SCA NEWS

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

PRESIDENT'S MESSAGE

Volume 45, Number 28
December 2024

Kathryn E. Glas
MD, MBA, FASE
President
Society of Cardiovascular Anesthesiologists

Welcome to fall and the start of celebrations – Diwali, Thanksgiving, Hannukah, Christmas, Kwanzaa, and New Years in many countries and cultures. We are currently preparing the slate to start voting for our next officers in January. As with the US national elections, your vote matters, and we ask all of you to consider active participation in the election process to ensure the officers represent your needs for the society. The call for volunteers for committee memberships has closed and notifications will go out shortly. We have over 600 volunteers actively engaged in ensuring the education, research and service goals of our society are met. We thank everyone who volunteered, and all the members doing great work for the benefit of cardiac, thoracic and vascular Anesthesiology and our patients.

We have added a task force in Artificial Intelligence, led by Dr. Muehlschlegel, to explore how we might utilize this technology for our patients in future. Anyone with ideas can reach out to him, or volunteer to be a part of the team. Note that many committees, councils and task forces meet regularly via zoom. Our in-person meetings for most volunteer work is at the Annual Meeting, and the ASA. The education task force sent a survey, and we intend to review the results and plan member-driven recommendations at our January board of directors meeting. We are increasing the size of our Veritas education team to allow further growth of SCA University at the request of members. The anesthesia review question bank (ARC) has been very popular, and we wish everyone taking the test a successful day.

Financial stewardship is a key responsibility of the board of directors and the executive committee. In recent months, Dr. Shook and a team of leaders have been reviewing the society's revenues and expenses to identify opportunities to further enhance financial stability and sustainability. We are dedicated to strengthening relationships with industry partners, refining and improving our educational and research offerings, and exploring strategies to expand these missions. The society will focus on enhancing meetings, increasing CME content (including online offerings), expanding industry relations, and renewing our commitment to charitable donations that support research and the next generation of anesthesiologists. Our portfolio remains robust, with interest revenue supporting our missions in recent years. Our goal is to diversify revenue streams, reduce reliance on interest income, and further solidify the society's financial foundation and future.

Thank you all for your continued engagement and work towards enhancing our critically important mission.

Sincerely,

Kathryn E. Glas, MD, MBA, FASE

Registration Is Now Open for SCA Echo 2025!
February 20 – 23

Loews Atlanta Hotel
1065 Peachtree St. NE
Atlanta, Georgia 30309

The four-day SCA Echo conference will showcase multidisciplinary panels delving into the pivotal role of echocardiography in surgical decision-making concerning valvular disease and mechanical circulatory support. Below are a few of the topics that will be covered:

- **3D Assessment of the Mitral Valve**
- **Case-based Presentations - Clinical Application of 3D Imaging**
- **Tricuspid Valve - Understanding a Complex and Dynamic Structure**
- **ECMO 101 - Making Sense of the Alphabet Soup**
- **Clinical Dilemmas - Adult Congenital Heart Disease**

View Full Agenda

Register Now

Register Now!

New Gold OnDemand Option

Journal of Anesthesia & Analgesia — How to View Free Access Articles

Below are links to the three SCA sections of the A&A Journal. Each month, these links automatically update with new publications. "Free Access" articles will have a "Free" tag just below the article details. After one year, all A&A articles become complimentary.

[Cardiovascular and Thoracic Anesthesiology]

[Cardiovascular Pathophysiology and Outcomes]

[Hemostasis and Thrombosis]

2025 SCA Nominating Slate

The SCA Nominating Committee, chaired by Immediate Past President Dr. Andrew Shaw, MB, FCCM, FFICM, FRCA, is pleased to endorse the following candidates for the 2025 election cycle. Information about each candidate will be available in the February newsletter and through the online election system.

