

## CARDIOTHORACIC SURGERY

### CT01 IMPACT OF COMPLETION ANGIOGRAPHY AFTER SURGICAL CORONARY REVASCULARIZATION

S. KUMAR, R. AHMAD, J. GREELISH, J. BALAGUER, M. PETRACEK AND  
J. BYRNE

*Vanderbilt Heart Institute, Nashville, TN, United States*

**Background** Coronary revascularization surgery does not traditionally employ angiography to assess procedural success. Early graft failure is reported up to 30% in one year (JAMA Nov 2005) may relate to technical errors or conduit problems. We hypothesize that intra-operative assessment of graft by angiography identifies graft defects and may improve the long term graft survival.

**Methods** We have developed one of the first hybrid operation room in the USA. In one year period 203 consecutive patients (age:63+/-16, M/F:126/39) underwent coronary revascularization with angiography before decannulation.

**Results** Of 436 grafts, 72 angiographic defects were detected in 69 grafts (17% of total grafts). There were 11% conduit defects, 3% anastomotic defects, and 3% target vessel error. Of 72 defects, 25/72 defects required minor revision, 47/72 required either surgical or percutaneous intervention. Intra-operative angiography added an average 20+/-12 minutes to the surgery and 112+/-56 ml contrast. Renal function at 24hours and 48 hours after procedure did not vary significantly between patients who did vs. those who did not have revisions. There were no significant differences in cardiopulmonary bypass time, aortic cross clamp time, and length of hospital stay for patients who underwent revision compared to those who did not. Renal function, bleeding complication, transfusion were similar in patients with percutaneous vs. surgical revision.

**Conclusions** Intraoperative graft angiography performed at the time of CABG identifies graft defects, allowing for immediate surgical or percutaneous revision. Long-term study is in progress to assess whether intra-operative completion angiography decreases the rate of early graft failure.

### CT02 A STUDY TO EVALUATE VARIOUS TECHNIQUES OF CORONARY ARTERY BYPASS GRAFTING

P. SINGHAL, B. D. MAHON, A. SHARMA AND J. P. RIORDAN

*Wellington Public Hospital, Wellington, New Zealand*

**Introduction** In Wellington Hospital, CABG is being performed by various techniques like OPCAB, On-pump cardioplegic arrest, fibrillatory arrest and On-pump beating heart.

**Aim** This study was undertaken to compare morbidity and mortality between On-pump CABG and OPCAB on basis of Euroscore.

**Material and Method** From January 2003 till December 2004, data were collected according to Australasian society of Cardiothoracic surgery data set. Euroscores were calculated and patients were divided into 3 groups. Results of OPCAB and On-pump CABG were compared on basis of Euroscore group. In this period we performed 350 On-pump CABG and 254 OPCAB.

**Results** OPCAB group had less number of grafts per patients. Even for triple vessel disease numbers of grafts were lower in OPCAB group. OPCAB group had more patients with total arterial revascularization. There were 10 deaths in On-pump group and 1 in OPCAB group. In the low and moderate risk group there was no significant difference in hospital stay, ventilation hours and ICU stay. However inotropic requirement and requirements of blood products were less in OPCAB group. There was no statistically significant difference between Incidence of new renal failure or arrhythmia in two groups. 2 patients in each group had blocked graft in immediate postop period and required revascularization. There were only 5 patients in the high-risk group in OPCAB making intergroup comparisons difficult.

**Conclusion** OPCAB does not offer any significant advantage in terms of mortality and morbidity over On-pump CABG. To evaluate the effects of number of grafts and total arterial revascularization, it needs a long-term follow-up.

### CT03 RESULTS OF LEFT CORONARY OSTIOPLASTY FOR PROXIMAL SHORT SEGMENT LEFT MAIN STENOSIS

C. S. PEECEEYEN AND H. PATERSON

*Westmead Hospital, New South Wales, Australia*

**Background** Surgical angioplasty of left main coronary artery (LMCA) in critical left main stenosis has been described as an alternative to CABG to restore antegrade coronary perfusion. We review our experience with onlay saphenous vein patch augmentation for ostial and short segment proximal left main stenosis in selected patients.

**Methods** All data were compiled prospectively and medical records reviewed. Follow up information obtained from cardiologists and local doctors through telephonic questionnaires.

**Results** Between May 1997 and August 2005, 14 left coronary ostioplasties (9 posterior and 5 anterior approaches) were performed in 13 patients. One patient had to be taken off the study group because of failed posterior ostioplasty that was identified on table. Another patient who had previous CABG and persistent angina despite patent grafts, had symptomatic relief following left main ostioplasty.

No peri-operative mortality or myocardial infarction. All patients were followed up for an average period of 5 years. One patient had kinked anterior onlay patch and underwent ostioplasty by posterior approach subsequently. One patient died two years postoperatively due to stroke. All others were leading active symptom free lives. 4 (3 posterior and 1 anterior) follow up coronary angiograms showed widely patent LMCAs.

**Conclusion** Left coronary ostioplasty is a safe procedure, which promises excellent results. Eventhough it is considered as an alternative to CABG, in certain situations may be needed as an adjunct to patent grafts to achieve total revascularization. The anterior approach may be technically easier, but there is a definite risk of kinking of onlay patch.

### CT04 ULTRA MINIMALLY INVASIVE MITRAL VALVE SURGERY WITHOUT AORTIC CROSS CLAMP

S. KUMAR, R. AHMAD, J. GREELISH, M. PETRACEK, J. BALAGUER AND  
J. BYRNE

*Vanderbilt Heart Institute, Nashville, TN, United States*

**Objective** We developed a technique for mitral valve surgery through an ultra small (5 cm) right lateral thoracotomy without aortic cross clamp. This study reports our combined ST. Thomas and Vanderbilt Heart Institutes five years experience with this technique.

