

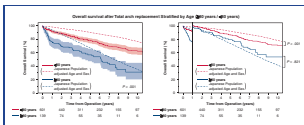


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### Adult Articles in AATS Journals

339 Adult

#### Adult: Aorta



**346 Total arch replacement in octogenarians and nonagenarians: A single-center 18-year experience**



*Yuki Ikeno, MD, Koki Yokawa, MD, Katsuhiko Yamanaka, MD, PhD, Takeshi Inoue, MD, Hiroshi Tanaka, MD, PhD, Kenji Okada, MD, PhD, and Yutaka Okita, MD, PhD, Kobe, Japan*

TAR could be performed with an acceptable overall survival and resulted in less reoperation in octogenarians and nonagenarian.

**357 Commentary: Bringing life to the golden years**

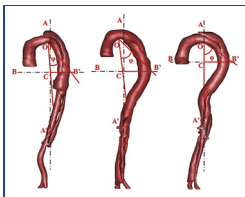
*Joseph S. Coselli, MD, Houston, Tex*

Although open total aortic arch replacement carries greater operative risk for octogenarians than for younger patients, the survival benefits outweigh the risks for those who are otherwise healthy.

**358 Commentary: Still not too old for surgery!**

*Sung Jun Park, MD, and Joon Bum Kim, MD, PhD, Seoul, Republic of Korea*

On the horizon of “super-aged society,” discussions regarding cardiovascular research are moving forward, reproducing benefits of such complex procedures as total arch repair in very elderly patients.



**360 Predictor of false lumen thrombosis after thoracic endovascular aortic repair for type B dissection**



*Da Li, BE, Liqing Peng, PhD, Yi Wang, PhD, Jichun Zhao, PhD, Ding Yuan, PhD, and Tinghui Zheng, PhD, Zigong and Chengdu, China*

The false lumen thrombosis rate of type B aortic dissection after TEVAR can be predicted by the size of the question mark shape, which accounts for the morphology of both the aortic arch and the descending aorta.

**368 Commentary: The secret life of aortic dissections**

*Grayson H. Wheatley, III, MD, Nashville, Tenn*

Aortic tortuosity index is an important predictor of success after thoracic endovascular repair of acute type B aortic dissections.

# Table of Contents

- 369** **Commentary:** Is it possible to predict the evolution of false lumen in type B aortic dissections treated by thoracic endovascular aortic repair?

*Luca Di Marco, MD, PhD, Alessandro Leone, MD, Luca Botta, MD, Giacomo Murana, MD, PhD, and Davide Pacini, MD, PhD, Bologna, Italy*

The degree of the angulation of the aortic arch could be a valid parameter to predict the false-lumen thrombosis in type B aortic dissection treated by thoracic endovascular aortic repair.

## Adult: Aorta: Letters to the Editor

- e11** **Dissecting sex and gender**

*Arjen L. Gökalp, MD, Carlijn G. E. Thijssen, MD, Jolien W. Roos-Hesselink, MD, PhD, and Johanna J. M. Takkenberg, MD, PhD, Rotterdam, The Netherlands*

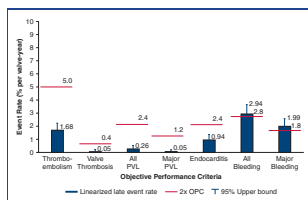
- e11** **Reply from authors:** Semantics against improving outcome of type A dissection surgery: We can win the battle, but how not to lose the war?

*Bartosz Rylski, MD, Klaus Kallenbach, MD, and Friedhelm Beyersdorf, MD, Freiburg, Germany, and Luxembourg, Luxembourg*

- e13** **Spontaneous coronavirus disease 2019 (COVID-19)-associated luminal aortic thrombus**

*Clancy Mullan, MD, Camilla Powierza, MD, P. Elliott Miller, MD, Arnar Geirsson, MD, Prashanth Vallabhajosyula, MD, MS, and Roland Assi, MD, MMS, New Haven, Conn*

## Adult: Aortic Valve



- 371** **Safety, efficacy, and hemodynamic performance of a stented bovine pericardial aortic valve bioprosthesis: Two-year analysis**

*François Dagenais, MD, Michael G. Moront, MD, W. Morris Brown, MD, Michael J. Reardon, MD, Michael W. A. Chu, MD, Elizabeth Gearhart, MS, and Robert J. M. Klautz, MD, PhD, Québec City, Québec, and London, Ontario, Canada; Toledo, Ohio; Atlanta, Ga; Houston, Tex; Minneapolis, Minn; and Leiden, The Netherlands*

A 2-year analysis of the Avalus valve (Medtronic, Minneapolis, Minn) shows excellent clinical outcomes and acceptable hemodynamic performance comparable to the 1-year data.

**This article has an associated discussion and webcast.**

- 382** **Commentary:** Two-year outcomes after surgical aortic valve replacement with a new bioprostheses—The data are still good!

*Oliver J. Liakopoulos, MD, Cologne, Germany*

A 2-year analysis of a new stented bovine, supra-annular pericardial aortic valve demonstrates low all-cause mortality, low valve-related adverse events, and stable hemodynamic performance in 604 patients enrolled in the PERIGON pivotal trial.

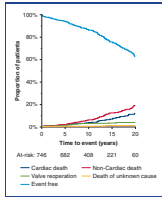
- 384** **Commentary:** One more option in the conundrum of choice of aortic valve bioprostheses

*Vito Domenico Bruno, PhD, and Umberto Benedetto, PhD, Bristol, United Kingdom*

The early results of the PERIGON trial demonstrate the safety and efficacy of the new Avalus aortic valve (Medtronic, Minneapolis, Minn), but what about the long term?

