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The Forest for the Trees

Paul Dirac, an English theoretical physicist who studied quantum mechanics and electrodynamics said “The measure of greatness in a scientific idea is the extent to which it stimulates thought and opens up new lines of research.”

This is a perfect time to reflect on the direction that SCA is heading with regard to research and publication. Our Society has a journal within Anesthesia & Analgesia, the official journal of the SCA where we engage our journal to publish reputable science, late-breaking trials, relevant clinical trials, educational reviews, novel cases, and clinical practice guidelines. The tenure of the recent editors of the cardiovascular section of Anesthesia & Analgesia has ended; we want to thank them deeply for their years of service spent cultivating the SCA “journal within a journal.” Thank you and congratulations to Dr. Chuck Hogue, associate editor-in-chief; Dr. Martin London, associate editor for Perioperative Echocardiography and Cardiovascular Education; and Dr. Jerrold Levy, past associate editor for the Hemostasis section.

In April 2016, the new editor-in-chief, Dr. Jean-Francois Pittet will officially begin his role. He states that he and his team “propose to make, from A&A, the destination journal of the anesthesia community. To achieve this goal, my vision is to develop a journal that is reader-centered and provides the best experience for authors throughout the review process, to publish the best possible articles in echo and research, to improve mentoring of young anesthesiologists, to promote the role of anesthesiologists as perioperative physicians and to reach out to anesthesiologists and the general public in the western world and developing countries.”

For the Society of Cardiovascular Anesthesiologists, a new team of cardiovascular editors has been appointed. As SCA president it is my distinct pleasure to congratulate them and to introduce them to our Society members. Here are a few brief comments and the visions shared with us from each of our new editors.

Associate Editor-in-Chief Dr. Scott Beattie: “I am honored and privileged as a member of the Society to accept the responsibilities as the incoming associate editor-in-chief (cardiovascular) for Anesthesia & Analgesia, the official journal of our society. The journal is the preeminent vehicle to advance the Mission of the Society in promoting excellence in patient care through education and cardiovascular thoracic perioperative research. I view this as a timely opportunity that sits at the intersection of teaching, clinical investigation, knowledge translation, and clinical care. Clinical investigation is, I believe, the life-blood of improvement for our specialty. Evidence-based medicine can only improve clinical outcomes if high-quality research is translated to clinical care. The editor must assume responsibility to facilitate timely and erudite presentation of these advancements. As the associate editor-in-chief I also embrace the global nature of our specialty and plan to be visible, approachable, and open to novel and exciting hypotheses. Please join me in facilitating the creation of a user-friendly, open collegial editorial process, which entices investigators to submit their work to the journal. This process will create added value for our members and investigators, new and old, and last but certainly not least........our patients.”

Associate Editor for Perioperative Echocardiography and Cardiovascular Education Dr. Nikolaos Skubas: “As editor I plan to actively solicit the submission of research reports and authoritative reviews and editorials, streamline the review process and maintain a respectful dialogue with the authors. In working with my colleagues, I expect to widen the focus of submissions to include vascular, thoracic, and intensive care topics that are of interest to the cardiovascular anesthesiologist. We will also enhance global appeal and explore new and creative avenues for presentation of published and web-based material. In doing so, we hope to enrich the pool of potential manuscript authors to include aspiring SCA members and international authors.”

Associate Editor for Hemostasis: Dr. Roman Sniecinski: “Deciding on appropriate transfusion of blood products, particularly those used to achieve hemostasis, remains one of the routine, yet demanding, aspects of caring for patients undergoing cardiovascular procedures. Novel anticoagulants, new testing devices, and an increasing number of quality metrics continue to challenge the busy clinician. It is my goal as section editor for Hemostasis to make Anesthesia & Analgesia a destination for high-quality clinical and translational research that can provide guidance in this field.”

To quote Stephen King: “When you write...you spend day after day scanning and identifying the trees. When you're done, you have to step back and look at the forest. It's truly the job of our esteemed new SCA editors. In addition to sound science, reasonable methodology, and the above-mentioned eloquently-stated goals, they have to ensure that our journal publishes that which will serve SCA members best in providing excellence in patient care and outcomes. They have to see the forest for the trees.”

Linda Shore-Lesserson
Patients Under Follow-Up at a Large Tertiary Centre

A Multicenter Trial of Remote Ischemic Preconditioning for Heart Surgery

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Register Now for the 19th Annual SCA Comprehensive Review & Update of Perioperative Echo

May 1–6
Loews Atlanta Hotel
Atlanta, GA

Register online now for SCA’s Echo Week, the 19th Annual SCA Comprehensive Review and Update of Perioperative Echo.

The 19th Annual SCA Comprehensive Review and Update of Perioperative Echo is a 5-day course covering the fundamentals and application of echocardiography. This interdisciplinary program, sponsored by SCA in partnership with the American Society of Echocardiography (ASE), has been developed to meet the growing demand for education on the fundamental diagnostic modality and monitoring of perioperative cardiac performance.

Benefits

- Didactic lectures with panel discussions
- Interactive, small-group discussions on imaging techniques and cardiac kinetics in perioperative decision making
- Porcine heart wet lab dissection with echocardiographic and surgical correlation
- Interactive game show to review course content
- Mock exam at the end of the week to test your knowledge
- The opportunity to earn more than 40 AMA PRA Category 1 Credits (To claim your credits, you must complete the Overall Evaluation at the end of the course.)

Optional Sessions*

Image Optimization Workshops (formerly "PBLDs")
Saturday, May 1, 7–8:30 pm, and Wednesday, May 4, 6:15–7:45 am

Image optimization workshops allow participants to engage in small-group, topic-specific discourse with 2D and 3D echocardiography experts. Each workshop is small enough to allow for interaction, discussion, and exchange of ideas.

3D Imaging and Laptop Computer Workshop
Wednesday, May 4, 4–7 pm, and Thursday, May 5, 6:30–9:30 pm

Participants will practice dataset imaging analysis in clinical scenarios in three 1-hour sessions, during which three topics will be covered concurrently. Each attendee will be assigned a laptop workstation. Registration is limited to 90 participants for each session.

