear cell number was  $5.8 \times 10^7$  (range 0.8-18.6). So far MIBI-SPECT and PET scanning was re-evaluated in 9 patients. In 4 of 5 patients with a transmural infarction PET showed a 20%-50% reduction in infarct size. In one of these patients infarcted area diminished by 25% without revascularization. No significant change in ejection fraction was found. Four patients without transmural infarction showed markedly reduced perfusion defects assessing hibernating myocardium.

**CONCLUSIONS:** Our data provide preliminary evidence for myocardial regeneration after this novel form of cellular therapy.

## ABSTRACT 123

## AN IN VITRO STUDY TO EVALUATE THE POSSIBILITIES OF ENDOTHELIAL CELL SEEDING ON NO-REACT® TREATED BOVINE INTERNAL MAMMARY ARTERIES

P.M. Dohmen (1), S. Posner (2), W. Erdbrügger (2), W. Konertz (1)

(1) Department of Cardiovascular Surgery, Charité,

Humboldt University Berlin, Berlin, Germany

(2) Auto-Tissue Ltd., Berlin Germany

**Background :** This feasibility study was performed to compare small diameter xenogenic internal mammary arteries treated with No-React® (NRIMA) and e-poly-tetrafluoroethylene (ePTFE) seeded with autologous vascular endothelial cells for the use of coronary bypass surgery.

**Methods :** Two groups of seeded prosthesis were NRIMA grafts ,group I (n=12), and ePTFE grafts, group II (n=12) , both coated with or without fibrin glue. The grafts were mounted during the seeding into a special developed bioreactor. The conditions of the circulating medium was continuously measured and adjusted to maintain optimal viability for endothelial cells. Afterwards, the grafts were conditioned under pulsatile flow over a wide range of physiologic flow conditions.

**Results :** Both groups showed a sufficient number of vascular endothelial cells seeded onto the grafts (Table). Vascular endothelial cell density increases after coating with fibronectin. There was no significant decrease of endothelial cells seen after the conditioning phase, independent to fibrin glue use.

	Without glycoproteins After cond.(cells/cm <sup>2</sup> )	With glycoproteins After cond.(cells/cm <sup>2</sup> )
NRIMA graft	108.000 ±13.000**	222.000 ±16.000*
ePTFE graft	72.000 ±11.000	131.000 ±7.000

cond. = conditioning, \* p<0.008; \*\* p<0.016

**Conclusions :** Under pulsatile flow it seems to be possible to condition endothelial cells onto No-react® treated bovine mammary arteries. The cell density nearly doubled as compared to seeded ePTFE grafts.

ABSTRACT 124

**FIRST EVER REPORT ON NO REACT-BOVINE INTERNAL MAMMARY ARTERY PERFORMANCE.**

Shekar L C Reddy, Jain Pillai, Leslie Mitchell, Sudhir Naik, John Dark, Asif Hasan, Simon Ledingham and Stephen C Clark.

No react bovine internal mammary artery(NR-BIMA) is available for restricted use in europe. In this first ever study on this conduit, we aim to investigate the clinical performance and patency rates with magnetic resonance angiography.

**Methods:** Seven patients received 8 grafts using NR-BIMA. Approval from the Medical devices agency(UK) was obtained for each patient. One patient required salvage CABG. Follow-up ranged between 1-4.5 years. Graft patency was investigated with MRI angiography. One patient was excluded from MRI because of intracerebral metal clips.

**Results:** There was no mortality in this group. Currently 6 patients are asymptomatic and one patient has class II anginal symptoms. 4 of the 7 grafts remained patent (57%). Longest patency was 4.5 years in a patient who underwent salvage CABG. Other associated grafts in this cohort of patients were : 5 left internal mammary arteries(all patent) and 7 sphenous vein grafts (4/7, 57% patent).There were no occluded NR-BIMA grafts in a patient with patent vein grafts.

**Conclusions:**

1. At 2.5 year mean follow up it had 57% patency with longest being 4.5 yrs.
2. NR-BIMA is a safe conduit and holds promise for the future

## ABSTRACT 125

**AUTOLOGOUS PERIPHERAL BLOOD STEM CELLS TRANSPLANTATION FOR MYOCARDIAL REGENERATION: A NOVEL STRATEGY FOR CELL COLLECTION AND SURGICAL INJECTION.**

Giulio Pompilio, Aldo Cannata, Fedro Peccatori, Francesco Bertolini, Maurizio C Capogrossi and Paolo Biglioli.

Department of Cardiovascular Surgery, Cardiovascular Gene and Cell Therapy Clinical Program, Centro Cardiologico Monzino IRCCS, Milano, Italy; Division of Hematology-Oncology, European Institute of Oncology IRCCS, Milano, Italy; Laboratory of Vascular Pathology, Istituto Dermopatico dell'Immacolata IRCCS, Roma, Italy.

**Background.** We describe an original technique for intramyocardial injection of peripheral blood-derived stem cells (PBSC) collected by apheresis in order to induce and positively selected with anti CD-133 antibody.

**Materials and methods.** We designed a pilot clinical phase-1 trial to assess the feasibility and safety of PBSC transplantation for myocardial regeneration and angiogenesis. We enrolled so far 2 patients with evidence of a large ischemic area in the left ventricle with target coronary artery not suitable for traditional revascularization; and 2 others patients candidates to surgical revascularization with a distinct large recent inferior infarction. 10 mg/Kg/die of Lenograstim were subcutaneously administered for 4 consecutive days in order to mobilize stem cells from the bone marrow to the peripheral blood. Stem cells mobilized were collected by means of apheresis and processed in order to purify the CD133+ cells fractions. All patients received PBSC intramyocardial injection and concomitant off-pump coronary artery bypass grafting, but patient 4, which was treated by PSBC implant alone through a minimally-invasive trans diaphragmatic approach. Patients are followed up for 6 months after surgery.

**Results.** In mean we collect 1-5x10<sup>6</sup> CD133+ cells/Kg in a final volume of 15 mL. Both the procedures and postoperative course were uneventful and no complications related to PBSC mobilization, collection and injection were noted. White blood cell count normalized in all cases before hospital discharge. Patients are recovering well at a mean of 4 months from the intervention. All patients completed the 6-months follow-up. SPECT and echocardiographic reinvestigation showed a significant improvement in perfusion of the treated areas. In particular, patient 4 (PBSC as sole therapy in the inferior wall) showed a marked improvement in rest perfusion and angina.

**Conclusions.** This novel method of peripheral bone marrow stem cells collection and intramyocardial injection is safe, feasible and reproducible. However, further evidences are needed in order to definitely assess safety issues and clinical results.

ABSTRACT 126

**HUMAN SKELETAL MUSCLE-DERIVED STEM CELLS FOR MYOCARDIAL REGENERATION : DEVELOPMENT OF A NEW CELL CULTURE TECHNIQUE**

Claudio Muneretto<sup>o</sup>, Gianluigi Bisleri<sup>o</sup>, Giulio Alessandri\*, Alberto Negri<sup>o</sup>, Jacopo Manfredi<sup>o</sup>, Paolo Piccoli<sup>o</sup>, Andrea Ridolfi<sup>o</sup>, Arnaldo Caruso\*

Division of Cardiac Surgery<sup>o</sup>, Department of Microbiology\*, University of Brescia Medical School, Italy

Skeletal muscular derived stem cells(SkmSC) may hold the potential for cellular cardiomyoplasty: however, most of the studies have been performed in animals and the functional and phenotypic properties of human SkmSC are still not clearly defined.

After harvesting brachioradialis muscle specimens from patients undergoing coronary surgery using the radial artery we dissociated the tissue samples with trypsin: the resulting cells were cultured in collagen coated flasks with epidermal growth factor and basic fibroblast growth factor and in absence of fetal calf serum. Afterwards, cell differentiation was obtained by addition of fetal calf serum, EGF, bFGF and Platelet Derived Growth Factor.

The adhering cells showed a spindle morphology; additionally, we observed a steadily increasing number of rounded floating cells that could be maintained in vitro for more than six months.

After induction of differentiation, immunohistochemistry revealed that both the spindle and rounded cells were positive to muscular markers(striatum muscle actine, desmin). Moreover, we obtained also differentiated cells showing a neurogenic lineage phenotype(GFAP, Nestin).

Our technique allows the isolation and the rapid expansion of human SkmSC from small tissutal specimens. Isolated SkmSC showed phenotypic and morphologic heterogenicity with a capability to differentiate into different cell lineages under appropriate cultural conditions.

## ABSTRACT 127

**INTRAMYOCARDIAL APPLICATION OF BONE MARROW DERIVED STEM CELLS IN COMBINATION WITH TRANSMYOCARDIAL LASER REVASCULARISATION (TMLR).**

H.M. Klein<sup>1</sup>, A.Ghodsizad<sup>1</sup>, A. Borowski<sup>1</sup>, N. Feifel<sup>2</sup>, J.Draganov<sup>3</sup>, A. Zaleh<sup>4</sup>, I. Piechaczek<sup>2</sup>, I. Burchertz<sup>2</sup>, E. Gams<sup>1</sup>.

1 Department of Cardiovascular and Thoracic Surgery, Heinrich-Heine University of Duesseldorf, Germany

2 Miltenyi Biotec; Medical Development and R&D Department, Bergisch Gladbach, Germany

3 Department of Anesthesiology, Heinrich-Heine-University Duesseldorf, Germany

4 Department of Diagnostic Radiology, Heinrich-Heine-University, Germany

**Abstract**

To restore tissue viability in ischemic myocardium not amenable for coronary artery bypass grafting (CABG), TMLR and recently stem cell transplantation have been used in clinical setting.

We have combined both procedures to rescue myocardial regions that could not be revascularised by CABG.

A new method for intraoperative isolation of CD 133+ stem cells during a limited period of time was developed and used to treat two patients. Laser channels were made in predefined region within hibernating myocardium and subsequently isolated autologous CD133+ stem cells were injected in a defined constellation around the laser channels.

The intraoperative processing of AC133+ stem cells is safe and effective. We were able to isolate an average of  $3.45 \times 10^6$  autologous AC133+ bone-marrow (max. purity 97%). Improvement of the regional function in the predefined region was observed six weeks postoperatively. In One patient who died on 21th postoperative day due to pneumonia, postmortom histopathological analysis of myocardial specimen revealed enhanced neoangiogenesis.

By using synergistic angiogenetic effects, TMLR and stem cell transplantation could become a novel revascularisation therapy for ischemic myocardium. Our method of rapid cell isolation opens new perspectives for intraoperative application of stem cells for patients scheduled for elective and in particular for emergency revascularisation.

ABSTRACT 128

**INFLUENCE OF THE AUTOLOGOS BONE MARROW CELLS  
TRANSPLANTATION IN THE ISCHEMIC MYOCARDIUM.  
ONE-YEAR FOLLOW-UP.**

Oliveira SA; Dallan LA; Lisboa LAF; Gowdak LHW; Schettert I; Vieira M; Rochitte CE; Meneghetti C; César LAM; Krieger JE; Chamone DF; Ramires JAF.  
Heart Institute (InCor), University of São Paulo Medical School, Brazil

**Introduction:** We assessed the hypothesis that transplantation of autologous bone marrow cells (BMC) combined to coronary artery bypass grafting (CABG) in patients (pt) with diffuse coronary artery disease (CAD) is safe and may help increase perfusion in the ischemic myocardium.

**Methods:** 10 pt with triple-vessel disease and who were not optimal candidates for "complete" surgical revascularization due to the extension of the disease were enrolled. BMC were obtained immediately prior to surgery, and the lymphomonocytic fraction separated by density gradient centrifugation. During surgery, multiple injections were performed in the non-grafted areas of ischemic myocardium.

**Results:** Pt received  $2.6 \pm 0.2$  grafts and were injected with  $32 \pm 6 \times 10^6$  cels/mL ( $CD34^+ = 1.3 \pm 0.13\%$ ). One year vs. baseline MRI showed reduction in the total ischemic score (0.65 vs. 0.21;  $P=0.01$ ) but more interestingly, also in the ischemic score of the injected area (1.21 vs. 0.43;  $P=0.002$ ). Similarly, cardiac scintigraphy showed improvement in perfusional defects in 9 out of the 12 injected segments ( $P=0.03$ ).

**Conclusions:** In one-year follow-up, transplantation of autologous BMC is safe and may have contributed to increase myocardial perfusion in non-grafted areas. Provided that these findings are confirmed in a larger series, this strategy may be considered as a therapeutic option for diffuse CAD.

## ABSTRACT 129

**MAGNETIC RESONANCE MAPPING OF TRANSPLANTED ENDOTHELIAL PROGENITOR CELLS FOR THERAPEUTIC NEOVASCULARIZATION IN ISCHEMIC HEART DISEASE**A.Weber<sup>1</sup>, I.Pedrosa<sup>2</sup>, T.Asahara<sup>1</sup>, NM.Rofsky<sup>2</sup>, DW.Losordo<sup>1</sup><sup>1</sup> Department of Cardiovascular-Research, St.Elizabeth's Medical Center, Boston, USA<sup>2</sup> Department of Radiology, Beth Israel Deconess Medical Center, Boston, USA

**PURPOSE:**Intramyocardial transplantation of endothelial progenitor cells(EPCs) has been previously correlated with significant augmentation of vascularity and improvement of left ventricular function following myocardial ischemia. However, precise intramyocardial localization of the transplanted are unknown. We present a novel technique using magnetic resonance imaging(MRI) to localize transplanted EPCs in ischemic hearts.

**METHODS:**CD34(+)cells were isolated from human peripheral blood by magnetic-bead selection: CD34(+)cells adhere to CD34-antibody-coated magnetic-beads, while CD34(-)cells do not. All cells were labeled with fluorescent-DiI-dye to permit histological localization. CD34+cells or CD34(-)cells(1x10<sup>5</sup>, 1x10<sup>6</sup> and 2x10<sup>6</sup>) were transplanted into non-ischemic (n=6) or ischemic myocardium (n=2) of Sprague-Dawley rats. Rats were sacrificed 24-hours after cell transplantation. The resected hearts were imaged ex-vivo using 3-Tesla and 8.5-Tesla magnets. Morphological correlation between the MRI findings and fluorescent microscopy for identification of retained CD34+cells was evaluated.

**RESULTS:**CD34(+)cells were identified as areas of low signal intensity on T2\*-weighted images within the myocardium. The extent of the low signal intensity at a given echo time was proportional to cell dosage. No areas of low signal were identified in the CD34(-)cell transplanted hearts. Histological localization of DiI-labeled CD34(+)cells documented a direct anatomic correlation with the localization of transplanted cells on the MRI images.