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## Adult: Mitral Valve



385



### Long-term outcomes of chordal replacement with expanded polytetrafluoroethylene sutures to repair mitral leaflet prolapse

*Tirone E. David, MD, Carolyn M. David, BN, Myriam Lafreniere-Roula, PhD, and Cedric Manlihot, PhD, Toronto, Ontario, Canada*

Chordal replacement with ePTFE sutures is effective and durable technique of correction of mitral valve leaflet prolapse.

**This article has an associated discussion and webcast.**

395

### Commentary: The mitral repair tool kit

*Marc Gillinov, MD, Daniel J. P. Burns, MD, MPhil, and Per Wierup, MD, PhD, Cleveland, Ohio*

Mitral valve repair often requires more than a single repair technique.

396

### Commentary: If your pants are too loose, use both belt and suspenders

*Ruggero De Paulis, MD, Rome, Italy*

Associating the technique of leaflet resection with the use of PTFE chordae not only increases the ability to correct the majority of complex lesions but also guarantees long-term stability of the result.

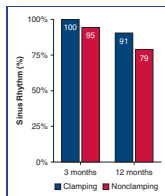
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### Commentary: Expanded polytetrafluoroethylene cordal implantation for mitral valve repair: The founder series

*James S. Gammie, MD, Baltimore, Md*

Tirone David pioneered the use of ePTFE cords for mitral valve repair. The present series provides compelling evidence for the effectiveness and long-term durability of ePTFE-based mitral valve repair.

## Adult: Arrhythmias



399



### Clamping versus nonclamping thoracoscopic box ablation in long-standing persistent atrial fibrillation

*Niels Harlaar, BSc, Niels J. Verberkmoes, MD, Pepijn H. van der Voort, MD, Serge A. Trines, MD, PhD, Stefan E. Verstraeten, MD, Bart J. A. Mertens, PhD, Robert J. M. Klautz, MD, PhD, Jerry Braun, MD, PhD, and Thomas J. van Brakel, MD, PhD, Leiden and Eindhoven, The Netherlands*

Nonclamping devices might provide less-effective isolation of the posterior left atrium during thoracoscopic ablation for long-standing persistent AF when compared with clamping devices.

406

### Commentary: Off-pump ablation of atrial fibrillation—Can it work?

*Leonid Sternik, MD, Ramat Gan, Israel*

In performing off-pump atrial fibrillation ablation, it is difficult to achieve transmural lesions. Safe and effective ablation can be done on cardiopulmonary bypass with an arrested heart and open left atrium.

407

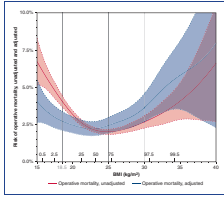
### Commentary: Pursuit of the electrically isolated box

*Richard J. Shemin, MD, Los Angeles, Calif*

Optimal results for the surgical MAZE procedure require reproducible low risk and an effective procedure. This study suggests that bipolar radiofrequency clamps provide the best results.

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## Adult: Coronary



### 409 **Body mass index as a tool for optimizing surgical care in coronary artery bypass grafting through understanding risks of specific complications**



*Naritomo Nishioka, MD, Nao Ichihara, MD, PhD, MPH, Ko Bando, MD, PhD, Noboru Motomura, MD, PhD, Nobuya Koyama, MD, PhD, Hiroaki Miyata, PhD, Shun Kohsaka, MD, FACC, Shinichi Takamoto, MD, PhD, and Kazuhiro Hashimoto, MD, PhD, Tokyo, Japan*

In patients undergoing CABG, a deviation of BMI from 21 to 23 was proportionally associated with increased adjusted risk of mortality. Low and high BMI were associated with different types of morbidity.

### 421 **Commentary:** Are you too thin or too fat to have an open-chest cardiac operation? Probably not, but there are risks that you should know about

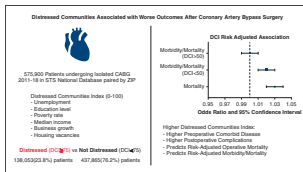
*Victor A. Ferraris, MD, PhD, Lexington, Ky*

Extremes of population obesity, as measured by body mass index, are associated with increased coronary artery disease requiring surgical intervention, although this relationship is vague and ill-defined. This observation seems to be a problem of affluence and improved living conditions and is much less common in poorer countries.

### 423 **Commentary:** Jack Sprat could eat no fat and his wife could eat no lean

*George L. Hicks, MD, Rochester, NY*

Body mass index is a surrogate marker for other conditions that can influence patient outcomes after coronary surgery.



### 425 **Distressed communities are associated with worse outcomes after coronary artery bypass surgery**



*J. Hunter Mehaffey, MD, MSc, Robert B. Hawkins, MD, MSc, Eric J. Charles, MD, PhD, Dylan Thibault, MS, Matthew L. Williams, MD, Matthew Brennan, MD, MPH, Vinod H. Thourani, MD, Vinay Badhwar, MD, and Gorav Ailawadi, MD, Charlottesville, Va; Durham, NC; Philadelphia, Pa; Washington, DC; and Morgantown, WVa*

The DCI is a composite measure of socioeconomic distress that is independently associated with risk-adjusted CABG outcomes.

**This article has an associated discussion and webcast.**

### 433 **Commentary:** Follow the resources: Let us count the ways to measure distress in cardiovascular surgery

*Robert S. D. Higgins, MD, MSHA, Baltimore, Md*

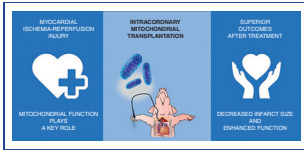
Economic resources influence outcomes after coronary artery bypass grafting.

### 434 **Commentary:** Do you live in a distressed community? How do you know? What does this mean? What are the risks? How do you get help?

*Victor A. Ferraris, MD, PhD, Lexington, Ky*

Living in a distressed community may limit cardiac surgical care alternatives, but more information about this relationship is required. Who lives in distressed communities?