Topics

- Mitral Valve Analysis 1
- Mitral Valve Analysis 2
- Application to Specific Cases

*Optional sessions require a separate registration fee.

Registration is now open. Visit the 2016 Echo Week page on our website for further information.
Register Now for the 2016 SCA Annual Meeting & Workshops

Clinical Decision Making in Cardiovascular Anesthesiology and Perioperative Medicine

April 2–6
Manchester Grand Hyatt
San Diego, CA

These meetings are a unique educational activity that allow anesthesia providers and perioperative physicians involved in delivering care to patients undergoing cardiovascular and thoracic surgery around the world an opportunity to come together to discuss important issues in the field. This year’s meeting will focus on clinical decision making in cardiovascular anesthesiology and perioperative medicine.

Highlights
- Daily moderated scientific and complex case poster sessions
- Small-group Problem-Based Learning Discussions (PBLDs) with experts in the field
- Special fellow/junior faculty program with career and mentoring advice, complex case discussions, and a fellow-focused workshop

5th Annual Thoracic Anesthesia Symposium

April 1–2
Manchester Grand Hyatt
San Diego, CA

The Thoracic Anesthesia Symposium (TAS) is a unique educational activity entirely focused on thoracic anesthesia for academic and private practitioners. Separate registration is required for this symposium.

Highlights
- Comprehensive hands-on workshops
- Small-group PBLDs with experts in the field
- Coffee breaks with exhibitors

Registration is now open. Visit the 2016 annual meeting page for details.
Election Underway for Director-at-Large Positions

Voting began on January 29 for director-at-large candidates for the SCA Board of Directors. The election will close at 5 pm ET on March 17, 2016.

The SCA Nominating Committee reviewed a number of outstanding candidates and, after careful consideration, has endorsed the following for election. The candidates with the two highest vote totals will be selected. Please watch your e-mail for your personalized link, username, and password—remember to cast your ballots.

Director-at-large nominees endorsed by the SCA Nominating Committee:

- Hilary P. Grocott, MD FRCP FASE
- E. Andrew Ochroch, MD
- Andrew Shaw, MB FRCA FCCE
- Douglas Shook, MD FASE
- Mark Stafford-Smith, MD FRCPC FASE

Call for Committee Volunteers

SCA is excited to accept your application for committee appointment. The application period for SCA committees will be open through February 15, 2016. Committee volunteers play an instrumental part in leading and executing the SCA strategic initiatives and help build a strong network for expanding professional development opportunities. Committee participation is open to SCA members who are not currently serving in other leadership positions within the society and have maintained active membership for at least the past 12 consecutive months.

Nominate yourself or someone you know to be part of a movement dedicated to the field of cardiovascular anesthesiology.

Now Accepting Applications for the Kaplan Leadership Grant

The 2016 Kaplan Leadership Grant is sponsored by the SCA Foundation for SCA members who are within 10 years of graduation from residency/fellowship. This grant aims to assist early-career cardiothoracic and vascular anesthesiologists grow into future leaders by granting funding to further their leadership development through course work and leadership-specific studies.

Submit your application for the Kaplan Leadership Grant today!

Updating Your Address in the SCA Database

If you did not receive SCA’s 38th Annual Meeting & Workshops Save the Date postcard in the mail and you currently have your institutional address as your address in the SCA database, we encourage you to update your address in the SCA database to your home address. Please call our member services department toll free at 855.658.2828 or log in to the SCA website to update your address now.

SCA Bulletin Submission Guidelines

Submissions to the SCA Bulletin are encouraged and welcome. All content should be submitted via e-mail to joinyo@scahq.org as a Microsoft Word document, with images and videos provided as attachments (minimum 72 dpi resolution, but 96 dpi is preferred). Please do not insert images into the Word document, which results in reduction of quality. Any other assets, such as videos, must also be provided as attachments or external links. In addition, please use a byline that includes credentials, affiliations, and the city and state of those affiliations. SCA adheres to AMA style when possible, including citations and references. Please see the chart below for additional guidelines.
Literature Review (maximum 800 words)

Editor: Sheela Pai Cole
spaicole@stanford.edu

Summarize and review articles published in the past 6–12 months in journals related to fields related to cardiac anesthesiology (other than A&A and Anesthesiology). Content for the Literature Review includes

- an abstract in your own words
- a paragraph at the end with your comments
- citation from the original article.

Echo Corner (maximum 1000 words)

Editor: Kathrivel Subramaniam
subramaniamk@upmc.edu

Content for the Echo Corner includes

- an echo case scenario (maximum 300 words)
- a question with multiple choice answers
- the answer and its explanation (maximum 300 words)
- videos (acceptable formats include swf, flv, mp4, wmv)
- up to 10 references.

Pro/Con (maximum 1000 words)

Editor: Yong Peng
ygpeng62@gmail.com

Send your topic suggestions to the section editor and include up to 10 references.

Best Practice Corner (maximum 1200 words)

Editor: Dalia Banks
dabanks@ucsd.edu

Include up to 10 references.

Innovation Corner (maximum 1200 words)

Editor: Dalia Banks
dabanks@ucsd.edu

Share what you are doing or working on that is innovative or new in the cardiac anesthesia world. Send us a big-picture article about new ideas you have implemented and ways they are making an impact in your hospital and can make an impact in others. Content for the Innovation Corner includes

- a title
- an explanation of how the idea was implemented
- the results of its implementation
- any benefits to your department or hospital.

