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INTRAOPERATIVE LEFT SUBCLAVIAN ARTERY OCCLUSION WITH LEFT HAND ISCHEMIA AND STEAL SYNDROME IN THE LEFT INTERNAL THORACIC ARTERY

Matija Jelenc, MD, Ivan Kneževič, MD, Milenko Stankovič, MD, Borut Gersak, MD, PhD

Department of Cardiovascular Surgery, University Medical Centre Ljubljana, Ljubljana, Slovenia

We present the case of a 62-year-old man with left main stenosis, left coronary artery dominance, normal ejection fraction, no valvular pathology, and status post right carotid stenting, who was scheduled for elective coronary revascularization. We performed off-pump coronary revascularization with the left internal thoracic artery to the left anterior descending artery and with saphenous vein grafts to the intermediate artery and the first and second obtuse marginals. Proximally, the 3 venous grafts were anastomosed to the right internal thoracic artery because of a porcelain ascending aorta. During construction of distal anastomoses to the obtuse marginals, the arterial pressure in the left radial artery suddenly dropped. The left hand was found to be pale and pulseless. A femoral artery catheter was placed for pressure monitoring, and the anastomoses were finished as planned. Intraoperative transit-time graft flow measurement showed reversed flow in the left internal thoracic artery. Postoperatively, an angiography evaluation showed subtotal stenosis of the proximal left subclavian artery. The artery was dilated and stented. The postoperative course was uneventful, and the patient was discharged on the 12th postoperative day.

INFLUENCE OF CORONARY ARTERY AND BYPASS GRAFT PARAMETERS ON GRAFT FLOW AND PULSATILITY INDEX: A MATHEMATICAL MODEL WITH IN VIVO CORRELATIONS

Matija Jelenc, MD, Borut Gersak, MD, PhD

Department of Cardiovascular Surgery, University Medical Centre Ljubljana, Ljubljana, Slovenia

Intraoperative transit-time flow measurement is a common method of quality control in coronary surgery. The decision when to redo an anastomosis in case of low graft flow (Q) or a high pulsatility index (PI) is difficult because many parameters can influence the measurement. The aim of our study was to analyze the influence of coronary artery and graft parameters on Q and PI with a mathematical model and to correlate the results with in vivo measurements. The parameters studied were coronary artery and bypass graft compliance, stenosis at the proximal and distal graft anastomosis, proximal coronary artery stenosis, distal coronary runoff, and presence of competent valves in the graft. Results showed that stenosis at the distal anastomosis, poor runoff, and competitive flow all decreased graft flow and increased the PI. Increasing graft or coronary artery compliance increases PI with no change in Q. Stenosis at the proximal anastomosis decreases Q and slightly decreases PI. The presence of competent valves slightly decreases PI and increases Q. The simulation results indicate that the in vivo flow measurement can be viewed as a sum of 2 flow curves: the flow to the coronary artery and the flow for the pulsatile expansion of the graft.

REDUCTION OF MICROEMBOLIC SIGNALS WITH A SINGLE-CLAMP STRATEGY IN CORONARY ARTERY BYPASS SURGERY: A PILOT STUDY

H. Gašparović, B. Malojčić, J. Vojković, M. Borojević, B. Biočina, A. Lekić, D. Belina

Departments of Cardiac Surgery and Neurology, University Hospital Rebro Zagreb, Zagreb, Croatia

Background: Neurologic deficits are perhaps the most feared complication following cardiac surgery. Aortic trauma generates emboli and hence harbors the potential for neurocognitive injury. The single aortic clamp strategy of coronary artery bypass grafting (CABG) aims to reduce aortic manipulation. We hypothesized that this approach will lead to a reduction in microembolic signals (MES) evaluated by transcranial Doppler (TCD), which are a surrogate measure of cerebral embolism.

Methods: This pilot study was based on a prospective analysis of 19 patients in whom CABG was performed either with a single aortic clamp (SC group) or with a conventional multiple aortic side-clamp technique (MC group). There were no differences in age (mean ± SD, 61 ± 6 years versus 65 ± 10 years; P = NS) or EuroSCORE (2.2 ± 1.6 versus 2.9 ± 1.9; P = NS) between the 2 groups. Neurocognitive evaluation was based on the mini–mental state examination (MMSE). The preoperative MMSE values of the SC and MC groups were similar (29.5 ± 1 and 28.8 ± 1, respectively; P = NS).

Results: The total number of MES was lower in the SC group than in the MC group (82 ± 44 versus 142 ± 83;

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Correspondence: Borut Gersak, Department of Cardiovascular Surgery, University Medical Center, Zaloska 7, 1000 Ljubljana, Slovenia; 386-1-522-49-41; fax: 386-1-522-25-83 (e-mail: bgersak@maat.si).

P = .06). Neurocognitive performance was reduced in the 2 groups, compared with preoperative values. This reduction was more pronounced in the MC group (21.5 ± 1.9 versus 25.1 ± 1.9 in the SC group; *P* = NS). One patient in the MC group had a reversible ischemic neurologic deficit (*P* = NS). There were no deaths or perioperative myocardial infarctions in either group.

Conclusions: The single-clamp CABG strategy led to a reduction in MES, indicating a less pronounced embolic burden compared with the conventional side-clamp CABG strategy. This strategy translated into better performance on neurocognitive testing. A larger-scale study is needed to confirm these encouraging preliminary results.

LEFT MAIN CORONARY ARTERY DISEASE: SURGERY OR INTERVENTIONAL CARDIOLOGY?

Sotirios Prapas, Ioannis Panagiotopoulos, Vaios Tzifos, Vassilios Kotsis, Dimitrios Protogeros, Ioannis Linardakis, Theofanis Tzanavaras

Henry Dunant Hospital, Athens, Greece

Objective: To evaluate and compare the early and mid-term results of invasive methods in the treatment of the left coronary artery disease (LMS): surgical and interventional cardiology (PCI).

Methods: We studied 2 groups of patients: group A, surgical treatment (off-pump coronary artery bypass [OPCAB] without aortic manipulations), and group B, stent placement. Group A consisted of 132 patients who underwent coronary bypass surgery between 2001 and 2006 for LMS (9.2% of the total number of coronary patients of the department). Of these patients, 63% (83 patients) had LMS >75%, 22% (29 patients) had pure left main coronary artery disease, and 43.2% (57 patients) had LMS and 3-vessel disease. An intra-aortic balloon pump was used preoperatively in 14 patients (10.6%). Most of the patients were treated with double- and triple-vessel OPCAB (31.8% and 38.6%, respectively). Group B consisted of 49 patients treated with stent placement in the left main coronary artery (3.9% of the total number of angioplasties in the laboratory) from May 2005 to December 2007. The coronary angiography evaluations revealed that 55% of the patients had peripheral LMS, with 18% having LMS in the initial part of the left main coronary artery and 27% having LMS in the central part. The follow-up for group A is 12 to 84 months and is 14 ± 10 months for group B.

Results: The overall mortality rates in the follow-up were comparable for the 2 groups (group, A 5.3%; group B, 6.1%); however, the incidences of myocardial infarction after the intervention and the need for reintervention seemed to favor group B (1.5% versus 10.2%, and 5.3 versus 20.3%, respectively).

Conclusions: In the absence of contraindications, surgical myocardial revascularization is the appropriate solution for the left main coronary artery disease.

CEREBRAL MONITORING IN CARDIAC SURGERY

Bojan Biočina, Hrvoje Gašparović, Igor Gošev, Marko Borojević, Mate Petričević

Department of Cardiac Surgery, Clinical Hospital Centre "Rebro," Zagreb, Croatia

Atheromatous aorta has become an important risk factor for morbidity in cardiac surgery over the last few decades, with an increasing age of the population as a main reason. The cerebral circulation is particularly affected by this pathologic condition. One of the main reasons for cerebral damage is atheromatous emboli caused by aortic manipulation during open heart surgery. Because the conventional technique in cardiac surgery relies to some degree on aortic manipulation, planning how to manage the atheromatous aorta plays a crucial role in cardiac surgery nowadays. Preoperatively, multislice computed tomography, magnetic resonance imaging, and echocardiography (ECHO) are complementary approaches to detecting lesions with various calcium contents. The gold standard for evaluating the atheromatous aorta is epiaortic ECHO. Other monitoring methods include transcranial Doppler, which detects microemboli in the cerebral circulation, and transcranial infrared spectrophotometry, with which intracranial O^2 saturation can be measured. Perioperative electroencephalography, usually with analysis of evoked potentials, has lost part of its previous importance in cerebral monitoring, but it is still in use, especially in pediatric cardiac surgery. In conclusion, a wide spectrum of diagnostic and monitoring techniques has been developed to monitor cerebral function and to minimize the potential for damage during cardiac surgery. Use of these techniques has greatly helped cardiac surgery become safer and more reproducible.

CORONARY ARTERY BYPASS GRAFTING IN PATIENTS WITH HEPARIN-INDUCED THROMBOCYTOPENIA

Stavros Siminelakis, Angeliki Kotsanti, Nikolaos Baikoussis, Constantinos Paziouros, Constantinos Siogas, Nicholas Kolaitis

University Hospital of Ioannina, Ioannina, Greece

Background: Heparin-induced thrombocytopenia II (HIT II) develops in 1% to 3% of patients treated with heparin or low molecular weight heparin (LMWH). We describe the successful management of a patient with coronary artery disease and HIT II.

Case history: We present the case of a 78-year-old man whose platelet count decreased from 190,000/μL to 69,000/μL during his hospitalization in the cardiologic unit. The use of LMWH was suspected, and the results of an examination for antiplatelet antibodies were positive (68%). We postponed coronary artery bypass grafting; 4 months later, the antibody levels were still high.

Clinical course: Surgical intervention was performed on the beating heart. Fondaparinux sodium was administrated 2

days preoperatively and a single dose was given 30 minutes before anastomoses of the left internal mammary artery to the left anterior descending artery. We observed a moderate hemorrhage, which was collected into a thorax drainage tube. On the third postoperative day, the platelet count was 113,000/μL.

Discussion: The management of HIT patients who undergo cardiac surgery varies widely in the literature. The management of this particular patient was successful, and the postoperative course was uneventful. Consequently, we suggest Fondaparinux sodium as an alternative treatment in these cases; however, more studies are needed.