Adult: Coronary: Basic Science



e15



**Preischemic autologous mitochondrial transplantation by intracoronary injection for myocardial protection**

*Alvise Guariento, MD, David Blitzer, MD, Ilias Doulamis, MD, Borami Shin, MD, Kamila Moskowitzova, MD, Arzoo Orfany, MD, Giovanna Ramirez-Barbieri, MD, Steven J. Staffa, MS, David Zurakowski, PhD, Pedro J. del Nido, MD, and James D. McCully, PhD, Boston, Mass*

Preischemic autologous mitochondrial transplantation by intracoronary injection is a novel strategy that provides prophylactic myocardial protection from ischemia-reperfusion injury.

**This article has an associated discussion and webcast.**

e31

**Commentary: Mitochondria: The magic bullet?**

*Richa Dhawan, MD, MPH, and Mark A. Chaney, MD, Chicago, Ill*

Autologous mitochondrial transplantation ameliorates ischemia-reperfusion injury after myocardial insult in animal models and holds potential for clinical trials.

e33

**Commentary: Mitochondria are more than just the cells' powerhouse**

*Jakob Vinten-Johansen, PhD, Atlanta, Ga*

Supplementation of mitochondria by intracoronary delivery is a novel approach to cardioprotection that seeks to send reinforcements to the cardiomyocytes' population rather than interdict the noxious events that cause their demise.

Adult: Coronary: Letters to the Editor

e35

**“The use of animals in research will .... be necessary to help drive scientific discovery in” (cardiac surgery)!**

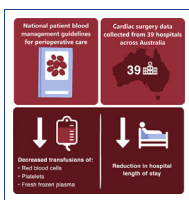
*David Santer, MD, PhD, David J. Chambers, PhD, and Bruno K. Podesser, MD, Vienna and St. Poelten, Austria; Basel, Switzerland; and London, United Kingdom*

e36

**Reply from authors: Are we really reducing, refining, and replacing?**

*N. Bryce Robinson, MD, Irbaz Hameed, MD, and Mario Gaudino, MD, New York, NY*

Adult: Perioperative Management



437



**Impact of patient blood management guidelines on blood transfusions and patient outcomes during cardiac surgery**

*Adam H. Irving, MSc, Anthony Harris, PhD, Dennis Petrie, PhD, Alisa Higgins, MPH, Julian Smith, FRACS, and Zoe K. McQuilten, PhD, Melbourne, Australia*

National patient blood management guidelines were associated with a reduction in blood transfusions and hospital length of stay for cardiac surgery patients in Australia.

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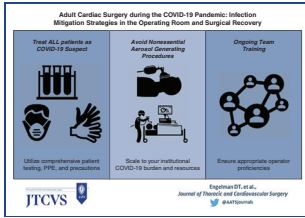
**Commentary: Adjudicating a blood sport?**

*J. W. Awori Hayanga, MD, MPH, FACS, FRCS, FCCP, Jeffrey Cannon, MD, and Heather K. Hayanga, MD, MPH, Morgantown, WV, and Cleveland, Ohio*

Following rules that govern blood transfusion might work.

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## Adult: Perioperative Management: Invited Expert Opinions

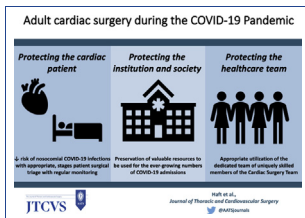


### 447 **Adult cardiac surgery and the COVID-19 pandemic: Aggressive infection mitigation strategies are necessary in the operating room and surgical recovery**



*Daniel T. Engelman, MD, Sylvain Lothar, MD, FRCPC, Isaac George, MD, Duane J. Funk, MD, FRCPC, Gorav Ailawadi, MD, Pavan Atluri, MD, Michael C. Grant, MD, Jonathan W. Haft, MD, Ansar Hassan, MD, PhD, Jean-Francois Legare, MD, MSc, Glenn J. R. Whitman, MD, and Rakesh C. Arora, MD, PhD, and on behalf of The Society of Thoracic Surgeons COVID-19 Task Force, Springfield, Mass; Winnipeg, Manitoba, and Saint John, New Brunswick, Canada; New York, NY; Charlottesville, Va; Philadelphia, Pa; Baltimore, Md; and Ann Arbor, Mich*

Aggressive infection mitigation strategies are necessary to safeguard our patients and healthcare workers during the COVID-19 pandemic.



### 452 **Adult cardiac surgery during the COVID-19 pandemic: A tiered patient triage guidance statement**



*Jonathan W. Haft, MD, Pavan Atluri, MD, Gorav Ailawadi, MD, MBA, Daniel T. Engelman, MD, Michael C. Grant, MD, Ansar Hassan, MD, PhD, Jean-Francois Legare, MD, MSc, Glenn J. R. Whitman, MD, and Rakesh C. Arora, MD, PhD, and on behalf of The Society of Thoracic Surgeons COVID-19 Task Force and the Workforce for Adult Cardiac and Vascular Surgery, Ann Arbor, Mich; Philadelphia, Pa; Charlottesville, Va; Springfield, Mass; Baltimore, Md; and Saint John, New Brunswick, and Winnipeg, Manitoba, Canada*

The current COVID-19 pandemic has had profound impact on the landscape of the delivery of cardiac surgery care. The intent of this document is to provide guidance on issues pertaining to surgical case triage and monitoring and surgical team leadership in these challenging and rapidly evolving times.

## Adult: Perioperative Management: Letters to the Editor

### e39 **Does nasal screening for *Staphylococcus aureus* before surgery compromise health care professional safety in the COVID-19 era?**

*Nicolas Mayeur, MD, PhD, Pierre Berthoumieu, MD, and H el ene Charbonneau, MD, PhD, Toulouse Cedex 03, France*

### e41 **Commentary: Rethinking surgical protocols in the COVID-19 era**

*Daniel T. Engelman, MD, and Rakesh C. Arora, MD, PhD, Springfield, Mass, and Winnipeg, Manitoba, Canada*

In the current era of the SARS-CoV-2 (ie, COVID-19) pandemic, routine preoperative nasal swabbing for identification of Staph carriers in our patient population should be reconsidered.