One position is available for **President-Elect**, among the following nominees:

- Douglas C. Shook, MD, FASE - Brigham and Women's Hospital

One position is available for **Secretary/Treasurer**, among the following nominees:

- James H. (Jake) Abernathy III, MD, MPH, FASE, FAHA – Johns Hopkins University School of Medicine
- Mary Beth Brady, MD, FASE – Johns Hopkins University School of Medicine
- Michael P. Eaton, MD, FASA - University of Rochester School of Medicine

Two positions are available for **Director-at-Large**, among the following nominees:

- Theodore Cios, MD, MPH, FASA, FASE - Penn State Hershey Medical Center
- Charles Nyman, MBBCh - Brigham & Women's Hospital
- Daryl Oakes, MD - Stanford University
- Alessia Pedoto, MD, FASA - Memorial Sloan Kettering Cancer Center and Weil Cornell Medicine
- Jacob Raphael, MD, FAHA - Thomas Jefferson University Hospital
- Jochen Steppan, MD, DESA, D. ABA, FAHA, FASA - Johns Hopkins University School of Medicine

Two positions are available for the **Nominating Committee**, among the following nominees:

- Richard D. Shue, MD, FASE - University of Washington School of Medicine
- Choy Lewis, MD - Northwestern University

One position is available for the **CME Committee** member, among the following nominee:

- Dalia Banks, MD, FASE - University of California

The 2025 online election for SCA leadership is scheduled to open on January 20, 2025.

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

SCA Member Benefit Highlight: DocMatter

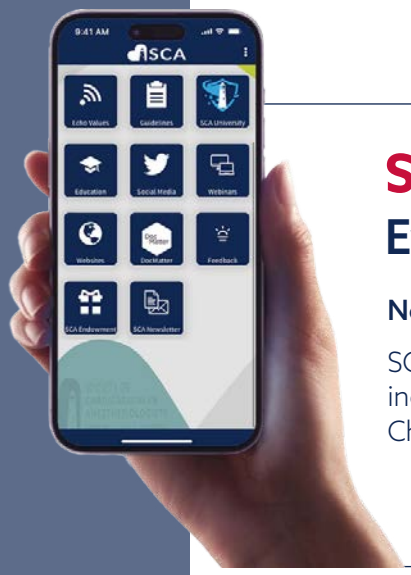
DocMatter is like being in a thousand-person practice where you can pitch a problem and depend on getting some help from your friends right away. It's a massive repository of experience I find essential.

From residency to retirement, physicians rely heavily on structured and ad hoc peer learning. This life-long education takes the form of national and regional society meetings, grand rounds, morbidity and mortality conferences, case conferences, journal clubs, tumor boards, industry-sponsored educational events, conversations with colleagues, and so on. These typically in-person learning opportunities are critical to the transfer of knowledge, which in turn ensures the best possible outcomes for patients.

Today, we must ask the question: how can we use the global connectivity of the internet to remove geographic and point-in-time constraints to democratize and broaden this peer learning?

Answer: DocMatter, the first of its kind, internet-enabled and human-supported collaboration platform, built by and for physicians to bring the structure of in-person learning online. Result: improving all patient outcomes, one physician at a time.

Log into your SCA membership portal to get started!



SCA Mobile App

Everything You Need. Anywhere You Go.

Now available on the Apple App Store and Google Play Store for FREE!

SCA has released an official app that gives you easy access to everything SCA, including: SCA Guidelines, Educational Content, Timely Webinars, Social Media Channels, and more!

GET IT ON Google Play

Available on the App Store

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

SCHOLARSHIP

2025 SCA DEI Junior Resident Scholarship

Accepting Applications through January 19, 2025

The Society of Cardiovascular Anesthesiologists Diversity, Equity and Inclusion Committee (DEI) Junior Resident Scholar Program provides selected underrepresented minority (URM) anesthesiology residents (CA1) early exposure to cardiovascular anesthesiology by attending the SCA Annual Meeting, presenting a poster and interacting with SCA members and leaders. Applications will be accepted through January 19, 2025. **To submit an application, click here!**

THE GOALS OF THIS SCHOLARSHIP

- To expose URM residents to the clinical practice of cardiothoracic anesthesiology by attending the SCA annual meeting.
- To give URM resident scholars early involvement in the SCA through interactions with and mentorship by leaders of the sub-specialty and other cardiothoracic anesthesiologists.

SCHOLARSHIP INFORMATION Ten scholarships will be awarded in 2025!

REQUIREMENTS

- Nomination of URM resident by the program director or cardiothoracic faculty
- The nominee must be an academically promising URM CA1 resident in good standing in an ACGME-accredited residency program.
- Each nominee must submit an essay addressing the following (maximum 500 words):
  - Diverse background of the nominee
  - Nominee's understanding of the issues of DEI in Cardiovascular medicine
  - Nominee's interest in CV anesthesia
- A letter of support from the program director and one additional letter of recommendation from a faculty member.
- The CV of the nominee.
- Recipients must be members of the SCA, or agree to become one, to accept the scholarship. Non-members will receive a complimentary, one-year resident/fellow membership to meet this requirement.

