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519  The American Board of Thoracic Surgery: Update
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Baltimore, Md

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528  Objective measures for longitudinal assessment of robotic surgery training
Rajesh Kumar, PhD, Amod Jog, MSE, Balazs Vagvolgyi, MSE, Hiep Nguyen, MD,
Gregory Hager, PhD, Chi Chiuang Grace Chen, MD, and David Yuh, MD, Baltimore, Md, Boston,
Mass, and New Haven, Conn

We describe a longitudinal study for objectively assessing and differentiating between clinical and
technical operational skills in robotic surgery. We are able to record all system variables from the da
Vinci surgical systems. Data collected from 12 surgeon subjects were analyzed to identify the
learning curves and skill measures.

Congenital Heart
Disease (CHD)

535  Younger gestational age is associated with worse neurodevelopmental outcomes
after cardiac surgery in infancy
Donna A. Goff, MD, MS, Xianqun Luan, MS, Marsha Gerdes, PhD, Judy Bernbaum, MD,
Jo Ann D’Agostino, DNP, Jack Rychik, MD, Gil Wernovsky, MD, Daniel J. Licht, MD,
Susan C. Nicolson, MD, Robert R. Clancy, MD, Thomas L. Spray, MD, and J. William Gaynor, MD,
Philadelphia, Pa

The impact of near-term delivery on neurodevelopmental outcomes after cardiac surgery in infancy
is unknown. Younger gestational age predicted worse performance for multiple
neurodevelopmental domains at 4 years of age. In the absence of maternal and/or fetal indications,
delivery at 39 to 40 weeks is associated with better neurodevelopmental outcomes.

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543 Decellularized versus standard cryopreserved valve allografts for right ventricular outflow tract reconstruction: A single-institution comparison
Mark Razmetov, MD, PhD, Jitendra J. Shah, MD, Dale M. Geiss, MD, and Randall S. Fortuna, MD, Peoria, Ill

From January 2000 to April 2005, 100 patients (mean age 19.3 ± 16.8 years) received decellularized (SynerGraft [SG]; n = 39) or standard cryopreserved valved allografts (SCAs; n = 61) conduits. The 2 cohorts were similar with respect to age, gender, weight, conduit indication, bypass and crossclamp time, and conduit size. Follow-up time was not significantly different between the 2 groups. This study suggests that the midterm performance of SGs may be superior to that of SCAs. Decellularization of the cryopreserved allografts may provide a more durable option for patients who need RVOT reconstruction.

550 Comparative analysis of antifibrinolytic medications in pediatric heart surgery
Sara K. Pasquali, MD, MHS, Jennifer S. Li, MD, MHS, Xia He, MS, Marshall L. Jacobs, MD, Sean M. O’Brien, PhD, Matthew Hall, PhD, Robert D. B. Jaquiss, MD, Karl F. Welke, MD, MS, Eric D. Peterson, MD, MPH, Samir S. Shah, MD, MSCE, and Jeffrey P. Jacobs, MD, Durham, NC; Cleveland, Ohio; Shawnee Mission, Kan; Tacoma, Wash; Philadelphia, Pa; and St Petersburg and Tampa, Fla

We performed a comparative analysis of antifibrinolytic medications in 22,258 children undergoing heart surgery. These observational data suggest aprotinin is associated with reduced bleeding and mortality with no increase in dialysis. Comparative analyses suggest similar efficacy of aminocaproic acid and improved outcomes associated with tranexamic acid compared with aprotinin.

558 In vitro comparison of different mechanical prostheses suitable for replacement of the systemic atrioventricular valve in children
Tomaso Bottio, MD, PhD, Carlo Dal Lin, MD, Alban Lika, MD, Giulio Rizzoli, MD, Vincenzo Tarzia, MD, Edward Buratto, MD, and Gino Gerosa, MD, Padova, Italy

The current study compares the hydrodynamics of 4 different mechanical prostheses fitting the atrioventricular annulus in children regardless of labeled size. The Sorin Overline exhibited the best diastolic performance, and the Medtronic Advantage Supra valve had the lowest total energy loss index.

