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We present our experience with four-arm robotic surgery for lung lobectomy with mediastinal node dissection. It is practicable, safe, and associated with shorter postoperative hospitalization than open surgery. The number of lymph nodes sampled suggests that the procedure is oncologically adequate.

- 26 Risk factor analysis for postoperative acute respiratory distress syndrome and early mortality after pneumonectomy: The predictive value of preoperative lung perfusion distribution**
Joon Bum Kim, MD, Sei Won Lee, MD, Seung-Il Park, MD, Yong Hee Kim, MD, and Dong Kwan Kim, MD, Seoul and Seongnam, Korea

After pneumonectomy, multivariable analyses identified lower predicted postoperative forced expiratory volume in 1 second and higher perfusion fraction of resected lung as predictors of postoperative acute respiratory distress syndrome and early mortality.

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32 A prospective, randomized trial comparing BioGlue and Vivostat for the control of alveolar air leak

Elizabeth Belcher, MRCP, FRCS, PhD, Michael Dusmet, MD, Simon Jordan, FRCS, MD, George Ladas, FRCS, FETCS, Eric Lim, FRCS, MSc, and Peter Goldstraw, FRCS, London, United Kingdom

Although BioGlue has been shown to be efficacious in the control of airleak after thoracic surgery, Vivostat has inherent advantages as a sealant. In a randomized, controlled trial of BioGlue versus Vivostat in the control of alveolar airleak, there were no differences in duration of airleak, intercostal drainage, or hospital stay.

39 Double-bar application decreases postoperative pain after the Nuss procedure 

Tomohisa Nagaso, MD, Junpei Miyamoto, MD, Kiyokazu Kokaji, MD, Ryohei Yozu, MD, Hua Jiang, MD, HongMei Jin, and Tamotsu Tamaki, PhD, Tokyo and Nippon, Japan; and Shanghai, China

We investigated whether double-bar application reduces pain after the Nuss procedure. Patients who received double-bar application had less pain than those with single-bar application, which was further supported by a biomechanical study demonstrating that stresses on the thoraces are reduced by additional bar application.

45 A randomized, controlled study of amiodarone for prevention of atrial fibrillation after transthoracic esophagectomy



James E. Tisdale, PharmD, Heather A. Wroblewski, MSN, Donna S. Wall, PharmD, Karen M. Rieger, MD, Zane T. Hammoud, MD, Jerry V. Young, MD, and Kenneth A. Kesler, MD, Indianapolis, Ind

Patients undergoing esophagectomy randomly received amiodarone (n = 40) or no prophylaxis (control, n = 40). The incidence of atrial fibrillation was lower in the amiodarone group than in the control group (15% vs 40%, $P = .02$, relative risk reduction 62.5%). Amiodarone significantly reduced the incidence of atrial fibrillation after esophagectomy.

Acquired Cardiovascular Disease (ACD) 52

Endovascular repair of aortic arch lesions in high-risk patients or after previous aortic surgery: Midterm results

Ludovic Canaud, MD, Kheira Hireche, MD, Jean-Philippe Berthet, MD, Pascal Branchereau, MD, Charles Marty-Ané, MD, PhD, and Pierre Alric, MD, PhD, Montpellier, France


The aim of this study is to assess the midterm outcomes after endovascular repair of aortic arch lesions in high-risk patients or after previous aortic surgery. Hybrid endovascular aortic arch reconstructions provide an attractive alternative for treating aortic arch lesions in high-risk patients.

59 Determinants of in-hospital and long-term surgical outcomes after repair of postinfarction ventricular septal rupture

Satsuki Fukushima, MD, PhD, Peter J. Tesar, FRACS, Homayoun Jalali, FRACS, Andrew J. Clarke, FRACS, Hemant Sharma, MCh, Jivesh Choudhary, MCh, Harry Bartlett, PhD, and Peter G. Pohlner, FRACS, Chermside and Brisbane, Australia


A consecutive series of 68 patients who underwent repair of postinfarction VSR was studied with a mean follow-up period of 9.2 ± 4.9 years. Thirty-day mortality was 35%, and actuarial survival of 30-day survivors was 51% at 15 years. Predictors of long-term congestive cardiac failure and ventricular arrhythmia varied.