**Methods** Six hundred and twenty five (316 M /309 F; aged 22–75 mean of 62 years) underwent ultra minimally invasive mitral valve surgery between August 2000 and June 2006. Through a 5 centimeter right lateral thoracotomy along the 4th intercostal space access to the pericardium and the left atrium was gained. Cardiopulmonary bypass was instituted through femoral cannulation. Under cold fibrillatory arrest (28°C) without aortic cross clamp, mitral valve repair (n = 196) or replacement (n = 380), in addition to mitral valve procedure we performed tricuspid valve repair (n = 69), ASD/PFO closure (n = 201) and Maze (n = 156). Mean pre operative New York Heart Association function class was 2.2 ± 0.9. Twenty eight patients had ejection fraction less than 20%.

**Results** Thirty-day mortality was 1.28% (n = 8). Operating time, bypass time operating averaged 189 ± 52, 113 ± 35 minutes, respectively. Three patients had conversion to sternotomy. Fifteen patients (2.4%) underwent reexploration for bleeding. Average length of hospital stay from surgery to discharge was 6.85 ± 3 days. Ten patients (1.6%) had neurological events. Renal failure required hemodialysis in 5 patients (0.81%). Long term follow-up results are awaited.

**Conclusions** This study demonstrate that this simplified technique of ultra minimally invasive mitral valve surgery is reproducible and provides the least invasive operative approach with low mortality and morbidity with good cosmetic results.

### CT05 MECHANICAL VALVE OR TISSUE VALVE: DO PATIENTS REGRET THEIR DECISION?

J. B. MACEMON, S. T. SMITH AND D. P. SHAW

Canterbury District Health Board, Christchurch, New Zealand

**Purpose** Patients undergoing heart valve replacement are usually given a choice of valve type, mechanical or tissue. Each of these broad valve types has basic advantages and disadvantages which are discussed with the patient pre-operatively, allowing them to make their decision. Post-operatively patients have a variety of experiences, related to the valve itself, complications of the operation, and other co-morbidities. The aim of this study was to determine patient satisfaction with the type of valve they chose, and whether they would have changed their mind given their experience.

**Methodology** A one page postal survey with multiple choice questions was sent to 350 patients identified on the hospital database who had undergone cardiac valve replacement. The data obtained was compared to database information and analysed.

**Results** Patients reported a variety of experiences following their discharge from hospital, from thrombo-embolic events, arrhythmias, bruising and bleeding and ongoing warfarin dosing difficulties. Very few patients (<0.5%) stated that given their experience would have chosen a different type of valve. Also few patients (<5%) who received biological valve replacements ended up requiring warfarin long term.

**Conclusions** Despite many patients having significant problems post-operatively, very few regret their choice of valve type.

### CT06 AORTIC FAT PAD AND NEW ATRIAL FIBRILLATION POST CARDIAC SURGERY. CARDIAC LYMPHATICS REVISITED

R. W. LUPINSKI

Waikato Hospital, Waikato, New Zealand

Lymphatics of the heart have not generated any broad or sustained interests among clinicians. Few publications on cardiac lymphatics are available, anatomy not routinely known and the true role of cardiac lymphatics remains doubtful. One important anatomical concept needing clarification is that of the lymphatic nature of conduction tissue. Sino-atrial node lymphatic collector is incorporated into Aortic Fat Pad and as such is the most frequently damaged lymphatic vessel during cardiac surgery. Thus, preservation of Aortic Fat Pad and its lymphatic collector should reduce the incidence of new atrial fibrillation in patients post cardiac surgery, an observation reported in the literature recently.

### CT07 THE UNIVERSAL ANASTOMOTIC STENT – A NOVEL PROXIMAL CORONARY ARTERY BYPASS ANASTOMOTIC DEVICE

M. P. HARDEN AND A. SIMS

University of New South Wales, New South Wales, Australia

**Purpose** Proximal anastomotic devices have been developed to produce predictable results that eliminate surgical technique as a variable with respect to the anastomosis, improve graft patency and lower the incidence of stroke. One criticism of current devices is foreign material contact at the anastomosis which is thought to stimulate intimal hyperplasia and thrombosis. In co-operation with AllVascular Restorative Vascular Solutions, an anastomotic device for use in vein graft-aortic anastomosis, the Universal Anastomotic Stent (UAS), was developed to eliminate foreign body contact with blood.

**Methodology** The design concept for the UAS was based on the Venous Valve Transfer stent developed by AllVascular. This stent is designed to transfer a functional venous valve to a vein with valve incompetence as a treatment of venous valve insufficiency. The UAS prototype developed from this stent underwent pre-clinical testing in sheep for design review.

**Results** Animal trials established that an external nitinol expanding stent can be used to create an arterial anastomosis. Loading a vein graft onto the UAS proved difficult in the absence of a crimping tool. A design concept for a dedicated loading tool has been developed and an animal model for future testing was finalised.

**Conclusions** The UAS, compared to existing anastomotic devices, has the advantage of maintaining intima-intima contact at the anastomosis, which may reduce the inflammatory response. External stenting may limit compliance mismatch at the anastomosis and reduce intimal hyperplasia. Further animal testing is required to establish if this novel anastomotic device will be suitable for human use.

### CT08 SURGICAL MANAGEMENT OF INFECTIVE ENDOCARDITIS: OUR EXPERIENCE

D. DAS, A. MOHANRAJ, P. HAYWARD, P. K. KUBA, S. SEEVANAYAGAM AND B. BUXTON

Austin Hospital, Victoria, Australia

**Purpose** In the light of improvement in results of surgery for acute infective endocarditis(IE),we analysed our surgical outcomes and risk factors associated with mortality in patients operated for acute IE in the past decade.

**Methodology** A retrospective study of 85 consecutive patients (54 males, 31 females, Mean age  $50.4 \pm 18.9$  years) who underwent surgery for IE between January 1997 to December 2006 was performed. The preoperative profiles, intraoperative findings and the postoperative outcomes were analysed.