569 Exercise capacity and cardiac reserve in children and adolescents with corrected pulmonary atresia with intact ventricular septum after univentricular palliation and biventricular repair
Soha Romeih, MD, Maarten Groenink, MD, PhD, Arno A. W. Roest, MD, PhD, Mart N. van der Plas, MD, PhD, Mark G. Hazekamp, MD, PhD, Barbara J. M. Mulder, MD, PhD, and Nico A. Blom, MD, PhD, Amsterdam, Leiden, and Utrecht, The Netherlands; and Tanta, Egypt

Surgical treatment of PAIVS is challenging. Clinical outcomes of biventricular repair seem favorable to univentricular palliation, but data on superiority of biventricular repair regarding exercise capacity are conflicting. The present study analyzed differences in exercise capacity and cardiac reserve in patients with surgically corrected PAIVS.

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Failure of remote ischemic preconditioning to reduce the risk of postoperative acute kidney injury in children undergoing operation for complex congenital heart disease: A randomized single-center study

Kirsten Rønholt Pedersen, MD, Hanne Berg Ravn, MD, PhD, DMSc, Johan Vestergaard Povlsen, MD, Michael Rahbek Schmidt, MD, PhD, Erland Jørn Erlandsen, MSc, and Vibeke Elisabeth Hjortdal, MD, PhD, DMSc, Århus and Viborg, Denmark

In this randomized, controlled, single-center study, we investigated the effect of remote ischemic preconditioning on kidney function in children undergoing operation complex congenital heart disease. We found no evidence of a protective effect of remote ischemic preconditioning on kidney function or any variables reflecting postoperative morbidity.

Commentary

Remote ischemic preconditioning for renal protection in children undergoing surgery for complex congenital heart disease: What do we know now and where do we go next?

James S. Tweddell, MD, Milwaukee, Wis

Utility of endobronchial ultrasound–guided mediastinal lymph node biopsy in patients with non–small cell lung cancer

Benjamin E. Lee, MD, Elaine Kletsman, PA, John R. Rutledge, MAS, and Robert J. Korst, MD, Paramus and Ridgewood, NJ

We sought to determine the role of endobronchial ultrasound–guided transbronchial needle aspiration in the mediastinal evaluation of patients with non–small cell lung cancer. In 73 patients, endobronchial ultrasound–guided transbronchial needle aspiration had a sensitivity of 95%, specificity of 100%, and negative predictive value of 94%. Endobronchial ultrasound–guided transbronchial needle aspiration could be a useful technique in evaluating the mediastinum in patients with non–small cell lung cancer.

Invasive adenocarcinoma with bronchoalveolar features: A population-based evaluation of the extent of resection in bronchoalveolar cell carcinoma

Bryan A. Whitson, MD, PhD, Shawn S. Groth, MD, MS, Rafael S. Andrade, MD, Mohi O. Mitiek, MD, Michael A. Maddaus, MD, and Jonathan D’Cunha, MD, PhD, Minneapolis, Minn

The Surveillance, Epidemiology, and End Results database was analyzed to evaluate the effect of the extent of pulmonary resection for bronchoalveolar cell carcinoma on long-term survival. Compared with wedge resections, anatomic resections (lobar and segmentectomy) were associated with improved survival.

Active ectopic thymus predicts poor outcome after thymectomy in class III myasthenia gravis

Vincenzo Ambrogi, MD, and Tommaso Claudio Mineo, MD, Rome, Italy

The presence of germinal centers in both the native and ectopic thymus predicts poor outcome after thymectomy in nonthymomatous class III myasthenia gravis. These patients should be rigorously followed and undergo early aggressive therapy.

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607 Prognostic significance of using solid versus whole tumor size on high-resolution computed tomography for predicting pathologic malignant grade of tumors in clinical stage IA lung adenocarcinoma: A multicenter study
Yasuhiro Tsutani, MD, PhD, Yoshihiro Miyata, MD, PhD, Haruhiko Nakayama, MD, PhD, Sakae Okumura, MD, PhD, Shuji Adachi, MD, PhD, Masahiro Yoshimura, MD, PhD, and Morihito Okada, MD, PhD, Hiroshima, Yokohama, Tokyo, and Akashi, Japan

The solid tumor size on high-resolution computed tomography and maximum standardized uptake values on positron emission tomography/computed tomography have high predictive value for high-grade malignancy and prognosis in clinical stage IA lung adenocarcinoma than that of whole tumor size.