STRATEGY FOR MANAGEMENT OF ANTIPLATELET THERAPY IN OFF-PUMP CORONARY ARTERY BYPASS SURGERY

Emir Mujanović, Emir Kabil, Jacob Bergsland

BH Heart Centre Tuzla, Tuzla, Bosnia and Herzegovina

Treatment with antiplatelet agents for augmenting graft patency was established many years ago. The original studies using a combination of dipyridamole and aspirin demonstrated significant improvements in vein graft patency compared with a control group that did not receive these drugs. Off-pump coronary artery bypass (OPCAB) surgery presents the clinician with a different challenge, because the absence of cardiopulmonary bypass leaves the patients hypercoagulable in the early critical postoperative phase. Arterial grafts have similar patencies in OPCAB and on-pump surgery, independently of whether platelet-active drugs are administered and which surgical technique is used. There are indications, however, that vein grafts may fare worse in OPCAB. We performed a small randomized study of OPCAB patients. Patients received aspirin either alone or in combination with postoperative clopidogrel. Only patients with at least one saphenous vein graft were included. Grafts of the left internal mammary artery to the left anterior descending artery were patent in all cases, independently of clopidogrel administration. Vein graft patency was significantly better when clopidogrel was administered. The benefit of clopidogrel was most significant in patients with low flow in the vein graft. Such low-flowing grafts occluded frequently in the nonclopidogrel group. We conclude that clopidogrel should be administered postoperatively in patients who undergo OPCAB with saphenous vein grafts, especially when the grafts have low flow. Further studies are indicated with a larger group of patients.

CONVENTIONAL CARDIOPLEGIC ARREST VERSUS ON-PUMP BEATING HEART SURGERY IN PATIENTS WITH A SEVERELY DAMAGED LEFT VENTRICLE

Zan Mitrev, Nikola Hristov

Special Hospital for Surgery "Filip Vtori," Skopje, Macedonia

Objective: Comparing 2 different techniques for myocardial protection during surgery of a severely damaged left ventricle.

Materials and Methods: Sixty-three patients with terminal coronary artery disease and a severely damaged left ventricle underwent surgery in our center. Thirty-one patients (group 1) underwent surgery with standard cardiopulmonary bypass (CPB) and conventional blood cardioplegic arrest, and 32 patients (group 2) underwent surgery with beating-heart CPB without aortic cross-clamping and cardioplegic arrest. The patients were selected for each group according to their clinical status and surgeon preference. We performed a retrospective analysis of the patients' preoperative, intraoperative, and postoperative hemodynamic data and evaluated hospital mortality.

Results: The mean (±SD) preoperative ejection fraction for group 1 was 26.9% ± 2.9%, versus 23.6% ± 5.2% for group 2. Two patients (6%) in group 1 received an intra-aortic balloon pump (IABP) preoperatively, compared with 8 patients (25%) in group 2 (P = .02). All patients underwent complete revascularization with left ventriculoplasty and valvular reconstruction as indicated and were able to come off CPB with mild to moderate inotropic support and with an IABP inserted in 2 patients (6%) in group 1 and 3 patients (9%) in group 2. There were no intraoperative deaths. Postoperative hemodynamic and intropic-support data were similar for the 2 groups, with IABP support needed in 2 more patients (6%) in group 1 and 1 patient (3%) in group 2. There were no reinterventions and no differences in extubation time, chest tube drainage, and transfusion requirements. Hospital stays were similar for the 2 groups, and hospital mortalities were 4 (13%) in group 1 and 5 (16%) in group 2.

Conclusion: Beating-heart CPB can be used safely in patients with extremely damaged hearts, and although technically demanding, it provides good intraoperative heart protection for the performance of surgical corrections, with good short-term results.

COMPARISON OF 3 DIFFERENT SURGICAL METHODS IN AORTIC ROOT ANEURYSMS: LONG-TERM RESULTS

Barış Çaynak, MD, Ertan Sağbaş, MD, Ismihan Selen Onan, MD, Onur Sen, MD, Burak Onan, MD, Zehra Bayramoğlu, MD, Birol Kabakci, MD, İlhan Sanisoğlu, MD, Belhhan Akpınar, MD

Istanbul Bilim University Florence Nightingale Hospital, Istanbul, Turkey

Background: Atheromatous aneurysms of the ascending aorta frequently present with aortic regurgitation (AR). We describe our experiences with replacement of the noncoronary sinus by tailoring the supracoronary graft with or without aortic valve replacement and compare the results with those for patients who underwent the classic Bentall operation.

Methods: Patients were divided into 3 surgical groups: patients who underwent the classic Bentall operation (group 1, n = 54), patients with a dilated noncoronary sinus who underwent replacement of the ascending aorta with a noncoronary sinus extension repair (NCCE) (group 2, n = 27), and patients who underwent separate aortic valve replacement and NCCE procedures (group 3, n = 18).

Results: There were significant reductions in the aortic root in group 2 (Z = –4.560; *P* < .001) and group 3 (Z = –3.758; *P* < .001). The mean degree of AR decreased from 1.56 ± 0.5 to 0.67 ± 0.5 postoperatively in group 2 (Z = –3.874; *P* < .001). Hospital mortality was 6 (6.1%; 3 in group 1, 3 in group 2). The rate of late mortality was 6.1% (3 in group 1, 3 in group 2). The type of operation was not an independent predictor of overall mortality. New York Heart Association class, cardiopulmonary bypass time, concomitant surgery, and sex were the only predictors of mortality.

Conclusions: Noncoronary cusp extension for aortic root remodeling in patients with aneurysm of the ascending aorta is a technically simple and durable method compared with the Bentall procedure.

TRICUSPID VALVE REPAIR WITH ANTERIOR LEAFLET AUGMENTATION

Saeid Hosseini, Faranak Kargar, Mathias H. Aazami, Mohamad M. Peighambari

Rajaei Cardiovascular Medical and Research Center, Tehran, Iran

For decades, the concept of repairing tricuspid valve regurgitation (TR) has made no significant headway, except for work on the tricuspid valve annulus, and residual or recurrent TR is common after recent valve-repair procedures. Annular undersizing/stabilizing (either ring- or suture-based) and bicuspidization are the 2 main technical methods used in addressing functional TR. Nevertheless, the actual reported rates of procedure-related repair failure and residual evolving TR speak to our incomplete understanding of its underlying pathogenesis and the influence of postoperative hemodynamic conditions on the stability of the repaired tricuspid valve. The perception that residual evolving TR may be associated with both a poor clinical outcome and the considerable attrition sustained by the reoperation have stimulated attempts in recent years at further investigating this *parent-pauvre* of heart valve surgery, yet without any solid development in the available surgical armamentarium. An invaluable surgical tool, autologous pericardium has been used successfully to repair many cardiac lesions. The encouraging results from its use in repairing heart valves have been applied to repair TR. Our preliminarily results with leaflet augmentation in addition to annuloplasty are encouraging and offer an integrated surgical approach to the complex pathophysiology of TR. Nevertheless, the current technique, being in its infancy, needs to stand the test of time in terms of the long-term stability of the repaired tricuspid valve.

A NOVEL APPROACH IN END-STAGE CARDIOMYOPATHY: THE ROLE OF AUTOLOGOUS BONE MARROW MONONUCLEAR CELL IMPLANTATION

Sotirios Prapas, Dimitrios Protogeros, Fotini Danou, Ioannis Panagiotopoulos, Vassilios Kotsis, Theofanis Tzanavaras, Helen Chandrinou

Henry Dunant Hospital, Athens, Greece

Objective: To propose an alternative treatment for end-stage ischemic cardiomyopathy consisting of off-pump revascularization of ischemic areas, external reshaping of the left ventricle (LV) to restore a near-normal geometry, and autologous bone marrow–derived mononuclear cell (BM-MNC) implantation.

Methods: Forty-seven patients (mean age, 58 ± 8.9 years) underwent the above procedure. All patients were in New York Heart Association (NYHA) classes III to IV, and 4 were transplantation candidates. They underwent standard laboratory, transthoracic echocardiography, dipyridamole thallium scintigraphy (DTS), and cardiac magnetic resonance imaging (MRI) evaluations preoperatively and at 3, 6, and 12 months postoperatively. After revascularization and external LV reshaping, BM-MNCs were injected into predetermined peri-infarct areas where revascularization was impossible.

Results: Forty-five patients survived during a follow-up period of 3 to 37 months. Mean ejection fractions improved from 21.7% ± 7.4% to 30.6% ± 6.9%, 36.5% ± 4.3%, and 37.7% ± 4.2% at 3, 6, and 12 months, respectively. The mean LV end-diastolic diameter was reduced from 66.1 ± 4.9 mm to 62.6 ± 3.9 mm, 60.5 ± 2.9 mm, and 59.3 ± 4.2 mm, respectively. Previously nonviable areas on DTS evaluations were found to contain viable tissue, and MRI showed hypokinesia in previously akinetic areas. The NYHA class improved to I to II. No significant arrhythmias were noted during the follow-up period. One patient died from low cardiac output, and 1 patient died from septic shock.

Conclusions: Combined off-pump surgical treatment and autologous BM-MNC transplantation for end-stage ischemic cardiomyopathy is safe and feasible and appears to improve the patients' functional status.

OUTCOME OF THE STICH TRIAL: FIRST RESULTS AND FUTURE IMPLICATIONS

Sinisa Gradinac, MD

Dedinje Cardiovascular Institute, Belgrade, Serbia

The STICH trial is a National Institutes of Health–sponsored prospective randomized trial of >2200 patients with heart failure. Its aim is to revisit the results of the CASS study from 30 years ago, which was performed with 78 patients. The study was performed in >120 hospitals worldwide. The first results of the trial (that are not yet known to researchers) are to be described at the next American College of Cardiology meeting in Orlando, Florida, USA. We briefly report on early results and expectations of further follow-up.

LONG-TERM RESULTS AFTER RECONSTRUCTIVE SURGERY FOR ANEURYSMS OF THE LEFT VENTRICLE

Daniel Unić, D. Barić, Ž. Sutlić, I. Rudež, M. Planinc, D. Jonjić

Dubrava University Hospital, Zagreb, Croatia

Objectives: To present our experience in left ventricle (LV) remodeling and long-term follow-up results.

Patients and Methods: From May 1998 to February 2009, 85 patients with postinfarction LV aneurysm underwent reconstructive procedures. The mean (±SD) age was 58.7 ± 8.9 years (range, 36-79 years). The mean LV ejection fraction was 39.8% ± 13.1% (range, 20%-70%). The mean EuroSCORE was 6.0 ± 2.9 (range, 3-19), and the mean predictive mortality rate was 8.2% ± 11.9% (1.6%-85.6%). Many (44%) of the patients were in New York Heart Association (NYHA) functional class II preoperatively, and 32% of the patients were in NYHA class III or IV. The LV was reconstructed with the endoventricular patch technique in 56 patients (66%). In 29 patients (34%), the LV was reconstructed by linear closure. In 79 patients (93%), concomitant myocardial revascularization was performed. Procedures on the mitral valve were performed in 11 patients (13%; repair in 10 patients and replacement in 1).