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66 To graft or not to graft? Do coronary artery characteristics influence early outcomes of coronary artery bypass surgery? Analysis of coronary anastomoses of 5171 patients 

Dumbor L. Ngaage, MSc, FWACS, FETCS, FRCS (C-Th), Imranullah Hashmi, MBBS, Steven Griffin, FRCS(C-Th), Michael E. Cowen, FRCS, Alexander R. Cale, MD, FRCS (C-Th), and Levent Guvendik, FRCS, East Yorkshire, United Kingdom

Small coronary diameter and extensive atherosclerosis, increasingly encountered in current practice, pose operative difficulties. This study reports the impact of grafting poor-quality coronary targets and incomplete revascularization, which can result from avoiding such vessels, on early postoperative major adverse cardiac events.

73 Long-term (5- to 20-year) patency of the radial artery for coronary bypass grafting 

Paul Achouh, MD, Redha Boutekadjirt, MD, Daniel Toledano, MD, Nadjib Hammoudi, MD, Jean-Yves Pagny, MD, Pascal Goube, MD, Khaled Ould Isselmou, MD, Bernard Lancelin, MD, Régis Fouquet, MD, and Christophe Acar, MD, Paris and Corbeil, France

Angiographic evaluation of the radial artery graft was performed after 5 to 20 years in 202 patients. Patency of radial arteries was 83% at 10.5 years, which was similar to previously reported patency rates at 1 year and 5 years.

80 Influence of timing of intraaortic balloon placement in cardiac surgical patients

Jayshree D. Lavana, MBBS, MD, FJFICM, John F. Fraser, MB ChB, MRCP, FRCA, FFARCSI, FJFICM, Susan E. Smith, BSc (Hons), Lesley Drake, BBusHA (HIM), Peter Tesar, MBBS, FRCS, and Daniel V. Mullany, MBBS, FANZCA, FJICM, Brisbane, Queensland, Australia

This study evaluated the association of timing of intraaortic balloon placement with outcomes in cardiac surgical patients. Observed in-hospital and risk-adjusted mortality were lower in patients receiving preoperative compared with intraoperative or postoperative balloon pumps.

86 Quality of mitral valve repair: Median sternotomy versus port-access approach

Ehud Raanani, MD, Dan Spiegelstein, MD, Leonid Sternik, MD, Sergey Preisman, MD, Yaron Moshkovitz, MD, Aram K. Smolinsky, MD, and Amihai Shinfeld, MD, Tel Aviv, Israel

The durability of minimally invasive mitral valve repair has not been well investigated. One hundred forty-three patients underwent surgical intervention for posterior leaflet pathology: 61 through the port-access and 82 through the sternotomy approach. Late echocardiographic analysis revealed that 82% (49/60) of patients with port access and 91% (73/80) of patients with sternotomy were free from moderate or severe mitral regurgitation ($P = .11$).

91 Mortality after coronary artery revascularization of patients with rheumatoid arthritis

Joji J. Varghese, MD, Sushma Koneru, MD, Steven L. Scaife, MS, Whitney E. Zahnd, MS, and Mark L. Francis, MD, Springfield, Ill

Among all patients undergoing either percutaneous coronary interventions or coronary artery bypass grafting, patients with rheumatoid arthritis were 49% less likely to die while hospitalized after adjusting for confounding variables. Patients with rheumatoid arthritis undergoing either procedure also had reduced lengths of hospitalization and reduced total hospital charges.

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97 A new approach to interventional atrioventricular valve therapy

Andreas Goetzenich, MD, Guido Dohmen, MD, Nima Hatam, MD, Thorsten Deichmann, Dipl-Ing, Christoph Schmitz, Dipl-Ing, Andreas H. Mahnken, MD, PhD, Rüdiger Autschbach, MD, PhD, and Jan Spillner, MD, Aachen, Germany

We show the functionality of an additional heart valve prosthesis placed in a complex, collapsible, and self-expanding hollow body, adapting to surrounding structures and excluding the left atrium. We show that anchoring an additional heart valve in the mitral position does not necessarily need to be performed in the heart valve structure itself.

103 Nonelective cardiac surgery in the elderly: Is it justified? 


Ravi K. Ghanta, MD, Prem S. Shekar, MD, Siobhan McGurk, BS, Donna M. Rosborough, RN, MS, and Sary F. Aranki, MD, Boston, Mass

We review the long-term survival and quality-of-life outcomes of 262 consecutive octogenarians and nonagenarians who underwent nonelective cardiac surgery. Survival and postoperative quality of life after nonelective cardiac surgery equals that of the general elderly population. Age alone should not disqualify a patient for urgent or emergent cardiac surgery.

110 How much of the intraaortic balloon volume is displaced toward the coronary circulation?

Christina Kolyva, PhD, George M. Pantalos, PhD, John R. Pepper, MChir, FRCS, and Ashraf W. Khir, PhD, Middlesex and London, United Kingdom; and Louisville, Ky

The blood volume displaced toward the coronary circulation during intraaortic balloon inflation was assessed in vivo and in vitro. This volume was approximately 5% of the nominal volume of the intraaortic balloon. Although small, this volume can provide significant augmentation in baseline coronary flow.