613 Is there a benefit of awake thoracoscopic surgery in patients with secondary spontaneous pneumothorax?
Masafumi Noda, MD, PhD, Yoshinori Okada, MD, PhD, Sumiko Maeda, MD, Tetsu Sado, MD, PhD, Akira Sakurada, MD, PhD, Yasushi Hoshikawa, MD, PhD, Chiaki Endo, MD, PhD, and Takashi Kondo, MD, PhD, Sendai, Japan

The outcome of video-assisted thoracic surgery in awake and anesthetized condition for secondary spontaneous pneumothorax was retrospectively compared using propensity score matching. Video-assisted thoracic surgery in awake patients showed a lower incidence of postoperative respiratory complications compared with that with general anesthesia.

617 Impact of patient–prosthesis mismatch after transcatheter aortic valve-in-valve implantation in degenerated bioprostheses
Moritz Seiffert, MD, Lenard Conradi, MD, Stephan Baldus, MD, Malgorzata Knap, MD, Johannes Schirmer, MD, Olaf Franzen, MD, Dietmar Koczyk, MD, Thomas Meinertz, MD, Hermann Reichenspurner, MD, PhD, and Hendrik Treede, MD, Hamburg, Germany

Transcatheter aortic valve-in-valve implantation can be performed to avoid high-risk reoperation. However, patient–prosthesis mismatch frequently occurs, making adequate patient selection with regard to xenograft and patient size crucial to avoid this potential problem. Although patient–prosthesis mismatch did not influence short-term outcome, potential problems may emerge over longer follow-up.

625 On-pump versus off-pump coronary artery bypass surgery in high-risk patients: Operative results of a prospective randomized trial (on-off study)
Massimo G. Lemma, MD, PhD, FECTS, Enrico Coscioni, MD, Francesco P. Triffo, MD, Paolo Centofanti, MD, Corrado Fonadacane, MD, Andrea Salica, MD, Agnese Rossi, MS, Tiziana De Santo, MS, Giuseppe Di Benedetto, MD, Luigi Piazza, MD, Mauro Rinaldi, MD, Antonio L. De Luca Tuttputi Schinos, MD, Ruggero De Paulis, MD, Monica Contino, MD, and Michele Genoni, MD, Milano, Salerno, Caserta, Turin, Bari, Rome, and Sesto San Giovanni, Italy; and Zurich, Switzerland

We performed a prospective multicenter randomized clinical trial to analyze risk reduction of cardiopulmonary bypass complications after on-pump and off-pump coronary artery bypass grafting in high-risk patients (euroScore ≥6). The rate of the primary composite end point was lower for the off-pump patients (unadjusted $P = .009$, adjusted $P = .010$). Off-pump coronary artery bypass grafting reduces early mortality and morbidity in high-risk patients.
632 Prophylactic tricuspid annuloplasty in patients with dilated tricuspid annulus undergoing mitral valve surgery
Umberto Benedetto, MD, Giovanni Melina, MD, Emiliano Angeloni, MD, Simone Refice, MD, Antonino Rosciturbo, MD, Cosimo Comito, MD, and Riccardo Sinatra, MD, Rome, Italy

Progression of functional TR is not uncommon after mitral valve surgery and is associated with poor outcomes. We demonstrated that prophylactic tricuspid valve annuloplasty in patients with tricuspid annulus dilatation prevents TR progression after mitral valve surgery.

639 Surgical problems and complex procedures: Issues for operative time in robotic totally endoscopic coronary artery bypass grafting
Dominik Wiedemann, MD, Nikolaos Bonaros, MD, PhD, Thomas Schachner, MD, Felix Weidinger, MD, Eric J. Lehr, MD, PhD, Mark Vesely, MD, and Johannes Bonatti, MD, FECTS, Innsbruck, Austria, and Baltimore, Md

Among 325 patients undergoing robotically assisted totally endoscopic coronary artery bypass grafting in 2 centers, overall survivals were encouraging. Prolonged operative times of 8 hours and longer, however, significantly influenced morbidity and mortality.