Results: The perioperative mortality rate was 3.5% (3 patients). Long-term follow-up was completed by means of phone interview with a mean duration of 31.6 months (range, 1-120 months). There were 9 late deaths (11%) during follow-up. Fifty-nine patients (72%) were in NYHA functional classes I and II.

Conclusion: LV remodeling is a safe surgical procedure with low perioperative morbidity and mortality and excellent long-term survival, even in patients with severely reduced systolic function.

ZOTAROLIMUS-ELUTING STENTS VERSUS SIROLIMUS-ELUTING STENTS OR PACLITAXEL-ELUTING STENTS: METAANALYSIS OF RANDOMIZED TRIALS

Alban Dibra, MD,[1] Adnan Kastrati, MD[2]

[1]University Hospital Center "Nene Tereza," Tirana, Albania;
[2]Deutsches Herzzentrum, Munich, Germany

Background: Clinical trials comparing zotarolimus-eluting stents (ZES-Endeavor) versus the most frequently used drug-eluting stents—the sirolimus-eluting stents (SES-Cypher) or paclitaxel-eluting stents (PES-Taxus)—have reported conflicting results regarding their relative performance.

Methods: We performed a metaanalysis of 4 randomized trials comparing ZES with SES or PES during a follow-up period of 9 to 24 months. A total of 4635 patients were enrolled in these trials. The primary endpoint was target lesion revascularization. Secondary endpoints were mortality, myocardial infarction, and stent thrombosis rates. Odds ratios (ORs) were used as summary estimates. The pooled ORs were calculated using the DerSimonian and Laird method for random effects.

Results: Use of ZES was associated with a marked increase in the odds of target lesion revascularization, compared with the use of SES or PES (OR, 1.87; 95% confidence interval [CI], 1.36-2.56; $P < .001$). On the other hand, there was no significant difference between the respective groups of patients regarding the odds of death (OR, 1.20; 95% CI, 0.70-2.04; $P = .52$), myocardial infarction (OR, 0.69; 95% CI, 0.44-1.08; $P = .10$), or stent thrombosis (OR, 1.53; 95% CI, 0.76-3.07; $P = .24$).

Conclusions: Zotarolimus-eluting stents are less effective and similarly safe, compared with sirolimus-eluting or paclitaxel-eluting stents.

PAS-PORT PROXIMAL CONNECTOR DEVICE: A SINGLE-CENTER EXPERIENCE

Timothy Sakellaridis, Mihalis Argiriou, Victor Panagiotakopoulos, Athanassios Krasas, Konstantinos Neofotistos, Ioannis Paralikas, Christos Charitos

2nd Cardiac Surgery Department, "Evagelismos" General Hospital, Athens, Greece

Purpose: PAS-Port (Cardica, Redwood City, CA, USA) is an automated device for proximal anastomoses of vein conduits in coronary artery bypass grafting (CABG) without partial clamping of the aorta. The purpose of our report is to describe the experience of our center in the use of this device.

Patients and Methods: Forty-five patients (31 men and 14 women; mean age, 69 ± 9 years), underwent off-pump CABG (OPCAB) with the use of PAS-Port during a 6-month period. All patients had a bypass of the left internal mammary artery to the left anterior descending artery. In all 45 patients, the proximal anastomoses of the vein conduits were done with the PAS-Port proximal connector device, with a mean of 2 proximal anastomoses in each patient.

Results: In 3 patients, we had to convert the proximal anastomoses to a hand-sewn technique and a partial aortic clamp. With the use of PAS-Port, the times of proximal anastomoses were <2 minutes, and the total duration of the operation was much shorter. The patency of the conduits was examined at surgery with a flow meter. Short-term results were examined after 6 to 12 months with either computed tomography coronary angiography or coronary angiography.

Conclusions: The use of PAS-Port provides safety for the proximal anastomoses with excellent patency of the conduits and a lower operation time.

EXTERNAL SAPHENOUS VEIN MESH PREVENTS GRAFT OCCLUSION IN BYPASS SURGERY

Theo Kofidis, Chin Siang Ong, Felix Woitek, Guohao Chang, Darren H. L. Lee, Uwe Klima, Chuen Neng Lee

Department of Cardiac, Thoracic and Vascular Surgery, National University of Singapore, Singapore

Coronary artery bypass grafting is the most efficient therapy for advanced ischemic heart disease. The commonly used saphenous vein grafts have high rates of occlusion, which cause severe cardiac-related events, such as infarctions, arrhythmias, angina pain, and death. The reasons for graft failure are vein–to–coronary artery mismatch, formation of intimal hyperplasia, graft dilation, and disadvantageous flow dynamics. The present prospective randomized clinical trial introduces—for the first time in human use—a mesh made of nitinol that is placed around the venous graft to prevent occlusion. The mesh

downsizes the vein's external diameter up to 50% to avoid intima hyperplasia, to stabilize the graft, to preclude kinking, and to prevent dilation. In this manner, the vein is "arterialized"; that is, it mimics the hydrodynamics of an arterial graft. The use of nitinol mesh–modified veins has proved superb in baboons and sheep, compared with regular grafts. We performed the first implantations in humans, and 65 implantations have thus far been performed in 5 centers, of which 20 have been in Singapore. No vein mesh–related complications have been noted. We obtained 64-slice computed tomography scans in the first postoperative days, and all grafts displayed perfect patency and a smooth course around the heart. The endpoint is angiographic patency at 1 year. Should the human grafts reproduce the patencies shown in the animal setting, the impact would be large with respect to the choice of grafts, the frequency of redo surgery, and the freedom from cardiac-related events.

OFF-PUMP CORONARY ARTERY BYPASS GRAFTING: SINGLE-CENTER EXPERIENCE

T. Klokocovnik

Clinical Department of Cardiovascular Surgery, University Medical Centre, Ljubljana, Slovenia

Background: Despite widespread use of cardiopulmonary bypass in cardiac surgery in previous decades, surgeons around the globe have searched for less invasive methods. Some pioneering techniques, such as off-pump coronary artery bypass grafting (OPCAB), were further developed. Later, discussions about the superiority of the OPCAB versus on-pump coronary artery bypass grafting (ONCAB) became one of most debated cardiac surgery topics. In this retrospective study, we evaluated a single-center experience with OPCAB over the last 11 years.

Methods: Between February 1997 and January 2008, 1023 patients underwent OPCAB surgery for ischemic heart disease. We evaluated the cause of referral, the left ventricular ejection fraction (LVEF) before surgery, the number of coronary artery bypass grafts performed, the time to extubation after surgery, the length of intensive care unit (ICU) stay, the need for inotropic support and an intra-aortic balloon pump (IABP) after surgery, the postoperative need for red blood cell transfusion, postoperative morbidity and mortality, and the cumulative costs of surgical intervention.

Results: The mean age (±SD) was 64 ± 22 years. Twenty-five percent of the procedures were urgent, 31% were of high priority, and 44% were elective. Some of the patients (9.1%) were referred because of acute myocardial infarction, 37.3% had unstable angina pectoris, and 62.7% had stable angina pectoris. The LVEF was >60% in 38.4% of the patients, between 40% and 60% in 48.5%, and <40% in 13.4%. A mean of 2.8 grafts were performed per OPCAB procedure. The mean time to extubation was 11 hours, and the mean ICU stay was 3.2 days. Inotropic support was required in 38% of the patients, and 7.2% of the patients needed an IABP. Transfusions of red blood cells were required in 27% of the patients. In the postoperative period, 6.1% of the patients had wound infection, and 15.3% of the patients had atrial fibrillation. Sternal dehiscence occurred in 3.5% of the patients, and 0.2% had pneumothorax. Postoperative bleeding necessitated reoperation in 2.7% of the patients. Postoperative mortality was 2.1%.

Conclusion: We currently perform OPCAB surgeries in 32% of all patients referred for myocardial revascularization. OPCAB surgery in our center is surgeon (not patient) specific. The results of OPCAB surgery are comparable with the results of ONCAB surgery. The patients undergoing OPCAB surgery have shorter ICU stays, shorter intubation times, a lower need for red blood cell transfusion, a lower incidence of postoperative cardiac arrhythmia, and lower treatment costs.

ROLE OF ENDOVASCULAR STENT GRAFT IMPLANTATION IN TREATMENT OF PATIENTS WITH ANEURYSMS AND DISSECTIONS OF THE THORACIC AORTA: A 5-YEAR EXPERIENCE

Gencho Nachev, D. Petkov, B. Baev, V. Papantchev, P. Simeonov, D. Trendafilova, M. Nedevska

St. Ekaterina University Hospital, Sofia, Bulgaria

Background: Aneurysms and dissections of the thoracic aorta are conditions challenging for treatment. A growing body of knowledge is showing the usefulness of endovascular stent graft (EVSG) as a therapeutic alternative for these patients. The aim of present study was to review our experience with the EVSG as a sole therapy or in combination with conventional surgery.

Patients and Methods: For the period between 2003 and 2008, 41 patients received an EVSG. The mean age of the patients was 51.8 years (range, 22-74 years). The vast majority of the patients were male (85.4%, 35 patients). There were 25 patients (61%) with DeBakey type III aortic dissection, 8 patients (19.5%) with DeBakey type I aortic dissection, and 8 patients (19.5%) with aortic aneurysms. Emergency EVSG implantation was performed in 33 patients (80.5%). Nine patients (22%) underwent EVSG implantation after conventional surgical intervention because of postoperative complications.

Results: The overall in-hospital mortality rate was 9.75% (4 patients). There was no mortality in patients who underwent scheduled EVSG. Insignificant leakage after EVSG implantation was present in only 5 patients (12.1%). The following complications were observed: low cardiac output syndrome, acute myocardial infarction, acute renal failure, prolonged mechanical ventilation, lower limb ischemia, and aneurysmal rupture. Nevertheless, most of these complications were related to the primary disease (aortic dissection in most of the cases) and not to EVSG implantation per se.

Conclusions: Our experience shows that EVSG implantation is a suitable tool for treating patients with aneurysms and dissections of the aorta, including their complications. If the selection of patients is proper, the method shows relatively low mortality and morbidity.

SURGICAL ABLATION FOR PAROXYSMAL AND PERSISTENT ATRIAL FIBRILLATION COMBINED WITH CORONARY ARTERY BYPASS GRAFTING

Alexander Romanov, E. Pokushalov, A. Cherniavskiy, I. Pak, Y. Kareva

State Research Institute of Circulation Pathology, Novosibirsk, Russia

Background: The aim of this study was to evaluate the efficacy of radiofrequency ablation of atrial fibrillation (AF) during coronary artery bypass grafting (CABG).