**Results** Native valve endocarditis (NVE) was present in 78/85 patients and prosthetic valve endocarditis(PVE) in 7/85 patients. The aortic, mitral, tricuspid and multiple valves were involved in 30, 28, 15 and 9 patients respectively. Seven out of 12 intravenous drug abusers had tricuspid valve involvement. The commonest organism was Staphylococcus aureus. The indications for surgery were heart failure (75.2%), failure of medical management (15.2%), abscess (9.4%) and embolism (8.2%). 65 patients underwent valve replacements (55 prosthetic valves, 6 homografts and 2 Ross procedures). 20 patients underwent valve repairs/vegetectomies, of which 5 were mitral repairs. There were 16 in-hospital deaths (18.8% overall). The mortality was 16.6% in NVE compared to 42.8% in PVE ( $p < 0.05$ ). PVE, ventilation greater than 24 hours, acute renal failure and severe left ventricular dysfunction were associated with increased mortality ( $p < 0.05$ ). 4 patients required reoperation for recurrent endocarditis during 1 year follow-up.

**Conclusion** Operation for active IE carries acceptable mortality rate for this aggressive disease. Prolonged ventilation, renal failure and severe LV dysfunction are associated with increased risk of mortality.

### CT09 ACUTE ISCHAEMIC VENTRICULAR SEPTAL RUPTURE – A FORMIDABLE SURGICAL CHALLENGE

A. K. SIBAL, S. PRASAD, P. F. MILSOM, P. J. RAUDKIVI, P. M. ALISON AND D. A. HAYDOCK

Greenlane Cardiothoracic Surgical Unit, Auckland Hospital, Auckland, New Zealand

**Purpose** To evaluate our surgical results for ischaemic Ventricular Septal Rupture and suggest practice guidelines.

**Methodology** A retrospective review of data from patient records from 1992 to 2006 for presentation, surgical approaches, recurrence and mortality and analyzed for future management guidelines.

**Results** We had 36 patients with a mean age of  $70.44 (+/- 6.34)$ . 14 patients (38.9%) had an inferior/posterior defect, 28 were in shock (22 on IABP). Severe LV and RV dysfunction were present in 18 and 20 patients respectively. Repair involved patches after infarctectomy (17) or infarct exclusion (18), using either continuous or interrupted suture. Concomitant CABG was performed in 15. 11 patients had residual shunts, 2 requiring device closure and one surgery. Prolonged ICU and hospital stay was the norm. Early mortality was 52.78% (inferior defects – 85.71%, anterior defects – 31.82%). On Univariate analysis Inferior VSD (OR 7.7; 95% CI 1.7, 33.3), Moderate to severe RV impairment (OR 5.0; 95% CI 0.92, 33.3), Pre op shock (OR 6.7; 95% CI 1.6, 33.3), Early presentation post MI and infarctectomy during repair (3.8; 95% CI 0.9, 15.4), predicted mortality. For subgroup of anterior VSD, only pre-op shock (OR11.1; 95% CI 1.0, 100) predicted a poor outcome. On multivariate analysis, Inferior defects and shock at presentation were the dominant predictors for early death. Repair without cardioplegia (OR5.2; 95% CI 0.48, 56.09) was the only risk factor for recurrence.

**Conclusions** Acute ischaemic VSD is a grim surgical disease with high mortality. Inferior defects should be offered surgery only in exceptional circumstances due to uniformly poor outcome.

### CT10 MANAGING DEEP STERNAL WOUND INFECTIONS WITH VACUUM ASSISTED CLOSURE

Y. CHEN, A. A. ALMEIDA, S. MITNOVETSKI, J. GOLDSTEIN, C. LOWE AND  
J. A. SMITH

*Monash Medical Centre, Victoria, Australia*

**Purpose** Deep sternal wound infection is a rare but serious complication of cardiac surgery. Currently there is no consensus on the optimal management. Vacuum Assisted Closure (V.A.C.) has been increasingly used to facilitate wound healing. We aim to review the management of deep sternal wound infections using V.A.C. dressing at our hospital.

**Methodology** 31 consecutive deep sternal wound infections over a five year period were reviewed. V.A.C. dressing was used either as a stand alone therapy or as an intermediate therapy to late sternal reconstruction.

**Results** Deep sternal wound infections were diagnosed on average 13 days from initial surgery. 26 (84%) patients were treated with V.A.C. dressing. Of these, 17 (65%) had stand alone V.A.C. therapy and 9 were followed by sternal reconstruction. The average duration of V.A.C. dressing in the two groups were 21 and 13 days respectively. 7 patients died, 6 in the stand alone V.A.C. group and 1 in the intermediate V.A.C. group. The length of hospital stay was similar in both groups (41 vs. 45 days). Median follow up was 17 months. No late relapse was found in the stand alone group. In the intermediate therapy group, 2 patients had chronic wound sinuses and one patient had a wound collection.

**Conclusion** V.A.C. dressing may be used both as a stand alone and as an intermediate therapy for deep sternal wound infection. Reconstructive surgery may be avoided in a significant proportion of patients. No late relapse has been associated with V.A.C. use.

### CT11 CARBON DIOXIDE FLOODING IN CARDIAC SURGERY: AN OLD TECHNIQUE REVISITED

N. I. L. BHASKAR

*Wellington Hospital, Wellington, New Zealand*

Cerebral air embolism is a known complication of open-heart surgery with devastating consequences. Neurologic injury after CPB can be divided into 2 types:

Type I: Focal injury.

Type II: Intellectual deterioration/neurocognitive impairment (up to 53% at the time of hospital discharge and 42% could be impaired for up to 5 years). Increasing evidence points to cerebral embolization as the principal culprit. Since the early days of modern cardiac surgery, surgeons have attempted to limit its damage by various means. One of the early techniques propounded was carbon dioxide insufflation of the pericardial cavity. Carbon dioxide, was uniquely positioned for this, being denser than air, more soluble than air, and easily managed perioperatively if the blood levels were to go up beyond physiological ranges. The technique gradually went into disuse, since there was no instrumentation, in the early days of CPB to measure and establish its impact on the actual outcomes. Secondly, the devices, through which CO<sub>2</sub> was delivered, were not effective.