**CONCLUSIONS:**Magnetically labeled EPCs transplanted for therapeutic neovascularization in myocardial ischemia can be visualized with ex-vivo MR imaging at high-field strengths.



Thursday, March 11, 2004

8:00 – 9:30 PM East Ballroom

## **An Evening at the Movies**

**Abstracts 130 - 139**

THURSDAY  
AFTERNOON

ABSTRACT 130

**INTERNAL CAROTID ARTERY ENDARTERECTOMY BEFORE  
CARDIAC SURGERY : "NEW TECHNIQUE" WITH MINI  
CERVICOTOMY**

VAISLIC C. , BICAL O. , ROBINE B. BOCARA G.,SOUFFRANT G.  
,BOUHARAOUA T.,SPORTICHE M..

CMC Parly 2 , Institution Saint Joseph

**Purpose :** To assess carotid techniques with semi-eversion and mini cervicotomy before cardiac surgery, a technique taking away cervicotomy from sternotomy with haemostatic and infectious barrier aims.

**Method :** Between January 2001 and July 2003 one hundred patients had a carotid endarterectomy with semi-eversion and mini cervicotomy before cardiac surgery. The technology is described on video. Collected data were post-operative complications, mediastinites after cardiac operation and mid-term restenoses.

**Results :** The opening obtained with mini incision was comfortable in all cases. 89 endarterectomies with semi-eversion were performed, 11 patients received a patch by use of a shunt.

There was no per-operative death nor cerebro-vascular stroke. One transitory ischemic attack and one well supported myocardial infarction occurred. Through a mean follow-up period of 10 months, one restenosis was reported which was therefore re-operated upon. One patient died after cardiac surgery and no mediastinitis nor cervical haematoma occurred.

**Conclusion :** This technique which moves away from both cutaneous incisions is possible in all cases and gives excellent results.

## ABSTRACT 131

**SURGERY OF DIFFUSE ANEURYSMAL DISEASE OF PROXYMAL THORACIC AORTA THROUGH MEDIAN STERNOTOMY**

R. Di Bartolomeo, D.Pacini, E. Pilato.  
Cardiac Surgery Department, Bologna, Italy

We present our experience using an anterior approach for the replacement of extensive aneurysm of the thoracic aorta.

In the last year 20 patients have been operated because aneurysm of ascending aorta, aortic arch and descending thoracic aorta by means of a median sternotomy. In almost all patients, any procedure in the ascending aorta was also performed except in one case. In some patients a small anterior left thoracotomy at the 4th intercostal space was required, allowing the replacement of the aorta until the diaphragm.

Antegrade selective cerebral perfusion (ASCP) according to Kazui's technique, has been utilized as brain protection method. All procedures were performed successfully and the aneurysm completely resected in all its extension. No neurological complications or other major complications occurred. We believe that the anterior approach for extensive thoracic aorta replacement is feasible, allows the use of ASCP and results are encouraging.

In the same presentation, a brief video of ascending aorta, aortic arch and descending thoracic aorta replacement through sternotomy will be presented.

ABSTRACT 132

**ROBOTIC REPLACEMENT OF THE DESCENDING THORACIC AORTA:  
PROOF OF A CONCEPT**

Eyal E. Porat, M.D., Peter D. Herrera, B.S., Roy Sheinbaum, M.D.,  
Anthony L. Estrera, M.D., Anders Vinnerkvist, M.D., Tam T.T. Huynh,  
M.D. Bradley S. Allen, M.D., Hazim J. Safi, M.D.

**Purpose:** This video demonstrates the replacement of the descending thoracic aorta (DTA) in the closed chest using a totally robotic technique. The robotic techniques of mobilizing and resecting the DTA, and replacing it with a graft using U – Clips are demonstrated.

**Methods:** A 40 kg pig underwent surgery using the da-Vinci robotic surgical system. Under single lung ventilation and CO<sub>2</sub> insufflation, the DTA was completely dissected and mobilized. Proximal and distal cross-clamps were applied through 2 accessory stab wounds. The DTA was opened and a segment was removed. Using interrupted U – Clips, a 14mm woven Dacron tube graft was anastomosed to the animal's DTA.

**Results:** The animal survived the procedure in good hemodynamic state. Both anastomoses were completed without difficulty with a cross clamp time of 42 minutes. The anastomoses were challenged for bleeding by administering high dose of alpha 1 adrenergic receptor agonists. The animal's systolic blood pressure was increased to 200mm Hg with no evidence of leak.

**Conclusion:** This surgical video demonstrates that replacement of the DTA can be performed successfully in a closed chest of a large mammal using a totally robotic technique. Further studies should address the long-term durability of this procedure.

## ABSTRACT 133

**"DISSECTION OF BOTH INTERNAL THORACIC ARTERIES THROUGH LEFT THORACOTOMY APPROACH FOR "OFF PUMP" MYOCARDIAL REVASCULARIZATION".  
BITA – THORACAB TECHNIQUE.**

Máximo C. Guida, M.D., Giuseppina Pécora, M.D., Alvaro Bacalao, M.D., Gustavo Muñoz, M.D., Orlando Riera, M.D., Myriam Pecchinenda, Tech., Marcelo Salas, Tech., Luis Rodríguez, M.D.

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**ABSTRACT**

The current and most commonly used procedure for myocardial revascularization includes one internal Thoracic Artery (ITA) to the left anterior descending artery (LAD) in order to improve patient's survival.

Additionally, the use of both internal Thoracic arteries (BITA) has been suggested for better long –term patency in comparison to the Saphenous vein graft (SVG). Recently, we started the use of Left Thoracotomy for complete Myocardial Revascularization on the beating heart with good results using a combination of LITA with Radial Artery and SVG.

We report herein the technique for dissection of both internal Thoracic Arteries (BITA) through Left Thoracotomy (THORACAB), in skeletonized fashion accomplished from its origin to its distal bifurcation under direct vision without any special retractor or instruments.

Four By-pass grafts were performed on the beating heart; the RITA was anastomosed to the LAD and the LITA to the Marginal branch. Two SVG were anastomosed to the Diagonal and PDA.

The postoperative course was uneventful and the patient discharged at home 40 hours after surgery.

A video shows the technique of the procedure.

ABSTRACT 134

**OFF PUMP ABLATION FOR ATRIAL FIBRILLATION THROUGH A LIMITED STERNOTOMY ACCESS**

Vibhu R. Kshetry, MD  
Minneapolis Heart Institute Minneapolis, MN

**Purpose-** Feasibility of limited access incision via lower partial sternotomy using off pump technique for surgical ablation of atrial fibrillation (AF).

**Method-** Between June 30, 2002 and March 1, 2003, eight patients underwent off pump left atrial ablation for isolation of pulmonary veins (PVs) (3 standalone pts and 5 concomitant to MV repair in 3 patients and to ASD repair in two patients). The mean age was 49 years. Seven patients had paroxysmal AF and one patient had persistent AF. A lower partial sternotomy incision with a "T" into the fourth intercostal space was performed. After opening the pericardium, A FLEX 10 device (AFx, Fremont, CA) was used to create an encircling ablation line around the PVs. Left atrial appendage was ligated in all patients. Patients were discharged on anti-arrhythmic drugs and anti-coagulant for 3 months.

**Results-** All procedures were completed uneventfully. All patients were able to be discharged on the fourth post-operative day. As of the latest follow up (over 6 months), all patients were in normal sinus rhythm and were off anti-arrhythmic drug and anti-coagulant.

**Conclusion-** Lower partial sternotomy can provide adequate exposure and cosmesis to successfully perform off pump left atrial ablation to treat atrial fibrillation.

## ABSTRACT 135

**ROBOTICALLY ASSISTED CLOSED CHEST MICROWAVE ABLATION OF LONE ATRIAL FIBRILLATION: EARLY CLINICAL EXPERIENCE**

S. Gadasalli, MD; M. Agusala, MD; R. Naidu, MD; M. Jones, MD; M. Shroff, MD; R. Barrera, PAC; S. Quismundo, RN; V. Srivastava, BA

**Purpose-** Feasibility of closed chest robotically assisted off pump microwave ablation of lone AF.

**Method-** Between June and October 2003, seven consecutive drug resistant, permanent lone AF patients underwent our robotically assisted microwave ablation procedure using the Flex 10. The procedure consisted of performing 4 small port incisions on the right chest to access the pericardial sac to place a Flex 10 probe around the pulmonary veins. Additional three ports on the left chest or a single subxiphoid port were used to visually confirm the position of the device posterior to the LAA. Sequential ablations were performed until producing a continuous ablation line around the PVs. Subsequent linear right atrial lesions were created in 3 patients.

**Results-** All procedures were uneventful and were completed after a mean of 289 minutes, ranging between 186 minutes and 371 minutes. The mean post-operative length of hospital stay was 4.7 days, ranging between 2 to 8 days. At latest follow up, five patients were in NSR, one patient was still in AF, and one patient died from a non cardiac-surgical related medical problem.

**Conclusion-** Robotically-assisted totally endoscopic microwave ablation is technically feasible and safe for use in the treatment of drug resistant atrial fibrillation.

ABSTRACT 136

**EXTRACORPOREAL CIRCULATION WITHOUT EXTERNAL CLAMPING AND CANNULATION OF THE AORTA: TRANSVENTRICULAR PLACEMENT OF A NEW MULTIFUNCTIONAL AORTIC CANNULA**

Albertus M Scheule, Wolfram Beierlein, Andreas Straub, Gerhard Ziemer

**Background:**

Stroke is a devastating complication after coronary artery bypass grafting (CABG). An atherosclerotic ascending aorta is a major risk factor for plaque detachment during cannulation and external clamping in patients undergoing CABG on extracorporeal circulation (ECC). To avoid external cannulation and clamping we developed and tested a new multifunctional cannula in a pig model.

**Methods:**

The cannula has a double balloon endoclamping function and is placed through the apex of the left ventricle, through the aortic valve in the ascending aorta. It has two integrated lines for cardioplegic solution and for venting the left ventricle. In the animal model we used a single balloon cannula because of a short ascending aorta in pigs. The cardioplegic solution was administered via aortic root perfusion.

**Results:**

The cannula was placed with Seldinger technique smoothly and reproducibly. Left enddiastolic pressure did not rise after passing the aortic valve. Weaning from ECC was unproblematic and histological examination did not reveal any damage of the aortic valve.

**Conclusions:**

This cannula can be used in patients with a severe atherosclerotic ascending aorta. The risk of plaque detachment and stroke during ECC might be reduced.

## ABSTRACT 137

**"FLOW WATCH" FOR STAGED REPAIR OF COMPLEX D - TRANSPOSITION OF GREAT ARTERIES WITH AORTIC ARCH OBSTRUCTION : A USEFUL EVOLUTION OF THE CONVENTIONAL BANDING PROCEDURE.**

Hitendu Dave 1, Alexander Kadner 1, Margrit Fasnacht 2, Urs Bauersfeld 2, Ali Dodge – Khatami 1, Rene Pretre 1.

- 1 Clinic for Cardiovascular Surgery University Hospital Zurich, Switzerland.
- 2 Department of Cardiology, Childrens Hospital Zurich, Switzerland.

**Background:** d-TGA, VSD, hypoplastic aortic arch and coarctation is a challenging association. The great arteries are frequently side by side and the left coronary artery often presents a retro-commissural, intramural course. This constellation accumulates independent risk factors for death after an arterial switch operation(ASO). We used FlowWatch (FW), an implantable and externally programmable pulmonary artery (PA) banding device, to break down the repair in two stages and perform the ASO in a larger child.

**Methods:** A 3.2 kg child, with this defect underwent extended resection of aortic coarctation and implantation of FW around the PA. The banding was progressively increased from 15 to 85% over a period of 21 days. FW explantation and ASO with VSD closure were performed on day 75.

**Results:** FW successfully restricted PA flow, while maintaining normal valve function. At explantation, the pulmonary arteries, bifurcation and valve were macroscopically normal, allowing performance of an ASO. The coronary arteries, arising from a single ostium, could be separated and the internal wall of the intramural course resected with heightened precision. Postoperative course was uneventful with a normal pulmonary (neo-aortic) valve and ventricular function.

**Conclusions:** The FW, because it seems not to alter the morphology of the pulmonary valve and bifurcation, allows the performance of an anatomic repair in this complex association in two stages. An enhanced growth of the LVOT after coarctation repair and PA banding reduces the great vessels discrepancy. Finally, the preparation of a difficult pattern of coronary arteries (in this case a retrocommissural, intramural LCA) is eased up after somatic growth of the child.

ABSTRACT 138

**ADVANCING TECHNOLOGIES AND MINIMAL INVASIVNESS**

Bilal Kaan Inan

Advancing technologies and minimal invasiveness are becoming the leading items for the recent years for all surgeons. Robotic surgery, videoendoscopic surgery, and endovascular access are the most popular ones.

We were trying to be minimally invasive by laparoscopy and thoracoscopy. We operated two cases whose indications were; hyperhidrosis and causalgia after freezing of the feet.

In both of these cases; we performed videoendoscopic retroperitoneal lumbar sympathectomy. For both cases, surgical outcome, patients' comfort, and cosmetic results were very good. Also, for these cases, hospitalization was only two days. We believe that videoendoscopy for selected cases is the best way to operate.

## ABSTRACT 139

**AORTIC VALVE REPLACEMENT IN A BEATING HEART.**

Pierluca Lombardi, Marco Ricci, Fuad Moussa and Tomas Salerno.

As techniques in cardiac surgery have evolved during the last two or three decades, much of the attention has focused on the experimentation of new strategies of myocardial protection and on the introduction of new techniques of minimally invasive valvular operations.

In the strategy proposed and described in this video, myocardial protection is promoted essentially by maintaining the heart in a beating-empty and continuously perfused state.

The myocardium is supported by a combination of antegrade and retrograde flow. As a result, as in "warm heart surgery", the principles behind "beating heart surgery" can be fundamentally simplified to the theoretical and actual elimination of any degree of supply-demand mismatch.

In fact, in "beating heart surgery", despite myocardial oxygen consumption remains substantial, oxygen supply approximates that of normal physiologic conditions, as the heart remains continuously perfused at rates similar to those of physiologically perfused hearts.

Furthermore, the beating-empty state may also prevent the occurrence of myocardial edema, one of the consequences especially after prolonged periods of cardioplegic arrest, which in turn may have detrimental effects on myocardial contractility and postoperative ventricular function.