Methods: Forty-two patients (mean age, 59 ± 7 years) with AF (23 paroxysmal, 19 persistent) and ischemic heart disease underwent CABG combined with ablation of AF (Cardioblate; Medtronic, Minneapolis, MN, USA). All patients were divided into 3 groups. Group I (n = 12; 6 paroxysmal, 6 persistent) underwent an epicardial pulmonary vein isolation with bipolar saline-irrigated radiofrequency ablation; group II (n = 15; 9 paroxysmal, 6 persistent) underwent endocardial fragmentation of the left atrium, including pulmonary vein isolation, left atrium appendectomy, and creation of an ablation line from the left atrial appendage to the mitral valve; and group III (n = 15; 7 paroxysmal, 8 persistent) underwent endocardial ablation of 4 ganglionated plexi and epicardial pulmonary vein isolation. In all patients, an electrocardiographic monitoring device (Reveal XT; Medtronic) was implanted immediately after surgery.

Results: No procedure-related complications were observed. Two patients (4.7%) required reoperation because of bleeding. All patients were discharged from the hospital in sinus rhythm. The rates of freedom from atrial fibrillation at the 6-month follow-up were 71.8%, 69.3%, and 84.2% in groups I, II, and III, respectively ($P < .05$).

Conclusions: Radiofrequency ablation concomitant with CABG seems to be sufficient for treatment of paroxysmal and persistent AF, especially for endocardial ganglionated plexi ablation combined with pulmonary vein isolation.

DETECTING VOLUME RESPONDERS PRIOR TO CARDIAC RESYNCHRONIZATION THERAPY DEVICE IMPLANTATION VIA MINITHORACOTOMY. THE SEPTAL FLASH AS A PREDICTOR OF IMMEDIATE LEFT VENTRICULAR REVERSE REMODELING DETECTABLE BY INTRAOPERATIVE ECHOCARDIOGRAPHY

Maja Čikeš, Bart Bijnens, Željko Gjurić, Kanso Saade, Igor Gošev, Richard Matasić, Martina Lovrić Benčič, Davor Puljević, Maja Hrabak, Božidar Ferek-Petrić, Hrvoje Gašparović, Davor Miličić, Bojan Biočina

Department for Cardiovascular Diseases, University Hospital Centre Zagreb, Zagreb, Croatia

Background: Although cardiac resynchronization therapy (CRT) is well established as an adjunctive heart failure treatment, a 30% rate of nonresponders poses a challenge to improve the detection of potential responders prior to device implantation. A mechanism-based approach to patient selection has previously been proposed, and part of this approach consists of the septal flash as an echocardiographic sign of intraventricular dyssynchrony, which is predictive of the CRT response.

Methods: In this pilot study, we analyzed data from 5 consecutive patents (2 women and 3 men; mean age, 63 ± 10 years) referred for CRT implantation by minithoracotomy. Intraoperative transthoracic or transesophageal echocardiography data, as well as Doppler myocardial imaging data, were acquired before and after CRT device implantation. The septal flash was defined as an early ventricular septal motion within the isovolumic contraction period, which was imaged with gray scale or tissue Doppler color M-mode. Reverse remodeling was defined as a reduction of the left ventricular end-systolic volume (LVESV) of ≥10%. The right atrial and ventricular leads were placed transvenously, and the LV screw-in lead was positioned epicardially on the lateral wall, avoiding areas of magnetic resonance late enhancement.

Results: The septal flash was detected preoperatively in all patients and resolved immediately after onset of biventricular pacing. A significant postimplantation reduction in the LVESV (mean, 248 ± 99 mL versus 190 ± 100 mL; $P = .01$) and a significant increase in the ejection fraction (mean, 19% ± 5% versus 27% ± 4%; $P = .01$) were measured in all patients. Likewise, a significant increase in postimplantation dP/dt measured noninvasively from the mitral regurgitation trace was noted in all patients (mean, 321.3 ± 32.2 mm Hg/s versus 655.9 ± 29.8 mm Hg/s; $P = .001$).

Conclusion: The preoperative presence of the septal flash is a valid predictor of LV reverse remodeling and an increase in contractility that occur immediately after CRT device implantation.

POSTOPERATIVE INHALED NITROUS OXIDE IN CONGENITAL CARDIAC SURGERY

Andrew Chatzis, A. C. Chatzis, N. M. Giannopoulos, D. Bobos, C. Contrafouris, M. Milonakis, F. Mitropoulos, J. Sofianidou, T. Kousi, Ch. Apostolidis, M. Dimitropoulou, A. Athanasiadis, P. Pappas, F. Kakava, A. Tsoutsinos, M. Papafilaktou, M. Azariadis

Onassis Cardiac Surgery Centre, Athens, Greece

Objective: We present our experience with inhaled nitrous oxide (NO) in the postoperative management of patients undergoing cardiac surgery for congenital heart disease.

Methods: From May 2007 to March 2009, 17 patients (8 male and 9 female; median age, 9 months [range, 19 days to 10 years]; median weight, 7 kg [range, 3.1-30 kg]) with congenital cardiac malformations and pulmonary hypertension (PHT) underwent corrective or palliative surgery in our unit. Principal diagnoses included total anomalous pulmonary venous connection in 5 patients, large or multiple ventriculoseptal defect in 8 patients, anomalous origin of left coronary artery from pulmonary artery in 1 patient, common

atrioventricular canal in 1 patient, and complex congenital heart disease in 2 patients. Fourteen patients underwent complete repair, 2 had a Glenn procedure, and 1 underwent pulmonary artery banding. All patients received postoperative inhaled NO at 15.8 ± 4 ppm for a median of 57 hours. Inotropic support included milrinone at a mean dose of 0.5 ± 0.07 μg/kg per minute for a median of 6 days.

Results: There were no early deaths. One patient died 4 months later in another hospital following further cardiac surgery. All but one of the patients experienced postoperative hemodynamic and respiratory stability and were extubated at a median of 99 hours (range, 21-264 hours). The median intensive care unit and hospital stays were 7 and 14 days, respectively.

Conclusion: Adjunct postoperative treatment with inhaled NO proved successful along with other supportive measures in achieving hemodynamic and respiratory stability in patients with congenital heart disease and PHT who underwent surgery.

Π-CIRCUIT TECHNIQUE FOR CORONARY REVASCULARIZATION: 5 YEARS' EXPERIENCE

Sotirios Prapas, Ioannis Panagiotopoulos, Vassilios Kotsis, Dimitrios Protogeros, Ioannis Linardakis, Theofanis Tzanavaras, Argiris Michalopoulos

Henry Dunant Hospital, Athens, Greece

Objective: To evaluate the feasibility/effectiveness of the π-circuit technique as the method of choice for patients requiring coronary revascularization.

Methods: From February 2001 to November 2005, 1359 patients underwent coronary revascularization with the use of the π-circuit technique, which consists of the following: (1) beating heart surgery, (2) off-pump coronary artery bypass grafting, (3) no touching of the aorta, (4) use of composite grafts, and (5) totally arterial revascularization. Preoperative, intraoperative, and postoperative variables were evaluated in the high-risk subgroups by means of the Fisher exact test, the chi-square test, the Kaplan-Meier method, and Cox regression analysis.

Results: Three deaths occurred in the intensive care unit in the first 7 days after surgery. The in-hospital mortality rate was 1.5% (21 patients). There were various early postoperative complications, such as renal failure, pulmonary complications, prolonged mechanical ventilation, superficial sternal wound infection, atrial fibrillation, reexploration, postoperative use of an intra-aortic balloon pump, psychological complications, and gastrointestinal complications. The incidence of these complications varied from very low (psychological complications, 0.6%; reexploration, 0.7%; and sternal wound infection, 1%) to high (20% atrial fibrillation). The incidences of other complications were in-between. The incidences of overall events during the midterm follow-up period (4-60 months) for recatheterization, reintervention, and midterm mortality were 2.4%, 0.6%, and 4.8%, respectively.

Conclusions: The π-circuit technique can be the method of choice for all high-risk patient subgroups requiring surgical revascularization. The technique is accomplished with low morbidity and mortality rates.

ENDOSCOPIC VEIN HARVESTING FOR CORONARY ARTERY BYPASS GRAFTING

Timothy Sakellaridis, Victor Panagiotakopoulos, Athanassios Krasas, Konstantinos Neofotistos, Polibios Drosos, Mihalis Argiriou, Christos Charitos

2nd Cardiac Surgery Department, "Evagelismos" General Hospital, Athens, Greece

Objective: Endoscopic vein harvesting (EVH) has been shown to be beneficial to the patient for reducing wound complications, reducing postoperative pain, shortening the hospital stay, and improving cosmetics. The purpose of this report is to describe our experience.

Methods: Forty-two patients (30 men, 12 women; mean ± SD age, 69 ± 9 years) underwent coronary artery bypass grafting (CABG) operations (30 CABG operations and 12 CABG operations plus aortic valve replacement) with EVH of the saphenous vein with VasoView® 6 (Maquet Cardiovascular, Wayne, NJ, USA). All CABG procedures with EVH were performed by 2 surgeons.

Results: Total harvesting times ranged from 24 to 69 minutes (mean, 39 minutes), but harvesting times decreased with experience. Total harvesting times (including wound closure) and the incidence of wound complications were significantly lower in the EVH group compared with the group with conventional vein harvesting. Because of our inexperience at the beginning, we had 6 conversions to classic harvesting. We had no wound infections, and we had a diminished use of analgesics. The hospital stay was 1 to 2 days shorter than for the patients with classic vein harvesting.

Conclusion: EVH represents a safe, cost-efficient method with excellent aesthetic results, diminished wound infections, and shorter operations.

DEBAKEY REPAIR FOR TYPE III THORACOABDOMINAL AORTIC ANEURYSM

Zan Mitrev, Nikola Hristov, Lidija Veljanovska

Special Hospital for Surgery "Filip Vtori", Skopje, Macedonia

A 65-year-old man with abdominal pain, nausea, and vomiting was admitted to our hospital. His condition was diagnosed with 64-slice computed tomography as thoracoabdominal aortic aneurysm, Crawford type III. Surgery was performed immediately through the sixth intercostal space and retroperitoneally; a DeBakey-type repair was used. Surgery included proximal end-to-side prosthesis implantation on the distal thoracic aorta, end-to-end anastomosis between the tubular and bifurcated graft, end-to-end anastomosis between the prosthesis and the right external iliac artery, and end-to-end anastomosis between

the prosthesis and the left external iliac artery. Flow was now redirected through the graft toward both iliac arteries. Next, the celiac trunk, both renal arteries, and the superior mesenteric artery were implanted over a short 10-mm vascular graft on the prosthesis. Following the repair, the aneurysm sac was opened, the bleeding points were sutured, and the aneurysm neck suture was ligated. The postoperative period was uneventful, and the patient was discharged home 6 days later.