FUNDING $1,000 travel stipend; complimentary basic registration to the 2025 SCA Annual Meeting.

EVALUATION AND SELECTION Scholarship applications will be reviewed and selected by the Scholarship Review & Selection Sub-Group of the DEI Committee at the SCA. Up to 10 scholarships will be awarded yearly.

Questions? Please write to us at dei-cmte@scahq.org.

Application will be accepted through January 19, 2025. Click here for details.

Save the Date

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

2026 SF Match Now Open

In-order to provide more consistency and predictability to the ACTA fellowship application process, the ACTA programs participate in a common application and match process provided by SF Match for recruitment. The schedule for the 2026 training year is as follows:

November 6, 2024	Applicant Registration Began
March 5, 2025	Central Application Service Target / Deadline Date
June 5, 2025	Program Rank List Submission Deadline (12 PM PT)
June 5, 2025	Application Rank List Submission Deadline (12 PM PT)
June 19, 2025	Match Results
June 20, 2025	**Post-**Match Vacancies Posted
July 2026	Training Position Starts

SF MATCH

Applicants and programs participate by registering with SF Match and applicants applying to the programs of their choice. Both programs and applicants submit a rank list based on their preferences. Notably, only programs where an applicant has interviewed can be ranked in the match.

Critical to the match process, programs and applicants can make an Exception Agreement prior to submitting their rank list to SF Match. Exception Agreements allow an applicant and program to agree to match each other prior to submitting their respective rank lists. Importantly, all ACTA positions must be included in the match, including all Exception Agreement positions.

Exceptions to the standard match process have been agreed upon by the ACTA Fellowship Program Directors Council in the following situations:

1. Applicants who are in active military service at the time of application.
2. Internal candidates, i.e., applicants who are currently in the anesthesiology residency program at the same institution as the ACTA fellowship.
3. Applicants who are making a commitment to come to the institution of the ACTA fellowship for more than one year.
4. Applicants who are enrolled in an anesthesiology residency outside of the USA at the time of application.
5. Applicants who reside outside the USA at the time of application or who are not eligible for ABA certification due to non-US training.
6. Applicants whose spouse or partner is applying for a GME-approved post graduate training program in a medical specialty in the same region as the ACTA fellowship.

Please Note: Eligible applicants and programs who wish to take advantage of an exception rule are still required to participate in the match ranking process and must complete an exception agreement found on the SCA website via the link below. This year exception agreements will be posted on the SCA website for transparency to programs and applicants. Any match irregularities will be referred to the ACTA Fellowship Program Directors Council of the SCA.

Only program directors may begin the exception agreement process. Fellows must not initiate. **Program Directors, click HERE to begin.**

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

Don't Delay! Apply for a SCA Grant

Apply Now! 2025 SCA Research Grants

SCA supports cardiothoracic and vascular research projects. This is the basis for the creation of the SCA Starter Grant, Diversity and Inclusion Grant, Mid-Career Grant, and the In-Training Grant.

The SCA is committed to promoting the representation of women and underrepresented minority investigators. Diversity is vitally important to advance scientific discovery. The SCA especially encourages individuals from all racial, ethnic, or gender groups to apply.

Grants Information

Four types of grants will be awarded in 2025 to SCA members ONLY:

- **SCA In-Training Grant –** $15,000 for one year.
- **SCA Starter Grant –** up to $25,000 a year for 2 years
- **SCA Diversity and Inclusion Grant –** up to $25,000 a year for 2 years
- **SCA Mid-Career Grant –** up to $50,000 a year for 2 years

The Starter Grant and the Diversity and Inclusion Grant request the same application information and formatting. At the time of application, the PI should identify if they are eligible for, and wish to be considered for, both the Diversity and Inclusion Grant and the Starter Grant or for one or the other only. Please use the research grant title page to identify which grant or both.

The awards will be announced during the 2025 SCA Annual Meeting & Workshops in Montreal, Canada. The grant period of 24 months can begin any time from July 1 to December 31 of the year granted. Grant recipients are required to present their work at a subsequent SCA Annual Meeting.

Application submission period will close on February 7, 2025.