E-mail from info@scahq.org

If you receive word that your colleagues are not receiving e-mails from info@scahq.org, please notify them that they may want to "whitelist" scahq.org to override their spam filters. It may also be beneficial if they contact their IT support to let them know what is being blocked.
Outcome and Impact of Aortic Valve Replacement in Patients with Preserved LVEF and Low-Gradient Aortic Stenosis


Reviewers: Xiya Yu, MD\(^1\); Yong G. Peng, MD, PhD, FASE\(^2\)

1. Department of Anesthesiology, Changhai Hospital, The Second Military Medicine University, Shanghai, China
2. Department of Anesthesiology, University of Florida, Gainesville, FL

Background

Patients with aortic stenosis (AS) who have low mean transvalvular gradient (LG; <40 mmHg), AVA (<0.1 cm\(^2\)) and preserved left ventricular ejection fraction (LVEF) who undergo aortic valve replacement (AVR) may raise uncertainty regarding the actual severity of the stenosis and impact of survival benefit.

Methods

A literature search was performed in PubMed, Embase\(^1\), Ovid\(^2\), and Google Scholar for studies published between 2005 and 2015. The patients with LG AS and preserved left ventricular ejection fraction (LVEF) including paradoxical low flow (LF-LG) AS and normal flow (NF-LG) AS compared with other high-gradient (HG) AS or moderate AS (MAS) were analyzed regarding survival benefit associated with AVR and overall mortality regardless of treatment options. All individual studies used hazard ratios (HRs) reflecting long-term mortality and a random effect model calculating the composed statistics and their 95% confidence intervals (CIs). Meta-analysis outcomes were displayed in forest plots. Analysis was conducted using Review Manager Version 5.2.

Results

Eighteen studies were included in the meta-analyses and the total number of patients was 7459. Patients with LF-LG AS have an increased risk of mortality compared with patients with NF-LG AS (HR 1.80; 95% CI: 1.29 to 2.51), HG (HR 1.67; 95% CI: 1.16 to 2.39), and MAS (HR 1.68; 95% CI: 1.31 to 2.17). However, all AS patients who underwent AVR have a lower risk of mortality compared with medical treatment cohorts. The patients with LF-LG were less likely to be referred to AVR compared with patients with HG AS (odds ratio: 0.32; 95% CI: 0.21 to 0.49) because the patients with LF-LG and NF-LG were elderly and had more comorbidities such as coronary artery disease, diabetes, hypertension, and renal failure compared with those with HG.

Conclusion

Patients with paradoxical LF-LG AS had a higher risk of mortality compared with patients with all other subtypes of severe AS who had preserved LVEF. However, the patients' overall outcomes were improved with AVR vs. medical therapy. The patients with NF-LG compared with those with HG AS had a similar risk of mortality despite different clinical and laboratory manifestations. This study suggests the LF-LG AS and NF-LG AS patients who were symptomatic may need further diagnostic evaluation to clarify the severity of aortic stenosis and determine the indication for AVR.

Comments

This is a retrospective meta-analysis study that investigated patients with AS who had low-gradient and preserved LVEF including paradoxical LF-LG AS and NF-LG AS. The survival benefit associated with AVR and the overall mortality was assessed regardless of treatment options compared with other subgroups of patients with HG AS or MAS. The study revealed that all subgroups of patients with severe AS who underwent AVR had a survival benefit compared with the medical therapy. Further analysis suggested that patients with paradoxical LF-LG AS had a higher risk of mortality compared with all other subtypes of severe AS who had preserved LVEF.

After carefully reviewing this study, there are several issues that need to be addressed. The primary concern is the lack of information in the description of LF-LG. Despite defining LF (stroke volume index <30 ml/m\(^2\) LG is transvalvular mean gradient<40 mmHg.), it is important to identify other potential causes of low flow status such as concomitant mitral regurgitation, tricuspid regurgitation, or atrial fibrillation, etc. The study also failed to provide information on preload or whether the patient had a compromised right ventricular function. If these conditions were present, the forward stroke volume and transvalvular gradient may be reduced despite the absence of some of the typical features of paradoxical low-flow gradient described in the article. The study gave no clear explanation of why...
patients with preserved LVEF could have either LF-LG or NF-LG.

Secondly, the paradoxical LF condition of patients may be attributed to measurement errors, a small body size, or even previously emphasized inherent inconsistencies in the guideline criteria. Patients with prolonged LV ejection time may be partially responsible for the reduced mean transvalvular flow rate. However, there was a lack of detailed discussion to elucidate this concept in the article.

In addition, there was possible selection bias in the study. The patients with LF-LG had similar baseline characteristics compared with patients with NF-LG. However, matched with the HG AS patient subgroup, patients with LF-LG and NF-LG revealed more comorbidities and worse clinical manifestation characteristics.

Finally, the patients who were recruited in the study were a heterogeneous group. There exists the potential issue regarding variable subgroup assignments such as: subgroup subjects were unequally matched, subjects had overlapping analysis, and ill-defined inclusion and exclusion criteria for subgroup assignments because the selection criteria was based on three different guidelines (2007, 2012, 2014). The inconsistent selection standard may have confounding factors impacting the study results. The observations of paradoxical LF-LG AS patients having elevated mortality may have little to do with the AS feature itself, but instead may be the result of patients' comorbidities such as coronary artery disease, diabetes, hypertension, and renal failure.

Further study is necessary to clarify why LF-LG AS patients with preserved LVEF have higher mortality vs. other subgroups of patients.
Mitral Valve Repair Without Repair of Moderate Tricuspid Regurgitation


Reviewer: Himani V. Bhatt, DO, MPA
Icahn School of Medicine at Mount Sinai, New York, NY

Background

The object of the study was to assess the long-term status of mild-to-moderate functional tricuspid regurgitation (TR) left untreated at the time of mitral valve repair in patients with dilated cardiomyopathy.

Methods

The researchers selected from their prospective hospital database 84 patients (age, 64 ± 9.6 years; ejection fraction, 0.31 ± 0.064) who underwent mitral repair for secondary mitral regurgitation in whom concomitant mild-to-moderate TR (nonlinear scale 1 to 4+) left untreated. TR was classified as mild in 61 patients (72.6%) and moderate in 23 patients (27.3%). Annular dilatation was not systematically measured and was not used as a trigger for tricuspid annuloplasty. Most patients were categorized as New York Heart Association functional class III or IV (56 of 84; 66.7%).