There has been increasing enthusiasm for the technique but no consensus on the technical considerations or on the actual benefits of the practice.

Our literature search showed that if practiced properly, carbon dioxide flooding does decrease the embolic counts significantly and that, by inference, could possibly improve the neurocognitive outcome. Since, there are no studies at this point in time, which show a direct beneficial correlation, we intend to do a prospective randomized controlled trial, to put things in proper perspective.

### CT12 SURGICAL MANAGEMENT OF DESCENDING NECROTIZING MEDIASTINITIS

N. K. KEJRIWAL, Z. LIN, G. PARKINSON, R. ULLAL AND P. SINGHAL

*Waikato Hospital, Hamilton, New Zealand*

Descending necrotizing mediastinitis is a form of mediastinitis caused by odontogenic infection or deep cervical infections, which spreads to the medi-

astinum via the cervical facial planes. Criteria adopted for the diagnosis of Descending Necrotizing mediastinitis are clinical manifestations of severe infection, demonstration of characteristic roentgenographic features, documentation of the necrotizing mediastinal infection and establishment of oropharyngeal or cervical infection with the development of the necrotizing mediastinal process. Most of the published reports in literature are single case report. The largest series published is of 17 patients over 15 years. Despite the increased use of CT scan as a diagnostic aid and the improvement in antibiotics, mortality in patients with descending necrotizing mediastinitis remains high, reported between 25–40% in the literature.

We have treated two patients with descending necrotizing mediastinitis at our institution. The primary oropharyngeal infection was Ludwig's angina in one and odontogenic abscess in other. Both patients underwent mediastinal drainage, one through midsternotomy and other through right thoracotomy in addition of cervical infection drainage. The outcome was favorable in both the patients.

Delay of diagnosis and inappropriate drainage of the mediastinum are the main cause of mortality in this life threatening condition. The various surgical approaches have been reported for mediastinal drainage to treat Descending necrotizing mediastinitis.

We report our experience of patients with Descending necrotizing mediastinitis and discuss the surgical management of this highly fatal condition.

### CT13 PREVENTION OF ATRIAL FIBRILLATION AFTER CABG WITH OMEGA-3 POLYUNSATURATED FATTY ACIDS

C. M. W. COLE, K. M. KOSTNER, J. MUNDY, T. MARWICK AND P. PETERS

*Princess Alexandra Hospital, Queensland, Australia*

**Purpose** Atrial fibrillation (AF) is a common complication of cardiothoracic surgery, occurring in more than 30% of patients undergoing CABG. Postoperative AF results in thromboembolic events, haemodynamic compromise and an increase in length and cost of hospitalisation. Any intervention that reduces the incidence of postoperative AF should result in fewer complications in addition to being of important economic benefit. Increased consumption of oily fish or Omega-3 Polyunsaturated Fatty Acid (PUFA) supplements substantially lowers the risk of sudden cardiac death and myocardial infarction both in primary and secondary prevention trials, through a reduction in fatal arrhythmias. Omega-3 PUFAs may also play a role in the treatment of AF as shown by cell culture research, animal models and a recent prospective observation study in 5000 elderly adults. With respect to postoperative AF, a recent Italian randomized controlled study in 160 patients showed that Omega-3 PUFA administration during hospitalisation in patients undergoing CABG reduced the incidence of postoperative AF by 54% and led to a shorter hospital stay.

**Methodology** We have undertaken a randomized, placebo controlled, prospective trial of Omega-3 PUFAs in patients undergoing CABG to examine its effect on the incidence of AF within 30 days and variations in length of hospital stay. We have also developed a clinically relevant measurement of the concentrations of the PUFA arachidonic acid and the omega-3 fatty acids eicosapentaenoic acid and docosahexaenoic acid in patients with and without atrial fibrillation.

**Results** We are presenting interim results of the first 80 patients enrolled in the trial.

### CT14 PREDICTING ONE-YEAR SURVIVAL AFTER SURGERY FOR EARLY STAGE NON-SMALL CELL LUNG CANCER

M. O'KEEFE, C. H. YAP, A. LEE, K. KIYINGI, N. ALAM AND G. WRIGHT

*St Vincent's Hospital, Victoria, Australia*

**Introduction** Post-operative survival after surgery for early stage non-small cell lung cancer (NSCLC) is influenced by factors such as stage of disease and co-morbidities. We sought to assess the performance of 2 models in predicting 1 year survival after resected NSCLC.

**Methods** The Colinet Simplified Co-Morbidity Score (SCS) (1) and a prognostic model by Birim (2) were retrospectively applied to a cohort of patients with surgically resected NSCLC. End-point was 1 year survival obtained from clinical follow-up and data-linkage with the Cancer Council of Victoria.

**Results** 216 patients were treated from Feb 1999 to Dec 2005. 52 patients were excluded due to missing data, leaving 164 patients for analysis. Mean patient age was  $66.4 \pm 10.3$ . Pathological stage was 1 in 61%, 2 in 19% and 3 in 17%. Observed 1 year survival was 78.7%.

SCS was predictive of 1 year survival: mean SCS 9.24 for survivors and 11.03 for non-survivors ( $p = 0.001$  by t-test). Patient's with low SCS (0-9) had a higher 1-year survival than those with high SCS (>9); 87.2% vs 69.2% ( $p = 0.005$  by chi-square test). SCS discriminated fairly for 1 year survival (area under ROC curve 0.66).

The predicted survival using the Birim model (74.2%) was similar to the observed survival ( $p = 0.43$ ). The model predicted survival well in both low (predicted 83% vs observed 88%,  $p = 0.51$ ) and high (66 vs 70%,  $p = 0.74$ ) risk groups. Birim model discriminated well for 1 year survival (area under ROC curve 0.70).