648 Outcomes of concomitant aortic valve replacement and coronary artery bypass grafting at teaching hospitals versus nonteaching hospitals
Raja R. Gopaldas, MD, Faisal G. Bakaeen, MD, Tam K. Dao, PhD, Joseph S. Coselli, MD, Scott A. LeMaire, MD, Joseph Huh, MD, and Danny Chu, MD, Houston, Tex

Patient outcomes after a complex cardiac procedure—concomitant aortic valve replacement and coronary artery bypass grafting—were compared among teaching hospitals with or without a thoracic surgery residency program and nonteaching hospitals. Our results suggest that these patients have better outcomes when treated at hospitals with a thoracic surgery residency program.

656 Myocardial remodeling with aortic stenosis and after aortic valve replacement: Mechanisms and future prognostic implications
William M. Yarbrough, MD, Rupak Mukherjee, PhD, John S. Ikonomidis, MD, PhD, Michael R. Zile, MD, and Francis G. Spinale, MD, PhD, Charleston, SC

The purpose of this review is 2-fold. First, to place into context mechanisms responsible for regulating the myocardial extracellular matrix during the natural history of aortic stenosis. Second, to identify potential structural and biological milestones that identify the transition from reversible to irreversible myocardial matrix remodeling in aortic stenosis.

665 Benefits and risks of using clopidogrel before coronary artery bypass surgery: Systematic review and meta-analysis of randomized trials and observational studies
Fausto Biancari, MD, PhD, K. E. Juhani Airaksinen, MD, PhD, and Gregory Y. H. Lip, MD, PhD, Oulu and Turk, Finland; and Birmingham, England

The risks associated with the use of clopidogrel before coronary artery bypass grafting were investigated in the present meta-analysis. Contrary to the findings of post hoc analyses of randomized trials, observational studies showed that recent exposure to clopidogrel is associated with a significantly increased risk of major adverse events.

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676 Update on acute kidney injury after cardiac surgery
Andrew Shaw, MB, FRCA, FCCM, Durham, NC

Recent advances in the epidemiology, diagnosis, prevention, and treatment of acute kidney injury after cardiac surgery are reviewed. New consensus definitions, new biomarkers of the presence and severity of acute kidney might herald the dawn of a new era in acute kidney injury.

682 Subclinical changes in serum creatinine and mortality after coronary artery bypass grafting
Daniel A. Tolpin, MD, Charles D. Collard, MD, Vei-Vei Lee, MS, Salim S. Virani, MD, Paul M. Allison, MD, MacArthur A. Elayda, MD, PhD, and Wei Pan, MD, Houston, Tex

We investigated whether subclinical increases in serum creatinine not meeting current criteria for acute kidney injury are predictive of mortality after coronary artery bypass grafting with cardiopulmonary bypass. Subclinical changes in perioperative serum creatinine levels did predict mortality among patients with preoperative renal insufficiency undergoing coronary artery bypass grafting.

689 Fungal infections and antifungal prophylaxis in pediatric cardiac extracorporeal life support
Aaron H. Gardner, MD, Parthak Prodhan, MD, Stephanie H. Stovall, MD, Jeffrey M. Gossett, MS, Jennie E. Stern, BS, Christopher D. Wilson, RN, and Richard T. Fiser, MD, Little Rock, Ark, and Fort Myers, Fla

A retrospective study evaluated the incidence of hospital-acquired fungal infections in pediatric cardiac patients requiring ECMO at a single institution over 19 years and assessed the efficacy of fluconazole prophylaxis in preventing fungal infections. Fungal infections were associated with increased mortality, and routine fluconazole prophylaxis was associated with fewer fungal infections.

696 Evaluation of the use of an induced puripotent stem cell sheet for the construction of tissue-engineered vascular grafts
Narutoshi Hibino, MD, PhD, Daniel R. Duncan, BS, Ani Nalbandian, BS, Tai Yi, MD, Yibing Qyang, PhD, Toshiharu Shinoka, MD, PhD, and Christopher K. Breuer, MD, New Haven, Conn

We evaluated the use of a cell sheet created from induced puripotent stem cell–derived vascular cells as a potential source for the construction of tissue-engineered vascular graft. The differentiated-induced puripotent stem cell sheet was made using temperature-responsive dishes and then seeded onto a biodegradable scaffold. These scaffolds were implanted as interposition grafts in the inferior vena cava of mice. Seeded-induced puripotent stem cells exerted a paracrine effect to induce neotissue formation in the acute phase and were reduced in number by apoptosis at later time points. Sheet seeding of our tissue-engineered vascular graft represents a viable mode of induced puripotent stem cell delivery over time.