Friday, March 12, 2004

8: 00 – 10:00 AM East Ballroom

## **High Risk Surgical Revascularization: Clinical Outcomes**

**Abstracts 140 - 148**

FRIDAY  
MORNING

## ABSTRACT 140

**IS STENTING SUPERIOR TO CONVENTIONAL BYPASS SURGERY IN HIGH RISK PATIENTS WITH LEFT MAIN CORONARY ARTERY STENOSIS? MID TERM RESULTS OF A PROSPECTIVE RANDOMIZED STUDY.**

Vicol C. (1), Reichenspurner H. (1), Reichart B. (1), Meiser B. (1), Tilmann P. (2), Giehl W. (2), Steinbeck G. (2), Boekstegers P. (2)

(1) Department of Cardiac Surgery and (2) Internal Medicine I of Großhadern Medical Center, Ludwig-Maximilians-University, Munich, Germany

**Objectives:** An increasing number of patients with left main coronary artery stenosis (LMCAS) and LMCAS equivalent are treated by stent implantation which appears to be safe in the short term follow-up. However, there is a lack of randomized studies comparing this therapy with conventional bypass surgery. We assess the results and cost effectiveness of conventional bypass surgery in high risk patients with LMCAS and LMCAS equivalent compared to retroinfusion-supported stenting.

**Methods:** We report on the one year results of a prospective randomized single center study in patients with symptomatic LMCAS and LMCAS equivalent and substantially increased risk for bypass surgery. Patients were randomized either to undergo cardio-pulmonary bypass-supported myocardial revascularization (group 1, n=21) or stenting (group 2, n=23). Stent implantation was supported by selective pressure-regulated retroinfusion of the anterior cardiac vein during ischemia.

**Results:** Patients of the two groups did not differ in baseline characteristics including Parsonnet-score. 28-days mortality (group 1: 9.5 vs. group 2: 8.7%) and one-year mortality (group 1: 23.8 vs. group 2: 21.7%) were similar in both groups. Event free survival after one year was higher in group 1 (71.4 vs. 52.3%, p=.02). With regard to cost effectiveness, however, group 2 compared favourably to group 1 (9,346+/-807 vs. 26,874+/-3,985) predominantly as a result of a shorter intensive care and hospital stay.

**Conclusions:** Retroinfusion-supported stenting is less expensive but has a similar high mortality and a lower event free survival compared to bypass surgery in high risk patients with LMCAS and LMCAS equivalent.

## ABSTRACT 141

**INFLUENCE OF DIABETES MELLITUS ON THE EARLY POSTOPERATIVE OUTCOME AND MIDTERM RESULTS IN PATIENTS WITH MULTIVESSEL DISEASE AFTER TOTAL ARTERIAL OFF-PUMP CABG**

Jae-Sung Choi, MD, Kwang Ree Cho, MD, Ki-Bong Kim, MD  
Seoul National University Hospital, Seoul, Korea

**BACKGROUND;** Diabetes mellitus is well-known risk factor for operative morbidities after CABG as well as restenosis after percutaneous coronary intervention.

**MATERIALS AND METHODS;** We prospectively studied 458 patients with multivessel disease who underwent off-pump CABG using all arterial grafts. Postoperative mortalities and morbidities, and graft patency at the early postoperative period and one year after surgery were compared between diabetic patients (group I; n=188) and non-diabetic patients (group II; n=270). Bilateral internal thoracic arteries were used in 72.9%(137/188) of the patients in group I and 82.6%(223/270) in group II.

**RESULTS;** There were no significant differences in operative mortalities (1.6% vs 1.1%), the number of distal anastomoses ( $2.9\pm 0.9$  vs.  $3.0\pm 0.9$ ), intensive care unit stay ( $32\pm 35$  vs.  $28\pm 22$  hours), and hospital stay ( $9\pm 5$  vs.  $9\pm 4$  days) between the groups I and II (p=ns). There were no significant differences in postoperative morbidities (such as atrial fibrillation, stroke, acute renal failure, low cardiac output syndrome, superficial wound infection, and mediastinitis) between the two groups (p=ns). There were no significant differences in the early postoperative patency (99.1%, 540/545 vs. 98.9%, 762/770) and one-year patency (93.4%, 295/316 vs. 93.8%, 467/530) between the groups I and II (p=ns).

**CONCLUSION;** Diabetes mellitus did not affect the early postoperative results and late graft patency in patients with multivessel disease undergoing total arterial off-pump CABG.

ABSTRACT 142

**"COMPLETE MYOCARDIAL REVASCULARIZATION ON THE BEATING HEART VIA LEFT THORACOTOMY". AN ALTERNATIVE APPROACH.**

Máximo Guida\*, MD, Giuseppina Pecora, MD, Álvaro Bacalao, MD, Orlando Riera, MD, Pablo Mendoza, MD, Gustavo Muñoz, MD, Luis Sánchez, MD, Alejandro Acuña, MD, Myriam de Guida, Tech., Marcelo Salas, Tech., Luis Rodríguez, MD.  
Fundacardio – foundation - Valencia – Venezuela.

**ABSTRACT**

**Background.** Left Thoracotomy is infrequently used for cardiac procedures, but its application in reoperative, Minimally invasive and Valvular surgery has been reported.

**Method.** Eighty-nine consecutive patients were submitted to a Myocardial Revascularization from November 1st 2002 to October 31st 2003. Seventy patients ( 78,7 %) were male and nineteen patients ( 21,3%) female, aged 44 to 84 years, mean 60,3 years , 35 ( 39,3%) with low EF, 42 ( 47,2%) previous MI, 74 (83,1 %) multivessel disease. The Euroscore was 3,4 and the Parsonnet score 8,4.

**Results.** One patient died (84 years-old) in our series ( 1,1%), the number of grafts averaged 2,33 per patient ( 1 to 5 grafts per patient ), 80 patients ( 89,9% ) were extubated in the operating room and 54 (60,7 %) discharged at home within 48 hours after surgery. No patient was converted on pump. Two patients (2,2 %) needed reoperation for bleeding and two patients (2,2%) , had perioperative stroke.

**Conclusions.** Off Pump complete Myocardial Revascularization via Left Thoracotomy was possible in all scheduled patients with good results. The operative mortality was less than expected and a Fast-track recovery achieved in more than 60,7% of patients. The technical access of the coronary target vessels was very simple after the learning curve and the standarization of the procedure. We conclude that this approach is safe and effective in a selected group of patients; however, long-term results are mandatory to confirm our favourable preliminary results.

## ABSTRACT 143

**ON-PUMP BEATING HEART CORONARY ARTERY BYPASS IN HEMODYNAMICALLY UNSTABLE PATIENTS**

Mark Anderson MD, Bernard Vasseur MD, Alan Spotnitz MD,  
Peter Scholz MD, Tyrone Krause MD  
Division of Cardiothoracic Surgery  
UMDNJ / Robert Wood Johnson Medical School  
New Brunswick, New Jersey

**Purpose:** To review our experience with on-pump beating heart CABG in patients with acute myocardial infarction and hemodynamic instability.

**Methods:** All patients identified as having an AMI and being taken to the OR emergently for the last 3 years were reviewed.

**Results:** 92 operations for salvage were identified of which 17 ( 13 male, 4 female, mn age 60 +/- 9 years ) were done with the beating heart technique. All were on inotropes upon arrival to the OR. 11 had an IABP in place. Estimated ejection fraction for the group was 17 +/- 7 %. The predicted risk of mortality was .85. A mean of 2.9 +/- 0.7 grafts were performed. CPB time was 85 +/- 17 minutes. 1 additional IABP was placed. There were no operative or 30 day deaths. Mortality in the conventional group was 10.6 ( 8/75 ) % Major complications included 1 re-exploration for bleeding and 3 patients with renal insufficiency, 1 requiring dialysis.

**Conclusions:** On-pump beating heart CABG is a safe and effective alternative to conventional arrested heart surgery in compromised patients experiencing acute myocardial infarction. The avoidance of global myocardial ischemia with the elimination of aortic cross clamping may be of paramount importance in this high risk group of patients.

ABSTRACT 144

**ADVANTAGE OF OFF-PUMP CABG IN HEMODIALYSIS PATIENTS.**

Junichi Nishimura 1) Haruhiko Akagi 1) Kei Sakai 1) Yuji Miyamoto 2)  
Hikaru Matsuda 2)

Cardiovascular Surgery Yao Tokushukai General Hospital, Yao-city, Japan1)  
Department of Surgery Osaka University Graduate School of Medicine2)

**Objective:** Chronic hemodialysis still remains a major risk-factor for CABG. Off-pump CABG(OPCAB) is expected to offer some benefits for this high-risk patients, however, it has not been clarified yet. To elucidate this issue, we conducted a multi-center retrospective review on chronic hemodialysis patients who underwent CABG.

**Patients:** Between 1998 and 2002, 53 hemodialysis patients underwent elective CABG at 14 centers. Nineteen patients received OPCAB(OPCABgroup), and 34 patients received conventional CABG(CCABgroup). Pre- and peri-operative variables and mortality were compared in two groups. There were no significant differences in preoperative variables(age, gender, duration of hemodialysis, LVEF, etc).

**Results:** There was no significant difference in the average number of grafts, however, operation-time, length of ICU stay, and amount of blood transfusion were less in OPCAB group. The hospital mortality was not significantly, but low in OPCAB group(0.0%vs.14.7%).

**Conclusion:** OPCAB significantly decreased operation-time, ICU stay, and the need for blood transfusion. The hospital mortality of OPCAB was low compared with that of CCAB. OPCAB may have advantages over CCAB in chronic hemodialysis patients.

## ABSTRACT 145

## A CLINICAL AND ANGIOGRAPHIC LONG TERM FOLLOW-UP IN 270 PATIENTS AFTER ENDOSCOPIC ATRAUMATIC CORONARY ARTERY BYPASS

Marek Cisowski, Agnieszka Drzewiecka-Gerber\*, Wojciech Kruczak\*\*, Rafal Ulczok, Maria Trusz-Gluza\*, Andrzej Bochenek

First Department of Cardiac Surgery, \*First Department of Cardiology, \*\*Department of Cardio-anesthesiology, Medical University of Silesia, Katowice, Poland

**Objective.** Endoscopic Atraumatic Coronary Artery Bypass (EACAB) is a challenging quickly developing surgical technique, resulting in a decrease the physical trauma, smaller number of in-hospital complications and better patients outcome.

**Methods.** A prospective clinical and angiographic long term control and follow-up study of 270 consecutive patients (pts) undergoing EACAB LITA to LAD was undertaken. Their mean age was  $55,1 \pm 9,5$ . In all the cases the endoscopic IMA harvest was employed.

**Results.** There were one early and two late deaths. At a mean follow-up of  $2,51 \pm 1,23$  years, 98,9% are alive and asymptomatic with or without medical treatment in every case; 96,7% are alive, asymptomatic, and without a repeated surgical or cardiologic intervention on the LAD. Major adverse coronary events were observed in 14 pts, (5,2%) and included: deaths 1,1%, myocardial infarction (1,1%), TVR (2,6%) and stroke (0,74%). An average pts CCS anginal status was  $1,13 + 0,7$ . In 157 pts control coronary angiography was performed (63,7%). Angiographic studies showed patent LITA-LAD graft in 152 pts (96,8%) - 5 pts (3,2%) had totally occluded graft. Coronary artery disease progression in other vessels was observed in 35 pts (22,3%). Successfully PCI procedure was performed in 25 pts (15,9%).

**Conclusions.** E-ACAB approach will have a major impact on the management of the coronary patient, providing to low mortality, fast recovery, high percentage of free of angina symptoms pts and excellent patency of LIMA-LAD anastomosis in long term follow-up.

ABSTRACT 146

**BEATING HEART VS. ON-PUMP CORONARY BYPASS SURGERY IN WOMEN.**

Jerzy Pacholewicz, Arkadiusz Farmas, Marcin Maruszewski, Roman Przybylski, Bogdan Ryfinski, Pawel; Tomaszewski, Robert Kalis, Marian Zembala

Silesian Center for Heart Disease, Department of Cardiac Surgery and Transplantology, Zabrze, Poland

**BACKGROUND:** Women have higher morbidity and mortality rates than men following coronary artery bypass graft (CABG) surgery. We investigated the outcome after coronary surgery compared on-pump to off-pump CABG surgery in women.

**METHODS:** There were investigated 622 women of 2704 consecutive patients who underwent direct myocardial revascularization with (364) and without (258) CPB in period from March 2001 to October 2003. Patient mortality and procedure complications controlling for 20 variables representing patient characteristics and comorbid conditions were analyzed. In two groups the EuroScore table was compare to estimate mortality rate.

**RESULTS:** Women undergoing on-pump CABG surgery experience a mortality rate 5,2% (19/364) vs. 2,7% (7/258) ( $p = NS$ ) than women undergoing off-pump CABG. The complication rates (on vs. off-pump) CathLab reinterventions (3/364 vs. 1/258( $p = NS$ ), hemorrhage (7/364 vs. 2/258( $p = NS$ ) and blood transfusions (232/364 vs. 100/258( $p < 0.01$ ), perioperative MI (20/364 vs. 1/258 ( $p < 0.01$ ), inotrops (154/364 vs. 58/258( $p < 0.01$ ), IABP (3/364 vs. 0/258( $p = NS$ ), neurological (2/364 vs. 0/258), renal failure (2/364 vs. 0/258), abdominal (1/364 vs. 0/258) were in some cases even significantly lower in off-pump group.

**CONCLUSIONS:** Evidence suggests that off-pump CABG surgery may be better for women due to lower mortality and rate of complications.

ABSTRACT 147

**CLINICAL OUTCOMES AMONG PATIENTS WITH LEFT MAIN DISEASE UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY IN COMMUNITY HOSPITALS**

Marc Katz, Michael Mack, Aaron Kugelmas, Mark Bladergroen, Chiwon Hahn, Edmund Becker, Steven Culler, April Simon, Emory University, Atlanta, GA, Cadiac Data Solutions, Inc., Atlanta, GA

**Purpose:** It is well known that left main (LM) disease is an indication for CABG surgery, however, with the advent of drug-eluting stents some believe that LM disease can be treated with PCI. This research is to provide outcome benchmarks for patients with LM disease.

**Methods:** A retrospective analysis was conducted using data from 18 community hospitals 1/2001 thru 6/2003. The study consists of 5,494 consecutive patients who underwent CABG only. Unadjusted outcomes were calculated for complications.

**Results:** 24.1% of the study sample had significant LM disease. The table reports unadjusted complication rates for LM patients. Only operative and predicted mortality, were significantly ( $p < 0.01$ ) higher among LM patients.

Results from the logistic regression analysis indicate that LM patients are 1.63 times ( $p = 0.017$ ) more likely to die during CABG.

**Conclusions:** Although observed and risk-adjusted mortality rates are higher for CABG patients with LM disease, the overall complication rates are low and represent a benchmark for comparing alternative revascularization strategies for LM disease.