Results

At a median follow-up of 7.3 years (interquartile range, 4.5 to 9.3), 17 patients (20.2%) had moderate-to-severe TR and 21 patients (25%) progressed at least 2 grades compared with their untreated preoperative TR. Freedom from moderate-to-severe TR or from untreated preoperative TR. Freedom from moderate-to-severe TR or from untreated preoperative TR. Freedom from significant presenting TR.

Comments

The authors of this study concluded that in patients with dilated cardiomyopathy (DCM) undergoing mitral valve (MV) repair for functional mitral regurgitation (MR), concurrent mild-to-moderate functional tricuspid regurgitation progressed to a higher grade when left untreated. Patients were followed as outpatients, and TR grade was acquired by means of transthoracic echocardiogram. Concomitant repair of TR during MV repair has received much attention recently and has been the topic of debate in the surgical literature. Severe tricuspid regurgitation leads to altered loading conditions that are imposed on the RV and over time these conditions lead to TV annular dilation leading to functional TR. TV annulus diameter was not used as a trigger for intervention in this study, however, many recent studies have shown the benefits of TV repair in annular diameters >4cm. In addition, the benefits of concomitant TR repair during mitral valve surgery has been demonstrated to have long-term benefits in terms of improved survival, improved RV function, and less TR progression over time even in the absence of significant presenting TR. In conclusion, the authors suggest that patients with DCM undergoing mitral valve surgery may benefit from concomitant TR repair, and the degree of TV dilation and RV function may serve as better indicators for guiding surgical decision making.

References

Midterm Outcomes of Open Descending Thoracic Aortic Repair in More Than 5000 Medicare Patients


Reviewer: Gautam Sreeram, MD
Assistant Professor of Anesthesiology, Emory University School of Medicine, Atlanta, GA

Background

Open descending thoracic aortic (DTA) repair plays an important role for younger patients or those who are not suitable candidates for endovascular repair. A variety of database registries have been used to investigate outcomes of DTA repairs. This study uniquely uses Current Procedural Terminology (CPT) codes from patients in the Centers for Medicare & Medicaid Services (CMS) database as a means to identify Medicare beneficiaries undergoing open DTA repair under a wide variety of therapeutic techniques. Since these CPT codes can be linked to hospitalization of beneficiaries, the actual surgical operation can be better defined with this process than through the use of ICD-9 diagnosis and procedure codes. Patient outcomes can then be examined.

Methods

A total of 5578 patients were identified by CPT codes through the Medicare database as having undergone DTA repair from 1999 to 2010; 5489 of them had complete hospital and surgeon provider data. Median duration of follow up was approximately 33.4 months. A Kaplan-Meir analysis was performed to assess survival and Cox regression analysis to determine predictors of death. The association of hospital and surgical volumes to survival was also assessed.

Results

Overall mortality was high with a median survival of 4.3 years and was strongly related to underlying aortic pathology. Early death rates (<180 days) were highest in patients with aortic rupture (59%) and acute aortic dissection (39%). Individual hospitals and individual surgeons had a strong independent association with survival when modeled as random effects through a separate multivariable mixed-effects Cox model (likelihood ratio test of omega^2=0.813). p < 0.001 and 100.65, p < 0.001 respectively). The late incidence of death (>180 days) was approximately 4.5% to 7.1% per year. This death rate paralleled that of a U.S. population with similar characteristics for age, sex, and race.

Conclusion

Large registry analyses have long been used to assess surgical outcomes. This retrospective, observational study of Medicare patients undergoing DTA repair showed a high overall initial mortality rate tied to underlying pathology. Hospital and surgeon experience played an important role in the pre-, intra-, and postoperative periods and greatly affected DTA survival.

Discussion

This study is noteworthy for two reasons. First, initial outcomes are still poor despite advances in medical therapy. Second, this study suggests what many have previously suspected—that higher hospital and surgical volumes are associated with improved postoperative outcomes. There was a dramatically low number of cases annually in a subset of 810 hospitals and 1068 surgeons. This amounted to an average of 6 operations per hospital per year and 2 operations per surgeon per year during the study period. The authors suggest that centralization of Medicare patients to a small number of centers with higher volume and surgical expertise should be considered. Interestingly, the relationship between volumes and survival was not linear, suggesting that rapid improvement could be obtained by a small increase in volumes (ie, going from centers with few DTA repairs to those with moderate volumes [50 to 199 repairs during the study period]). Several important limitations to this study exist. First, it did not include information on the impact of patient selection, pre-operative decision making, anesthetic methods, quality of postoperative care, and long-term management. Second, this database study only provides identifications of associations and not cause and effect analyses. Finally, non-Medicare patients who represent a younger patient population may have better outcomes. These questions likely need to be investigated in future studies before consolidation of care occurs.
Clinical Experience With Sternotomy Versus Subcostal Approach for Exchange of HeartMate II Left Ventricular Assist Device


Reviewers: Gregory Weiss, MD
Assistant Professor Cardiothoracic Anesthesia and Critical Care Medicine, Medical Co-Director ECLS, University of Colorado Anschutz Medical Campus

Background

As durable mechanical circulatory support device implantations continue to increase and patients receiving destination therapy survive longer, the need for device replacement has increased to match. Data from the bridge to transplant (BTT) and destination therapy (DT) trials looking at HeartMate II (Thoratec Corp, Pleasanton, CA) reported a replacement rate of 4% in the BTT early cohort and 9% in the DT group.1,2 The most common reasons for replacement in order of commonality are driveline lead failure (3%), device thrombosis (2.1–3.4%), and infection (0.6%).3,4 Mid-sternal and subcostal approaches to replacement have been utilized but not studied extensively.

Summary

**Study Design:** Retrospective single center review consisted of 123 patients with advanced heart failure who underwent implantation of a HeartMate II LVAD. These patients were divided into a subcostal approach group (SC) and median sternotomy group (MS). The SC approach was limited to indications requiring that only the motor be replaced. Of note, only 17 patients were included in the final analysis.