Click Here to Start your Application

Click Here for the 2025 SCA Research Grants requirements and instructions
Click Here for the Research Grants Checklist
Click Here for the Research Grants Title Page. *(Please submit with your application)*

2025 Kaplan Leadership Development Award

Accepting Applications through January 13, 2025

Applications for the 2025 Kaplan Leadership Development Award will be accepted through January 13, 2025. The award is designed to assist cardiothoracic and vascular anesthesiologists in their career by granting funding to further their leadership development through coursework and leadership-specific studies.

The Kaplan Leadership Award will be adjusted accordingly to offer an aggregate of $5,000 to either one recipient or divided among two.

$5,000/$2,500 from the SCA Endowment, with a $5,000/$2,500 match from the applicant's institution to fund a leadership education strategy

Click here Kaplan Leadership Development Award for more information on this award and how to apply.

Questions about the grant and grant application may be emailed to operations@scahq.org.

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

ENDOWMENT

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

SPOTLIGHT

AWEsome Woman Interview

Isobel A. Russell, MD, PhD

Emeritus Professor
University of California, San Francisco

I am a retired cardiothoracic anesthesiologist now active at the SCA as part of the Endowment Council.

1. What led you to become a Cardiovascular/Thoracic Anesthesiologist?
I was fortunate to do a cardiac anesthesia rotation at Yale University School of Medicine Department of Anesthesia. The faculty and fellows were so inspiring, I loved the pace of the work, the comradery and the stimulus of the heart rooms.

2. How did you hear about the SCA?
My advisor, Michael K Cahalan suggested I join and attend a meeting. At the last minute one of the speakers in the TEE workshop could not attend so I had to fill in. I taught mitral valve anatomy and pathology and my career in lecturing in TEE was launched!

3. What roles have you held for the society?
I have been a lecturer, chaired the TEE workshops and lecture series, Chair of the International Committee, Board Member, Chair of the Endowment Council.

4. What is one of your greatest achievements as a Cardiovascular/Thoracic Anesthesiologist?
To train and mentor numerous outstanding young fellows and faculty in various disciplines: anesthesia, pediatric cardiology, surgery, intensive care and nursing.

5. Do you have any advice for fellows and residents?
Find good mentors to advise you in your career decisions.

6. Have you experienced any difficulties as a woman in the field?
Yes, being called demeaning names, belittled and worse.

7. Do you have any advice for other women in the field?
Yes, seek senior faulty advice as early as possible, potentially ombudsmen or human resources and do not remain silent.

8. How do you balance work and personal life?
I've always made exercising and time for my children and family a first priority.

9. What is something you enjoy doing outside of work?
I enjoy exercise – swimming, cardio classes, weightlifting, walking with my dogs and the fine arts like the symphony and ballet. I enjoy reading, cooking, enjoy wine, travelling especially with my sisters and sons and having dinner with friends.

10. Would you change anything about the path you took to get to where you are now?
No, I have been extremely fortunate in my career choices and trajectories.

11. What was the best piece of advice you received?
The best piece of advice I ever received was to write for 30 minutes a day (Ron Miller) and to save as much as I could (Mike Cahalan).

LITERATURE REVIEW

Transcatheter or Surgical Replacement for Failed Bioprosthetic Aortic Valves

Reviewer:

Karuna Puttur Rajkumar, MD
Atrium Health Wake Forest Baptist
Winston Salem, NC

The article "Transcatheter or Surgical Replacement for Failed Bioprosthetic Aortic Valves," published in JAMA Cardiology, provides an in-depth retrospective analysis comparing valve-in-valve transcatheter aortic valve replacement (ViV-TAVR) with redo surgical aortic valve replacement (redo SAVR) in patients with failing bioprosthetic valves. Conducted on data from over 1,700 patients across three U.S. states from 2015 to 2020, this study aims to clarify outcomes, particularly mortality and morbidity, associated with each treatment.

The article notes an increasing trend towards ViV-TAVR over redo SAVR, driven by its less invasive nature and favorable periprocedural outcomes. ViV-TAVR showed significantly lower short-term complications, such as reduced rates of major bleeding, acute kidney failure, and new pacemaker requirements, and shorter hospital stays compared to redo SAVR. However, the long-term analysis raised concerns: after two years, ViV-TAVR was linked to higher mortality and greater incidences of heart failure hospitalizations. This finding contrasts with early outcomes, where mortality rates between the two procedures were similar, suggesting that the benefits of ViV-TAVR may diminish over time for certain patients.

The study's methodology, which included propensity-matched analysis, adds robustness to these findings, but the authors highlight potential residual confounding factors, such as patient selection biases and institutional expertise variations. Moreover, the absence of echocardiographic data and details on prosthesis-patient mismatch limit insights into specific mechanisms affecting long-term outcomes.