Complication Rates Following CABG

	LM Patients	All Other Patients	p-value
Operative Mortality	4.1%	2.3%	$p < 0.001$
Predicted Mortality	3.6%	2.7%	$p < 0.001$
ReOp Bleeding	2.6%	2.4%	$p = 0.761$
Stroke	1.3%	0.8%	$p = 0.138$
Renal Failure	4.9%	4.3%	$p = 0.357$
Multi-System Failure	1.1%	0.7%	$p = 0.143$

## ABSTRACT 148

**CARDIAC SURGERY WITHOUT TRANSFUSION IN 2003 :  
PER-OPERATIVE RISK AGGRAVATION AND TECHNICAL  
IMPROVEMENTS.**

VAISLIC C. , BICAL O.,DELEUZE P. , KUCHARSKY C. , KHOURY W.,GAILLARD D. , PONZIO O. , OLLIVIER Y. , ROBINE B. , SOUFFRANT G. BOUHARAOUA T..

**Purpose :** Between January 1991 and October 2003, 200 Jehovah Witnesses adult patients underwent elective cardiac surgery. To asses the impact on continuing progress of blood saving protocols and the increasing operative risk of patients proposed to surgery, we have re-assessed our results in this specific population.

**Methodology :** Files of the first 100 patients operated upon between 1991 and 1998 were reviewed, and compared to the following 100 ones treated between 1998 to today. All patients were scored using the Euroscore model. Types of surgeries are represented on the following table.

**Results :** In the latest series, patients are older (68 vs 51) and 13% underwent an iterative procedure, although there was none in the first series.

Three deaths occurred after one month at the beginning of our experience, only one in the latest series. Operative risk factors had distinctly deteriorated, with more redux , and ejective fraction lower than 35%. Major progress to maintain morbi-mortality stability were multi-factorial : preoperative erythropoietin in order to reach an haemoglobin minimal value of 14 g/dl, Cornell University protocol, Mini-ECC, warm blood cardioplegia, ultra-early extubation.

**Conclusion :** Cardiac surgery without transfusion can be realized with an equivalent risk to that of classical surgery, despite an operative risk aggravation, due to the association of recent conservative techniques.

	1991-1998 procedure /Early mortality	1998-2003 Early mortality
AVR	31 / 1	25 / 1
MVR	5	3
MVR+AVR	1	1
MITRAL PLASTY	1	9
CABG	61 / 2	58
AORTIC DISSECTION	0	2
ASD	1	
ASD+SDINUS VEINOSUS	1	
VSD CLOSURE	1	

Friday, March 12, 2004

1:30 – 3:00 PM East Ballroom

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session IV**

**Surgical Revascularization: Arterial Grafts**

**Abstracts 149 - 157**

## ABSTRACT 149

**REVASCULARIZATION OF THE RIGHT CORONARY ARTERY IN PATIENTS UNDERGOING BILATERAL INTERNAL THORACIC ARTERY GRAFTING**

R. Mohr, D. Pevni, Y. Ben-Gal, O. Lev-Ran, R. Braunstein, I. Shapira, G. Uretzky. Dept. of Cardiothoracic Surgery, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel. Background: Bilateral internal thoracic artery grafting (BITA) with composite T-graft enables right system (RCA) revascularization with the distal end of free right internal thoracic artery (ITA). This study compares this grafting technique with BITA and RCA revascularization with the gastro-epiploic artery (GEA) and saphenous vein grafts (SVG).

**Methods:** From April 1996 to July 1999, 1000 consecutive patients underwent left-sided revascularization with BITA. In 231, RCA grafting was performed with free right ITA, in 246 with GEA, in 142 with SVG and 381 did not receive any graft to the RCA (No Graft group).

**Results:** Female gender, old age (>70), emergency and Congestive Heart Failure (CHF) were less prevalent in the GEA group, and prior PTCA was more prevalent in the No-Graft group. Thirty-day mortality (3.6%, 4.9%, 2% and 3.4% in the ITA, SVG, GEA and No-Graft groups, respectively) and occurrence of perioperative complications (sternal infection, myocardial infarction, cerebrovascular accident, and bleeding) were similar. However, in sum, complication rate was higher in the ITA group (10.3%, 4.9%, 5.6% and 7.3% respectively,  $p=0.06$ ). Midterm follow-up (40-78 months) showed similar six year survival (Kaplan-Meier) (88%, 87%, 89.5% and 85.5%) and similar return of angina (10.8%, 6.3%, 10.6% and 9.5%) in the four groups.

**Conclusions:** Early and mid-term results in patients undergoing BITA are not affected by the conduit used for RCA grafting.

## ABSTRACT 150

**TOTAL ARTERIAL REVASCLARIZATION WITH A SINGLE Y-COMPOSITE GRAFT FOR PATIENTS WITH TRIPLE VESSEL DISEASE**

Young Tak Lee, Kay Hyun Park, Tae Gook Jun, Pyo Won Park

Department of Thoracic and Cardiovascular Surgery of Samsung Medical Center Sungkyunkwan University School of Med, Seoul, Korea (South)

**Background:** Treating triple vessel disease by grafting a single Y-composite graft with one arterial conduit attached to the side of the internal thoracic artery (ITA) is usually avoided because of the possibility of hypoperfusion.

**Methods:** Between March 2001 and June 2003, 271 patients who underwent total arterial revascularization for triple vessel disease were divided into two groups. Group I (n = 188) received only a Y-composite graft with two arterial conduits, and Group II (n = 83) received a Y-composite graft and one additional arterial conduit.

**Results:**

	Group I	Group II	P
Distal anastomoses required	3.9 ± 0.7	4.1 ± 0.8	0.021
In-hospital deaths	2	0	0.347
Perioperative myocardial infarctions	2	0	0.347
Hypoperfusion syndromes	0	0	1.0
Strokes	1	1	0.55
Atrial fibrillations	38	20	0.479
Mediastinitis	1	2	0.172

During follow-up (GI 8.7±6.4, GII 17.8±7.2), one patient needed an intervention on the right coronary artery (RCA) in Group II, but others required no additional procedures and had no symptoms of angina. Angiograms for 85 Group I patients showed a total (104/104) patency rate for the left ITA, and 210/218 (96%) patency for side branches with the right ITA or radial artery.

**Conclusion:** Single Y composite grafts with two arterial conduits could be an excellent strategy for treating triple vessel disease. However, additional conduits may be needed in patients with significant lesions (< 90% stenosis) because of the risk of developing competitive flow.

ABSTRACT 151

**SEQUENTIAL USE OF INTERNAL THORACIC ARTERY IN CORONARY BYPASS SURGERY: RESULTS OF 867 PATIENTS**

Bakay C., Korkmaz A.A., Caynak B., Onan B., Aytekin V.

Kadir Has University Florence Nightingale Hospital, Istanbul/TURKEY

**Background:** In attempt to promote excellent long-term functional results, the current trend is to bypass more coronary arteries with arteriel conduits. We describe our mid and long term results in extencive coronary revascularization using ITA grafts.

**Methods:** 867 patients who underwent coronary bypass operation with the use of at least one sequential ITA graft between January 1986 to August 2003 were reported; 730 men (84.2%) and 137 women (15.8%), age ranged from 29 to 81 years (mean age 58.5). Total 3633 (mean 4.19) anastamoses; 2484 (mean 2.86) arteriel, 2002 (mean 2.30) were squential ITA anastamoses.

**Results:** Follow up ranged from 1 month to 17 years (mean  $65 \pm 23.4$  months) for 522 patients (60.2 %).

17 patients died during follow-up (10 were cardiac related).

121 (23.18%) patients underwent coronary angiography (mean 49 months; range 10 days to 17 years).

Patency of sequential ITA anastamoses: 95.8% (251/262).

Patency of other arteriel grafts: 94.7% (18/19)(Non-sequential ITA, RGEA, IEA).

Rate of reintervention: 1.73%

**Conclusion:** Mid and long-term patency rates of sequential ITA anastamoses is excellent and is identical to that of single ITA grafting. Sequential use of ITA has the potential to improve the long-term results of CABG surgery.

## ABSTRACT 152

**TOTAL ARTERIAL MYOCARDIAL REVASCULARIZATION WITH COMPOSITE GRAFTS: IS THE LITA INFLOW ALONE SAFE FOR MULTIVESSEL GRAFTING?**

Claudio Muneretto, Gianluigi Bisleri, Alberto Negri, Jacopo Manfredi, Enzo Tarzia, Ilaria Nodari

Division of Cardiac Surgery, University of Brescia Medical School, Italy

Despite the excellent clinical results offered by composite arterial grafting, several authors raised concerns about the safety of composite Y/T grafts with single LITA inflow in presence of multivessel disease.

We prospectively evaluated 125 patients undergoing CABG surgery with composite arterial grafting: all patients received a LITA on LAD and a radial artery plus/or a right ITA. Composite grafts were realized using a single or double Y/T graft. Mean age was  $69\pm 6$  yrs., mean Euroscore was 5.7 ; 89.6% of patients (112/125) were operated off-pump.

Mean number of coronary anastomoses was  $3.1\pm 0.3$  ; 6 patients scheduled for off-pump surgery were converted on-pump due to unfavourable target vessel anatomy or hemodynamic instability. Mean ventilatory support duration and ICU stay were respectively  $16\pm 4$  hrs. and  $22\pm 5$  hrs. Hospital mortality was 1.6%; Among post-operative complications, early post-operative MI occurred in 0.8% of patients.

All hospital survivors were evaluated at a mean follow-up of  $18\pm 3$  months : we observed 3 late deaths; freedom from recurrence of angina/myocardial infarction was found in 97.6% of patients ; at angiography graft patency rate was 99.3% .

Total arterial myocardial revascularization with composite grafts and single LITA inflow could be safely performed in presence of multivessel disease, even off-pump

## ABSTRACT 153

**IS THE FLOW OF IN SITU RIGHT GASTROEPIPLOIC ARTERY GRAFT ADVERSELY INFLUENCED BY SYMPATHETIC ACTIVATION AFTER CABG?**

Ho-Geol Ryu, MD, Jae-Hyon Bahk, MD, Ki-Bong Kim, MD,  
Seoul National University Hospital, Seoul, Korea

**Background:** The blood flow through the right gastroepiploic artery (rGEA) is expected to decrease under a sympathetic activation. We evaluated the blood flow through the rGEA graft under a sympathetic activation, and compared with those of the internal thoracic artery (ITA) graft.

**Methods:** Eighteen patients scheduled for OPCAB using both ITA and rGEA as skeletonized in situ grafts, were studied prospectively. Continuous infusion of norepinephrine (0.005 $\mu$ g/kg/min of increment) was administered until the heart rate or mean blood pressure increased more than 15% compared to baseline, simulating the sympathetic activation. Basal hemodynamic values and blood flow velocities through the grafts were measured 10 minutes after finishing all anastomoses, after sympathetic activation, and 10 minutes after cessation of norepinephrine.

**Results:** Blood flow through the rGEA during infusion of norepinephrine increased from 32.6 $\pm$ 15.3 ml/min to 38.1 $\pm$ 18.8 ml/min, and that through the ITA increased from 39.3 $\pm$ 21.9 ml/min to 42.0 $\pm$ 19.4 ml/min. In terms of percentage change in flow rate, blood flow through both the rGEA and ITA grafts increased 24% ( $p=0.032$ ) and 16% ( $p=0.044$ ), respectively. Blood flow through the rGEA and ITA grafts returned to baseline level after cessation of norepinephrine (32.5 $\pm$ 17.0 ml/min and 37.2 $\pm$ 27.6 ml/min, respectively).

**Conclusion:** The decrease in blood flow through the rGEA did not occur under a sympathetic activation. The in situ rGEA demonstrated an increased blood flow under a sympathetic activation and could be used safely as an in situ arterial conduit

## ABSTRACT 154

**THE EFFECT OF SKELETONIZATION OF THE RADIAL ARTERY IN THE EARLY CLINICAL OUTCOME USING THE "θ-CIRCUIT"**

S.Prapas, D. Protogeros, J. Panagiotopoulos, A. Sidiropoulos, V. Economopoulos, G.Platsas, F. Danou, V.Kotsis.

Cardiac Surgery Dept., "Henry Dunant" Hospital, Athens, Greece.

**Introduction:**

The radial artery is the graft of second choice for arterial revascularisation. In our practice it plays an important role in the creation of the  $\pi$ -circuit for total arterial, aorta non-touch, off-pump coronary revascularisation. We investigate the effect of skeletonization of the radial artery in early clinical outcome.

**Material and methods:**

Nine hundred eight consecutive isolated coronary cases operated on between February 2001 and October 2003. In 475/908 cases the radial artery was prepared and used as a component of the  $\theta$ -circuit. In the first period (Feb 2001- Apr 2003) the radial artery was used in 359/475 patients without skeletonization (group A). In the second period of six months we changed our technique skeletonizing the radial artery in 116/475 patients (group B). The operative technique, which was performed in all cases, consisted of the application of the  $\theta$ -circuit to the diseased coronary bed. The  $\theta$ s circuit is based on preconstructions (compositions, extensions or sequential grafting) on the two pedicled skeletonized IMA's for total arterial, off-pump and aorta non-touch revascularization. The same pharmaceutical regimen was used in all patients for radial spasm protection. We compared the two groups retrospectively according to the preoperative characteristics, the operative data and the postoperative outcome.

**Results:**

There were no statistically significant differences in the preoperative and operative data in the two groups. In group A, no deaths or morbidity related to cardiac events were present. In group B, two patients died after a progressive deterioration in cardiac function. One patient was reopened 3 hours postoperatively because of evidence of ischaemia due to radial artery spasm and another developed dilatation of the right side of the heart as a consequence of ischaemia due to the same reason. Both patients survived, after substitution of the graft in the first patient and use of papaverine solution to release the spasm in the second one.

**Conclusion:**

The use of skeletonized radial artery grafts for total arterial revascularisation seems to be associated with a higher incidence of postoperative graft spasm leading to increased morbidity.

## ABSTRACT 155

**ANTI-OXIDANTS PROPERTIES OF ARTERIAL GRAFTS USED IN CORONARY BYPASS GRAFTING SURGERY**

Omar Mangoush, Thanos Athanasiou, Koki Nakamura, Adrian H Chester, Philip Johnson, Mohamed Amrani

**Objectives**

The internal thoracic artery (ITA) continues to be the conduit of choice over radial artery (RA). Although both conduits have similar endothelial function and sustain equal mechanical trauma during harvesting, the main reason underlying the difference in patency rate is not completely understood. This study explores possible differences in anti-oxidants defence mechanisms between both conduits.