AORTO-BILATERAL-FEMORAL-BILATERAL-POPLITEAL BYPASS FOR LERICHE SYNDROME WITH OCCLUSION OF BOTH SUPERFICIAL FEMORAL ARTERIES

Zan Mitrev, Nikola Hristov

Special Hospital for Surgery "Filip Vtori", Skopje, Macedonia

A 68-year-old man, a smoker with hypertension and hyperlipidemia, presented in our hospital with pain in both calves at rest. His symptoms had started 1 year before with pain in both legs after walking a short distance. The preoperative workup revealed Leriche syndrome with occlusion of both superficial femoral arteries (shown by 64-slice computed tomography). Operative treatment included aorto-bilateral femoral bypass with a 16/8-mm Dacron Y graft, which was anastomosed end-to-end to the aorta and side-to-side to both common femoral arteries. The excess 8-mm tube grafts were cut, and the procedure continued with an end-to-side anastomosis with an 8-mm Dacron tube graft on the popliteal artery. The distal tube graft was then connected with the proximal tube graft on the femoral level with an end-to-end anastomosis. The same operative steps were repeated for the other leg. The patient's postoperative stay was uneventful, and he was discharged home 7 days later. A follow-up 64-slice computed tomography evaluation of the aorto-bilateral-femoral-bilateral-popliteal bypass showed an excellent result.

PORT-ACCESS CARDIAC OPERATIONS: MID- AND LONG-TERM RESULTS

Barış Çaynak, Ertan Sağbaş, İlhan Sanisoğlu, Zehra Bayramoğlu, Belhhan Akpınar

Istanbul Bilim University Florence Nightingale Hospital, Istanbul, Turkey

Background: The aim of this study was to assess the mid- and long-term results of port-access cardiac surgery.

Materials and Methods: Two hundred one patients (74 male, 127 female; median age, 52 ± 8 years) underwent port-access surgery between January 2002 and December 2008. Peripheral extrathoracic cardiopulmonary bypass (CPB) and a transthoracic aortic clamp with antegrade cardioplegia were used in all cases. The types of operations were mitral valve repair or replacement in 107 cases, atrial septal defect (ASD) closure in 88 cases, ASD closure and mitral valve repair in 5 cases, and atrial myxoma resection in 1 case. A concomitant radiofrequency ablation procedure for atrial fibrillation was performed in 72 patients. There were 6 reoperations.

Results: The median intensive care unit and hospital stays were 1.49 ± 1.7 days and 6.2 ± 1.81 days, respectively. The in-hospital mortality rate was 1.5% (n = 3). Two patients required conversion to sternotomy (1 for pleural adhesions, 1 for bleeding revision). Five patients (2.5%) underwent minimally invasive surgical revision for bleeding. There were no perioperative myocardial infarctions, permanent strokes, or major vascular complications. Peripheral arterial stenosis at the cannulation site was observed in 2 patients.

Conclusion: Video-assisted cardiac surgery through a microaccess port may be performed safely, at a low risk of morbidity and mortality.

CONSERVATIVE MITRAL VALVE SURGERY

Sabjan Memishaj, E. Harja, E. Likaj, S. Dumani, A. Fino, A. Refatllari

Division of Cardiovascular Surgery, University Hospital Center "Mother Tereza," Tirana, Albania

Background: The aim of this study was to report our results with conservative mitral valve surgery.

Methods and Results: Seventy patients underwent their operations over a period of 4 years. The mean (± SD) age was 43.6 ± 12 years. The mechanism responsible for mitral regurgitation was restricted motion in 90% of the patients, prolapse of the anterior leaflet in 2.86%, prolapse of the posterior leaflet in 5.71%, and lack of coaptation in 1.42%. The cause of the regurgitation was rheumatic disease in 78.6% of the patients, degenerative disease in 10%, ischemia in 2.86%, and other causes in 8.57%. The surgical techniques used were commissurotomy and Wooler procedure in 32 patients, commissurotomy and annular ring in 14 patients, quadrangular resection and annular ring in 2 patients, Alfieri and annular ring repair in 2 patients, commissurotomy Wooler and annular ring in 1 patient, and simple commissurotomy in 7 patients. The mean cross-clamp time was 65.3 ± 36.6 minutes. The degree of preoperative insufficiency was 47.8%, 34.7%, and 17.4% for grades 1, 2 to 3, and 4, respectively. During the postoperative period, only 30% of the patients were in grade 1 insufficiency, and 70% had no regurgitation. Survival in the hospital was 100%.

Conclusion: Conservative mitral valve surgery is successful in treating rheumatic, ischemic, and degenerative valve disease. Our clinic has a good experience with rheumatic diseases.

RESULTS OF REDO VALVE SURGERY

Endri Harja, S. Memishaj, E. Likaj, S. Dumani, A. Baboci, A. Fino, A. Refatllari

University Hospital Center "Mother Tereza," Tirana, Albania

Background: Reoperative valvular surgery is generally associated with increased mortality and morbidity.

Aim: To study risk factors for postoperative mortality and morbidity of patients undergoing redo valve surgery.

Methods: We retrospectively analyzed in-hospital data for 86 patients who underwent redo mitral and aortic surgery between 2001 and 2008.

Results: Redo valve surgery constituted 10.8% (86 patients) of our isolated valve cases (781 patients), with 90.7% (n = 78) undergoing their first redo surgery, 5.8% (n = 5) undergoing their second redo, and 3.5% (n = 3) undergoing their third redo. Men and women constituted 25.6% and 74.4% of the patients, respectively. The mean age was 44.72 ± 11.85 years for the men and 47.18 ± 9.33 years for the women. Twenty-six patients (30.2%) were in New York Heart Association (NYHA) classes II to III, 55.8% were in NYHA class III, and 12% were NYHA class IV; emergency operations constituted 2.3% of the cases. The mean interval between operations was 10.95 ± 6.88 years. The indication for reoperation was periprosthetic leakage in 12.79% (11 patients), mechanical prosthesis dysfunction (pannus formation) in 10.46% (9 patients), prosthetic thrombosis in 11.66% (10 patients), restenosis after open commissurotomy in 26.74% (23 patients), restenosis after closed commissurotomy in 10.46% (9 patients), prosthetic valve endocarditis in 9.3% (8 patients), other valve site in 10.46% (9 patients), bioprosthetic structural deterioration in 6.97% (6 patients), and redo valve surgery plus coronary artery bypass grafting in 1.16% (1 patient). The overall mortality rate was 5.81%.

Conclusions: Advances in perioperative care and increasing experience have transformed redo valve surgery into a safe technique at our clinic.

SUCCESSFUL AND INNOVATIVE TREATMENT OF MALIGNANT FORM OF LONG QT SYNDROME (LQTS) IN INFANCY

Ranko Ugljen, MD, Stjepan Ivanković, MD, Božidar Ferek-Petric, PhD, Milivoj Novak, MD, Ivan Malčić, MD, Dražen Belina, MD, Bojan Biočina, MD

Department of Cardiac Surgery, Clinic of Surgery, University Hospital Center Osijek, Osijek, Croatia

Objectives: In this report, we present the innovative treatment of an infant with a malignant form of Romano-Ward syndrome with an implantable cardioverter-defibrillator (ICD).

Introduction: Romano-Ward syndrome is a genetic heart channelopathy that is associated with a prolonged QT interval, T-wave abnormalities, and torsade de pointes ventricular tachycardias that may cause syncope and occasionally sudden cardiac death. In this condition, a duration of the QT interval of 480 milliseconds in females or 470 milliseconds in males is considered prolonged. The prolonged QT interval is due to an overload of myocardial cells with positively charged ions during ventricular repolarization.

Case Presentation: A 10-month-old infant was admitted to the local hospital because of respiratory arrest after her mother began resuscitation at home. The infant was transferred on the same day to our university hospital and was resuscitated because of ventricular fibrillation, which lasted 3 hours in the pediatric intensive care unit. The heart rhythm was temporarily normalized after administration of intravenous magnesium and mexiletine hydrochloride. Because of numerous episodes of ventricular tachycardias and fibrillation despite conservative treatment, an ICD was implanted via a median sternotomy. One transvenous coil electrode of the ICD was placed on the posterior epicardial wall of the left ventricle, and the other was placed on the anterior wall of the right ventricle with 1 additional bipolar pacing electrode. The large battery for the ICD was placed in the left hemiabdomen between the external and internal oblique muscles. One week after surgery, the baby was discharged home in good clinical condition.

Conclusion: Implantation of an ICD in neonates and infants is surgically challenging because of the adult size of ICD system. With our technical innovation, it is possible to successfully implant an ICD, even in a small child with a severe form of LQTS.

DEVICES FOR INTRAOPERATIVE BRAIN MONITORING

Marko Borojević, Bojan Biočina

Clinical Hospital Centre Zagreb, Zagreb, Croatia

Central nervous system complications continue to be major causes of morbidity and mortality after cardiac surgery. Cerebrovascular insufficiency (CVI) and encephalopathy are most often forms of perioperative neurologic damage. CVI appears in 1% to 3% of cases, whereas encephalopathy occurs in 10% to 15% of cases. Neurocognitive dysfunction is extremely common after surgery and has been noted, depending on the source, in 20% to 60% of patients. The purpose of this review is to summarize the results of the functional literature and to present an overview of neuromonitoring by electroencephalography, transcranial Doppler, near-infrared spectroscopy, and jugular bulb oximetry during cardiac surgery with cardiopulmonary bypass. Etiologic mechanisms for perioperative brain injury most probably lie in cerebral hypoperfusion and embolization. The rapidly advancing field of clinical neuromonitoring holds the promise of providing modalities that can detect injurious processes acutely to allow for intervention. Strategies to optimize neurologic outcome continue to evolve. With new technological developments, perioperative neurologic monitoring has become easier, and data suggest these modalities can usefully identify adverse neurologic events and possibly predict outcome. These methods have a promising future, especially when investigators combine a few of them into multimodality monitoring. However, neuromonitoring methods have to be investigated more rigorously to prove their clinical utility in cardiac surgery.

WHICH IS THE OPTIMAL TIME FOR PLACEMENT OF AN INTRA-AORTIC BALLOON PUMP IN PATIENTS UNDERGOING CARDIAC SURGERY?

Nikolaos Theakos, Panagiotis Dedeilias, Georgios Rallis, Marios Patronis, Argyni Psevdi, Mihalis Argiriou, Panagiotis Hountis, Konstantinos Bolos

"Evangelismos" General Hospital, Athens, Greece

Aim: To determine the optimal time for placement of the intra-aortic balloon pump (IABP) in patients undergoing cardiac surgery.