117 How much septal–lateral mitral annular reduction do you get with new ischemic/functional mitral regurgitation annuloplasty rings? 

Wolfgang Bothe, MD, Julia C. Swanson, MD, Neil B. Ingels, PhD, and D. Craig Miller, MD, Stanford and Palo Alto, Calif

The amount of disproportionate mitral annular septal–lateral reduction inherent in new ischemic/functional mitral regurgitation annuloplasty rings is unknown. Relative to the Edwards Physio ring, the GeoForm provides the greatest degree of septal–lateral reduction, followed by the IMR ETlogix and Medtronic Profile 3D, whereas the St Jude Medical Rigid Saddle Annuloplasty Ring's septal–lateral dimensions were similar.

122 Changes in cardiac and cognitive function and self-reported outcomes at one year after coronary artery bypass grafting

Lars Mathisen, MS, Per Snorre Lingaas, MD, Marit Helen Andersen, PhD, Per Kristian Hol, MD, PhD, Per Morten Fredriksen, PhD, Kjetil Sundet, PhD, Berit Rokne, PhD, Astrid Klopstad Wahl, PhD, and Erik Fosse, MD, PhD, Oslo and Bergen, Norway

Individual changes in cardiac performance, cognitive function, and angina, assessed at 1 postoperative year, were significant for subjective health status relative to the predictions possible from preoperative health status, sex, and graft patency. Awareness of the extent and impact of outcome variation on health status is important when counseling patients.

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Congenital Heart Disease (CHD)

- 129 Fenestration during Fontan palliation: Now the exception instead of the rule**
Jorge D. Salazar, MD, Farhan Zafar, MD, Kashif Siddiqui, MD, Ryan D. Coleman, BA, David L. S. Morales, MD, Jeffrey S. Heinle, MD, Joseph W. Rossano, MD, Emad B. Mossad, MD, and Charles D. Fraser, Jr, MD, Houston, Tex


Highly selective use of fenestration during Fontan palliation preserves excellent short- and long-term outcomes while avoiding the risks of hypoxia, paradoxical embolus, and need for late catheter-based interventions. Increased use of extracardiac conduits is associated with decreased use of fenestration.

- 137 Chronologic changes in P-wave characteristics after the Fontan procedure: The effect of surgical modification**
Masahiro Koh, MD, Hideki Uemura, MD, Akiko Kada, MPH, Koji Kagisaki, MD, Ikuo Hagino, MD, and Toshikatsu Yagihara, MD, Osaka, Japan, and London, United Kingdom

P-wave characteristics were analyzed chronologically after 3 types of Fontan-type procedures. Changes in P-wave characteristics over time showed that intra-atrial baffling and atriopulmonary connection caused a similar trend toward a propensity to development of arrhythmia. An extracardiac conduit was associated with unchanged P-wave characteristics, supporting this procedure as the preferred option.

- 144 Genetic factors are important determinants of impaired growth after infant cardiac surgery**
Nancy Burnham, RN, MSN, CRNP, Richard F. Ittenbach, PhD, Virginia A. Stallings, MD, Marsha Gerdes, PhD, Elaine Zackai, MD, Judy Bernbaum, MD, Robert R. Clancy, MD, and J. William Gaynor, MD, Philadelphia, Pa, and Cincinnati, Ohio

Impaired growth for both weight and head circumference is common (both >30%) in this cohort of children after infant cardiac surgery. Genetic factors such as the apolipoprotein E ϵ 2 allele and the presence of a definite or suspected genetic syndrome were associated with impaired growth velocity. Persistent poor growth might have long-term implications for the health and development of children with congenital heart defects.

- 150 Patent ductus arteriosus ligation is associated with impaired left ventricular systolic performance in premature infants weighing less than 1000 g**
 *Patrick J. McNamara, MB Bch MRCPCH, Lilian Stewart, MD, Sandesh P. Shivananda, MD, Derek Stephens, MSc, and Arvind Sehgal, MD, Toronto, Ontario, Canada*

Patent ductus arteriosus ligation is associated with cardiorespiratory instability. The nature of the deterioration may relate to impaired left ventricular performance, particularly in neonates weighing <1000 g.