**Methods**

Chemiluminescence and organ bath techniques were used to assess changes in the rate of reactive oxygen species (ROS) generation and the endothelium-dependent vasodilatation function (EDVF) of both arteries. Vessels were studied up to 72-hour storage to induce endothelial impairment. The localization, activity and the effect of inhibition of superoxide dismutase (SOD) were assessed in both arteries.

**Results**

RA generated less ROS (P-value = 0.03) and its EDVF was greater than ITA at 0-time, however, as time passed RA generated much more ROS (P-value  $\leq$  0.01, at 48 hour vs 2 hour) and its EDVF deteriorated much quicker than ITA (P-value  $<$  0.01 at 24 hour vs 2 hour). The amount of SOD1 and SOD3 and the total activity of SOD were more in ITA compared with RA. Inhibition of SOD increased ROS generation and impaired the EDVF in both arteries, but these changes were statistically significant in RA but not in ITA.

**Conclusions**

At steady state, RA seems to be an ideal conduit, where it generates less ROS and its endothelium-dependent vasodilatation function is better than ITA. However, ITA has more active SOD and it handles oxidant stress better than RA.

## ABSTRACT 156

**ENDOSCOPIC RADIAL ARTERY HARVEST FOR CORONARY ARTERY BYPASS GRAFTING – INITIAL CLINICAL EXPERIENCE**

Curtis T. Hunter, Benjamin Eskenazi, Richard Murphy, Yusheng Bao, Harold L. Lazar, Richard J. Shemin, Oz M. Shapira, Dept. of Cardiothoracic Surgery, Boston Medical Center, Boston, MA, USA

**Background:** Recently, an endoscopic technique was developed to harvest the radial artery (RA) via a 3 cm wrist incision in patients undergoing CABG. The clinical experience with this approach is limited.

**Aim:** To evaluate our initial clinical experience with this technology.

**Methods:** Data were prospectively collected on 60 consecutive patients undergoing CABG with endoscopic radial artery harvest using the Ultra-Retractor (CardioVations, Somerville, NJ) and the Harmonic scalpel (Ethicon Endo-Surgery, Cincinnati, OH).

**Results:** There were 53 (88 %) men and 7 (12 %) women with a mean age of 60 years (43-75). Forty (67%) cases were non-elective. Twenty-five (42 %) patients had diabetes. Sixty percent of the operations were performed "on-pump" and 40% "off-pump". Average RA harvest time was 57 minutes (range 30 to 120 minutes) with a significant learning curve (75 min for the 1st 20 cases and 50 min for the last 40). Two (3 %) radial arteries were discarded, one because of extensive calcifications and the other because of damage to the conduit. There were no mortality, perioperative myocardial infarction or stroke. There was one re-exploration of the forearm for a tunnel hematoma. Average follow-up in 40 patients was 4 months (1-10 months). One patient expired (sudden death). There were no MI or reinterventions, with 98% of patients in functional class I/II. There were no motor deficits. There were no sensory deficits in the distribution of the lateral antebrachial cutaneous nerve, but transient mild dorsal thenar numbness or paresthesias were observed in 75%. Cosmetic results were defined as good to excellent in 90% of patients.

**Conclusions:** Short-term results of endoscopic radial artery harvest are excellent. There is a significant learning curve. Long-term follow-up as well structural and functional assessment of the conduit are indicated.

## ABSTRACT 157

**EARLY RESULTS OF REVASCULARIZATION OF THE LEFT ANTERIOR DESCENDING ARTERY WITH DRUG ELUTING STENTS: COMPARISON WITH OFF PUMP SURGERY**

I. Herz, Y. Moshkovitz, A. Hendler, S. Adam, G. Uretzky, I. Shapira, R. Mohr.  
Department of Cardiothoracic Surgery, Tel Aviv Sourasky Medical Center and  
Catheterization Laboratories, Assouta Medical Center, Tel Aviv, Israel.

**BACKGROUND:** This study compares early results of LAD stenting with drug-eluting stents (Cypher) with off-pump bilateral internal thoracic arterial (BITA) grafting.

**METHODS:** From June 2002 to May 2003, 200 consecutive patients underwent myocardial revascularization of the LAD territory: 100 by Cypher and 100 by BITA. The two groups were similar; however, left main disease and triple vessel disease (25% and 61% vs 2% and 29%), age >70 (40% vs 17%) and IABP (7% vs 0%) were more prevalent in the BITA group and prior PTCA in the Cypher group (37% vs 17%).

**RESULTS:** The number of coronary vessels treated per patient in the BITA group was higher (2.7 vs 1.9,  $p < 0.01$ , N.S.). Thirty-day mortality was 1% in the BITA group and 0% in the Cypher group. Mean follow-up was 9 months. There was one late death in each group. Angina returned in 32% of the Cypher group and 1% of the BITA group. There were nine re-interventions in the Cypher group: seven coronary angioplasties (including two to the LAD) and two surgical interventions. There was no re-angina or re-intervention in the surgical group.

**CONCLUSION:** Despite a higher risk profile of patients treated with BITA, their clinical outcome is better. A longer and more complete angiographic follow-up is required in order to determine the role of drug eluting stents in LAD revascularizat

Friday, March 12, 2004

1:30 – 3:00 PM Versailles Gallerie

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session V**

**Advances in Aortic and Endovascular Therapy**

**Abstracts 159 - 167**

## ABSTRACT 159

**THE SHELHIGH SUPERSTENTLESS® VALVE TO OVERCOME PROSTHESIS-PATIENT MISMATCH: A RESULTS OF 155 CONSECUTIVE PATIENTS**

P.M. Dohmen, J. Bohm, M. Rogge, S. Dushe, W. Konertz

Department of Cardiovascular Surgery, Charité Hospital, Humboldt University Berlin, Berlin, Germany.

**Background :** This study was performed to show hemodynamic performance of the No-React® treated aortic porcine bioprosthesis.

**Methods :** Follow-up was performed of 155 implantations of the SuperStentlessâ Shelhigh prosthesis, inserted from February 2001 at the Charité hospital. Mean age was  $73.2 \pm 8.0$  years. Aortic valve stenoses was diagnosed in 72.3%. Concomitant procedures were performed in 101 pts. (65.2%). Prosthesis-patient mismatch was calculated of each patient (table). Hemodynamic follow up was performed up to two years of follow-up.

**Results :** The mean implanted diameter was  $24.3 \pm 2.3$  mm. The mean valve EOA was  $2.05 \pm 0.24$  mm<sup>2</sup>, at a patient BSA of  $1.88 \pm 0.19$  m<sup>2</sup>. The mean EOAI was  $1.10 \pm 0.14$  cm<sup>2</sup>/m<sup>2</sup>. The mean pressure gradient at discharge was  $14.8 \pm 6.2$  mm Hg, at 1 year  $14.4 \pm 4.8$  mm Hg and at 2 years  $11.2 \pm 3.9$  mm Hg. Freedom from re-operation was 98.1 % up to two years.

	21(n=19)	23(n=33)	25(n=33)	27(n=18)	29(n=5)
BSA (m <sup>2</sup> )	$1.75 \pm 0.18$	$1.89 \pm 0.20$	$1.91 \pm 0.11$	$1.99 \pm 0.11$	$1.84 \pm 0.11$
EAOI (cm <sup>2</sup> /m <sup>2</sup> )	$0.93 \pm 0.10$	$1.09 \pm 0.10$	$1.12 \pm 0.10$	$1.16 \pm 0.07$	$1.36 \pm 0.08$
MPG (mm Hg)	$17.1 \pm 9.0$	$13.8 \pm 5.7$	$16.3 \pm 5.9$	$13.1 \pm 4.4$	$8.0 \pm 2.0$

**Conclusions :** With the SuperStentless bioprosthesis it is possible to overcome prosthesis- patient mismatch and low pressure gradient's indicate favorable hemodynamic.

## ABSTRACT 160

**EIGHTEEN MONTHS FOLLOW-UP OF A NEW TUBULAR EQUINE PERICARDIAL STENTLESS AORTIC VALVE**

Friedrich S. Eckstein, Jürg Schmidli, Hendrik Tevaearai, Franz F. Immer, Christian Seiler, Thierry P. Carrel

University Hospital Berne, Dep. of Cardiovascular Surgery and Cardiology, Freiburgstrasse, CH-3010 Berne, Switzerland

**Objective:**

The 3F aortic prosthesis is a new biological stentless valve (investigational device). It has a tubular design and is fabricated from three equal leaflets of equine pericardium. The valve is implanted in the annulus in standard technique either by running or interrupted sutures. There is no need for a second suture line since three commissural tabs only have to be fixed through the aortic wall. Favourable hemodynamics, durability and stress performance were proven during laboratory and animal tests. We present the early clinical results and hemodynamic performance of the 3F valve in patients undergoing aortic valve replacement.

**Methods:**

From June 2002 to November 2003, 23 patients (14m/9f) underwent AVR with a 3F valve. Mean age was  $77\pm 13$  years (range 31-88). In 12 patients combined revascularization was performed, one patient received bi-atrial ablation therapy and three patients carotid endarterectomy. Mean systolic gradient and valve performance were investigated intra- and postoperatively by Doppler echocardiography.

**Results:**

There were two deaths, one none valve-related due to aortic rupture in an 83-years old lady and one fatal cerebral embolism in a 77-years old lady five days postoperatively. Aortic cross clamp time was prolonged to  $83\pm 27$  min due to combined cardiac procedures in 13 patients. At 6 month follow-up mean systolic gradient was  $13\pm 7$  mmHg (n=17), at 12 month  $15\pm 9$  mmHg (n=10). During follow-up all valves appeared normally, but trivial central aortic valve regurgitation was found in four patients. There was no structural valve failure, need for re-operation or late mortality.

**Conclusion:**

The 3 F aortic valve shows favourable preliminary hemodynamic results. Due to the new valve design, implantation technique is simplified comparing with other stentless valves, but anticoagulation treatment is still mandatory for the first three months postoperatively. Long-term evaluation and follow-up is mandatory to assess life span and durability.

ABSTRACT 161

**TIPS AND TRICKS OF ISTHMUS ENDOPROSTHESIS STENT-GRAFT TREATMENT: ANIMAL IMPLANTATION OF DEDICATED DEVICE**

A. Bortone, E. De Cillis , D. D'Agostino, M. Sciascia, L. de Luca Tupputi

Cardiac Surgery, University of Bari, Italy

Among the 111 patients treated in our Department by endovascular stent-graft, 101 (91%) were identified as having involvement of the isthmus. Therefore, the descending aortic disease is essentially a pathology of isthmus. The keystone of treatment of all type of aortic lesion lies on understanding the morphology of this region that is gifted with a "double S" configuration. The current thoracic devices are not compliant system and we believe should be deeply modified taking in account that the media of the aorta is a perfectly compliant system. The resultant of power's transmission is 45° oriented and produces a transmural radial force that recently animal implantation has demonstrate to be a torsional movement. Our new device is conformant while simultaneously is able to transmit torsional forces. The dedicated delivery system is arch compatible, flexible but stiff enough and three-dimensional oriented. Moreover, the new stent-graft follow the 3D anatomy of the "double S" configuration of the isthmus area by reducing the mismatch between the aorta and the device itself.

## ABSTRACT 162

**CHALLENGES ASSOCIATED WITH INTEGRATION OF  
ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSMS  
IN A COMMUNITY HOSPITAL**

Daniel Watson,MD, Gary Ansel,MD, Lori Wiseman, and Thomas Tan  
from Riverside Methodist Hospital in Columbus, Ohio.

**Purpose**

Our study will compare preoperative patient demographics and outcomes for elective, asymptomatic AAA repairs performed at our center for a 33-month period.

**Methods:**

342 consecutive elective infrarenal AAA repairs performed at a single medical center were selected for this study. The patients underwent either endovascular (ER) or open repair (OR) depending on patient and surgeon collaborative determinations. Ruptured and symptomatic AAA's were excluded from our study. Preoperative demographics, anesthesia, complications, and discharge status were analyzed and statistical analysis was done to determine significant differences.

**Results:**

Preoperative status was essentially similar between ER and OR. OR used more general anesthesia (99% vs. 86%,  $p < 0.001$ ) and had more complications than ER, including dysrhythmia (8.65% vs. 1.59%,  $p=0.005$ ), ileus (13.94% vs. 0.79%,  $p < 0.0001$ ), infection (8.17% vs. 0.0%,  $p=0.0007$ ), respiratory complications (12.50% vs. 1.59%,  $p=0.0003$ ), and renal complications (5.29% vs. 0.79%,  $p=0.032$ ). ER had a higher rate of wound hematoma (4.76% vs. 0.48%,  $p=0.007$ ). ER patients also had significantly less blood loss (1930ml vs. 379ml,  $p < 0.001$ ), better independent discharge status ( $p < 0.0001$ ), shorter length of stay (1.8 days vs. 8.2 days,  $p < 0.001$ ), and a lower mortality rate (0.75% vs. 3.85%,  $p=0.0954$ ).

**Conclusions:**

Based on our study, we cautiously continue to encourage the consideration of ER of AAA's in our patient population while being mindful of its limitations.

ABSTRACT 163

**ENDOVASCULAR APPROACH TO BYPASS REDO CONVENTIONAL AORTIC SURGERY**

Gabriele Iannelli, Luigi Di Tommaso, Mario Monaco, Raffaele Smimmo, Federico Piscione, Nicola Spampinato

Reoperations for thoracic and abdominal aortic aneurysms or pseudoaneurysms increase conventional surgical risk: an endovascular approach has been considered.

From January 2000 to July 2003, 49 patients (pts) underwent endovascular surgery for thoracic and abdominal aneurysms. Four of them, with an history of previous conventional aortic surgery, developed a new aneurysmal pathology of the aorta.

Two patients showed a contained rupture of a pseudo-aneurysm at the proximal anastomosis of an infrarenal aorto-aortic bypass. Both pts received an endovascular procedure achieved by a transfemoral approach: the first one with an aorto-monoiliac stent graft system and a femoro-femoral bypass; the second one with a bifurcated endograft.

In the thoracic group, the first pt, with mitral valve and ascending aorta replaced because of Marfan syndrome, showed five years later a descending aortic aneurysm treated with a stent graft. The last one, with an aorto-bifemoral bypass because of obstruction of the aortic bifurcation, showed six years later a distal arch aneurysm treated with endograft achieved by a branch of the previous bypass.

No major complications or deaths occurred in these pts.