In conclusion, the study underscores ViV-TAVR's short-term safety benefits but advises caution due to increased late-stage mortality, advocating for further randomized trials to assess ViV-TAVR and redo SAVR effectiveness, especially in younger or lower-risk populations. The findings are valuable for clinicians navigating treatment options for a growing population of bioprosthetic valve patients.

SOCIETY OF CARDIOVASCULAR ANESTHESIOLOGISTS
Knowledge • Care • Investigation

Effect of Volatile Versus Propofol Anesthesia on Major Complications and Mortality after Cardiac Surgery: A Multicenter Randomized Trial

New issues here: Pragmatic approach to a wide range of cardiac surgery patients, here including valve surgery

Questions: Does TIVA or volatile anesthesia effect composite outcomes in cardiac surgery across multiple centers in a prospective randomized trial.

Deng XQ, Yu H, Wang WJ, Wu QL, Wei H, Deng JS, Li ZJ, Wu JZ, Yang JJ, Zheng XM, Wei JJ
https://doi.org/10.1016/j.bja.2024.05.008.
British Journal of Anesthesia, Volume 133, Issue 2, 2024, 296-304

Reviewer:

Matthew Bryan Barajas, MD
Vanderbilt University Medical Center

Background

The debate on the benefits of total intravenous anesthesia (TIVA) vs volatile anesthesia for cardiac surgery wages on. The MYRIAD trial (The Mortality in Cardiac Surgery Randomized Controlled Trial of Volatile Anesthetics) remains the strongest evidence to date, which demonstrated no difference in mortality rates after coronary artery bypass grafting (CABG). In the August issue of the SCA newsletter we reviewed a retrospective registry analysis of patients who underwent valve surgery in South Korea which also demonstrated no significant differences in outcomes between anesthetic techniques. Here the VIRS trial (Volatile anaesthesia versus total IV anaesthesia in caRdiac Surgery) sought to expand upon MYRIAD by using a broader composite outcome scoring technique after randomizing patients in an intention to treat manner to whole case TIVA or volatile for cardiac surgery, both valvular and bypass.

Methods

Patients over 18 years of age who were scheduled to undergo elective cardiac surgery at one of 16 surgical centers across China were randomized. Exclusion criteria included emergency surgery, minimally invasive cardiac surgery not via median sternotomy, and pregnancy. Randomization was stratified by age, sex, BMI, EuroSCORE, and predicted bypass time. Clinical providers during the anesthetic and in the post-operative period were segregated so those evaluating outcomes were blinded to allocation. Patients in the TIVA group were prohibited from receiving volatile at any point intraoperatively. Sevoflurane or desflurane mean alveolar concentration (MAC) was maintained between 0.5-2 MAC while the propofol was administered at a rate of 3–8 mg/kg/hour.

Primary composite outcome was a major complication, one requiring surgical or pharmacological intervention, was life-threatening, or caused significant disability. These included: arrhythmia, acute heart failure, acute myocardial infarction, cardiac arrest, cardiac tamponade, pulmonary infection, pleural effusion, respiratory failure, acute respiratory distress syndrome, pneumothorax, stroke, postoperative cognitive impairment, epilepsy, acute renal dysfunction, postoperative hemorrhage, deep vein thrombosis, sepsis, shock, and multi-organ dysfunction.

Secondary outcomes included any-cause mortality at 6months or 1 year, duration of mechanical ventilation, length of stay in the ICU and hospital, and total hospital cost.

A sample size of 3100 was based off an assumed pulmonary complications rate of 13.3% in the TIVA group and 9.7% in volatile group and powered to discover a 3.6% difference.

Data Analysis

Variable differences were assessed for balance. No imputation was planned but it was performed as a post hoc analysis with mixed-effect logistic regression.

Results

There were no statistically significant imbalances in baseline characteristics, according to predefined criteria. 3123 out of 5289 eligible patients were enrolled. After exclusions, 2996 patients were included in the intention to treat analysis. There was no significant difference in composite primary outcome rate, 33.8% in volatile and 33.2% in TIVA. Mortality at 30 days was not significantly different between groups, 2% of volatile patients, and 1.9% of TIVA patients. There were no differences in the primary outcome in subgroup analyses. There were no differences in any of the secondary outcomes studied.