**Conclusion** SCS and the Birim model can both be used to estimate 1-year survival. They may aid the clinician in deciding who should be considered for surgical resection.

(1) Colinet B. *Br J Cancer* 2005; 93:1098–1105.

(2) Birim O. *J Thorac Cardiovasc Surg* 2006; 132:491–498.

### CT15 RISK STRATIFICATION MODELS FOR HEART VALVE SURGERY

C. H. YAP, M. O'KEEFE, M. MOHAJERI AND M. YI

*St Vincent's Hospital, Victoria, Australia*

**Purpose** Risk stratification models may be useful in aiding surgical decision-making, preoperative informed consent, quality assurance and healthcare management. While several overseas models exist, no model has been well-validated for use in Australia. We aimed to assess the performance of two valve surgery risk stratification models in an Australian patient cohort.

**Method** The Society of Cardiothoracic Surgeons of Great Britain and Ireland (SCTS) and Northern New England (NNE) models were applied to all patients undergoing valvular heart surgery at St Vincent's Hospital Melbourne and The Geelong Hospital between June 2001 and November 2006. Observed and predicted early mortalities were compared using the chi-square test. Model discrimination was assessed by the area under the receiver operating characteristic (ROC) curve. Model calibration was tested by applying the chi-square test to risk tertiles.

**Results** SCTS model ( $n = 1095$ ) performed well. Observed mortality was 4.84%, expected mortality 6.64% (chi-square  $p = 0.20$ ). Model discrimination (area under ROC curve 0.835) and calibration was good (chi-square  $p = 0.9$ ). The NNE model ( $n = 1015$ ) over-predicted mortality. Observed mortality 4.83% and expected 7.54% (chi-square  $p < 0.02$ ). Model discrimination (area under ROC curve 0.835) and calibration was good (chi-square  $p = 0.9$ ).

**Conclusion** Both models showed good model discrimination and calibration. The NNE model over-predicted early mortality whilst the SCTS model performed well in our cohort of patients. The SCTS model may be useful for use in Australia for risk stratification.

### CT16 HYBRID OPEN AND ENDOVASCULAR PROCEDURES FOR COMPLEX AORTIC PATHOLOGY IN THE HIGH-RISK SURGICAL PATIENT

M. L. NEALE, J. M. HEMLI, M. JAIN AND P. W. BRADY

*Royal North Shore Hospital, New South Wales, Australia*

**Purpose** The management algorithm for the complex aorta in the high-risk patient continues to evolve, especially given increasing applicability of endovascular solutions to these cases. We present three examples of aortic pathology managed in a staged fashion utilising hybrid open/endovascular techniques, as alternatives to classic aortic procedures.

**Methodology** Hybrid open/endovascular procedures were employed in three select cases. All patients underwent an open aortic "debranching" procedure, in which some of the cervical/thoracic/abdominal aortic branches were relocated, to permit subsequent insertion of an endoluminal prosthesis while preserving end-organ perfusion. The stent-graft was inserted as a separate procedure.

**Results** All patients were males aged over seventy-five years. Two patients presented with saccular aneurysms of the mid-distal aortic arch, whereas the third patient had a Crawford type I thoracoabdominal aortic aneurysm associated with chronic dissection. The left common carotid/subclavian arteries were relocated in all three patients, as were the major abdominal visceral vessels in the patient with thoracoabdominal disease. Endoluminal stent-grafts were placed into the relevant portion of the aorta in all patients. Stent-graft placement was successful in all cases, with radiologically confirmed exclusion of the relevant aortic pathology. There was no mortality and no significant morbidity.

**Conclusion** Patients considered to be at high risk for thoracic/thoracoabdominal open aortic surgery may be suitable for an endovascular management strategy, although an accompanying surgical debranching procedure may be required to facilitate the subsequent appropriate placement of a stent-graft.

### CT17P IMAGES OF AN INFARCT RELATED INCOMPLETE LEFT VENTRICULAR RUPTURE MANAGED WITH PERICARDIAL PATCH REPAIR

S. D. GALVIN, R. W. BUNTON AND V. CHEN

*Dunedin Hospital, Dunedin, New Zealand*

**Introduction** A 54-year-old woman presented with an inferior MI & post infarction pericarditis. Incomplete LV rupture was confirmed by MRI. She was managed with pericardial patch repair of her LV.

**Case** Our patient presented with 1 week of chest pain, elevated Troponin T & ECG suggesting a recent inferior MI. Angiography showed an occluded obtuse marginal artery, left ventriculogram a 1 cm endocardial defect in a hypokinetic segment of the infero-lateral LV & transthoracic echo a small LV wall defect with a haemodynamically insignificant pericardial effusion. Cardiac MRI confirmed an infero-lateral infarct & an anatomical defect suggesting incomplete rupture of the LV free wall. Operatively straw colored pericardial fluid & a shaggy pericarditis were noted. Myocardium supplied by the obtuse marginal artery had appearances of recent infarction & on cardiopulmonary bypass a pericardial patch was glued over this area. The patient required elective drainage of a persistent pericardial effusion and was discharged on the 13th post-operative day. 4 weeks after discharge she was asymptomatic with echo showing a resolving pericardial effusion.

**Discussion** Incomplete LV rupture following MI is rare & caused by haemorrhagic dissection of the ventricular wall leaving a defect lined by epicardium alone. The natural history is not well described but may include free wall rupture with an in-hospital mortality of 70%. Pericardial patch augmentation of the LV may reduce the risk of free wall rupture.

**Conclusion** Management of incomplete LV rupture is poorly described but reinforcement of the area with a pericardial patch may be performed safely to reduce the risk of free wall rupture.

### CT18P RADIOFREQUENCY ABLATION OF LUNG TUMOURS: A SYSTEMATIC REVIEW

J. C. ZHU, T. D. YAN, D. BLACK AND D. L. MORRIS

*Department of Surgery, St. George Hospital, New South Wales, Australia*

**Purpose** This systematic review aims to assess the safety and efficacy of radiofrequency ablation (RFA) for pulmonary malignancies.