### e43 **Commentary: When a cardiac surgeon takes care of patients with Coronavirus Disease 2019: It's gonna be ok!**

*Antonio Miceli, MD, PhD, Milano, Italy*

The strict observance of protective measures and the interruption of elective surgical procedures enhance the security and safety of patients and health care personnel.

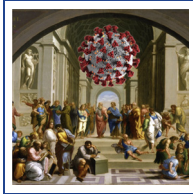
### e44 **Commentary: Compliance with the American Association for Thoracic Surgery guidelines will prevent sternal wound infections and minimize postoperative complications in cardiac surgery patients during the COVID-19 pandemic**

*Harold L. Lazar, MD, Boston, Mass*

Compliance with the AATS guidelines will prevent sternal wound infections and minimize postoperative complications in cardiac surgery patients during the COVID-19 pandemic.

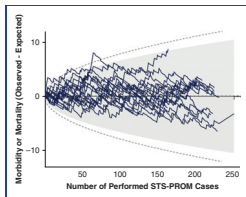
- e49 Reply to author:** Further expansion on the horizon? Thrombectomy for stroke after cardiothoracic surgery  
*Faheem Sheriff, MD, Kenneth Shelton, MD, Arminder S. Jassar, MBBS, Aman B. Patel, MD, and Thabele M. Leslie-Mazwi, MD, Houston, Tex, and Boston, Mass*

## Adult: Ethics: Editorial



- 456 Cardiothoracic surgeons in pandemics: Ethical considerations**  
*Daniel Drake, MD, Cynthia D. Morrow, MA, PhD, Kathleen Kinlaw, MDiv, HEC-C, Michele De Bonis, MD, Alberto Zangrillo, MD, and Robert M. Sade, MD, for the Cardiothoracic Ethics Forum, Traverse City and Ann Arbor, Mich; Atlanta, Ga; Milan, Italy; and Charleston, SC*
- This paper focuses on a range of ethical issues related to pandemics, especially allocation of scarce resources (ventilators, ECMO).

## Adult: Education



- 460 Objective measure of learning curves for trainees in cardiac surgery via cumulative sum failure analysis**  
*Elizabeth D. Krebs, MD, MSc, William Z. Chancellor, MD, Robert B. Hawkins, MD, MSc, Jared P. Beller, MD, J. Hunter Mehaffey, MD, MSc, Nicholas R. Teman, MD, Gorav Ailawadi, MD, and Leora T. Yarboro, MD, Charlottesville, Va*



Trainee-performed cases have excellent results, with better than expected outcomes. Cusum analysis characterizes learning curves and is a promising tool for resident evaluation throughout training.

**This article has an associated discussion and webcast.**

- 467 Commentary:** The importance of objective assessment for the future of residency training  
*Joel Price, MD, MPH, FRCSC, Vancouver, British Columbia, Canada*
- The authors describe using CUSUM to track resident learning curves. This technique can be useful to make assessment quantitative and objective in the era of competency-based training.
- 469 Commentary:** If you don't measure it, you can't improve it  
*Bobby Yanagawa, MD, PhD, Maral Ouzounian, MD, PhD, and Tsuyoshi Kaneko, MD, Toronto, Ontario, Canada, and Boston, Mass*
- Cumulative sum, or CUSUM curves, a method to continuously detect deviations from the mean, can be used as an adjunct to monitor resident performance in surgical training.

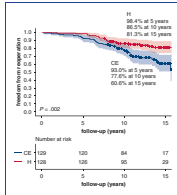
## Adult: Education: Letters to the Editor

- e51 Closing the gap by filling the gaps: Leveraging international partnerships to train the world's cardiac surgical workforce**  
*Dominique Vervoort, MD, and Luis Daniel Velazco-Davila, MD, Baltimore, Md, and Oklahoma City, Okla*
- e52 Reply:** International partnerships to help train the world's cardiothoracic surgery workforce  
*Victor A. Ferraris, MD, PhD, Lexington, Ky*
- e53 Reply from authors:** Raising the bar for quality and access to cardiothoracic surgical training internationally  
*Alexander P. Nissen, MD, and Tom C. Nguyen, MD, Fort Sam Houston and Houston, Tex*
- e54 Reply:** In pursuit of the unfilled position  
*Ann E. Hwalek, DO, MS, and Nahush A. Mokadam, MD, Columbus, Ohio*

## Congenital Articles in AATS Journals

471 Congenital

## Congenital: Pulmonary Valve


**476** Long-term durability of bioprosthetic valves in pulmonary position: Pericardial versus porcine valves


*Jae Gun Kwak, MD, PhD, Ji Hyun Bang, MD, Sungkyu Cho, MD, PhD, Eung Re Kim, MD, Beatrice Chia-Hui Shih, MD, Chang-Ha lee, MD, PhD, and Woong-Han Kim, MD, PhD, Seoul, Republic of Korea*

We compared long-term results of 2 different types of bioprosthetic valves, porcine and pericardial valve, in pulmonary position in the patients with congenital heart diseases.

**485** **Commentary:** Looking for the ideal pulmonary valve

*Gianluigi Perri, MD, PhD, and Lorenzo Galletti, MD, PhD, Rome, Italy*

The long-term performance of bioprostheses in the pulmonary position is limited, especially when implanted in younger patients. Porcine valves seem to have a slight advantage in term of valve deterioration, but no definitive data are available. A randomized prospective study is needed to compare the results between different types of bioprostheses at the pulmonary position.

**487** **Commentary:** Finding the best pulmonary bioprosthetic valve: An unobtainable target?

*Reilly D. Hobbs, MD, and Ming-Sing Si, MD, Ann Arbor, Mich*

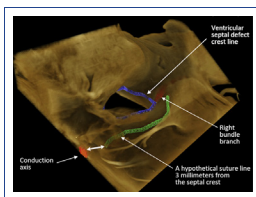
Determining the best pulmonary bioprosthetic valve is difficult, if not impossible.