We propose the endovascular approach as a suitable back-up option in redo-aortic surgery

## ABSTRACT 164

**PARTIAL CLAMPING (PC) OF THE BRACHIOCEPHALIC TRUNK (BCT) FOR TOTAL ASCENDING AORTA REPLACEMENT (TAAR) WITHOUT CIRCULATORY ARREST (CA): MIDTERM CLINICAL RESULTS.**

Calafiore AM 1, Di Mauro M 2, Mestres CA 3, Miguel Josa 3, Pano M 2, Pomar JL 3

1. Division of Cardiac Surgery, University Hospital, Torino, Italy

2. Department of Cardiology and Cardiac Surgery, "G D'Annunzio" University, Chieti, Italy

3. Department of Cardiovascular Surgery, Hospital Clínic, Institut d'Investigacions Biomediques August Pi i Sunyer (IDIBAPS), University of Barcelona, Barcelona, Spain

**Background.** Midterm results of PC of BCT for TAAR without circulatory arrest CA were evaluated in elective patients. Contraindications to the procedure were BCT/aortic arch calcifications and chronic aortic dissection.

**Methods.** Right radial arteries was cannulated for evaluation of systemic pressure after BCT partial clamping. A specially designed clamp was applied obliquely to occlude 50% of the BCT and partially the aortic arch. The distal tip of the clamp was positioned in front of the left subclavian artery. From January 2002 to October 2003, 92 had TAAR, 30 (28 due to aortic arch calcification and 2 chronic dissection) with and 62 without CA using BCT partial clamping. In this latter group, 27 patients underwent aortic valve replacement, 11 Bentall, 2 Cabrol, 1 David, 1 Yacoub procedures. Aortic cross clamping time and cardiopulmonary bypass time were respectively  $96\pm 36$  and  $118\pm 48$  minutes.

**Results.** Thirty-day mortality was 1.6%. No cerebrovascular accident occurred, demonstrating the safety of the technique. Major complications were acute respiratory insufficiency in 2 cases and acute renal failure in 5. Mean follow-up was  $9.0\pm 6.5$  months. 18-month survival was  $96.6\pm 0.9$

**Conclusions.** BCT partial clamping for TAAR without CA gives good early and midterm clinical results.

## ABSTRACT 165

**OPEN VS. ENDO: EARLY EXPERIENCE BEYOND THE CLINICAL TRAILS**

Trent L. Prault M.D., Scott L. Stevens M.D., Michael B. Freeman M.D., Mitchell P. Goldman M.D., David Cassada M.D.; Division of Vascular Surgery, University of Tennessee Medical Center; Knoxville Tennessee

**Objective:** To analyze and compare open (OR) vs. endovascular (EVAR) abdominal aortic aneurysm repair at our institution.

**Methods:** Elective abdominal aortic aneurysm repair was attempted in 256 patients at the University of Tennessee Medical Center in Knoxville, between December 1999, and November 2002. 140 patients underwent attempted EVAR, 116 had OR. All patients were included on an intent-to-treat basis, and results were reviewed retrospectively. Statistical methods included the Student's t-test, and Chi-square analysis.

**Results:** Patients were age matched between the two groups (70.2 vs. 69.0;  $p=0.936$ ). Patients in the OR group had significantly higher ASA classes than the EVAR group (2.96 vs. 3.07;  $p=0.006$ ). However, there was no difference between the groups, OR vs. EVAR, with respect to the presence of COPD (55% vs. 46%;  $p=0.129$ ), CAD (69% vs. 66%;  $p=0.638$ ), diabetes mellitus (12% vs. 18%;  $p=0.167$ ), mean LVEF (51.8% vs. 53.9%;  $p=0.28$ ), and mean pre-operative creatinine levels (1.2 vs. 1.1;  $p=0.167$ ). Tobacco use was more prevalent in the OR group (78.4% vs. 64.2%;  $p=0.013$ ), and known carotid artery disease was more prevalent in the EVAR group (20.0% vs. 6.9%;  $p=0.003$ ). The EVAR group and significantly shorter lengths of stay ( 4.2 vs. 9.0 days;  $p=0.000$ ), ICU days (0 vs. 3.2;  $p=0.000$ ), time in the OR ( 119.6 vs. 225.7 min;  $p=0.000$ ), and EBL (189.1cc vs. 897.9cc;  $p=0.000$ ). Mean aneurysm size was larger in the OR group (5.6cm vs. 4.9cm;  $p=0.000$ ). Perioperative complications occurred in 31 patients in the OR group, 5 in the EVAR group ( $p=.000$ ). Two perioperative deaths occurred in the OR group, none in the EVAR group. To date there is no significant difference in all cause mortality in the two groups (OR 9.6% vs. EVAR 8.0%;  $p=0.651$ ). Seven patients in the EVAR group required secondary interventions. Six were managed with endovascular techniques, one underwent femoral-femoral bypass.

**Conclusions:** In the perioperative period, patients who undergo endovascular aneurysm repair have significantly less morbidity and mortality than do equally matched patients undergoing open repair. With mid-term follow-up (2-5 years), mortality is no different. Morbidity conferred by the need for secondary intervention, in the endovascular group, is minimal

## ABSTRACT 166

**PERFUSION OF THE SUBCLAVIAN ARTERY IN TYPE A-DISSECTION: CLINICAL OUTCOME IN REGARDS OF GRAFT VS. DIRECT CANNULATION**

O. Reuthebuch, U. Schurr, J. Hellermann, M. Lachat, A. Künzli, M. Turina:  
University Hospital Zurich, Zurich, Switzerland

**Objective:** To assess the clinical outcome after direct or indirect cannulation via graft of the right subclavian artery in patients treated for acute Type A aortic dissection.

**Method:** Between 01/00 and 02/03 62 consecutive patients were treated. Baseline characteristics were similar in both groups. Type of cannulation was chosen by surgeon. In direct approach a 18F cannula was inserted (Group 1) and subclavian artery clamped distally; in indirect approach (Group 2) an 8mm graft was anastomosed end-to-side; artery was snared distally in the later part of the series. Subsequent intraoperative protocol was identical.

**Results:**

Parameter	Group 1	Group 2	P Value
n	26	36	
pump time (min)	160±61	188±65	ns
deepest temp(C°)	22,3±3,7	21,5±3,4	ns
mean arterial pressure (right arm, mmHg)	56,5±8,4	36,15±6,9	ns
blood transfusion (units)	11.4±9.3	8.9±6.5	ns
bleeding (ml)	2173±2305	1229±932	0.0346
creatinine kinase (U/l)	828 (110-7257)	1170 (265-17000)	ns
lactate (mmol/l)	1,8 (0,6-7,7)	2,8 (0,8-14)	0.0041
neurologic deficit right arm	2	0	ns
neurologic outcome central better:	3 (12%)	10 (28%)	ns
stable:	19 (73%)	17 (47%)	ns
worse:	4 (15%)	8 (22%)	ns
missing data:	0	1 (3%)	ns
ICU stay (h)	65,3±58	84,4±69	ns
Time to extubation (h)	27,4±46,4	35.5±48.7	ns
Mortality (<30d)	1 (4%)	4 (11%)	ns

Intraoperative and postoperative data are depicted in table 1. In Group 1 two patients were suffering from hyperperfusion syndrome of right arm (edema, blisters, loss of sensitivity).

**Conclusion:** There was no difference between patients treated with direct or indirect cannulation of the subclavian artery. In indirect cannulation a loose snaring of the artery distally to the graft insertion avoids hyperperfusion of the limb.

ABSTRACT 167

**THE CLINICAL AND FISCAL IMPACT OF ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSMS**

Daniel Watson,MD, Gary Ansel,MD, Lori Wiseman, and Thomas Tan  
from Riverside Methodist Hospital in Columbus, Ohio.

**Purpose:**

This study will attempt to analyze cost, reimbursement, application and outcome differences between endovascular (ER) and open repair (OR) of abdominal aortic aneurysms in a community hospital.

**Method:**

187 consecutive elective AAA repairs by both methods (74 ER, 110 OR) performed at a single center between July 2001 and March 2003 were analyzed. Average values in postoperative clinical demographics, hospital charges, reimbursement, direct cost, indirect cost, total cost and hospital profit/loss were calculated for this period.

**Results:**

The average length of stay was higher for OR than ER (9.38 days vs. 1.94 days,  $p < 0.001$ ). Significant reductions in operative time (4 hrs vs. 2.67 hrs) and ICU utilization (100% vs. 4.05%) were seen in the ER population. Total hospital costs were slightly higher for OR than ER (\$21,989 vs. \$19,668) despite a considerable difference in cost of the grafts ( $> \$11,000$  for ER versus  $< \$500$  for OR). However, hospital charges were much lower for ER than OR (\$32,660 vs. \$48,877) and there was an average loss of \$4,986 on ER cases versus a profit of \$2,064 on OR procedures. 30-day mortality was not significantly improved in the ER population (1.35% vs. 2.72%,  $p=0.05$ ).

**Conclusions:**

Our data suggests that in medical centers where low morbidity and mortality rates are already established for OR, ER offers improvements in hospital convalescence and operating room times but no beneficial fiscal impact or overall morbidity/mortality rate when similar preoperative medical risks exist.

Friday, March 12, 2004

1:30 – 3:00 PM Fontaine Room

**Original Scientific Presentations  
Breakout Sessions**

**Breakout Session VI**

**Innovative Congenital Surgery  
Techniques and Technology**

**Abstracts 168 - 173**

FRIDAY  
AFTERNOON

## ABSTRACT 168

**EXPERIENCE ON THE WAY TO TOTALLY ENDOSCOPIC CLOSURE OF ATRIAL SEPTAL DEFECTS**

N. Bonaros, T. Schachner, A. Öhlinger, P. Jonetzko, Ch. Kolbitsch, G. Laufer, J. Bonatti

**Background**

Remote access perfusion and robotics have enabled totally endoscopic closure of atrial septal defects (ASD) or patent foramen ovale (PFO). We report on a stepwise approach towards a totally endoscopic procedure.

**Methods**

16 patients, age 39 (21-55) years underwent limited access ASD or PFO closure. As a preparative step the operation was carried out through minithoracotomy in 11 patients. 6 following patients were operated in a totally endoscopic fashion using the daVinci<sup>TM</sup> telemanipulation system.

**Results**

In the endoscopic approach significant learning curves were noted for cardiopulmonary bypass time  $y(\text{min}) = 226-41 * \ln(x)$  ( $p = 0.011$ ) and aortic cross clamp time  $y(\text{min}) = 134-42 * \ln(x)$  ( $p = 0.039$ ) ( $x = \text{procedure number}$ ). There was no hospital mortality and no residual shunts were detected in postoperative echocardiography. Ventilation time was 9h (0-18) for the minithoracotomy group and 9h (4-19) for the totally endoscopic group. ICU stay was 20h (18-24) and 18h (18-120) respectively.

**Conclusions**

Totally endoscopic closure of ASD or PFO can be safely implemented into a heart surgery program. An intermediate step performing the operations through minithoracotomy and adapting to remote access perfusion systems seems worthwhile. Learning curves are steep and adequate defect closure does not seem to be compromised by the totally endoscopic approach.

## ABSTRACT 169

**ESTHETICAL CONSIDERATION IN CONGENITAL HEART SURGERY: OPEN HEART SURGERY THROUGH A MINIMAL RIGHT THORACOTOMY IN CHILDREN.**

D. Mishaly MD, G. Amir MD, S. Prisman MD, J. Hegesh MD, M. Frand MD, A. AK. Smolinsky MD, A Khuri MD, A Lorber MD

(1) The Department of Pediatric Cardiac Surgery, (2) The Department of Anesthesiology, (3) The Department of Pediatric Cardiology, (4) The Department of Cardiac Surgery.

**Background.** Median sternotomy is the conventional approach for open heart procedures for correction of cardiac defects for many years; however, the cosmetic result is poor, with significant psychological and social results of the new method of open heart surgery through minimal right thoracotomy in adults, we are expanding the use of this method in children for correction of congenital heart defects.

**Methods.** Since September 2002, 20 patients underwent correction of congenital cardiac malformations with cardiopulmonary bypass through minimal right anterior thoracotomy involving a short sub-mammary incision (4-6 cm). The average age was 9.5 (range, 3.5 to 15 years). The average weight was 28 (14 to 53). The patients had various cardiac defects and associated anomalies. All the defects were approached through the right and/or the left atrium.

**Results.** There was no early mortality or morbidity, there was no late mortality, one patient had some swelling of the leg that resolved after a conservative treatment. The mean cardiopulmonary bypass time was 127 minutes (range, 74 to 197 minutes), The mean postoperative stay was 5 days (range, 4 to 6 days). The esthetic result was very satisfactory.

**Conclusions.** The minimal right anterior thoracotomy incision is a safe and effective alternative to a median sternotomy for correction of cardiac defects that can be approached through the right or left atrium. Advantages of this approach compared with median sternotomy are less injury, maintenance of the continuity and the integrity of the bony thorax, and prevention of the development of post sternotomy deformation. This "invisible surgery" meets the trendy approach that "It is not enough to be good, it has to look good".

ABSTRACT 170

**ANIMAL PLEURAL EFFUSION MODEL FOR FETAL SURGERY, PACING AND PHARMACOTHERAPY IN HYDROPS FETALIS**

Vicki L Mahan, Evgueni Fayn, Howard Chou, Daniel Zavitz, Emine Dindar, Marc Ovadia

Though vital for surgical innovation, few animal models of disease exist, limiting surgical innovation to incremental procedural modification performed on humans. This is unfortunate for fetal surgery where two lives are at risk.

**Purpose/Methods:** In an effort to develop a small animal model relevant to hydrops fetalis and useful for testing prototypes/deployment techniques of the fetal pacemaker we developed a rat model. Under 2D-ultrasonography and xylazine/ketamine anesthesia saline is introduced via an intercostal angiocath stopping for Kussmaul respiration or bradycardia. Experimentation (testing prototypes/deployment techniques) is followed by necropsy.

**Results:** In 10 Sprague rats effusions measuring  $12.9 \pm 6.7$  were created (range 6- 25mL). Bradycardia occurred in all, allowing experimental pacing, with heart rate normalization for superior prototypes. Effusions were visualized sonographically and instrumented easily. Necropsy identified one extrathoracic collection previously suspected.

**Conclusion:** A useful animal model is described for fetal surgery, pacing and pharmacotherapy in hydrops fetalis. In light of the increased use of fetal surgery for correction of cardiac anomalies and the frequency of lethal postop bradycardia this will facilitate surgical research Support: NIH 1R43-HL-67520-1(DZ,MO)

## ABSTRACT 171

**ISOLATED VSD CLOSURE THROUGH A PARTIAL INFERIOR STERNOTOMY IN CHILDREN**

Alexander Kadner,MD; Hitendu Dave, MD; Ali Dodge-Khatami, MD; Dominique Bettex,MD; Marko I. Turina, MD; René Prêtre, MD

Clinic for Cardiovascular Surgery, University Hospital Zurich

**Objective:** Review our experience with partial inferior sternotomy as an alternative and less invasive approach for the repair of isolated ventricular septal defects (VSD) in children.