Discussion

This study both confirms and adds to the findings of MYRIAD. Here a strict anesthetic intraoperative regimen included the on and off pump periods, eliminating one major concern with MYRIAD protocol. Additionally, this study expanded upon the CABG focused MYRIAD protocol, with 70% of patients having valve surgery. The pragmatic approach employed in this study, greatly increases the external validity of the conclusions. This study was not powered to detect differences in individual organ outcomes, therefore we cannot draw firm conclusions however no differences in subgroup analyses were seen.

Limitations include the high ratio of low-risk patients, as with minimal damage present there would be a limited therapeutic effect ceiling in either arm of this study. Furthermore, other intravenous drugs such as dexmedetomidine were left to the discretion of the anesthesia providers and may have contributed to outcomes. In a similar vein, sedation in the immediate post-operative period and for any re-operations was not controlled for. Lastly, dosing of primary anesthetics was left to the discretion of the provider and not controlled for or targeted for equivalent levels of depth of anesthesia.

ECHO LITERATURE REVIEW

Right Ventricular Strain Improves the Echocardiographic Diagnosis and Risk Stratification of Transthyretin Cardiac Amyloidosis Among Other Phenotypes of Left Ventricular Hypertrophy

Benay Ozbay, MD, Bharadwaj S. Satyavolu, MD, Corey Rearick, MD, Prem Soman, MD, PhD, William E. Katz, MD, Ahmet Sezer, PhD, and Leyla Elif Sade, MD
J Am Soc Echocardiogr. 2024 Oct;37(10):947-959

https://doi.org/10.1016/j.echo.2024.06.006

Published online June 2024.

Primary Reviewer:
Ellesse Credaroli, DO
University of Pennsylvania
Secondary Reviewers:
Hesham Ezz, MD
Cole Rinehart, MD
Mark Danila, MD
University of Pennsylvania

Background

Strain imaging is gaining popularity as a prognostic tool both in left and right ventricular dysfunction. Applications include evaluating the impact on mortality, predicting the need for aortic valve replacement, assessing disease progression in patients with chronic aortic regurgitation, predicting outcomes for patients with pulmonary hypertension, and for the assessing right ventricular function during lung transplantation.[1-3] More recently studies have shown that right ventricular strain may aid in the diagnosis and risk stratification of various cardiomyopathies.[4] Specifically, transthyretin cardiac amyloidosis (ATTR-CA) is a relatively common cause of heart failure with a high rate of progression to restrictive cardiomyopathy. Unfortunately, prognostic improvements have been limited due to diagnostic delay and thus it is crucial for clinicians to familiarize themselves with this clinical entity.[5]

Echocardiography with speckle tracking, cardiac MRI, and cardiac scintigraphy have provided a means of diagnosis without endomyocardial biopsy in most patients. The most common early feature is left ventricular hypertrophy, though other echocardiographic red flags can aid in the diagnosis6. Strain imaging can assess the degree of deformation due to myocardial amyloid fibril deposition, potentially allowing for earlier diagnosis.

Ozbay Et Al. sought to explore the diagnostic and prognostic value of right ventricular free wall strain (RVfw strain) in patients with ATTR-CA.

HIGHLIGHTS

- RVfw strain has incremental diagnostic value for ATTR-CA.
- RVfw strain is particularly useful in moderately hypertrophied ventricles.
- RVfw strain is associated with outcome independently of clinical covariates.
- RVfw outperforms RV PYP uptake for diagnostic and prognostic purposes.

Methods

Patients with suspected cardiac amyloidosis were referred to University of Pittsburgh Medical Center. Subjects with light chain cardiac amyloidosis, prosthetic mitral valves, paced rhythms,

interatrial septal device, and hypertrophic cardiomyopathy were excluded. Comprehensive clinical testing was performed. Inclusion criteria for the diagnosis of ATTR-CA was a positive Tc-99m PYP SPECT coupled with biochemical tests (exclude clonal dyscrasia), hematology consultation for patients with positive paraprotein detection, potential bone marrow biopsy, endomyocardial/extracardiac tissue biopsy, and amyloid typing. Subjects with LVH (septal wall thickness > or = to 1.2 cm) where any type of cardiac amyloidosis was excluded were included in the control group. Non obstructive hypertrophic cardiomyopathy diagnosis was confirmed by genetic testing, CMR, and stress echo. The protocol was accepted by the IRB. Medical records were reviewed by a physician blinded to both PYP scintigraphy and echocardiography results. Patients were followed for 5 years for major adverse cardiovascular and cerebrovascular events (MACCE) including all-cause mortality, heart failure hospitalizations, and stroke. A positive PYP scan was considered the index time for follow up to homogenize the study group in terms of treatment initiation and outcome assessment.