**488** **Commentary:** The conundrum of pulmonary valve substitutes

*Lucia Cocomello, MD, and Massimo Caputo, MD, FRCS, Bristol, United Kingdom*

Considering their significant tissue degeneration at follow-up, is it time to reverse the trend toward using bioprosthetic valves for pulmonary valve replacement in young patients for the next decade?

## Congenital: Ventricular Septal Defect


**490** Visualization and quantification of the atrioventricular conduction axis in hearts with ventricular septal defect using phase contrast computed tomography


*Shuichi Yoshitake, MD, Yukihiro Kaneko, MD, PhD, Kiyozo Morita, MD, PhD, Masato Hoshino, PhD, Yoshihiro Oshima, MD, PhD, Masashi Takahashi, MD, PhD, and Robert H. Anderson, MD, PhD, on behalf of the SPring 8 Cardiovascular Structure Analyzing Research Group, Tokyo, Sayo, Hyogo, Kobe, and Niigata, Japan; New York, NY; and Newcastle upon Tyne, United Kingdom*

Use of phase contrast computed tomography revealed the precise location of the atrioventricular conduction axis in the setting of ventricular septal defect, providing information that should help surgeons repair such defects without producing any conduction disturbance.

**497** **Commentary:** Advanced imaging technologies may help to eliminate the need for pacemaker implantation following repair of ventricular septal defect

*Thierry Carrel, MD, Bern, Switzerland*

New imaging and 3D reconstructive technologies may help to avoid pacemaker implantation following repair of complex congenital malformations associated with ventricular septal defect.



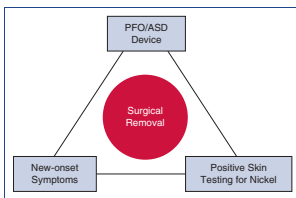
- 498** **Commentary:** Validation of our understanding of atrioventricular conduction anatomy using phase-contrast computed tomography  
*Bahaaldin Alsoufi, MD, Louisville, Ky*

Phase-contrast computed tomography validates our existing knowledge of atrioventricular conduction relationship to ventricular septal defects based on previous histologic studies.

- 500** **Commentary:** What is invisible to the eye could be seen through the heart: How advancements to the visualization of the conduction tissue can improve surgical and electrophysiology procedures  
*Nicholas H. Von Bergen, MD, and Petros V. Anagnostopoulos, MD, MBA, Madison, Wis*

A novel imaging technology provides detailed anatomic information on the location of the cardiac conduction system and creates exciting possibilities for the future.

## Congenital: Congenital Heart Surgery



- 502** **Surgical explantation of atrial septal closure devices for refractory nickel allergy symptoms**



*Vikas Sharma, MD, Rosemary A. DeShazo, MD, Chloe R. Skidmore, MS, Jason P. Glotzbach, MD, Antigone Koliopoulou, MD, Hadi Javan, MD, Stephen H. McKellar, MD, Douglas L. Powell, MD, and Craig H. Selzman, MD, Salt Lake City, Utah*

Systemic hypersensitivity after implantation of ASD devices in patients with documented nickel allergy are debilitating. Surgical removal resolves symptoms and markedly enhances quality of life.

**This article has an associated webcast.**

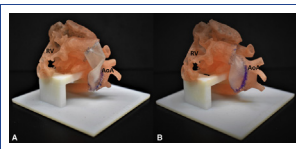
- 510** **Commentary:** Black swan theory or just another bird sighting?  
*C. Huie Lin, MD, and Michael J. Reardon, MD, Houston, Tex*

Nickel allergy exists, but patient selection is very important in avoiding complications.

- 512** **Commentary:** A nickel for your thoughts: An overlooked allergen in implantable devices?  
*Phillip S. Naimo, MD, and Igor E. Konstantinov, MD, PhD, FRACS, Melbourne, Australia*

Nickel allergy may present a significant problem with some implantable devices.

## Congenital: Congenital Heart Surgery: Invited Expert Opinion



- 515** **Three-dimensional printing in congenital cardiac surgery—Now and the future**

*Glen S. Van Arsdell, MD, Nabil Hussein, MBChB, and Shi-Joon Yoo, MD, Los Angeles, Calif; and Toronto, Ontario, Canada*

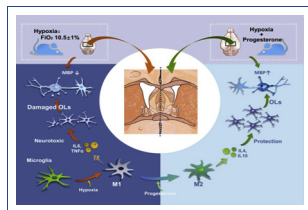
3D printing is changing the landscape for surgical training and surgical planning in complex congenital heart disease.

- 520** **Commentary:** Three-dimensional printing in congenital cardiac surgery: The future is now  
*Harold M. Burkhart, MD, and Arshid Mir, MD, Oklahoma City, Okla*

Three-dimensional printing is rapidly evolving and the time to incorporate it into congenital cardiac surgical training has arrived.

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## Congenital: Cerebral Protection: Basic Science



### e55 Benefits of progesterone on brain immaturity and white matter injury induced by chronic hypoxia in neonatal rats



*Gang Liu, MD, Yichen Yan, MD, Bowen Shi, MD, Junrong Huang, MD, Hongwei Mu, MD, Cong Li, MD, Huiwen Chen, MD, PhD, and Zhongqun Zhu, MD, PhD, Shanghai and Shenzhen, China*

Chronic hypoxia led to brain immaturity and WM injury by inducing microglial activation. The benefits of progesterone to the brain were achieved by switching the microglial activation state from M1 to M2.

### e67 **Commentary:** Progesterone the protector?

*Matthew C. Henn, MD, and Marc R. Moon, MD, St. Louis, Mo*

Progesterone is a promising therapy for neuroprotection in states of hypoxia in small animals, but further studies in man are needed to confirm its clinical applicability to cyanotic heart disease.