Methods: From January 1, 2006, through December 31, 2008, an IABP was placed in 31 patients who underwent the following cardiac operations: coronary artery bypass grafting (CABG), n = 19; aortic valve replacement (AVR), n = 2; mitral valve replacement (MVR), n = 3; AVR plus CABG, n = 3; MVR plus CABG, n = 3; MVR plus tricuspid annuloplasty, n = 1. The patients were divided into 2 groups according to the time of IABP insertion. In group A patients (n = 19), the IABP was placed up to 48 hours before cardiac surgery, whereas in group B patients (n = 12), the IABP was placed intraoperatively. The IABP was placed percutaneously in 21 patients and with femoral artery incision in 10 patients. The preoperative requirement for IABP placement was the coexistence of 2 or more of the following risk factors: (1) hemodynamic instability, (2) unstable angina, (3) recent (<2 weeks) myocardial infarction, (4) left main stem coronary disease (>70%), (5) a preoperative ejection fraction (EF) <30%, and (6) a New York Heart Association class ≥III.

Results: Seven patients (22.6%) died (3 patients intraoperatively, 4 patients in the immediate postoperative period). Four patients (57.1%) were in group A, and the rest were in group B. There were no statistically significant differences between the patient characteristics of the 2 groups with regard to age, sex, preoperative EF, mortality, mean time of extracorporeal circulation, and mean aortic-occlusion time.

Conclusions: Although the total number of patients enrolled in this study was small, we established no statistically significant differences between the 2 groups. Therefore, we cannot advocate precautionary preoperative use of an IABP in all high-risk patients undergoing cardiac surgery.

INTRAOPERATIVE MONITORING OF EVOKED POTENTIALS IN PATIENTS SUBMITTED TO CARDIAC SURGERY WITH CARDIOPULMONARY BYPASS

Nikolaos Theakos, Panagiotis Dedeilias, Georgios Rallis, Mihalis Argiriou, Timos Sakellaridis

"Evangelismos" General Hospital, Athens, Greece

Aim: The aim of this study was to evaluate the efficacy of evoked potentials (EPs) in patients undergoing elective on-pump cardiac surgery.

Materials and Methods: During the last 9 months, 167 consecutive patients undergoing elective cardiac surgery with cardiopulmonary bypass had the functional integrity of their nervous system continuously monitored by electroencephalography and by the somatosensory EP, neurogenic motor EP, and brain auditory EP. Surface electrodes were placed on the scalp, the 4 extremities, and the cervical spinal column. Baseline records were obtained from all patients before the induction of general anesthesia, and its depth was preserved constantly throughout the operation.

Results: Reducing the patient's temperature produced increased latency and decreased wave amplitude. Thirteen patients (7.78%) presented further reduction (>50%) of the wave amplitude, whereas the conduction rate of the EPs to the cerebral cortex was increased (>10%). These events prompted urgent notification of the anesthesiologist, the perfusionist, and the surgeon to perform the appropriate actions to avoid cerebral ischemia. No strokes or transient ischemic attacks were recorded.

Conclusions: Continuous recording of neurophysiological signals provides a reliable and effective way to protect the structural and functional integrity of the nervous system during on-pump cardiac operations. Neurophysiological recordings are a valuable tool for abjuring devastating postoperative complications from the central nervous system. Collaboration of the monitoring team with the anesthesiologist and the surgeon is critical in developing a proper anesthesia plan suitable for both surgical and monitoring procedures.

ENDOVASCULAR THORACIC STENT GRAFT IMPLANTATION FOR THE TREATMENT OF ACUTE AORTIC DISEASE

Nikolaos Theakos, Panagiotis Dedeilias, Georgios Rallis, Panagiotis Hountis, Argyni Psevdi, Mihalis Argiriou, Marios Patronis, Konstantinos Bolos

"Evangelismos" General Hospital, Athens, Greece

Aim: Diseases of the thoracic aorta are a considerable challenge to cardiothoracic surgeons because of the complexity of the disease and the multiple comorbidities of the patients. The aim of this study was to evaluate endovascular treatment with stent grafts in patients with acute pathology of the descending thoracic aorta (DTA).

Materials and Methods: From March 2002 to December 2008, 31 consecutive patients were treated with endovascular stent graft placement on an emergency basis. Nineteen patients (61.3%) experienced traumatic rupture of the DTA, and 12 patients presented with type B acute dissection. Prior to and following the stent-grafting procedure, all patients underwent spiral computed tomography (CT) angiography. Treatment response during follow-up was assessed with repeated CT angiography.

Results: Transluminal placement of the stent graft was technically successful in 29 (93.5%) of 31 patients. The survival rates were as follows: For the cases of traumatic rupture

of the DTA, stent grafting was technically unsuccessful in 2 cases (10.5%). One patient died on the operating table (from portal vein rupture), and 2 patients died 3 months after implantation (no procedure-related deaths). Fifteen patients (78.9%) are alive (mean survival time, 5.4 years). For the cases of acute dissection, 3 patients died (no procedure-related deaths) at 38, 23, and 10 months after stent graft implantation, and 8 patients (66.7%) are alive (mean survival time, 4.6 years). No neurologic complications or endoleakage was reported.

Conclusions: Emergent endovascular DTA repair with a stent graft is a safe and effective alternative to open cardiothoracic surgery.

FREE LATISSIMUS DORSI MUSCLE FLAP IN STERNAL RECONSTRUCTION

Željko Đuric, I. Gošev, H. Gašparović, T. Kopjar, D. Mijatović, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

We report on a case of sternal reconstruction with free latissimus dorsi muscle flap in a diabetic patient after coronary artery bypass surgery. Although multiple techniques have been proposed to treat these complications, the ideal reconstructive procedure is still a matter of debate. Sternal wound infection is a serious and potentially lethal complication of cardiac surgery. Radical sternectomy and immediate reconstruction provide control of sternal infection, thus reducing both the intensive care unit stay and hospital costs.

KITCHEN KNIFE IN THE RIGHT VENTRICULAR CAVITY

Željko Đuric, D. Belina, I. Gošev, M. Petričević, M. Kralik, R. Stern-Padovan, M. Mažar, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

The historical perspective on penetrating heart injuries certainly provides a picture of a poor prognosis and typically fatal outcomes until the beginning of the 20th century. These injuries are life threatening and require urgent surgical treatment. We report on a case of a suicide attempt with a knife in a paranoid patient who presented in the emergency department as hemodynamically stable and without clinical signs of pericardial tamponade. The knife was visibly protruding in the middle part of the sternal bone. Computed tomography evaluation showed 3-cm deep penetration of the right ventricle. During the emergency procedure with femoral cardiopulmonary bypass after removal of the knife, perforation of the right ventricle was seen without injuries to coronary arteries, papillary muscles, or septum. Immediate surgical repair is mandatory and represents the cornerstone of an uneventful postoperative course.

DOUBLE-PATCH TECHNIQUE FOR POSTERIOR POSTINFARCTION VENTRICULAR SEPTAL DEFECT REPAIR

Dražen Belina, Ž. Đuric, M. Zrno, D. Lovrić, V. Brida, A. Lekić, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Postinfarction ventricular septal defect (VSD) repair remains a surgically challenging procedure with a high rate of mortality and morbidity. The posterior type of postinfarction VSD has been associated with a grave prognosis because of the complex morphology of the rupture as well as the difficulty of the surgical approach. A 52-year-old man with posterior postinfarction ventricular septal rupture underwent a successful operation with a double-patch technique. In this approach, the VSD was exposed through a right and left ventriculotomy without an infarctectomy, and 2 Dacron patches were used, with tissue glue applied between the patches. This technique is reliable, ensures an excellent approach, and produces a strong fixation of the patches to the septum, thus reducing the risk of VSD recurrence.

AORTIC ANNULAR RECONSTRUCTION DUE TO COMPLICATION OF LATE PROSTHETIC VALVE ENDOCARDITIS

Željko Đuric, H. Gašparović, I. Gošev, D. Lovrić, S. Ivanković, I. Burcar, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Prosthetic valve endocarditis complicated with abscess formation is a serious, potentially lethal complication of cardiac surgery and poses a significant surgical challenge. We describe successful management of and an excellent result for an aortic annulus reconstruction for a periprosthetic aortic root abscess, which was a sequela of late endocarditis in a 68-year-old diabetic patient who had undergone a previous aortic and mitral valve replacement and coronary artery bypass grafting. The evaluation and treatment of these patients remain a challenge and require a great deal of teamwork to bring about the interdisciplinary approach necessary to solve the complexity of the disease.

THYROID CANCER OF THE RIGHT VENTRICLE

Selman Dumani, E. Likaj E, E. Harja, S. Memishaj, A. Fino, A. Refatllari

Division of Cardiovascular Surgery, University Hospital Center "Mother Tereza," Tirana, Albania

Introduction: Tumors of the heart are not rare. Their incidence is 1 in 500 cardiac surgical patients.

Case presentation: In this case, S.H. is a 36-year-old woman who was referred with the diagnosis of suspected myxoma of the right ventricle. The symptoms were a several-month history of weakness, palpitations, and syncopal events. A systolic murmur was noted in the paraventricular area. The electrocardiogram, laboratory results, and chest radiograph were normal. An echocardiography examination localized the tumor in the right ventricular outflow tract (RVOT), with obstruction of the RVOT. The right ventricular systolic pressure was 70 mm Hg.

Intervention: With the patient under cardiopulmonary bypass, we observed the carcinoid formation through the right atrium as encapsulated in the septomarginal part of the right ventricle with a base of 1.5 cm^2, which was excised without damaging the capsule along with some muscular tissue in the place of fixation. The carcinoid measured 3 × 6 cm, with a strong consistency and regular contours. During the procedure, we cut the anterior papillary muscle and sutured it with Prolene suture. The patient's postoperative course was good. The tricuspid valve was competent. The postoperative echocardiography evaluation showed the RVOT to be free and the RV to have very good contractility. Biopsy of the thyroid tissue showed it to be probably metastatic. Echocardiography of the thyroid gland showed normal results for hormonal tests (T^3, T^4, and thyroid-stimulating hormone). The thoracoabdominal computed tomography scan was normal. The results of an echocardiography examination 3 months later were the same as at first discharge.

Conclusion: Surgical treatment of cancer of the right ventricle is elected, and periodic observation is advised.

MALIGNANT TUMORS OF THE HEART

Serafeim Chlapoutakis, Achileas Tsitsipas, Theodoros Efstradiadis, Helias Mpogris, Iakovos Panteliadis

1st Department of cardiac surgery, Hygeia Diagnostic & Therapeutic Centre of Athens, Athens, Greece

Background: Malignant tumors of the heart can be primary or metastatic. Metastatic malignant tumors may occur through hematogenous and lymphatic routes (renal, hepatic, suprarenal, ovarian, uterus, stomach, prostates, and colon tumors) or as invasive tumors from structures near the heart (esophagus, thymus, lungs). Lung, breast, melanoma, lymphoma, and leukemia metastasize most frequently to the heart.