**Methods:** 24 consecutive patients with a median age of 4.5 months (range: 1- 54 months) underwent a partial inferior sternotomy for isolated VSD closure. Special features of the approach included a incision length of 4-6cm, a T-incision from the 4th ICR to the xyphoid, central cannulation, cross-clamping for CPB and cardioplegic arrest, approach through a right atriotomy. Perimembranous VSD's were closed with a continuous suture through a detached anterior tricuspid valve leaflet; muscular VSD's were directly approached. Echocardiography was available in all patients. Follow-up was complete with a median of 7 months.

**Results:** There was no mortality and no significant surgical morbidity. Median crossclamping and CPB times were 43 and 100 min, respectively. All patients were in sinus rhythm. Echocardiography confirmed the absence of any residual defects and the presence of a trace residual VSD in 4 patients with muscular VSD's.

**Conclusion:** Partial inferiorsternotomy is a less invasive and cosmetically superior approach than a standard full sternotomy. It provides excellent results when applied to isolated VSD's.

## ABSTRACT 172

**BEYOND EXTENDED MYECTOMY FOR HYPERTROPHIC CARDIOMYOPATHY: THE RPR (RESECTION, PLICATION, RELEASE) REPAIR COMES OF AGE**

Sanju Balaram MD PhD, Joseph J. DeRose Jr. MD, Mark V. Sherrid MD, Glenda Winson RN, Daniel G. Swistel MD.

**Objective:** Previous reports have documented that extended myectomy for left ventricular outflow tract obstruction (LVOTO) associated with hypertrophic cardiomyopathy (HCM) has good long-term results. In addition to the mid-septal resection (R) of HCM, our group has introduced a novel variation in anterior leaflet plication to be included with release (R) of papillary muscle attachments. We sought to investigate the medium and long-term success of this three-step repair that addresses all aspects of this complex condition.

**Methods:** Between 1997 and 2003, 19 patients underwent RPR repair for complex HCM pathology. Transesophageal echocardiography (TEE) was performed on all patients pre-and post-operatively to assess adequacy of resection, left ventricular outflow tract gradients, and mitral valve function. All patients underwent scheduled outpatient TEE for a mean follow-up of  $2.4 \pm 2.1$  years (range 0.5 to 6 years).

**Results:** The average age of the patients was  $56.9 \pm 14.3$  years. Mean degree of mitral regurgitation (MR) measured  $2.42 \pm 0.96$  with all patients exhibiting significant systolic anterior motion (SAM). Preoperative peak LVOTO measured  $137 \pm 43.6$  mm Hg. Additional concomitant procedures included coronary artery bypass grafting (n=4), aortic valve replacement (n=2) and radiofrequency ablation (n=1). Average length of stay was  $7.5 \pm 3.3$  days. The only postoperative complication was a single sternal wound infection. Initial post-operative TEE demonstrated significant improvement in mitral valve regurgitation ( $0.22 \pm 0.44$ ) ( $p < 0.0001$ ) as well as a marked reduction in LVOTO ( $10.1 \pm 17.6$  mmHg) ( $p < 0.0001$ ). During the follow-up period, the LVOT gradient remained insignificant with measurements of  $6.43 \pm 14.5$  ( $p < 0.0001$ ) with no change noted in the degree of MR ( $0.44 \pm 0.53$ ,  $p < 0.0001$ )

**Conclusion:** Mitral valve repair in the form of anterior leaflet plication and papillary muscle release is an important component of complicated HCM surgery for relieving LVOTO and eliminating MR. Durable long-term results can be achieved with an aggressive approach towards mitral valve pathology in the setting of HCM.

## ABSTRACT 173

**IS SELF-DETERMINATION OF ANTICOAGULATION IN CHILDREN AFTER FONTAN-PALLIATION SAFE?**

Helmut Mair 1, Joerg Sachweh 1, Sabine Daebritz 1, Bruno Reichart 1

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2 Pediatric Cardiology, University of Munich, Munich, Germany

**Objectives:**

Thromboembolism after Fontan procedures is a well known complication with poor prognosis. But prophylactic anticoagulation is still not routine. One reason may be the difficult stabilization of the anticoagulation level in children. We therefore assessed an appropriate anticoagulation management with INR self-determination of the children by their parents.

**Methods:**

We trained the parents of 31 patients (19 male) to measure the INR-levels of their children (mean age:  $4.2 \pm 3.5$  years) after Fontan operation using portable photometers and 15  $\mu$ l capillary blood obtained by lancing the fingertip of their children. After receiving the results within one minute, the parents adjusted the cumarine dosage of their children. All patients had undergone a Fontan-type operation in two steps (14 lateral tunnel, 17 extra-cardiac cavo-pulmonary connections). Previous palliative operations had been carried out in all patients. The therapeutic range was determined INR 2.5-3.5.

**Results:**

Mean follow-up time after Fontan procedure was 42 months (10-78 months). In a standard questionnaire the parents of 29 patients estimated the self-determination as good or very good. There were no problems to obtain the blood sample from any child. 86% of the INR values (mean  $2.6 \pm 0.3$ ) were within the target range. Postoperatively, no complications due to anticoagulation occurred: no bleeding, no embolic events or death. There were no pathological findings in the Fontan pathway in the echocardiography-controls. One patient died due to non cardiac reasons.

**Conclusions:**

Frequent INR self testing carried out by the parents leads to safe anticoagulation control. Our results suggest a prophylactic anticoagulation therapy after Fontan operation in a therapeutic range of INR 2.5-3.5.

## ABSTRACT 173A

**GLUTARALDEHYD-FREE PORCINE HEART VALVES DURING RIGHT VENTRICULAR OUTFLOW TRACT RECONSTRUCTION**

Dohmen P. M.D., Liu J., M.D. Erdbruegger W, M.D., Ellerbrok H, M.D., Pauli G, M.D., Ph.D. Konertz W., M.D., Ph.D.

Department for Cardiovascular Surgery, Charite Berlin, Germany, AutoTissue Ltd, Germany, Robert-Koch-Institut, Berlin, Germany

**Objective:** To ameliorate this untowards effect of GA several anticalcification treatments have been used with varying results. Our approach uses the total decellularization of porcine tissue which has shown to render the use to GA unnecessary. In vivo experiments indicated lack of calcifications and so a clinical trail was initiated.

**Methods:** From July 2002 to May 2003 forty-five decellularized porcine pulmonary valves have been implanted. 13 of them were seeded with autologous endothelial cells. 35 patients underwent the Ross-procedure and 10 reconstruction of the right ventricular outflow tract during operation of complex congenital heart disease, Echocardiography was obtained at discharge and 3 and 6 months postoperatively.

**Results:** One immunocompromised patient died 15 days after Ross-procedure and one late death occurred. Two valves had to be removed after four months due to technical failure during implantation. The other patients showed smooth and uneventful postoperative courses. Follow-up showed perfect functioning valves and no early calcifications. Echocardiographically obtained pulmonary valve function shown in the table (mean  $\pm$  SD). Clinically and functionally no difference between seeded and non-seeded valves could be detected.

	Discharge (n=35)	3 months (n=17)	6 months (n=13)
Mean flow m/s	0.81 $\pm$ 0.38	0.94 $\pm$ 0.69	0.76 $\pm$ 0.23
Peak flow m/s	1.03 $\pm$ 0.	32 1.13 $\pm$ 0.33	1.04 $\pm$ 0.38
Mean gradient (mmHg)	2.45 $\pm$ 1.49	3.01 $\pm$ 2.19	2.65 $\pm$ 1.73
Peak Gradient (mmHg)	5.10 $\pm$ 3.38	5.16 $\pm$ 3.36	4.90 $\pm$ 3.56

**Conclusions:** De-cellularized porcine heart valves showed perfect short term function. Whether re-popularized with host cells as seen regularly in animal experiments, appears also in human's remains to be answered.

Saturday, March 13, 2004

8:00 – 9:30 AM East Ballroom

## **Scientific Session IV**

# **New Valve Technology and Techniques**

**Abstracts 174 - 179**

## ABSTRACT 174

**PERICARDIAL STENTLESS VALVE: A SINGLE-SUTURE LINE IMPLANT TECHNIQUE**

Alberto Repossini, Igor Kotelnikov, Vincenzo Arena  
Istituto Clinico Humanitas Gavazzeni (Bergamo, Italy)

The Sorin Pericarbon Freedom (PF) stentless valve, is a new generation three-leaflet stentless prosthesis made of glutaraldehyde cross-linked pericardium, treated with a detoxification process. Presently, it is implanted in intra-annular position adopting two suture lines.

With an adequate original inflow and outflow trimming of the prosthesis, PF can be implanted also in supra-annular position adopting a single-suture line (O'Brien technique). This technique shows many advantages:

- Streamlined lamina flow from ventricle to aorta
- Largest valve orifice, the prosthetic size is selected one size more the aortic annulus dimension
- Leaflet coaptation is maximised and pericardium fully retains the sutures. Tearing, as reported with aortic porcine wall, is less likely to occur.

Between January 2002 and January 2003, the PF was implanted in 29 patients (15 male; mean age  $68 \pm 10$  years): aortic senile degeneration/calcification (73%). Cross clamp time was  $66 \pm 21$  min ( $62 \pm 18$  min in patients without concomitant procedures), and implant time  $30 \pm 8$  min.

All patients survived the intervention, no early and late deaths were observed. Four (14%) early non-valve related complications were reported. No late complication was observed.

Three patients had trivial central prosthetic regurgitation at intra-operative TEE. Only 1 was confirmed at 6-month. Hemodynamics at 6-month showed low trans-valvular gradients. Mean  $10 \pm 4$  mmHg and peak  $16 \pm 3$  mmHg.

In conclusion our initial experience, showed the single-suture technique applied to the PF valve is safe and reliable. Clinical outcomes are similar to those obtained with other techniques with satisfactory hemodynamic performance.

This preliminary experience suggests the opportunity to make available a pre-trimmed valve ready for the single-suture technique.

## ABSTRACT 175

**REAL STENTLESS AORTIC VALVE BIOPROSTHESIS- EARLY CLINICAL APPROACHES**

Z.K.Mitrev, T.N.Anguseva, R.V.Batista;  
 Special Hospital for Cardiosurgery, "Fillip II", Skopje, Macedonia  
 Campina Grande do Sul, PR-Brazil

**Aim:** Stenotic changes of aortic valve lead to severe hemodynamic disorders in pts. Mechanical eather bilogic prosthesis have some disadvantages such are continuous anticoagulative therapy, lost Valsalva-sinus influence on aortic blood flow, or middle pressure gradient. Natural tissue stentless valves have no ring, but still takes influence on normal Valsalva function and their use is limited by size of pts's aorta ring. The aim of study was to evaluate early clinical results of pts with implanted real stentless aortic valve.

**Methods:** We created our first stentless valve using porcine pericardium and replacing valve cusps on aortic fibrous ring of patient. We named it real stentless, because we use ring of patient's aorta as guide for its size. Radius of aortic ring is measured at base of aorta and multiplied by 3, which gives us length of 3 cusps. Porcine pericardium then is cut by calculated length and 2cm wide, folded 3 times and tailored in shape of heart. Leaflets are implanted using continuous sutures at newly created commissurae, keeping normal Valsalva sinuses. Including criteria for this study was: aortic valvular stenosis (regardless of ethyology) with normal aortic wall. Pts. were monitored by intraoperative and postoperative TEE.

**Results:** 38pts with aortic stenosis (21 with atherosclerotic, 15 with rheumatic ethyology, 2 with subacute endocarditis and chronic haemodialysis) had been included in study. Intraoperative TEE showed aortic morphology similar as normal, dp/dt ratio was 0.07, equal opening and closing time, average valve systolic gradient was 18.

Middle aorta cross-clamping time was 87min, and bypass time-105min. Average extubating time was 6h. Significant bleeding was noted in 2pts. (1 with/1 without surgical ethyology). Stroke and rhythm disturbances, notified at 1patient. Pts have been treated with aspirin 0,1mg/day. 1patient reoperated, due to severe aortic regurgitation. Follow up period 1-17m..

**Conclusions:** Real stentless aortic valve is a bio-prosthesis with a similar haemodynamic parameters as a normal valve and simple way of implantation. It ensures normal opening and closing time of leaflets, and larger indexed effective orifice area of the aorta. Longer follow-up is requiring assessing the durability of unstented pericardium in the aortic position, but early results are encouraging.

ABSTRACT 176

**TRIANGULAR PPLICATION OF THE ANTERIOR MITRAL VALVE LEAFLET: A NEW SURGICAL TECHNIQUE**

Rainald Seitelberger, Jan Bialy, Roman Gottardi, Ernst Wolner  
Department Cardiothoracic Surgery, AKH-Vienna, Vienna, Austria

Various surgical techniques have been performed in patients with anterior leaflet prolapse (ALP). This study summarizes the clinical experience with the new technique of triangular plication of the anterior leaflet in patients with ALP.

The new technique was used in 16 patients with mitral valve incompetence (MVI) Grade III or IV based on degenerative MV pathology. Repair of the ALP is performed after completion of repair for all additional mitral valve lesions. In short, a 6.0 suture plicates the prolapsed leaflet area in a triangular fashion towards the ventricular aspect of the leaflet by continuously decreasing the suture width.

There were no perioperative deaths. In 14 patients, additional repair techniques were performed. Early follow-up showed none or trivial MVI in all patients. At the latest follow up of at least one year, 11 patients presented without MVI, 4 patients with trivial MVI (Grade 0-1) and 1 patient with moderate MVI (Grade 1-2). All except 2 patients were in NYHA class I.

The technique of triangular plication in patients with ALP has provided excellent midterm results. Longterm follow up will be necessary to assess the implication of this technique as an effective surgical method in patients with a prolapsed anterior leaflet.

## ABSTRACT 176A

**NEW FLEXIBLE POLYMERIC HEART VALVE PROSTHESES FOR MITRAL- AND AORTIC POSITION**

SH Daebritz 1, B Fausten 2, B Hermanns 3, A Franke 4, J Groetzner 1, BJ Messmer 2, J Sachweh 1

Dept. of Cardiac Surgery 1, Klinikum Großhadern, Munich, Germany; Dept. of Thoracic and Cardiovascular Surgery 2, Institute of Pathology 3, Dept. of Cardiology 4, University Hospital, Aachen, Germany

**Background:** Current prosthetic heart valves comprise the disadvantage of either permanent anticoagulation or limited durability. Two different flexible polymeric valves are presented to aim at no need for permanent anticoagulation, longer durability and improved hemodynamics.