### e69 **Commentary:** It's not that we can't find a solution, it's that we can't isolate the problem

*Bahaaldin Alsoufi, MD, Louisville, Ky*

Underlying causes of neurologic deficits in neonates with congenital heart disease are still not defined and likely multifactorial, accumulative, and synergetic.

## Congenital: Perioperative Management: Invited Expert Opinion



### 522 COVID-19: Crisis management in congenital heart surgery

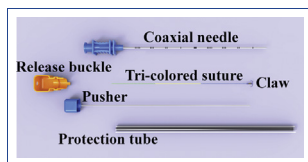


*Elizabeth H. Stephens, MD, PhD, Joseph A. Dearani, MD, Kristine J. Guleserian, MD, David M. Overman, MD, James S. Tweddell, MD, Carl L. Backer, MD, Jennifer C. Romano, MD, MS, and Emile Bacha, MD, Rochester and Minneapolis, Minn; Dallas, Tex; Cincinnati, Ohio; Chicago, Ill; Ann Arbor, Mich; and New York, NY*

## Thoracic Articles in AATS Journals

### 529 Thoracic

## Thoracic: Lung Cancer



### 532 Multicenter, prospective, observational study of a novel technique for preoperative pulmonary nodule localization



*Liwen Fan, MD, PhD, Haitang Yang, MD, PhD, LingMing Yu, MD, Zhixin Wang, MD, Jianding Ye, MD, Yang Zhao, MD, Deng Cai, MD, PhD, Heng Zhao, MD, and Feng Yao, MD, Shanghai, China, and Bern, Switzerland*

A 4-hook anchor with scaled suture provides advantages for thoracoscopic resection of small lung nodules. Our prospective evaluation showed good success, safety, feasibility, and tolerability.

### 540 **Commentary:** Preoperative localization: Another tool in the box

*Sandra L. Starnes, MD, Cincinnati, Ohio*

A new percutaneous localization device may ameliorate the disadvantages of the traditional hookwire technique. This adds another tool to the armamentarium of localization methods.

- 541** **Commentary:** A new tool for solitary peripheral nodule localization—Going beyond “good enough”

*Alexander Gregor, MD, and Kazuhiro Yasufuku, MD, PhD, Toronto, Ontario, Canada*

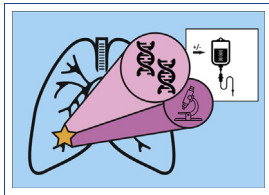
A new hook-and-suture device was safe and effective in localizing small SPNs  $\leq 10$  mm in size without requiring intraoperative imaging.

- 542** **Commentary:** One more way to skin the cat

*Waël C. Hanna, MDCM, MBA, FRCSC, Hamilton, Ontario, Canada*

The armamentarium of pulmonary nodule localization is being enriched by new techniques, and this is important for the evolution of thoracic surgery.

## Thoracic: Lung Cancer: Basic Science



- e71** **Molecular profiling of key driver genes improves staging accuracy in multifocal non-small cell lung cancer**



*Richard Zheng, MD, Qian Shen, PhD, Stacey Mardekian, MD, Charalambos Solomides, MD, Zi-Xuan Wang, PhD, and Nathaniel R. Evans, III, MD, FACS, Philadelphia, Pa*



DNA sequencing of multifocal NSCLC lesions improves staging accuracy compared with histologic review alone, and can prevent overtreatment of synchronous tumors with unindicated adjuvant therapy.



- e81** **Commentary:** Standing on similar, but different, shoulders

*Sanjeet Patel, MD, PhD, and Anthony W. Kim, MD, Los Angeles, Calif*

Molecular profiling with genomic sequencing may enhance the ability to distinguish between simultaneous primary lung cancers and intrapulmonary metastases in non-small cell lung cancers.

- e82** **Commentary:** How to “spot” a leopard: It’s in the genes

*John F. Lazar, MD, Washington, DC*

Next-generation sequencing should be performed on all multifocal lung cancer, but how to apply this information requires further thought and investigation.

- e83** **Commentary:** The A, C, G, and Ts of differentiating stage I and stage IV lung cancer

*Ory Wiesel, MD, and Bryan M. Burt, MD, Brooklyn, NY, and Houston, Tex*

Molecular profiling will resolve the long-standing staging uncertainty around multiple non-small cell lung cancers.

## Thoracic: Lung Cancer: Letters to the Editor

- e85** **Do not go too far when choosing intentional segmentectomy for small-sized lung cancers**

*Chengwu Liu, MD, Dong Tian, MD, and Qiang Pu, MD, Chengdu and Nanchong, China*

- e86** **Reply from authors:** Positive nodes after segmentectomy: Take a deep breath and give adjuvant treatment

*Syed S. Razi, MD, Dao Nguyen, MD, and Nestor Villamizar, MD, Miami, Fla*

- e87** **Reply:** The importance of appropriate selection for segmentectomy

*Chi-Fu Jeffrey Yang, MD, and Mark F. Berry, MD, Stanford, Calif*

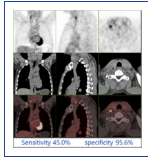
- e87** **Robotic segmentectomy: We are still on the way**

*Yajie Zhang, MD, PhD, Jiahao Zhang, MD, and Hecheng Li, MD, PhD, Shanghai, China*

- e88** **Reply:** Video-assisted thoracoscopic surgery versus robotic assisted surgery: Can they both co-exist?  
*Samuel Kim, MD, Chicago, Ill*

- e89** **Reply from authors:** Robotic segmentectomy: Benefit?  
*Kimberly J. Song, MD, and Raja M. Flores, MD, New York, NY*

## Thoracic: Esophageal Cancer



- 544** **Does [18F] fluorodeoxyglucose–positron emission tomography/computed tomography have a role in cervical nodal staging for esophageal squamous cell carcinoma?**



*Bin Li, MD, Nan Li, MD, Shuoyan Liu, MD, Yin Li, MD, Bin Qian, MD, Yawei Zhang, MD, Hao He, MD, Xiankai Chen, MD, Yihua Sun, MD, Jiaqing Xiang, MD, Hong Hu, MD, and Haiquan Chen, MD, Shanghai, Fuzhou, Beijing, and Jianguo, China*

FDG-PET/CT scanning exhibited high specificity but low sensitivity in diagnosing cervical lymph node metastases of esophageal cancer, indicating its limited value for this purpose.