Patients: Two women had malignant cardiac tumors. Both had a preoperative cardiac ultrasound evaluation, which showed a mass of 4 to 5 cm in the right atrium. The primary tumor of the first patient was a rachis malignant melanoma, which had been resected 8 months before. She came to us with a diagnosis of a right atrial mass. A frozen section showed a malignant cardiac tumor that had invaded the superior vena cava and featured a metastatic pericardial lymph node, so we did not proceed to resection of the mass. The primary tumor of the second patient was a malignant tumor of the cervix with metastasis in the pelvis, which had been resected 1 year before and was followed with radiation therapy. One year later, the patient returned with metastasis in the right atrium of the heart, which obstructed the outflow tract of the right ventricle. After a median sternotomy, we proceeded to a right atriotomy. A frozen section of the tumor confirmed its malignancy, and we proceeded to complete the surgical resection of the tumor. Both patients went home and are still alive.

Conclusion: Most malignant heart tumors are asymptomatic or present symptoms derived from the obstruction of cardiac chambers (dyspnea, arrhythmias, and so on) or by cardiac and pulmonary embolisms. Symptoms must be compared with the general situation of the patient (loss of weight, weakness, fatigue). If the pericardium is affected, then analysis of the pericardial fluid may be diagnostic. Diagnosis of cardiac tumors is usual a necrotomic finding, and only 30% can be diagnosed in vivo, especially by the pericardial effusion, if the pericardium is affected.

AORTIC ROOT PATHOLOGY: OUR CENTER'S EXPERIENCE

Vedran Ćorić

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

We are witnessing an increasing occurrence of aortic root pathology or at least an increasing recognition of this condition. In our research, we have followed all patients who underwent aortic root surgery in the Clinic for Cardiac Surgery of the University Hospital Center Zagreb. All patients had Bentall procedures performed. We divided the patients into 2 groups. Group 1 consisted of all patients admitted as emergent or urgent; group 2 consisted of patients who had planned aortic root surgery. We noticed that patients in group 1 (who had aortic dissection or aortic root endocarditis) had a significantly higher rate of morbidity and mortality than the patients in group 2 (in which the most common diagnosis was aortic root aneurysm). Therefore, we believe that it is very important that patients with suspected aortic root pathology be recognized and have their surgery scheduled, because the morbidity and mortality for scheduled aortic root replacement are comparable to those of a simple aortic valve replacement, whereas emergent and urgent operations have a significantly higher rate of morbidity and mortality.

TRANSPLANTATION PROGRAM AT THE UNIVERSITY HOSPITAL CENTER ZAGREB

Vedran Ćorić

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Heart transplantation is still the gold standard of treatment for end-stage heart failure. The transplantation program at the Clinic for Cardiac Surgery at the University Hospital Center Zagreb has been developing since 1988. To date, it has achieved results comparable with those of

other European centers. This report focuses on the results of the transplantation program in the last 5 years. Absolute indications for transplantation were end-stage heart failure, malignant cardiac arrhythmias that do not respond to the best medical therapy, and heart ischemia unreachable for revascularization. All patients who had undergone heart transplantation were taken prospectively in the study, and their preoperative conditions, complications, and survival were monitored. Among the causes of death, allograft failure was predominant. With new technologies at our disposal, primarily the ventricular assist device, we hope that the frequency of death will be reduced to the lowest-possible level.

PRIMARY CARDIAC SARCOMA PREOPERATIVELY PRESENTING AS RECIDIVATION OF CARDIAC MYXOMA

Igor Gošev, R. Ugljen, H. Gašparović, I. Burcar, Ž. Đuric, J. Vojković, T. Kopjar, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Primary cardiac sarcoma is a rare cardiac neoplasm that carries an ominous prognosis. It is the most common primary cardiac malignancy. We report on a 58-year-old woman who presented 4 months after an operation for cardiac myxoma with dyspnea on exertion. Echocardiographic evidence of tumor recidivation was found. During the procedure, we identified a mass of 6 × 7 cm arising from the posterior left atrial wall and extending into the left superior and inferior pulmonary veins. The pathohistologic diagnosis of the mass was malignant fibrous histiocytoma. Pathologic slides from the first operation were reviewed, and no sign of malignancy was found. Cardiac sarcomas are difficult to treat and end up lethally in the majority of cases. Expeditious surgical resection based on early identification and good preoperative imaging, together with postoperative chemotherapy, provides some hope for prolonged disease-free survival.

ENDOSCOPIC SAPHENOUS VEIN HARVESTING: BEGINNINGS

Ivan Burcar, MD, Stjepan Ivanković, MD, Hrvoje Gašparović, MD, PhD, Vedran Ćorić, MD, PhD, Ante Lekić, MD, Bojan Biočina, MD, PhD

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

In our study, we started testing endoscopic harvesting of the saphenous vein for coronary artery bypass surgery. We did postoperative follow-ups of our patients to assess their recovery, the level of pain, and their opinion about this method. Our postoperative follow-up included troponin T (TnT) levels, the amount of thoracic drainage, the time until extraction of the thoracic drains, and postoperative infection. For pain classification, we used a verbal description scale. We performed vein harvesting in 7 patients. One patient unfortunately died from iatrogenic dissection of the aorta on the fourth postoperative day (POD). On POD 2, all of the patients except the deceased patient were transferred out of the intensive care unit. We contacted the patients at home for follow-up at 6 weeks after discharge. One patient had experienced severe, distressing pain but reported no pain at the moment of speaking to us. The patient's leg was a bit swollen, and leg function was normal. Five patients reported that they had no pain and that their leg function was good. There were no postoperative infections. All patients were satisfied with their scars and the method. The quality of grafts used with this method was surprisingly good macroscopically. All patients, even the one with severe pain, are generally satisfied with the method. They are satisfied with the smaller scars, because they have all seen large scars on the legs of other coronary patients. We can say that perhaps this method takes a long time in the beginning, but we also believe that it will be performed faster in the near future. There were no differences between classic and endoscopic vein harvesting with respect to TnT levels, thoracic-drainage results, or the lengths of stay in the intensive care unit. We plan to standardize this method and to continue the follow-up of the patients.

AORTIC SCORE: QUANTIFICATION OF ATHEROSCLEROSIS-ALTERED ASCENDING AORTA BY EPIAORTIC ULTRASOUND

Igor Gošev, H. Gašparović, I. Burcar, Ž. Đuric, M. Čikeš, M. Petričević, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Patients with a significantly atherosclerosis-altered ascending aorta and aortic arch have an increased risk of neurologic deficits after cardiac surgery procedures. Intraoperative epiaortic ultrasound has proved to be a more reliable method for evaluating atherosclerotic changes than transesophageal ultrasound or standard manual exploration of the aorta by the designated surgeon. Thus far, the most common classification of aortic atherosclerosis has consisted of mild (<3 mm of intimal thickening), moderate (3-5 mm), or severe (characterized by intimal thickening of >5 mm; protruding, ulcerated, or mobile atheromas; thrombus formation; or spreading on a major portion of the atherosclerotic circumference) atherosclerosis. In our institution, the aortic score is divided into 4 segments: the position of the aortotomy and/or proximal anastomosis, the position of aortal clamping, the position of aortal cannulation, and the area distal from the aortal cannulation site. Atherosclerotic changes of each individual segment are quantified separately, and their sum equals the estimate of the atherosclerotic burden and the possible risk of neurologic deficit. Of 25 patients for whom epiaortic ultrasound was used, evaluation of the epiaortic score led to modifications of the surgical technique in 2 cases. In the postoperative period, there has not been a single case of severe neurologic deficit.

THE ROLE OF CREATINE PHOSPHOKINASE ISOENZYME MB AND TROPONIN (I) IN THE MONITORING OF POSTOPERATIVE MYOCARDIAL DAMAGE/ISCHEMIA

Andony Baddour, Georgios I. Tagarakis, Nikolaos B. Tsilimingas

Department of Cardiovascular and Thoracic Surgery, University of Thessaly, Thessaly, Greece

Objectives: The aim of the study was to investigate the sensitivity and characteristics of creatine phosphokinase isoenzyme MB (CPK-MB) and troponin (I) in the monitoring of myocardial damage (ischemia) after bypass heart surgery.

Methods: In 85 patients who underwent planned surgical coronary revascularization, we measured serum CPK-MB and troponin (I) levels at 6, 12, 24, 48, and 72 hours postoperatively.

Results: We noted an increase in the values of both parameters immediately postoperatively. The increases were, as expected, much greater in cases of ischemia. Troponin (I) tended to increase to higher percentages compared with initial values and remained at a pathologic state much longer than for CPK-MB, which returned to normal at least 24 hours earlier.

Conclusions: Troponin (I) and CPK-MB are sensitive markers of myocardial damage (ischemia), with the former bearing an advantage as far as sensitivity and duration of pathologic values are concerned.

EVALUATION OF AORTOCORONARY BYPASS GRAFT PATENCY BY MULTISLICE COMPUTED TOMOGRAPHY

Tonći Batinić, Ž. Grbić, L. Giunio

Clinical Hospital Centre (KBC), Split, Croatia

Background: Multislice computed tomography (MSCT) has been demonstrated to be a feasible, noninvasive, and useful imaging modality for evaluating aortocoronary artery bypass grafts (CABG). We investigated the abilities and accuracy of 16-slice CT in the detection of patency and significant stenoses (>50% decrease in diameter) in patients with previous CABG.

Methods: We conducted a retrospective analysis of all MSCT coronary angiographies performed on patients with CABG who were referred to our hospital between March 2007 and March 2009. All patients received beta-blockers to reduce the heart rate. A total of 126 CABG procedures (41 arterial grafts and 85 venous grafts) in 50 patients were evaluated. A subgroup of 17 patients underwent additional invasive coronary angiography (CA).

Results: We found 124 grafts to be depicted with adequate diagnostic quality, and these grafts were considered appropriate for evaluation. We detected 38 occluded grafts (2 arterial and 36 venous grafts). Of the patent grafts, 5 had significant stenosis (2 arterial and 3 venous grafts). When we compared CABG with both MSCT and CA, the diagnostic accuracy was 100% for occluded grafts and 99% for significant stenosis.

Conclusion: MSCT is an accurate and useful tool for the evaluation of bypass graft patency.

DIAGNOSIS AND MANAGEMENT OF CONGENITAL VASCULAR RING: A 6-YEAR EXPERIENCE

Michael Milonakis, Fotios Mitropoulos, Michael Milonakis, Constantinos Contrafouris, Dimitrios Bobos, Andreas Chatzis, Nikolaos Giannopoulos, Makis Azariadis

Department of Pediatric and Congenital Heart Diseases, Onassis Cardiac Surgery Center, Athens, Greece

Objective: Vascular rings are uncommon anomalies that cause tracheoesophageal compression, resulting in noncardiac morbidity. The purpose of this study is to review our experience in the management of congenital vascular rings.