- 158 Early and delayed atrioventricular conduction block after routine surgery for congenital heart disease**
Angela Lin, BS, William T. Mahle, MD, Patricio A. Frias, MD, Peter S. Fischbach, MD, Brian E. Kogon, MD, Kirk R. Kanter, MD, and Paul M. Kirshbom, MD, Cleveland, Ohio, and Atlanta, Ga

Surgery for congenital cardiac disease involving VSD closure can result in early or delayed AV block. A review of 922 patients a median of 4.1 years after surgery demonstrated a 2.3% incidence of postoperative AV block (1.4% transient, 0.9% permanent) and a 0.3% to 0.7% incidence of delayed AV block 2 to 34 months after surgery.

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Cardiothoracic Transplantation (TX)

- 161 A United Network for Organ Sharing analysis of heart transplantation in adults with congenital heart disease: Outcomes and factors associated with mortality and retransplantation**

Tara Karamlou, MD, MSc, Jennifer Hirsch, MD, MS, Karl Welke, MD, MS, Richard G. Ohye, MD, Edward L. Bove, MD, Eric J. Devaney, MD, and Robert J. Gajarski, MD, Ann Arbor, Mich, and Portland, Ore

Outcomes and risk factors for mortality and retransplantation (RTx) among patients with adult congenital heart disease (ACHD) were compared with those of other adult recipients (ARs). Transplantation prevalence increased by 41% among patients with ACHD, with a decrease in prevalence for ARs. Both death and RTx rates were higher among patients with ACHD, possibly because of differences in posttransplantation immunosuppression therapy.

- 169 The impact of bridge-to-transplant ventricular assist device support on survival after cardiac transplantation**

David A. Bull, MD, Bruce B. Reid, MD, Craig H. Selzman, MD, Rebecca Mesley, BS, Stavros Drakos, MD, Steven Clayson, MD, Greg Stoddard, PhD, Edward Gilbert, MD, Josef Stehlik, MD, Feras Bader, MD, Abdallah Kfoury, MD, Deborah Budge, MD, David D. Eckels, PhD, Anne Fuller, BS, Dale Renlund, MD, and Amit N. Patel, MD, Salt Lake City and Murray, Utah


In patients with idiopathic dilated cardiomyopathy, placement of a Heartmate I (Thoratec Corp, Pleasanton, Calif) ventricular assist device as a bridge to a cardiac transplant is associated with an elevation in pretransplant panel-reactive antibody sensitization and a decrease in 1- and 5-year survivals after cardiac transplantation.

- 174 Post-cardiac transplant survival after support with a continuous-flow left ventricular assist device: Impact of duration of left ventricular assist device support and other variables**

Ranjit John, MD, Francis D. Pagani, MD, Yoshifumi Naka, MD, Andrew Boyle, MD, John V. Conte, MD, Stuart D. Russell, MD, Charles T. Klodell, MD, Carmelo A. Milano, MD, Joseph Rogers, MD, David J. Farrar, PhD, and O. Howard Frazier, MD, Minneapolis, Minn, Ann Arbor, Mich, New York, NY, Baltimore, Md, Gainesville, Fla, Durham, NC, Pleasanton, Calif, and Houston, Tex

Post-cardiac transplant survival in patients supported with continuous-flow devices such as the HeartMate II LVAD is equivalent to that with conventional transplantation. Further, posttransplant survival is not influenced by the duration of LVAD support. The improved durability and reduced short- and long-term morbidity associated with the HeartMate II LVAD has reduced the need for urgent cardiac transplantation, which may have adversely influenced survival in the pulsatile LVAD era.

Perioperative Management (PM)

- 182 Effect of β -blocker use on outcomes after discharge in patients who underwent cardiac surgery** 

Anita Y. M. Chan, PhD, Finlay A. McAlister, MD, MSc, Colleen M. Norris, PhD, David Johnstone, MD, FACC, Jeffrey A. Bakal, PhD, and David B. Ross, MD, for the Alberta Provincial Program for Outcome Assessment in Coronary Heart Disease (APPROACH) Investigators, Edmonton, Alberta, Canada

In a prospective cohort of 3102 patients followed after cardiac surgery, discharge use of β -blockers was associated with lower 1- and 6-year mortality, even after adjusting for covariates. β -Blocker users exhibited lower mortality rates in all subgroups after nontransplant cardiac surgery, including those without heart failure or myocardial infarction.