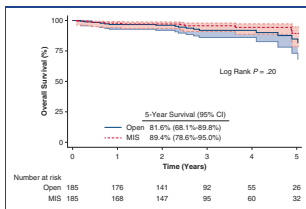
- 551** **Commentary:** Fluorodeoxyglucose–positron emission tomography/computed tomography for cervical adenopathy in esophageal carcinoma, an option for the selective surgeon  
*Wayne Hofstetter, MD, Houston, Tex*

In locally advanced esophageal cancer, PET alone may be adequate for stage. Patients who lack a PET or have early proximal disease may benefit from neck ultrasound as an alternative staging modality.

- 553** **Commentary:** Esophageal squamous cell carcinoma: A disease requiring more research  
*Ke-Neng Chen, MD, PhD, Beijing, China*

We should clearly note that PET/CT in ESCC is not only limited to detecting LNM, and the role of PET/CT in systemic staging is irreplaceable.

## Thoracic: Mediastinum



- 555** **A national analysis of open versus minimally invasive thymectomy for stage I to III thymoma**



*Chi-Fu Jeffrey Yang, MD, Jacob Hurd, Shivani A. Shah, BA, Douglas Liou, MD, Hanghang Wang, MD, PhD, Leah M. Backhus, MD, Natalie S. Lui, MD, Thomas A. D'Amico, MD, Joseph B. Shrager, MD, and Mark F. Berry, MD, MHS, Stanford and Palo Alto, Calif; Durham, NC; and Boston, Mass*

In this national analysis, minimally invasive thymectomy was associated with similar short-term outcomes and intermediate-term survival when compared with open thymectomy for stage I to III thymoma.

**This article has an associated discussion and webcast.**

- 568** **Commentary:** Minimally invasive versus open thymectomy for stage I to III thymoma—Big incision, small difference?

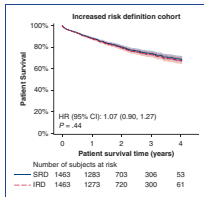
*Andrew E. Giles, MD, MPH, Nicholas LeBlanc, MD, and Biniam Kidane, MD, MSc, Winnipeg, Manitoba, Canada*

Minimally invasive thymectomy may be an acceptable alternative to open thymectomy, but longer follow-up is needed. Approach to stage III thymoma should be dictated by the pattern of invasion.

- 570** **Commentary:** Minimally-invasive thymectomy with minimal concerns  
*R. Taylor Ripley, MD, Houston, Tex*

Minimally-invasive thymectomy is an oncologically acceptable alternative to open thymectomy for the resection of thymoma. Multiple studies over nearly 3 decades do not support the concern of increased tumor dissemination.

## Thoracic: Lung Transplant



- 572** **The impact of change in definition of increased-risk donors on survival after lung transplant**



*Carli J. Lehr, MD, MS, Rocío Lopez, MS, Susana Arrigain, MA, Jesse Schold, PhD, MStat, MEd, Christine Koval, MD, and Maryam Valapour, MD, MPP, Cleveland, Ohio*

The donor risk definition update in 2013 increased the number of donors classified as nonstandard risk. The use of increased-risk donors expands the donor pool without impacting survival.

- 582** **Commentary:** The changing face of risk management

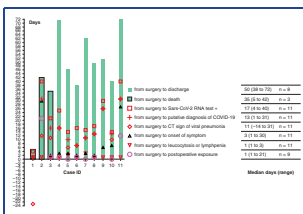
*Heather K. Hayanga, MD, MPH, Ankit Dhamija, MD, and J. W. Awori Hayanga, MD, MPH, Morgantown, WV*

Using organs from increased-risk donors does not jeopardize outcomes.

- 583** **Commentary:** Innovation...or disruption and the delayed acknowledgement of a new reality  
*Jacob A. Klapper, MD, Durham, NC*

Delayed acceptance in an era of rapid innovation.

## Thoracic: Perioperative Management



- 585** **Clinical course of coronavirus disease 2019 in 11 patients after thoracic surgery and challenges in diagnosis**



*Shu Peng, MD, PhD, Liu Huang, MD, Bo Zhao, MD, Shuchang Zhou, MD, Irene Braithwaite, MD, PhD, Ni Zhang, MD, and Xiangning Fu, MD, Wuhan, China, and Wellington, New Zealand*

The early signs of COVID-19 were disguised in 11 postoperative thoracic patients, resulting in a 27.3% fatality rate.

- 593** **Commentary:** Challenges to thoracic surgeons in the global coronavirus pandemic  
*Yang Zhang, MD, and Haiquan Chen, MD, PhD, Shanghai, China*

The global pandemic of COVID-19 brings challenges to thoracic surgeons. It is important to avoid unnecessary surgeries and to be alert to the risk of COVID-19 infection following thoracic surgeries.

- 594** **Commentary:** Echoes of war  
*Gaetano Rocco, MD, FRCSEd, New York, NY*

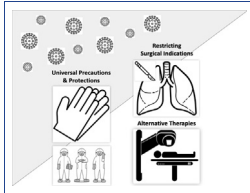
Aggressive identification of COVID-19 surgical candidates is mandatory to avoid lethal postoperative complications and prevent exposing surgeons to the contagion.