**Outcomes:** Endpoints included operative time, reoperation rates for bleeding, transfused blood products, intensive care unit (ICU) length of stay, and hospital length of stay.

**Results:** In the SC approach group, operation times were shorter (*p*=0.001), there were no reoperations for bleeding (*p*=0.05), transfusions were less (*p*=0.02 for PRBCs; *p*=0.02 for FFP, *p*=0.04 for platelets, *p*=0.02 for cryoprecipitate), hospital length of stay was shorter (*p*=0.04), and ICU length of stay was shorter (*p*=0.03). There were no deaths in either group and mean follow-up was similar.

**Conclusion**

Exchange of the HeartMate II pump can be performed with low morbidity and mortality and with good long-term outcomes utilizing the less invasive subcostal approach.

**Discussion**

The conclusions and results of this very small retrospective study are intuitive and consistent with not only common sense but also two prior studies that examined the same question.5,6 Both prior studies came to the same conclusions and demonstrated nearly identical outcomes. Not cited in this article were the results of the Gregoric et al. paper describing the exchange of the HeartMate XVE for the HeartMate II that found similar outcomes with a larger sample size.5 In its accompanying invited commentary by Dr. Andrew Lodge at Duke University, additional poignant reasoning for an SC approach is offered. Dr. Lodge reminds us of the rare but devastating complication of right ventricular damage on redo-sternotomy that can be avoided by the SC technique and suggests techniques for axillary arterial cannulation with femoral venous drainage that are commonly used today. This cannulation technique coupled with percutaneous de-airing catheters makes SC device exchange practical and safe. With the ever increasing need for device exchange due largely to more DT patients living longer, it should be possible to perform a prospective examination of this question with larger sample sizes.

**References**

5. Gregoric ID, Buckner AB, Jacob L, et al. Clinical experience with sternotomy versus...
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Transcatheter Aortic Valve Replacement Results in Improvement of Pulmonary Function in Patients with Severe Aortic Stenosis


Reviewers: Waqas Anjum, MD, Henry Liu, MD
Department of Anesthesiology & Perioperative Medicine, Drexel University College of Medicine, Philadelphia, PA

Background

More than 20% of patients undergoing transcatheter aortic valve replacement (TAVR) for aortic stenosis have coexisting chronic obstructive pulmonary disease (COPD). Of patients undergoing TAVR, those with pulmonary dysfunction are known to have worse outcomes compared with those who do not. It remains unclear whether TAVR has an effect on pulmonary function postprocedure. Moreover, the relationship between severe aortic stenosis, heart failure, and COPD remains equivocal. From the hypothesis that a proportion of preTAVR pulmonary dysfunction is of cardiac origin as opposed to pulmonary disease, the purpose of this study was to evaluate the impact of TAVR on pulmonary function and measure changes in B-type natriuretic peptide (BNP) in a bid to characterize the relationship between pulmonary function and TAVR.

Methods

The study was a single institution retrospective observational study. Data were collected from Emory University’s institutional adult cardiac database of The Society of Thoracic Surgeons (STS). Consecutive patients who underwent TAVR, had pulmonary function tests (PFTs) recorded preprocedure (up to 3 months prior) and postprocedure (up to 1 year after), and a diagnosis of COPD between April 2008 and October 2014 were selected. The procedure was performed using a balloon expandable valve; however, the procedure approach was not standardized with valves implanted through a retrograde transfemoral, transaortic, transcarotid or antegrade, transapical approach. Data extracted included demographic information, comorbidities, and preprocedural risk factors, BNP, FEV1, FVC, and procedural outcomes. Statistical analysis was employed to analyze data; methods used included X2 test and Fisher’s exact test for group variables with one-way analysis of variance used to compare group means. Multivariable linear or logistic regression analyses was performed to adjust for preoperative left ventricular function and glomerular filtration rate. A two-sided 5% statistical significance level was applied throughout.

Results

A total of 58 patients were identified as meeting criteria for the study. Of these, 26 had mild COPD (45%), 14 had moderate COPD (24%) and 18 had severe COPD (31%). Patient characteristics between the categories of COPD were well balanced within the cohort and did not meet statistical significance except for STS predicted mortality (p=0.003), preoperative FEV1 (p=0.0001), preoperative FEV1/FVC (p=0.02). In terms of post TAVR outcomes there was no significant difference between categories of COPD. When comparing preprocedural and postprocedural PFTs, there was a 10% improvement in FVC (95% CI: 4–17%), a 12% improvement in FEV1 (95% CI: 6–19%) and a 29% decrease in BNP (95% CI: 40–6%–). There was also an observed improvement in COPD classification: 27% of those with mild COPD preoperatively had no COPD postoperatively, and 64% and 50% of those with moderate and severe COPD, respectively, also saw an improvement in disease classification. Overall, 38% of patients in the cohort saw an improvement in FEV1 that was >10% reaching clinical significance. However, there was a subset of patients in whom there was either no change in pulmonary function status or a worsening was observed postTAVR; 27.6% of patients showed a worsening of FEV1 postprocedure, with 10.3% having a decrease of 10% or more and therefore meeting criteria for clinically significant change. The majority of patients (51.7%) did not show a significant change in FEV1 postprocedure. Following adjustment for glomerular filtration rate and left ventricular ejection fraction there was no change in DLCO (mean percent change -4%; 95% CI: -12–4). The procedural approach did not have a significant impact on outcomes; however, when looking specifically at those patients who had a worsening of FEV1, 23% had a transfemoral approach, 38% had a transapical approach, and 31% had a transaortic approach, suggesting that route of repair should be a consideration. There was no observed 30-day mortality in the study cohort.

Conclusion

Within the study population TAVR for patients with severe aortic stenosis results in an improvement in lung function as evidenced by improvement in pulmonary function tests (FEV1, FVC) and BNP. This was most evident in the moderate COPD group. The evidence...
suggests that a portion of observed airway obstruction is of cardiac origin and therefore reversible following valvular disease treatment.