Methods: We reviewed the medical charts of 1015 patients treated in our institution between 2002 and 2008. We identified 8 patients (4 boys and 4 girls) with congenital aortic arch anomalies. The median age was 6.5 months (range, 2 months to 6 years). The median weight was 7.15 kg. Most of the patients presented with respiratory-distress symptoms and stridor. Two of 8 patients presented with dysphagia, and choking episodes. Diagnosis was established in all cases with barium studies, bronchoscopy, echocardiography, angiography, computed tomography, and magnetic resonance imaging.

Results: Surgery was accomplished via a left thoracotomy. The operative mortality was zero. One patient developed pneumothorax. Postoperative recoveries were rapid, with a median ventilation time of 15 hours, a median intensive care unit stay of 27 hours, and a postoperative time to discharge of 7 days. The median length of follow-up was 12 months, with all the patients completely free of symptoms.

Conclusion: Our results suggest that early repair of congenital aortic vascular ring is safe and effective and provides complete symptomatic relief in all patients.

OUR EXPERIENCE WITH ADULT CONGENITAL HEART DISEASE

Ermal Likaj, A. Baboci, E. Harja, S. Memishaj, S. Dumani, A. Fino, A. Refatllari

Division of Cardiovascular Surgery, University Hospital Center "Mother Tereza," Tirana, Albania

Adults with congenital heart disease who are referred for surgery fall into 3 general categories: those without previous surgery, those with previous palliation, and those with complete physiological or anatomic repair returning for

revision of their repair because of residual defects or sequelae from their repairs. At our institution, most of the patients are adults without previous surgery. We have reviewed our registry for the 10-year period 1997 to 2007, and we found a group of 136 patients who underwent their operations for congenital heart disease as adults. The majority of the patients had atrial septal defect (ASD) presenting for the first time for surgery. Other frequent diagnoses were ventriculoseptal defect (VSD), tetralogy of Fallot, patent ductus arteriosus, and coarctation of the aorta; however, some patients presented for the second time with residual defects or correction failure, such as a residual shunt after VSD closure and mitral regurgitation after repair of ASD ostium primum. The mean age of patients was 25 years, with the extreme case of a 65-year-old woman presenting with ASD ostium secundum. Both primary repair and redo procedures are frequently complex and at increased risk because of long-standing abnormal physiology and hemodynamic characteristics. Surgical care of the adult with congenital heart disease requires a multidisciplinary team experienced in pediatric and adult cardiology and cardiac surgery.

RESULTS OF SALINE-IRRIGATED BIPOLAR VERSUS MONOPOLAR RADIOFREQUENCY ABLATION

Barış Çaynak, İlhan Sanisoğlu, Zehra Bayramoğlu, Ertan Sağbaş, Belhhan Akpınar

Istanbul Bilim University Florence Nightingale Hospital, Istanbul, Turkey

Purpose: We evaluated the results of a modified maze procedure with saline-irrigated bipolar radiofrequency ablation and monopolar radiofrequency ablation for restoring sinus rhythm over a specified follow-up period.

Materials and Methods: Between April 2001 and May 2007, 96 patients with chronic atrial fibrillation (AF) underwent a mitral valve and modified maze procedure. Patients were divided into 2 groups according to the ablative procedure. Patients in group A (n = 45) underwent saline-irrigated bipolar radiofrequency ablation and a mitral valve procedure, and patients in group B (n = 51) underwent saline-irrigated monopolar radiofrequency ablation and a mitral valve procedure.

Results: At discharge, freedom from AF was 56% in group A and 67% in group B ($P = .264$). At the end of the follow-up period, these frequencies were 83% in group A and 78% in group B ($P = .245$). The mean follow-up durations were 17.03 ± 8.87 months in group A and 19.82 ± 11.09 months in group B ($P = .136$).

Conclusion: At the end of the follow-up period, the patients who had undergone a modified maze procedure with either irrigated bipolar radiofrequency ablation or irrigated monopolar radiofrequency ablation had satisfactory results in terms of freedom from AF.

INCIDENCE AND PREDICTIVE FACTORS OF ATRIAL FIBRILLATION AFTER CORONARY ARTERY BYPASS SURGERY

Laureta Sulcaj, Endri Harja, Selman Dumani, Arben Fino, Anesti Kondili, Ali Refatllari

Division of Cardiovascular Surgery, University Hospital Center "Mother Tereza," Tirana, Albania

Objective: We sought to identify the incidence and predictive factors of postoperative atrial fibrillation occurring among patients undergoing coronary artery bypass surgery.

Methods: Included in this study were all patients who underwent coronary artery bypass surgery during 2008 in Cardiac Surgery of the University Hospital Center "Mother Tereza." Patients were monitored throughout their stay in the intensive care unit.

Results: Complete data were available for 117 patients. The mean age was >60 years. Women constituted 10% of the patients. Approximately 8% of the patients had heart failure symptoms of New York Heart Association classes II to III. Almost 30% of the patients had diabetes mellitus. The mean left ventricular ejection fraction was 58%. Fifty-one percent of the patients had a history of myocardial infarction, and 98% of the patients received beta-blockers preoperatively. The incidence of atrial fibrillation was 16% (19 patients). Multivariate regression analysis showed that a low potassium level was the only independent predictor of atrial fibrillation ($P = .02$). An older age was also associated with a trend toward a higher incidence of atrial fibrillation ($P = .09$).

Conclusion: A low potassium level and probably an older age are associated with an increased risk of atrial fibrillation among patients who have undergone coronary artery bypass surgery.

OUR EARLY EXPERIENCE WITH INTRAOPERATIVE EPICARDIAC CATHETER ABLATION WITH ESTECH COBRA EQUIPMENT

Csaba Busmann, Jenő Szolnoky, Gábor Dudás, Gábor Bogats, István Tomcsányi

State Health Centre, Budapest, Hungary

Atrial fibrillation is a concomitant sign in many surgical cases, so we decided to perform arrhythmia surgery explicitly close to the time of cardiac operations. The early techniques had lot of disadvantages, including bleeding. Many instruments were developed in the last few years to allow faster and simpler methods. We decided to use the Cobra instrument (Estech, San Ramon, CA, USA) because of its easy applicability. We can also perform intracardiac and epicardiac interventions with this instrument and can use it during minimally invasive operations with the thoracoscope. We describe our first 15 successful cases. These operations were performed simultaneously with aortocoronary bypass procedures.

THE ROLE OF MAGNESIUM IN THE DEVELOPMENT OF COGNITIVE DECLINE AND ATRIAL FIBRILLATION AFTER HEART SURGERY

Georgios Tagarakis, A. J. Baddour, I. Sataitidis, D. Karangelis, N. B. Tsilimingas

Cardiovascular and Thoracic Surgery Department, University of Larissa, Larissa, Greece

Objectives: The aim of the study was to control for a possible association between serum magnesium levels and the development of cognitive decline/atrial fibrillation after bypass heart surgery.

Methods: We included 150 patients in the study (95 men and 55 women) who had planned to undergo coronary artery surgery and checked them with a simple neuropsychological test (Surgical Patients Cognitive Scale [SPCS]), which was carried out preoperatively and at 5 days after surgery to evaluate the patients for the development of cognitive decline. The patients were also controlled for the development of postoperative atrial fibrillation. We included in our analysis all factors known to be related to mental disorder after heart surgery (age, neurologic history, diabetes mellitus, level of education, and so on), as well as those related to atrial fibrillation after heart surgery (eg, serum potassium levels). The patients were divided into 2 subgroups with low (0.1-0.8 mmol/L) and high (0.8-1.5 mmol/L) serum magnesium levels (immediately postoperative values).

Results: We noted an expected decline in postoperative test results of approximately 3% and an incidence of atrial fibrillation of 20%. Patients with high normal serum magnesium levels (0.8-1.5 mmol/L) appeared to have an advantage compared with the other patients with respect to both issues.

Conclusions: Magnesium seems to act protectively against the development of mental dysfunction, as well as against atrial fibrillation after bypass heart surgery.

SURGICAL TREATMENT OF HYDATID CYSTS OF THE HEART: REPORT OF 6 CASES

Gencho Nachev, B. Baev, A. Neutov, R. Shick, D. Petkov, G. Nachev

Department of Cardiac Surgery, St. Ekaterina University Hospital, Sofia, Bulgaria

Background: Cardiac echinococcosis is a very rare but life-threatening disease, requiring quick and precise diagnosis and surgical treatment.

Methods: In the period between 2000 and 2008, 6 patients underwent operation for diagnosed cardiac and pericardial echinococcosis. Four patients underwent their operations on cardiopulmonary bypass (CPB), and the remaining 2 patients underwent their operations without CPB. In 2 cases, mitral valve replacement was performed because of the involvement of the mitral apparatus close to the hydatid cyst. In 1 case, simultaneous atypical resection of the right lung was performed because of the additional hydatid cyst.

Results: The diagnosis and planning of the operations were based on transthoracic echocardiography, transesophageal echocardiography, and computed tomography scans. All patients were alive with no recurrences in the follow-ups.

AORTIC VALVE ENDOCARDITIS: A LATE COMPLICATION OF A BLAST TRAUMA

Tomislav Kopjar, H. Gašparović, I. Burcar, I. Gošev, Ž. Đuric, B. Biočina

Department for Cardiac Surgery, University Hospital Centre Zagreb, Zagreb, Croatia

Introduction: Despite healthcare improvements, progressive change in the at-risk population has prevented an overall reduction in the incidence of infective endocarditis.

Case Report: We report the case of a 55-year-old man who was admitted for acute aortic regurgitation (AR) due to endocarditis and functional mitral regurgitation (MR). The patient's history revealed an eventful sequela after a postwar blast trauma 2 years prior to the current onset of symptoms. A series of corrective surgical procedures for penetrating injury were performed. These procedures were complicated with pneumonia and sepsis. The onset of fever, angina, and dyspnea led to the current hospital admission. Abscess in the spleen, MR with P3 tethering, endocarditis (predominantly of the left coronary cusp) causing acute AR, and congestive heart failure were revealed. A splenectomy was performed to prevent later dissemination. We performed a successful aortic valve replacement and mitral valve repair. Intraoperative and follow-up echocardiographic evaluations showed desirable findings.

Conclusion: We consider that the adequate management protocol should be as described in our case study, ie, 6 weeks of targeted intravenous antibiotic therapy, surgical intervention, edema control, and long-term echocardiographic follow-up to facilitate early identification of a possible late prosthetic valve endocarditis.