704 Circulating interferon-γ–inducible Cys-X-Cys chemokine receptor 3 ligands are elevated in humans with aortic aneurysms and Cys-X-Cys chemokine receptor 3 is necessary for aneurysm formation in mice
Amy Gallo, MD, Ahmed Saad, MD, Rahmat Ali, MD, Alan Darabi, MD, PhD, George Tellides, MD, PhD, and Arnar Geirsson, MD, Palo Alto, Calif; and New Haven and West Haven, Conn

Patients with thoracic aortic aneurysms have elevated plasma levels of IFN-γ and IFN-γ–inducible chemokines, IP-10, I-TAC, and Mig compared with referent subjects. Their cognate chemokine receptor, CXCR3, is necessary for calcium chloride–induced arterial aneurysm formation in mice, suggesting that Th1-type immune responses are essential in the pathogenesis of the disease.
Transplantation of alveolar type II cells stimulates lung regeneration during compensatory lung growth in adult rats

Hironobu Wada, MD, PhD, Shigetoshi Yoshida, MD, PhD, Hideki Suzuki, MD, PhD, Yuichiro Sakai, MD, PhD, Teruo Mizobuchi, MD, PhD, Daitsuke Komura, PhD, Yasumori Sato, PhD, Sana Yokoi, MD, PhD, and Ichiro Yoshino, MD, PhD, Chiba, Japan

Periodic mRNA profiling and morphologic analysis led us to hypothesize that a stem/progenitor cell shortage exists after pneumonectomy in adult rats. We demonstrated that endotracheal transplantation of lung cells enriched in alveolar type II cells would stimulate lung regeneration during compensatory lung growth in adult rats.

AAV6-βARKct gene delivery mediated by molecular cardiac surgery with recirculating delivery (MCARD) in sheep results in robust gene expression and increased adrenergic reserve

Michael G. Katz, MD, PhD, Anthony S. Fargnoli, MS, JaBaris D. Swain, MD, Catherine E. Tomasulo, MD, Michele Ciccarelli, MD, Z. Maggie Huang, PhD, Joseph E. Rabinowitz, PhD, and Charles R. Bridges, MD, ScD, Philadelphia, Pa, and Charlotte, NC

The present study provides evidence that in a large animal model, MCARD-mediated βARKct gene delivery increases the inotropic response and rate of relaxation. We also demonstrate improved energy efficiency. The procedure appears to be safe with no untoward effects on multiple organ function.

Experience with more than 100 total artificial heart implants

Jack G. Copeland, MD, Hannah Copeland, MD, Monica Gustafson, MD, Nicole Mineburg, RN, CCTC, Diane Covington, RN, Richard G. Smith, MSEE, and Mark Friedman, MD, San Diego, Calif, and Tucson, Ariz

A total of 101 patients “too sick for LVAD implant” received SynCardia Total Artificial Hearts (SynCardia Systems Inc, Tucson, Ariz). Survival to transplantation was 68.3%, and survival 1 year after transplantation was 76.8%. Total Artificial Heart implantation offers the patient with “crash and burn” heart failure a reasonable chance to survive, and new portable drivers permit hospital discharge.

Improved survival in heart transplant patients living at high altitude

Curtis J. Wozniak, MD, Bradley C. Baird, MS, Josef Stehlík, MD, MPH, Stavros G. Drakos, MD, David A. Bull, MD, Amit N. Patel, MD, MS, and Craig H. Selzman, MD, Salt Lake City, Utah

We hypothesized that altitude negatively affects survival among patients undergoing heart transplantation. An analysis of the United Network of Organ Sharing database revealed that patients living above 2000 ft had improved survival, with an even more pronounced advantage above 4000 ft observed. The findings might be related to the pre-2006 organ allocation rules.

Quantification of caval flow contribution to the lungs in vivo after total cavopulmonary connection with 4-dimensional flow magnetic resonance imaging

Pablo Bächler, MD, Israel Valverde, MD, and Sergio Uribe, PhD, Santiago, Chile, and London, United Kingdom

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