**Methodology** Searches for relevant literature on RFA for lung tumours prior to Nov 2006 were performed in six electronic databases. Application of predetermined inclusion and exclusion criteria, quality assessment and data extraction were independently performed for all retrieved studies. Results were synthesized through tabulation and combined with a narrative review.

**Results** Sixteen relevant studies on lung RFA with more than 10 patients that reported rates of morbidity, mortality, complete tumour ablation, local recurrence or survival were identified for this review. All included studies were level 4 evidence case series with median follow-up periods ranging from 9–24 months. The overall post-procedural morbidity rates ranged from 15–76% and mortality rates ranged from 0–5%. The most common complications were pneumothoraces occurring at 9–61% of procedures. The rates of complete tumour necrosis achieved by RFA ranged from 38–98% while the rates of local recurrence from previously ablated lesions ranged from 2–38%. The overall median progression free interval ranged from 13 to 26 months. The

overall median survival from the time of lung RFA, ranged from 8–33 months, with 1, 2 and 3 year survival of 71–85%, 55–65% and 38–46%, respectively.

**Conclusion** The available evidence for radiofrequency ablation of primary and metastatic lung tumours is very limited. Surgical resection should remain the standard of care when feasible. Radiofrequency ablation, however, is safe and appears to have a promising role in the treatment of unresectable lung tumours.

#### CT19P

##### TRICUSPID VALVE REPAIR IN 'TORRENTIAL TRICUSPID REGURGITATION' FOLLOWING PERMANENT PACEMAKER LEAD EXTRACTION – A CASE REPORT

D. MEHROTRA, A. MILLER, H. MCALISTER AND N. K. KEJRIWAL

Waikato Hospital, Waikato, New Zealand

**Introduction** Traumatic tricuspid regurgitation secondary to blunt chest trauma has been reported in literature. We report our experience with a case of 'Torrential Tricuspid Regurgitation' following permanent pacemaker lead extraction which was successfully treated with tricuspid valve repair and annuloplasty.

**Report** A 67 year old woman was treated for Sick sinus syndrome with permanent pacemaker implant. She had three generator changes for end of life and repositioning. Erosion of generator, led cardiologist to plan lead and generator extraction with the surgical backup. During lead extraction a small piece of papillary muscle was avulsed. The patient remained hemodynamically stable in the theatre. However in ward she developed right sided cardiac failure not responding to conservative therapy. A transthoracic echo (TTE) revealed torrential tricuspid regurgitation with a freely mobile posterior leaflet with attached chordae and avulsed papillary muscle. During surgery the tricuspid valve was successfully repaired and transesophageal (TOE) images showed trivial to mild tricuspid regurgitation at the end of repair procedure. Additional procedure also included ligation of both atrial appendages and implantation of epicardial leads and pacemaker. Patient made good recovery from operation.

**Conclusion** To the best of our knowledge this is first report of repair of tricuspid valve in 'Torrential Tricuspid Regurgitation' following pacemaker lead extraction. We share our experience with tricuspid valve repair technique and annuloplasty.

#### CT20P

##### ENDBRONCHIAL PALLIATION USING ND:YAG LASER IS ASSOCIATED WITH IMPROVED SURVIVAL WHEN COMBINED WITH MULTIMODAL ADJUVANT TREATMENTS

C. HAN, G. WRIGHT AND D. PRASEYATPO

Peter MacCallum Cancer Institute, Victoria, Australia

**Purpose** This study aims to confirm the safety and effectiveness of Nd:YAG laser therapy in the contemporary setting and investigate the effectiveness of multi-modal therapy compared to laser alone.

**Methodology** 153 Nd:YAG laser treatments on 110 patients between 1999 and 2004 were reviewed retrospectively. Symptom scores for dyspnoea, haemoptysis and cough before and after the procedure were compared. Survival and time to reintervention were analysed using the Kaplan-Meier method. Multimodality treatment was compared to Nd:YAG laser therapy alone to determine differences in survival and time to reintervention. P values less than 0.05 were considered significant.

**Results** There were no operative mortality directly caused by laser intervention, however 30 day mortality was 6.5%. Deaths were due to progression of advanced neoplastic processes rather than laser intervention, 6.5% of patients had some post-operative morbidity. After Nd:YAG laser intervention, 76% of patients reported improvement to dyspnoea, 94% for haemoptysis and 75% for cough. Median survival after Nd:YAG laser treatment was 6.64 months, 21% requiring repeated laser. Compared to Nd:YAG laser treatment alone, multimodality treatments significantly prolonged median time to reintervention by 1.7 months ( $p = 0.002$ ) and prolonged median survival by 4.9 months ( $p < 0.001$ ) in patients with NSCLC.

**Conclusion** Nd:YAG laser intervention is safe and effective for palliation of endobronchial malignancies. In most cases it is only required to be per-

formed once. Multimodal treatment prolonged survival compared to Nd:YAG laser therapy alone.

#### CT23

##### WHAT'S NEW IN ICU

G. M. SHAW

Christchurch School of Medicine and Health Sciences, University of Otago, Christchurch, New Zealand

Intensive care medicine is at the intersection of medical, surgical and engineering sciences. While the lion's share of attention in medical research focuses on magic bullets, these have largely failed to deliver in intensive care. Specifically, significant improvements have come from improving what might be regarded as the 'bread and butter' of clinical practice. Improvements in the management of sedation, ventilation, glycaemic control, sepsis, shock and renal support have resulted in significant improvements in patient outcomes.

Simple measures such as switching off sedation on morning rounds can reduce duration of mechanical ventilation and length of intensive care stay by 32 to 35%<sup>1</sup>.

Reduction of tidal volumes in acute respiratory distress syndrome (ARDS) from 12 to 6 ml per kilogram has reduced mortality from 39.8% to 31% in a landmark study of 861 patients<sup>2</sup>. This is consistent with findings from smaller clinical trials and animal data linking shear forces in the lung, produced by mechanical ventilation, with biological injury.