Comments

1. Repair of aortic stenosis via TAVR should be a consideration in patients with COPD irrespective of disease severity.
2. Improvements in pulmonary function may result from repair of aortic stenosis via TAVR as a result of treating the cardiac component of the obstructive airway disease as evidenced by improvement in FEV1 and reductions in BNP.
3. This study shows a favorable trend for the transfemoral operational approach during TAVR for improvement of pulmonary dysfunction; however, further research needs to be carried out to ascertain the significance of the surgical approach as it relates to clinical outcomes.
4. Data presented are representative of a single institution study, which is very likely to be influenced by the patient demographics and comorbidities as well as the practice within the institution.
5. The study design is a retrospective observational study that extracted data from the STS database and is therefore subject to the limitations of the data already recorded, introducing a degree of bias. The authors disclose that not all patients with preoperative PFTs had postoperative PFTs measured, resulting in exclusion of these patients and thereby introducing selection bias. To elucidate the true effect, a prospective randomized control trial to mitigate against bias inherent of observational study designs should be followed.
6. The sample size was relatively small (n=58) making it difficult to extrapolate the data to the population at large.
7. A subset of patients in the mild COPD category went from mild COPD to no COPD. Given that COPD is an irreversible disease process, this calls into question the initial diagnosis. As outlined in the hypothesis, perhaps the preprocedure reduction in FEV1 is reflective of a disease process of cardiac origin that improved with repair of the aortic valve. As noted in the conclusion, some degree of airway obstruction may be of cardiac origin. Because COPD is a diagnosis of exclusion, care should be taken to ensure that the diagnostic data is in fact accurate. Future studies need to evaluate diagnostic data to avoid inaccurate conclusions.
Impact of Concomitant Tricuspid Annuloplasty on Tricuspid Regurgitation, Right Ventricular Function, and Pulmonary Artery Hypertension After Repair of Mitral Valve Prolapse


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Summary

The indications for, and results of, tricuspid annuloplasty in patients undergoing mitral valve (MV) repair remains controversial. This study was designed to evaluate a strategy of routine concomitant tricuspid annuloplasty for moderate tricuspid regurgitation (TR) or annular dilation patients undergoing degenerative MV surgery. Patients were analyzed retrospectively with longitudinal echocardiographic follow-up. Although patients undergoing tricuspid valve annuloplasty were older, had worse left and heart function, higher pulmonary artery (PA) pressures, and higher rates of atrial fibrillation than those patients undergoing MV repair alone, there were no differences in 30-day morbidity, mortality, or pacemaker requirement between the two groups. Tricuspid annuloplasty was independently associated with freedom from late moderate TR and was an independent predictor of recovery of right ventricular function. However, freedom from moderate TR at 7 years was not significantly different between the two groups. In the population studied, concomitant tricuspid annuloplasty was shown to be safe, effective, and associated with improved long-term right-heart remodeling.

Background

There is evidence that MV repair or replacement alone can improve functional TR. Traditionally, clinicians have taken a more selective approach toward concomitant tricuspid repair. However, proponents of a more aggressive approach to the safety and efficacy of tricuspid annuloplasty, as well as the relatively high mortality in patients undergoing repair surgery for isolated TR. They underscore the adverse impact of TR on long-term morbidity, mortality, and functional capacity, and the high incidence of significant TR after isolated MV surgery. The authors set out to bolster the data available in favor of a more aggressive approach toward concomitant tricuspid repair in patients already undergoing surgical treatment of degenerative mitral regurgitation (MR).

Method

This was a retrospective analysis of 646 consecutive patients over a 9-year period in a single center who had MV repair by a single surgeon. MV repair was performed on those patients with MR secondary to degenerative disease defined as Carpentier type II MR. To decrease potential confounders and re-operative surgeries, patients requiring concomitant aortic valve replacement and those with severe three-vessel coronary disease were excluded from the study.

Indications for concomitant tricuspid valve (TV) annuloplasty were documented moderate TR or significant TV annular dilatation defined as >40mm at end-diastole in the 4-chamber view. In the case of equivocal echocardiographic findings, direct intraoperative assessment was performed, with saline testing and comparison of leaflet surface area with annulus size. Of the 646 patients presenting for MV surgery, 419 patients fit the above criteria and thus underwent TV annuloplasty.

Operative mortality was defined as any death within 30 days of surgery or within the same hospital admission for surgery. Morbidity was defined as stroke, acute renal failure, prolonged ventilator requirement (>72 hours), reintubation, new requirement for a permanent pacemaker, deep sternal wound infection or sepsis, or surgical re-exploration. Patients were followed with echocardiograms in the hospital and after discharge with mean follow up of 3.7 years. Recurrent TR was defined as the first echocardiogram that revealed moderate or greater TR.

Results

Although patients undergoing concomitant TV repair were older, had worse left- and right-heart function at baseline, higher pulmonary artery pressures, and a higher rate of atrial fibrillation, there was no association between TV repair and increased operative morbidity and/or mortality. Although there was an initial deterioration in right ventricular function in...
both groups, it was more pronounced in the study group. Recovery was more rapid in the study group, and by 5 years postop the proportion of patients with normal right ventricular (RV) function was similar in both groups. Additionally, the study group had significant improvement in PA pressure and right atrial area before hospital discharge, and there was no significant difference between the 2 groups by mid-term follow-up. There were no re-operations for recurrent TR during the 7-year follow-up period, and freedom from moderate TR at 7 years was 97% in the study group compared with 91% in the control group. When looking at patients who had only mild TR, but qualified for annuloplasty based on another criteria, freedom from moderate TR at 7 years was 97% as opposed to 83% in those patients who did not have annuloplasty.