# Table of Contents

- 595** **Commentary:** The double responsibility of the thoracic surgeon at the time of the pandemic: A perspective from the North of Italy  
*Marco Scarci, MD, FRCS(Eng), FCCP, FACS, and Federico Raveglia, MD, Monza and Milano, Italy*

Insidious diagnosis and high fatality rate of COVID-19 require special management of patients referred to thoracic surgery. Maximum in clinical surveillance and preoperative selection are mandatory.

## Thoracic: Perioperative Management: Invited Expert Opinions



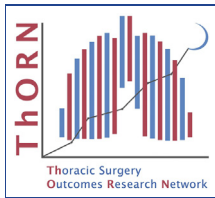
- 597** **Thoracic surgeons' insights: Improving thoracic surgery outcomes during the Coronavirus Disease 2019 pandemic**



*Ke-Neng Chen, MD, Shugeng Gao, MD, Lunxu Liu, MD, Jianxing He, MD, Ge-Ning Jiang, MD, and Jie He, MD, Beijing, Chengdu, Guangzhou, and Shanghai, China*



Limiting surgery, enhancing comprehensive treatment, and implementing strategies to prevent nosocomial COVID-19 infection will ensure medical safety and quality of care.



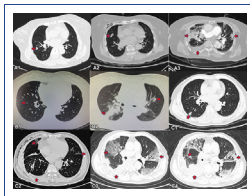
- 601** **COVID-19 guidance for triage of operations for thoracic malignancies: A consensus statement from Thoracic Surgery Outcomes Research Network**



*Thoracic Surgery Outcomes Research Network, Inc, New Haven, Conn*

The extraordinary demands of managing the COVID-19 pandemic has disrupted the world's ability to care for patients with thoracic malignancies. As a hospital's COVID-19 population increases and hospital resources are depleted, the ability to provide surgical care is progressively restricted—forcing surgeons to prioritize among their cancer populations. Representatives from multiple cancer, surgical, and research organizations have come together to provide a guide for triaging patients with thoracic malignancies, as the impact of COVID-19 evolves at each hospital.

## Thoracic: Perioperative Management: Case Report



- e91** **Clinical course of patients infected with severe acute respiratory syndrome coronavirus 2 soon after thoracoscopic lung surgery**

*Jingyu Huang, MD, PhD, Aifen Wang, MD, Ganjun Kang, MD, Deja Li, PhD, and Weidong Hu, MD, PhD, Wuhan and Zhangjagang, China*

Mortality may be very high in patients who contract SARS-CoV-2 pneumonia after lung lobectomy. Lung surgery should be performed with extreme caution in SARS-CoV-2 epidemic outbreak areas.

- e95** **Commentary:** Primum non nocere  
*Scott J. Swanson, MD, Boston, Mass*

Do not operate on elective thoracic patients until the COVID-19 pandemic subsides.

- e97** **Commentary:** Lung surgery in the time of COVID-19  
*Juan A. Muñoz-Largacha, MD, and Benjamin Wei, MD, Birmingham, Ala*

Best practices for surgical patients during the COVID-19 pandemic are not well described. This study reports a 67% mortality rate among 3 patients who contracted COVID-19 after thoracoscopic lobectomy.

## Announcements

### The American Association for Thoracic Surgery



**606** *AATS 100th Annual Meeting: A Virtual Learning Experience*

**606** *View Updated Content on AATS Online*

**606** *Update Your AATS Profile*

### The AATS Foundation



**606** *Invest in the Success of the AATS Foundation*

**606** *Apply for a Program*

### The Western Thoracic Surgical Association



**607** *Save the Date*

**607** *Applications for W TSA Membership*

### The American Board of Thoracic Surgery

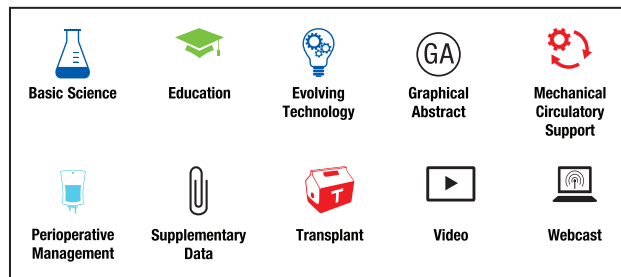


**608** *ABTS Announcement*

**608** *ABTS Requirements for the 10-Year Milestone for Maintenance of Certification*

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## Cover Photographs

**Left (Adult):** From Long-Term Outcomes of Chordal Replacement With Expanded Polytetrafluoroethylene Sutures to Repair Mitral Leaflet Prolapse. Technique of chordal replacement: A single expanded polytetrafluoroethylene suture is used to create several interdependent neochords.

**Center (Congenital):** From Three-Dimensional Printing in Congenital Cardiac Surgery—Now and the Future. Double outlet right ventricle with a subpulmonary VSD and subaortic stenosis (transposition of the great arteries type or Taussig-Bing anomaly) with side-by-side great arteries and interrupted aortic arch. Both septal (left) and basal (right) view models show the subpulmonary non-perimembranous VSD (*blue line*) and its relationship with the cardiac valves. A probe is placed through left ventricular outflow tract. The anatomy is suitable

for neonatal primary repair, consisting of the arterial switch operation, aortic arch reconstruction, and intra-ventricular baffling to the neo-aortic root. The entire aortic arch would require reconstruction with a generous patch to match the size of the neo-aortic root. VSD, Ventricular septal defect; RV, right ventricle.

**Right (Thoracic):** From Clinical Course of Coronavirus Disease 2019 in 11 Patients After Thoracic Surgery and Challenges in Diagnosis. CT of the chest of a 63-year-old male patient (case ID 1) with progression of COVID-19 before and after operation. Biopsy of solid tumor in the right lower lobe indicated adenocarcinoma. On day 4, he had extended bilateral reticular consolidation and sign of bronchogram. He died from respiratory failure 5 days after surgery.