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188 Leukoreduction program for red blood cell transfusions in coronary surgery: Association with reduced acute kidney injury and in-hospital mortality

Gianpaolo Romano, MD, Ciro Mastroianni, MD, Ciro Bancone, MD, Alessandro Della Corte, MD, PhD, FEACTS, Nicola Galdieri, MD, Gianantonio Nappi, FEACTS, and Luca Salvatore De Santo, FEACTS, Naples and Foggia, Italy

Definitive evidence for or against implementation of universal leukocyte reduction in cardiac surgery is still lacking. In this before-and-after cohort study of 1034 consecutive patients undergoing coronary artery bypass grafting, adoption of a prestorage leukoreduction program was associated with reduced acute kidney injury and hospital mortality in a propensity-matched analysis.

**Evolving Technology/
Basic Science (ET/BS)**

196 Technical considerations to avoid pitfalls during transapical aortic valve implantation

Daniel R. Wong, MD, MPH, Jian Ye, MD, Anson Cheung, MD, John G. Webb, MD, Ronald G. Carere, MD, and Samuel V. Lichtenstein, MD, PhD, Vancouver, British Columbia, Canada

TAVI has been performed with good results. Complications can often be mitigated by adhering to lessons learned from the early experience with this technology.

203 Efficacy of a novel bipolar radiofrequency ablation device on the beating heart for atrial fibrillation ablation: A long-term porcine study


Rochus K. Voeller, MD, Andreas Zierer, MD, Shelly C. Lall, MD, Shun-ichiro Sakamoto, MD, Richard B. Schuessler, PhD, and Ralph J. Damiano, Jr, MD, St Louis, Mo

In this porcine study, the bipolar radiofrequency ablation device Isolator II (AtriCure, Inc, Cincinnati, Ohio) was able to create reliable long-term transmural lesions of the modified Cox maze procedure on the beating heart without cardiopulmonary bypass 100% of the time.

209 Sustained local application of epidermal growth factor to accelerate reepithelialization of tracheal grafts

Jinbo Zhao, MD, Yong Han, MD, Zhibo Liang, MD, Zhipei Zhang, PhD, Qiang Lu, MD, Xiaolong Yan, MD, and Xiaofei Li, MD, Shaanxi, China

Gelatin microspheres were prepared as sustained-release vectors for epidermal growth factor and locally applied to tracheal allografts. In a murine orthotopic tracheal transplant model, sustained local application of epidermal growth factor accelerated epithelial regeneration after orthotopic tracheal transplant without increasing fibrosis.

216 In vitro functional comparison of therapeutically relevant human vasculogenic progenitor cells used for cardiac cell therapy 


Yan Zhang, MD, MSc, Serena Wong, BSc, Jessica Laflèche, BSc, Suzanne Crowe, Thierry G. Mesana, MD, PhD, Erik J. Suuronen, PhD, and Marc Ruel, MD, MPH, Ottawa, Ontario, Canada

This study compared the vasculogenic functions of clinically relevant progenitor cells and demonstrated that a novel source of expandable CD133⁺ cells from the CD133⁻ fraction of peripheral blood was vasculogenically more potent than other progenitors. Intercellular interactions were functionally important and can be used to improve the efficacy of cell therapies.

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
- 225 Loss of p53, rather than beta-catenin overexpression, induces survivin-mediated resistance to apoptosis in an esophageal cancer cell line**
Elizabeth Chang, BS, James Donahue, MD, Anna Smith, BS, John Hornick, BS, MS, Jaladanki N. Rao, PhD, Jian-Ying Wang, MD, PhD, and Richard J. Battafarano, MD, PhD, Baltimore, Md

Survivin is overexpressed in TE7 esophageal cancer cells and plays a critical role in resistance to camptothecin-induced apoptosis. Changes in transcriptional regulation of survivin contribute to its overexpression in TE7 cells. Loss of p53, rather than overexpression of beta-catenin, seems to be a more important factor in survivin overexpression.

- 233 Dor procedure for dyskinetic anteroapical myocardial infarction fails to improve contractility in the border zone** 
Kay Sun, PhD, Zhihong Zhang, MS, Takamaro Suzuki, MD, Jonathan F. Wenk, PhD, Nielen Stander, PhD, Daniel R. Einstein, PhD, David A. Saloner, PhD, Arthur W. Wallace, MD, PhD, Julius M. Guccione, PhD, and Mark B. Ratcliffe, MD, San Francisco and Livermore, Calif; and Olympia, Wash

Animal specific finite element models of sheep before and after the Dor procedure were created. The Dor procedure decreases end-diastolic and end-systolic stress but fails to improve contractility in the infarct border zone.

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Joss Fernandez, MD, Djurabek Babadjanov, MD, and Robert Saeid Farivar, MD, PhD, Iowa City, Iowa

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

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- e12 Fontan completion in patient with pulmonary artery sling associated with hypoplastic left heart syndrome**
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