A recent study of 1548 mainly cardiothoracic surgical patients found that intensive insulin therapy reduced intensive care mortality from 8.0% with conventional treatment to 4.6%, with the greatest reduction in death due to multiple-organ failure with a proven septic focus<sup>3</sup>. Bloodstream infections, acute renal failure, red-cell transfusions, and critical-illness polyneuropathy were also all reduced by over 40%.

Early goal directed therapy reduced in-hospital mortality from 46.5% to 30.5% in a cohort of 263 patients admitted to an emergency department in patients with severe sepsis or septic shock<sup>4</sup>. Significant benefits resulted from early resuscitation of shocked patients using predefined protocols.

**Summary** Targeted protocolised therapies across a wide range of intensive care conditions have resulted in the greatest outcome benefits for critically ill patients.

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#### CT24

##### ICU PROTOCOLS

D. R. BOWIE

Christchurch, New Zealand

During its development in the past 4 decades the perioperative care of cardiac surgery patients has been the most protocolised in any branch of surgery. Initially this protocolisation was developed to allow the introduction to the clinical environment of applied physiology which had previously only been possible in the research laboratory. Invasive pressure monitoring, blood chemistry management, cardiac performance manipulation and coagulation control were all subject to rule based management which could be successfully implemented by staff with a wide range of knowledge and experience.

Coronary Artery Surgery is now reported to be the commonest single procedure performed in North America and what was once considered 'Miraculous' is now routine. Active Physiological management which was once only

the realm of specialised units is now taught to all medical students. The protocols used in the perioperative management of 21st century cardiac surgery patients although still based on sound physiological criteria are now directed towards resource optimisation. Low mortality is now a given and so techniques which decreasing ICU and hospital stay and maximise value for money while at the same time decreasing complication rates are the new focus.

## CT25 CPAP: AN OVERVIEW AND CURRENT APPLICATIONS

G. M. SHAW

*Christchurch School of Medicine and Health Sciences, University of Otago, Christchurch, New Zealand*

CPAP was first used for over 70 years ago and confers benefit to patients through a number of different mechanisms:

- Reduction in left ventricular afterload
- Reduction in work of breathing
- Improved work sharing of fatiguing muscle groups
- Maintenance of lung volumes with improved ventilation perfusion matching and improvement in oxygen
- Prevention of upper airway obstruction
- Reduced stress and 'biological' injury

In a study of prophylactic CPAP following major abdominal surgery, those randomised to CPAP had a lower intubation rate (1% vs 10%, Relative risk [RR], 0.099, 95% CI, 0.01–0.76,  $p = 0.005$ ) and had a lower occurrence rate of pneumonia (2% vs 10%, RR, 0.19; 95% CI, 0.04–0.88,  $p = 0.02$ ), infection (3% vs 10%, RR, 0.27; 95% CI, 0.07–0.94,  $p = 0.03$ ), and sepsis (2% vs 9%, RR, 0.22, 95% CI, 0.04–0.99,  $p = 0.03$ ) than did patients treated with oxygen alone<sup>1</sup>.

The benefit of CPAP, largely through a reduction in the need for intubation and ventilation, are now clearly established in acute cardiogenic pulmonary oedema. A recent meta-analysis showed CPAP reduces mortality (RR, 0.59, 95% CI 0.38–0.90,  $p = 0.15$ ) and the need for mechanical ventilation (RR, 0.44, CI, 0.29–0.66,  $p = 0.0003$ )<sup>2</sup>.

**Summary** The perioperative cardiac surgical patient will frequently have impaired left ventricular function, pulmonary oedema, or atelectasis, all of which may be improved with the application of CPAP. Hence CPAP is likely to confer significant benefits through reduction in intubation, ventilation associated pneumonia, and mortality in the immediate post operative period.

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## CT26 MANAGING THE HUMAN FACTOR

R. HENDERSON

*Auckland, New Zealand*

Flying a commercial aircraft is sometimes referred to as being 95% sheer boredom and 5% sheer terror. The safety record of modern airliners is dramatic. In 2006 there was one fatal accident for every 2.6 million departures. To put this in perspective: there were 65 departures every 60 seconds during that year; and one fatal accident every 28 days. While progress continues to be made on both the technical and human issues involved with aircraft design and operation, recent accidents, such as Swissair 111, have shown how rapidly a situation can progress from uncertainly to alarm to critical.

In the last 10 years the number of airlines in the world flying western-built jets has increased by 46% (674 to 990), the number of flights has increased by 49%, the number of fatal accidents (hull losses) has decreased by 36% and the number of 'near-misses' has increased by 85%. These statistics suggest that major gains have been made in the area of human factors training given that the aircraft designs achieved a very high level of reliability some time ago.

Human factors training in aviation is now focused on the management of 'threats' and 'errors'. This presentation will review this training philosophy and consider parallels for the medical environment.

## CT27 A HISTORY OF ERRORS AND THE CHRISTCHURCH SOLUTION

D. P. SHAW

*Christchurch, New Zealand*

An adverse outcome represents the summation of many different errors. These errors may be equipment related, process related, personnel related etc. When the summation of these errors reaches a critical point an adverse outcome occurs.

After a personal analysis of adverse outcomes the below 5 rules were instigated.

The author believes that a large number of adverse medical outcomes could be avoided by the adherence of these rules. Such a system of rules removes the reluctance of many junior staff to contact their seniors, instead it acts as a compulsory communication protocol between the senior and junior staff.

These rules form part of the resident staff orientation. They are displayed in the nurses office on the ward and each resident is given a laminated credit card size version to clip to their hospital ID.