Comments

Moderate TR is a serious disease process that seems to be a predictor of reduced survival independent of right or left ventricular function and PA pressure. It is also an independent risk factor for decreased functional outcome and survival after mitral repair. The authors concluded that without incurring additional risk to the patient, a strategy of concomitant TV repair during MV repair surgery for degenerative disease nearly eliminates residual and recurrent TR and enhances long-term remodeling of the right ventricle. Additionally, they were able to achieve superior long-term freedom from TR and improve right ventricular function and PA pressures compared to MV repair alone.
Survival Prospects and Circumstances of Death in Contemporary Adult Congenital Heart Disease Patients Under Follow-Up at a Large Tertiary Centre


Reviewers: Mark Joseph Dugas, DO, and Sandeep Markan, MD
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Summary

Diller et al. retrospectively reviewed data on all adult patients (≥16 years of age) with adult congenital heart disease (ACHD) under care at Royal Brompton Hospital, a single tertiary center specializing in the care of congenital heart disease (CHD). The data were from 1991 to 2014. The study included 6969 patients (49.9% females) with a mean age at baseline of 29.0 ± 15.0 years. The patients were in New York Heart Association Functional Classification 1 (69%), 2 (26%), or 3 and 4 (5%), respectively. The median follow-up time for all patients was 9.1 years (corresponding to a total of 70,967 patient years of CHD). They reported 524 (7.7%) patients died over this time, giving an overall mortality rate of 0.72% per patient year.

Methods

Patients were grouped by diagnosis into groups based on their major underlying heart defect. Then, data on cause of death were retrieved from medical records and death certificates to measure mortality and record the cause of death for each patient. The researchers further used a method reported by Finkelstein et al. to estimate standardized mortality ratios (SMR) compared to an age- and gender-matched sample of the general population of the United Kingdom (UK) who were free of CHD. An SMR of 1.0 was considered normal standard mortality; the higher the SMR, the higher the risk of mortality.

A second and novel approach called “equivalent age” also was reported on in this study. Equivalent age was calculated using 5-year mortality for the different patient groups and then comparing it to the 2007 to 2009 interim life tables of the UK.

Results

There have been continuing and ongoing improvements to life expectancy in CHD, and more than 90% of these patients are now expected to survive into adulthood. This study helps provide estimates of how long patients with ACHD will live and even provides tables for mortalities for the various groups and, for reference, what the most common causes of death will be in these patient groups.

The reported survival for all patients in this study was significantly worse compared to the expected mortality for an age- and gender-matched sample from the adults in the UK without cardiac disease at all ages (SMR-2.29; p<0.0001). The SMRs measured in this study were highest in the Fontan group (SMR-23.4; p<0.0001), complex CHD (SMR-14.13; p<0.0001), and Eisenmenger syndrome (12.79; p>0.0001). The leading cause of death in the institution was chronic cardiac failure (42%). The other top causes were: pneumonia (10%), sudden cardiac death (7%), cancer (6.3%), and hemorrhage (5.5%).

Also important was the reported perioperative mortality rate for surgery and/or cardiac intervention of 4.8% at their institution. This perioperative mortality is very low (rates of perioperative mortality in the literature for ACHD are between 7.1% in 2012 and 26.3% in 1980). In contrast, there was no statistically significant difference in mortality seen in the group of patients with ductus arteriosus repair or atrial or ventricular septum repair when compared with the UK general population. (P>0.05).

Comments

This study has proven there has been improvement in the life expectancy of ACHD patients. With increasing age, the proportion of patients dying from cardiac factors has decreased, and more patients are now dying from non-cardiac factors. This study goes on to identify the causes of mortality for broad patient groups and measure their overall incidence. It also is the largest single center study with 70,967 patient years of data measured (the next largest is about 25,900 patient years), and it illustrates what can be achieved at a dedicated tertiary center specializing in ACHD patient care. Finally, the study points out a new way to counsel patients about life expectancy using “equivalent age” to describe risk of death in the general population in comparison to mortality and relating it to the age of a patient with ACHD. This makes the number intuitive and easy to understand. The example used in the article states a patient from the "Fontan physiology" who is 40 years old has a mortality rate very similar to a 75-year-old member of the general UK population who does not have CHD. His equivalent age is therefore 75 years of age. This allows patients and their families to better understand explanations of life expectancy.

One limitation of this study is that all data come from a single center in England. Secondly,
the distinction between primary and secondary cause of death is not always easy or clear to diagnose. Finally, the estimates of mortality are for a group of patients based on their disease and not on a single individual. This means one person with ACHD may have a higher or lower mortality rate depending on other factors they possess.
A Multicenter Trial of Remote Ischemic Preconditioning for Heart Surgery


**Background**

Ischemic preconditioning is a method that seeks to lessen the burden of reperfusion injury and end-organ ischemia that often accompanies cardiac surgery. Initial canine studies showed that transient occlusion of major coronary vessels resulted in decreased infarct size after subsequent prolonged coronary ischemia. In humans, remote ischemic preconditioning (RIPC) seeks to replicate this effect by inducing transient ischemia of non-vital tissue, such as the arm, to aid in protection of vital organs from future, prolonged ischemic events. Previous work has shown that RIPC can lead to a reduction in serum biomarkers (e.g., troponins, creatinine) associated with end-organ ischemia after cardiac surgery. However, studies using clinical outcomes as primary endpoints are scarce and often limited by small sample sizes.

**Methods**

This study is a prospective, randomized, double-blind, multicenter, parallel-group, controlled trial that took place between January 2011 and May 2014 at 14 German university hospitals. A total of 1,403 patients aged 18 years and over who were scheduled for elective cardiovascular surgery requiring cardiopulmonary bypass receiving total intravenous anesthesia (TIVA) with propofol underwent randomization. These patients were randomized into two groups: the treatment (RIPC) group and the control (sham RIPC) group. In the treatment group, RIPC was induced in 4 cycles of upper-limb ischemia where a blood pressure cuff was inflated to >200 mmHg (or at least 15 mmHg above the patient’s systolic blood pressure) for a duration of 5 minutes, followed by a period of cuff deflation for 5 minutes. In the control group, sham RIPC was instituted in a similar 4-cycle fashion on a dummy arm. Blinding was ensured by having the intervention carried out on a fully anesthetized patient with both the patient’s arm and the dummy arm hidden under surgical drapes. After excluding patients who did not receive the assigned intervention, those who received interventions outside of protocol, and other various exclusions based on eligibility and protocol violations, 583 patients were included in the RIPC treatment group and 584 patients were included in the sham RIPC control group.