**Methods:** The prostheses (ADIAM® lifescience AG, Erkelenz, Germany) are completely fabricated of polycarbonateurethane (PCU). The bi-leaflet flexible mitral prosthesis mimicks the natural mitral valve with a non-axial inflow creating a left ventricular vortex saving energy for systolic ejection of the blood. The tri-leaflet flexible aortic prosthesis has a diminished pressure loss and reduced stress and strain peaks at the commissures. Both valves underwent long-term in vitro testing and in vivo-testing in a growing calve animal model (20 weeks, 7 mitral, 7 aortic valves) and were compared to different commercial bioprostheses (7 mitral, 2 aortic). 2D echocardiography was performed after implantation and prior to scarification with autopsy and examination of the valves.

**Results:** In vitro durability was proven up to 20 years. In vivo hemodynamic performance and durability of the PCU valves was superior to all bioprostheses: survival 7 vs. 2 (mitral) and 5 vs. 0 (aortic). Degeneration and calcification of PCU valves was mild (mitral) and mild-moderate (aortic) compared to severe in bioprostheses. There was no thromboembolism.

**Conclusion:** The new flexible polymeric mitral and aortic valve prostheses are superior to current bioprostheses in animal testing. Clinical studies are planned.

ABSTRACT 177

**THE RECONSTRUCTED BICUSPID AORTIC VALVE AFTER TEN YEARS:  
CLINICAL AND ECHOCARDIOGRAPHIC FOLLOW-UP**

Reinhard Moidl, Marie-Theres Kasimir, Elena Deviatko, Natascha Simon-Kupilik,  
Ernst Wolner, Paul Simon  
Department of Cardiothoracic Surgery, University of Vienna, Austria

Fifteen patients with incompetent bicuspid aortic valves underwent valve sparing correction (mean age: 30.9+/-12.9, 9-79 years). All patients had triangular resection of the enlarged leaflet. Additionally 13 patients underwent commissuroplasty, in 5 patients leaflet perforation was corrected with glutaraldehyd fixated autologous pericardial patch.

One patient died during follow up from heart failure, 4 patients were reoperated because of valve failure (1 week n=2, 33 and 40 month)

At long term follow-up (mean: 9.8+/-0.3, 9-11 years)the remaining 10 patients were in NYHA classification I. Mean aortic flow velocity is 2.2+/-0.4m/sec; the mean grade of incompetence is 1.3+/-0.8. Optimal valvular function lead to normal ventricular diameters (LVESD 36.7+/-0.9mm, LVEDD 53.7+/-9.6mm) and normal ventricular function (FS 31.5+/-0.1).

In contrast to one year follow-up, the dimensions of the aortic root are stable at a mean follow-up of 9.8 years (mean AA 26.8+/-2.3, SV 31.8+/-5.7, ST 31.7+/-6.8, ascA 31.7+/-3.5mm).

In contrast to early follow-up with 4 reoperations, the remaining patients are stable after 10 years and have successful clinical and echocardiographic results. Reconstruction of bicuspid aortic valves is possible in selected patients but the mode of early failure is still unknown.

## ABSTRACT 177A

**FACTORS INFLUENCING THE RESULTS OF DOUBLE VALVE SURGERY IN PATIENTS WITH INFECTIVE DOUBLE VALVE DISEASE**

Henryk Siniawski MD, Onnen Grauhan MD, PhD, Hans Lehmkuhl MD, Miralem Pasic MD, PhD, Yuguo Weng MD, Charles Yankah PhD, Michael Hoffmann, Roland Hetzer MD, PhD

**Background:** The new Shelhigh heparin-bonded fabric-free valves were tested and factors influencing results analyzed.

**Methods:** Between 12/1996 and 9/2002, 38 patients (26m, 12f) with mean age 52 ( $\pm 15$ ) years were diagnosed with double valve endocarditis (DVE). Aortic replacement (AR; homografts, stented or semi-stented valves and No-React Bio-Conduit) and mitral replacement (MR; stented or No-React Biomitral valves) or reconstruction surgery with follow up to 10/2003 (mean 12  $\pm$  10 months) were performed. Results: DVE was caused by abscess metastasis in 14 patients (36.8%) and aortic jet metastasis towards the mitral valve in 24 (63.2%). Mitral reconstruction was performed in 26 (68.4%) and replacement in 12 (31.6%) with mortality rates of 14% and 28%, respectively ( $p < 0.05$ ). In four cases reinfection required reoperation. Factors associated with higher mortality (odds ratio) were: female gender 5.14 higher risk,  $p = 0.007$ ; preoperative epinephrine use 3.44,  $p = 0.07$ ; mitral surgery for abscess metastasis 4.65,  $p = 0.0159$ . EF  $> 60\%$  had a negative influence: odds ratio 0.36,  $p = 0.0027$ . Reinfection was not noted in the homografts or semi-stented valves (AR) used with mitral reconstruction.

**Conclusions:** Mortality in DVE depends on the path of infection extension. Reinfection did not occur in homografts or semi-stented valves for aortic surgery with mitral reconstructive procedures.

## ABSTRACT 178

**THE CASE FOR REPAIR IN MODERATE ISCHEMIC MITRAL REGURGITATION – ONE YEAR FOLLOW-UP STUDY.**

Jolanta Biernat, Krzysztof S Golba, Marek A Deja, Kazimierz Widenka, Marcin Malinowski, Stanislaw Wos; Dept of Cardiac Surgery, Katowice, Poland

The optimal management of moderate ischemic mitral regurgitation (MR) in patients subjected to CABG remains controversial.

117 consecutive patients with moderate ischemic MR underwent either isolated CABG (63) or CABG + concomitant MV repair (54). 12 months echocardiographic and clinical follow-up was completed in 41 patients in CABG group and 25 patients in MV repair + CABG group. Prior to operation patients in MV repair + CABG group had larger MR area:  $8.3 \pm 2.15 \text{ cm}^2$  vs.  $6.7 \pm 1.73 \text{ cm}^2$  ( $p=0.001$ ).

**Results:**

Preop(n=66)	CABG(n=41)	CABG+MVrepair	P as per (n=25)	RM ANOVA
MR area [cm <sup>2</sup> ]	$7.3 \pm 2.04$	$5.5 \pm 3.20\#$	$2.7 \pm 3.06^*$	$\$ < 0.001$
LV EDVI [ml/m <sup>2</sup> ]	$91.8 \pm 42.21$	$77.2 \pm 36.16$	$87.2 \pm 47.76$	0.102
LV ESVI [ml/m <sup>2</sup> ]	$48.1 \pm 22.57$	$42.7 \pm 19.99$	$45.5 \pm 25.86$	0.139
LV EF [%]	$45.5 \pm 11.$	$52.48.9 \pm 12.89$	$49.3 \pm 11.87^*$	0.033
NYHA	$1.8 \pm 0.88$	$1.6 \pm 0.76$	$1.4 \pm 0.65^*$	0.012

\*  $p < 0.05$  preop. vs. MVrepair+CABG, #  $p < 0.05$  preop. vs. CABG, \$  $p < 0.05$  CABG vs. MVrepair+CABG.

CABG alone decreases severity of ischemic MR but mitral valve repair seems necessary for improvement of left ventricle systolic function and reduction of CHF symptoms.

## ABSTRACT 179

**ISCHEMIC MITRAL VALVE REPAIR WITH LEAFLET EXTENSION PLASTY**

Choi-Keung Ng, Joachim Nesser #, Christian Punzengruber,\* Hannes Auer\*, Otmar Pachinger,\*\* Peter Hartl

Dept. of Cardiac Surgery & Cardiology\* Wels, Elisabethium Linz,# Univ. Clinic Innsbruck,\*\* Austria

**Purpose:** Is leaflet extension plasty safe to treat patients who had severe mitral regurgitation (MR) after inferior wall myocardial infarction?

**Patients:** Between 1994-2001, the restricted posterior mitral leaflet motion of 15 pts with severe MR were observed with asymmetric geometry of the mitral leaflets after a transmural posteromedial myocardial infarction. The infarcted papillary muscle does not

contract with progressive dilatation of left ventricle. The apical pull of papillary muscles at end systole is unbalanced. These deformations tend to produce restriction of leaflet motion leading to less leaflet coaptation. The papillary muscle discoordination with annular dilatation distorts leaflet coaptation sufficiently to produce severe MR.

**Methods:** To secure valve repair, leaflet extension plasty with pretreated autologous pericardium to enlarge the posterior leaflet surface area was performed for readjustment of the leaflet excursion and to restore the papillary muscle-annular relationship. This method enables to enlarge the posterior leaflet surface area over 100%. The leaflet edges are brought closer together, thereby allowing coaptation to occur more readily. This new strategy, in addition to utilizing an annuloplasty ring to reduce the annulus dilatation successfully eliminated the severe ischemic MR in pts with restrictive leaflet motion.

**Results:** No hospital deaths occurred in this series. Echo MR was absent or trivial in all patients at mid-term follow-up, 2 late death, 10 pts were in NYHA Class I and 3 in Class-II; there have been no thromboembolic events and no permanent anticoagulation.

**Conclusions:** This simple technique with good results is efficacious likely to have readjusted the muscle-annular relationship of a geometrically deformed mitral valve after acute or chronic myocardial ischemia. This achieves durable repair of valves that might otherwise need to be replaced, and expend to interest with earlier operation intervention. (*This operative technique will be demonstrated*)



Saturday, March 13, 2004

1:30 – 2:15 PM East Ballroom

## **Scientific Session V**

### **Featured CTT Abstracts**

**Abstracts 180 - 182**

ABSTRACT 180

**INTRAOPERATIVE ANGIOGRAPHY FOR QUALITY CONTROL IN INNOVATIVE CORONARY BYPASS PROCEDURES**

G.J. Friedrich, A.Öhlinger\*, M. Danzmayr\*, N. Bonaros\*, T. Schachner\*, O. Pachinger, P. Jonetzko, G. Laufer\*, J. Bonatti\*

Cardiology and Cardiac Surgery\* Departments, University Hospital Innsbruck, Austria

**Background:**

Innovative coronary bypass procedures require immediate proof of graft patency in order to compete with standard CABG and percutaneous interventions.

**Methods:**

We investigated 86 coronary bypass grafts in 75 patients. 33 grafts were performed on the beating heart (MIDCAB n=10, OPCAB n=23), 42 were carried out on the arrested heart using the daVinci™ telemanipulation system (18 through sternotomy, 24 in a totally endoscopic fashion). Transfemoral angiography was performed with an OEC 9800 (GE) mobile C-arm.

**Results:**

Except for 5 aortocoronary grafts, all target arteries and grafts could be visualized. Spasm was noted in 14% of all grafts, in 40% of all target vessels and was reversible by intraluminal application of nitroglycerine in all except 5 cases. Immediate surgical revision was needed in 8 patients (11%): proximal target vessel occlusion (n=3), anastomotic stenosis (n=2), contrast leakage at distal anastomotic site (n=2), intramural LIMA hematoma (n=1). No significant intraoperative or in-hospital ischemic events occurred. Freedom for target vessel reintervention at 1 year was 100%, freedom from return of angina was 94%.

**Conclusion:**

Intraoperative angiography is a useful imaging modality providing important information to optimize results in innovative coronary bypass procedures.

## ABSTRACT 181

**STENT-GRAFTING OF THE THORACIC AORTA BY THE  
CARDIOTHORACIC SURGEON**

Burkhardt Zipfel, Thomas Krabatsch, Robert Hammerschmidt, Roland Hetzer  
Deutsches Herzzentrum Berlin, Germany

**Purpose**

To evaluate endovascular stent-grafting as a new technique in cardiothoracic surgery.

**Methods**

All 98 stent-grafts (95 Talent®, 2 Endofit® , 1 Zenith®) were implanted in the OR. Fifty-nine (60%) were emergency procedures. Thirteen procedures were redoes for endoleaks. The left subclavian artery origin was covered in 14 cases. Femoral cut-down for access was performed in 95 procedures and sheath-through-graft technique to the common iliac in three. Surgical reconstruction of damaged access vessels became necessary in five procedures.

**Results**

Hospital mortality was 10.2 %. Paraplegia occurred in 2 %. Primary technical success was 88 %, secondary 95 %. No conversions to open repair were necessary. Two patients had elective secondary conversions. Secondary revascularization of the LSA was performed in 4 cases.

**Conclusions**

Endovascular repair of the thoracic aorta can be performed easily by the cardiothoracic surgeon with a limited set of endovascular instruments. The OR is the preferred site for this procedure because of the high incidence of emergency procedures and the potential need for extended surgical approach to the access vessels. A sufficient stock of stent-grafts is advisable.

## ABSTRACT 182

**SYNERGY OF OLD AND NEW TECHNOLOGY RESULTS IN SUCCESSFUL REVASCULARIZATION OF THE ANTERIOR MYOCARDIUM WITH RELIEF OF ANGINA IN THE ABSENCE OF SUITABLE TARGETS**

Robert L. Quigley, Richard Y. Highbloom; Albert Einstein Medical Center, Jefferson Health System; Philadelphia, PA, USA

**Purpose:** Diffuse and distal left anterior descending (LAD) coronary disease, refractory to conventional surgical and/or percutaneous revascularization represents a clinical and economic dilemma. Transmyocardial laser revascularization (TMLR) has improved angina without clear measurable improvement of myocardial perfusion. This study was undertaken to determine if combining a Vineberg implant with TMLR of the LAD distribution enhances myocardial perfusion and relieves symptoms.

**Material and Methods:** Twenty-one patients with an obliterated LAD and a viable anterior wall underwent off-pump coronary artery bypass grafting (OPCAB) (2.6 grafts/patient). Eight were studied with preoperative, postoperative-early (4-9 days), and postoperative-late (3-5 months) stress and rest nuclear imaging. In each case a Vineberg implant was modified such that the distal end of the conduit, as it emerged from the muscular tunnel, was anastomosed, to any patent LAD segment. The anterior wall was also instrumented with a Holmium Yttrium-Aluminum-Garnet (YAG) laser (8-16 sites).

**Results:** There has been 100% follow-up ranging from 6-36 months. There were no mortalities. All patients had complete relief of their angina. Serial perfusion scans demonstrated a two-phase improvement in perfusion. Three of the patients underwent angiography of the implant at 9 months, which in each case demonstrated a patent robust conduit.

**Conclusions:** Although some of the benefits of TMLR/Vineberg may be a consequence of collateral blood flow from other revascularized regions, we believe there to be a synergistic effect on perfusion and angina relief by these combined procedures which may be related to angiogenesis.