The rules are:

1. All referrals outside the service must be approved by a Registrar or Consultant
2. Ensure patients have a management plan
3. Ensure adequate patient records are maintained (objective, no personal conclusions, not inflammatory)
4. Instructions from those above in the chain of command cannot be countermanded by those below without discussion with those issuing the instructions
5. If you don't know – ask, you should never feel out of your depth

## CT28 CREATING THE "ERROR ENVIRONMENT"

A. F. MERRY

*Auckland, New Zealand*

The Second Global Patient Challenge, 'Safe Surgery Saves Lives' initiative of the World Health Organisation (WHO) will promote standardised, evidence-based approaches to improving patient safety, in part through measures to reduce certain common errors.

From harmless slips (using salt instead of sugar) to disastrous and costly failures (a wrong drug leading to the death of a patient, wrong co-ordinates in a navigational computer leading to the Erebus airline disaster, or the simultaneous use of empirical and metric systems of measurement in an international collaboration leading to the loss of a Mars probe), error shadows every human endeavour, in part because error is closely linked to creativity and success.

Our team has developed realistic scenarios using a high-fidelity human-patient simulator, in which participants must cope with multiple demands at times of high stress and distraction. In this 'error environment' anaesthetists are likely to fail in various ways, which may be predicted from the fundamental theories of the genesis of human error, thus allowing us to better study these otherwise rare events. In the next phase of our research we plan to include surgeons as active subjects, and to focus on the functioning of the team rather than the individual. This will further elucidate the factors which contribute to positive and negative aspects of human performance and will inform initiatives (such as that of the WHO) to improve patient safety in the operating room.

## CT29 MECHANICAL VALVE HISTORY – "MEDTRONIC" TELECONFERENCE PRESENTATION

A. CAMPBELL

Charles Hufnagel began the era of artificial heart valve implantation in 1952, before the existence of technology that allowed the heart to be arrested.

Hufnagel implanted a Lucite tube and ball in the descending aorta with clamps that facilitated rapid insertion without arresting the heart. Although valves in the descending aorta were somewhat successful in the management of aortic insufficiency, only a device placed in the appropriate anatomical or orthotopic position could help patients with valvular stenosis. This presentation will review the development of mechanical heart, emphasizing changes in valve design resulting from our greater understanding of blood hemodynamics, the mechanical forces imposed on valve components, and the interaction of artificial materials with components of circulating blood. The evolution from polymer to metal and finally the dominance of pyrolytic carbon as the material of choice will be explored. Similarities and differences between the four bileaflet valves that have received FDA approval and the two valves with CE mark approval that have not yet received FDA approval will be discussed.

### CT30 PERCUTANEOUS VALVE ACCOMPLISHMENTS AND CHALLENGES

A. CAMPBELL

At the end of the 20th century several inventors had suggested methods for catheter based implantation of cardiac valves. In September of 2000 Professor Philipp Bonhoeffer made transcatheter valve delivery a reality with the implantation of a stent mounted biological valve in the pulmonary position. Dr. Alain Cribier followed in 2002 with the first successful transcatheter implantation of a valve into the more challenging aortic position. Cardiac surgeons and industry seemed to show little interest in percutaneous valve delivery until January of 2004 when Edwards Life Science invested over \$125 million in acquiring PVT, the company building the valves implanted by Dr. Cribier and Medtronic revealed the company's support for Dr. Bonhoeffer's efforts. A number of challenges have been identified and significant progress has been made in addressing some of these challenges. This presentation will describe the challenges associated with pulmonic and aortic transcatheter valve delivery. The progress that has been made in overcoming these challenges as well as the efforts being made to overcome the remaining challenges will be discussed.

### CT31 HYPERBARIC OXYGEN IN POST-CARDIAC SURGERY STROKE PATIENTS – THE CHRISTCHURCH EXPERIENCE

A. J. GIBSON

*Christchurch Hospital, Christchurch, New Zealand*

**Introduction** Post-operative strokes occur in a small percentage of adult cardiac surgical patients and have devastating consequences for these patients.

There is evidence to suggest that Cerebral Arterial Gas Embolism (CAGE) is an important aetiological factor in most of these cases.

Hyperbaric Oxygen therapy (HBOT) is the administration of 100% oxygen at greater than atmospheric pressure. It is accepted as the definitive treatment for CAGE related to SCUBA diving accidents. The similarities between this and the pathophysiology of post cardiac-surgical strokes due to iatrogenic CAGE suggest that beneficial effects from HBOT may accrue to these patients.

**Purpose** The purpose of this study is to review the experience of treating post cardiac-surgical stroke patients in our local hyperbaric oxygen facility, including their presentation, delay before treatment and outcomes. The current evidence base is reviewed.

**Method** A retrospective case series analysis was conducted.

**Results** Over a 10 year period, patients with post cardiac-surgical strokes and who presented within the first 48 hours were referred for HBOT, of whom 12 were treated. The neurological outcomes were excellent in all but one case who died.

A review of the literature provides a rational basis for the potential benefits of HBOT in this scenario, but at present there is only limited clinical data to support its use.

**Conclusion** The postulated mechanisms for the development of post cardiac-surgical strokes provide a sound theoretical basis for the suggestion that the use of HBOT is associated with improved outcomes. However there is no prospective data to support such a claim. Such a trial would be problematic and until more evidence is available, HBOT should be considered on a case by case basis.

### CT32 WHEN TO CALL THE SURGEON

D. P. SHAW

*Christchurch, New Zealand*

Not infrequently, a patient status has changed and the surgeon is not informed. This not only leads to frustration but potentially bad outcomes. Devising a protocol for when to call the surgeon is fraught with difficulties. Frequently they are so complicated that individuals were unable to remember them thus the protocols are not applied. High turnover of junior staff means that large protocol books are not read.

The below three rules are designed to fulfil the role of protocols. They are compulsory flags for when the surgeon is to be called. They are not guides to management nor comments on adequacy of management. Their intent is to flag a change in status of the patient. The compulsory nature of the flags reduces the decision making and stress for the resident staff as to whether or not they should be calling the boss.

The surgeon is to be called when

1. The patient is to receive blood or blood products
2. The inotropes dose is doubled from admission
3. A vasoconstrictor is started