**Results**

Primary study endpoints were a binary composite endpoint of death from any cause, nonfatal myocardial infarction, new stroke, or acute renal failure up to the point of hospital discharge. Secondary endpoints were the occurrence of any individual component of the composite endpoint at 30 days, 90 days, and 12 months postoperatively; duration of mechanical ventilation; length of stay in the intensive care unit and total hospital stay; levels of troponin T and I; creatinine; new onset atrial fibrillation; and incidence of postoperative delirium.

**Conclusion**

The authors conclude that upper limb RIPC did not show any relevant clinical benefit with respect to the rate of postoperative myocardial infarction, stroke, renal failure, and death within 90 days.

**Comments**

Reperfusion injury and end-organ ischemia are highly undesirable complications of cardiac surgery. RIPC has the potential to attenuate these events.
surgery and cardiopulmonary bypass. Ischemic preconditioning has been thought to be a mechanism by which to attenuate these effects of cardiac surgery. Given the promise of RIPC in initial human trials showing a reduction in serum biomarkers for end-organ ischemia, the authors sought to determine whether there could also be a positive impact on clinical outcomes through upper-limb RIPC.

This study shows that there was no difference between RIPC and sham RIPC with regard to a host of clinical outcomes as set forth by the authors. Interestingly enough, this study also showed there to be no difference with regard to troponin levels or serum creatinine after RIPC or sham RIPC, 2 of the secondary endpoints in this study. This is in contrast to previous data purporting possible benefits of RIPC via reduction in serum biomarkers of ischemic injury. Furthermore, through subgroup analysis, the authors concluded that even careful selection of certain patient populations (eg, diabetics, coronary artery bypass graft-only surgeries) to receive RIPC might not lead to any clinical benefit.

There are several possible reasons there might not be a demonstrable clinical benefit to RIPC. First, as the study points out, certain anesthetics, including propofol, have been shown to attenuate the effects of RIPC. Additionally, volatile agents and opioid medications have also been shown to reduce the effects of RIPC. Because of the almost ubiquitous nature of these medications in cardiac surgery, the benefits of RIPC may be diminished. Second, as pointed out in an editorial, any benefits of RIPC may become undetectable or redundant in the presence of other factors that are known to be protective during cardiac surgery, namely hypothermia, cardiopulmonary bypass, and cardioplegia. Finally, it is also possible that, as this study concludes, there is just no perceptible clinical benefit to RIPC as it is currently described. In fact, there might be some harmful outcomes associated with RIPC, such as a theoretical increased risk of coronary plaque rupture and a trend toward more cardiovascular adverse outcomes as opposed to myocardial adverse outcomes in the presence of RIPC.

References

Echo Case

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A 30-year-old female was evaluated for increasing presyncopal symptoms and a long-standing history of mitral regurgitation. Her past medical history was noncontributory. She presented for robotic-assisted mitral valve repair. A 3D view of her mitral valve is shown below. Left ventricular and left atrial sizes were normal and the remainder of her echocardiographic examination was within normal limits.

Questions

1. What is the cause of her mitral regurgitation?
2. Is this abnormality associated with any other cardiac abnormalities?

Video 1: Transgastric (TG) midpapillary short axis (SAX)
Answer/Explanation

**Adult Congenital Mitral Valve Disease**

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The 2D echocardiographic image with color Doppler in the commissural view showed central mitral regurgitation jet through the A2 segment of the mitral valve (video 1). The 3D image shows a cleft in the anterior leaflet of the mitral valve (video 2). The cleft is centered at the base of the anterior leaflet in an inverted V-shaped appearance. The anterior leaflet occupies a majority of the mitral annulus. The anterior leaflet appears thickened. She underwent robotic-assisted mitral valve repair with suture closure of the cleft, resection of a primary cord on the anterior leaflet, and annuloplasty. Postrepair imaging demonstrated no residual regurgitation, acceptable inflow pressure gradients, and absence of systolic anterior motion.

Cleft anterior leaflet of the mitral valve is a rare cause of mitral regurgitation in adults. It is responsible for 33% of congenital mitral valve regurgitation with a pediatric incidence of 1:1340. More commonly it is found in infants with concomitant defects of the atroventricular septal canal. More common associated congenital heart defects include a primum atrial septal defect (ASD), atrioventricular septal defect, great arteries transposition, a cleft of the septal defect, and double mitral orifice.

Mitrval valve apparatus anatomy is abnormal in these patients. The base of the anterior leaflet becomes greater than that of the posterior leaflet. The anterolateral papillary muscle becomes abnormally placed in a more posterior location which produces a clockwise rotation of the leaflets. The cleft usually appears as an inverted V in the center of the leaflet and rarely appears rectangular and eccentrically located. The cleft edges become characteristically thickened by fibrous nodular tissue over time. Chordae tendinae of the anterior leaflet are normally positioned; however accessory chordae tendinae are often found attached to the septal or anterior walls of the left ventricle.

Functionally, a cleft anterior mitral leaflet produces regurgitation of increasing severity over time and directly correlates with increasing cleft size. Left-sided pressure and volume overload demonstrated by left ventricular and atrial enlargement are consequences. Subaortic stenosis is found in cases when accessory chordae tendinae adjoin the anterior leaflet to the basal left ventricular septum producing anterior leaflet tethering and left ventricular outflow tract narrowing.

Diagnosis is readily made with echocardiography. Both 2D and 3D imaging have many advantages, in this case including characterization of cleft morphology, regurgitant jet pattern, and associated defects.

The preferred treatment is mitral valve repair, which is highly effective and durable. Suture closure of the cleft, resection of accessory chordae, and ring annuloplasty are the mainstays of the repair, however, residual tethering of the anterior leaflet, which predisposes to postrepair systolic anterior motion, requires cutting of primary or secondary anterior leaflet chordae. Larger clefts may require closure with an autologous pericardial patch.

### References