Echocardiography: A complete transthoracic echo was performed (GE Healthcare). Strain analysis was applied to cine loops recorded at 40-90 frames/sec from 3 consecutive cycles. Left ventricular global longitudinal strain (GLS) was computed from apical long axis view, 4 chamber view, and 2 chamber view. Exclusion was utilized for poor tracking of 2 or more segments. Patients with AFib were included if ventricular rates were < 100 bpm. For the right ventricle, free wall thickness, TAPSE, and RV fractional area of change were measured. Peak longitudinal RV free wall strain was computed from an RV focused apical view and excluded the interventricular septum per task force recommendations. EchoPAC ver. 2.04, General Electric software was utilized for automated function imaging with manual adjustments of the region of interest (for wall thickness) to ensure optimal tissue tracking. Relative apical sparing (RAS) was calculated as a longitudinal strain ratio (average apical/average mid + average basal segments).

Tc-99m PYP Scintigraphy: Performed using standard recommendations from the American Society of Nuclear Cardiology. Planar and SPECT images were collected 60 minutes after the injection of 15 mCi of Tc-99m PYP. Repeat images were only repeated at 3 hours if the 60-minute images were thought to be equivocal. The presence of tracer in the myocardium indicated a positive scan.

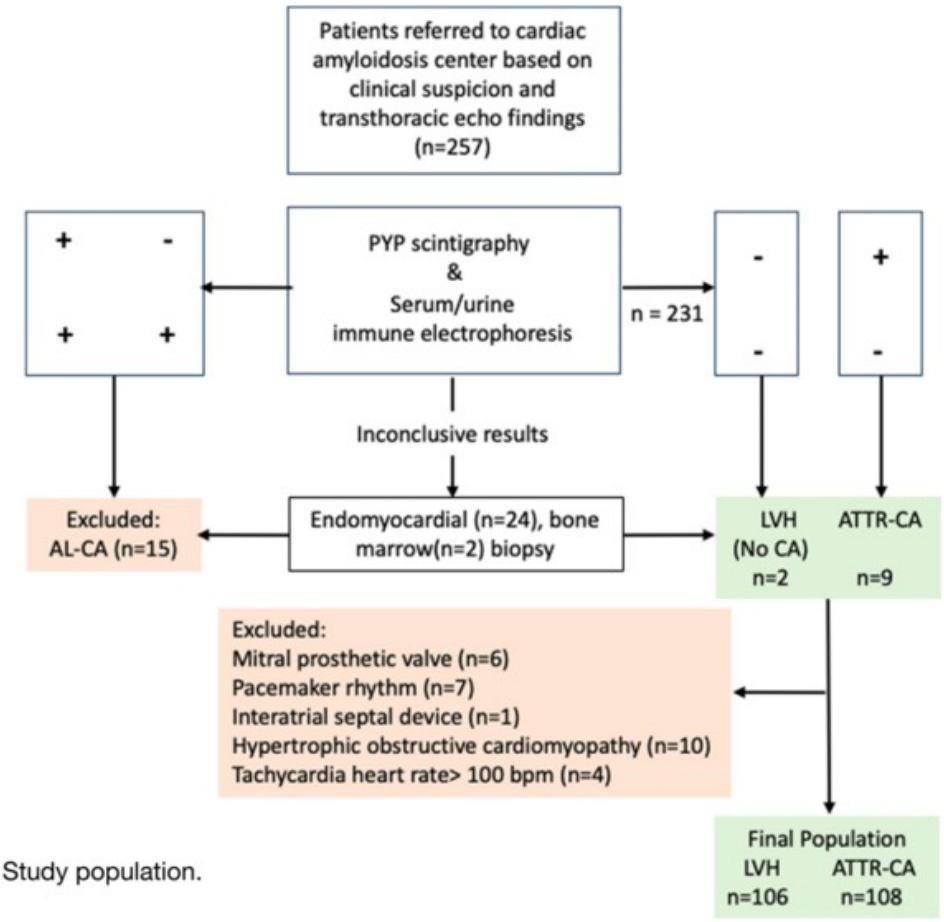


Figure 1 Study population.

Statistical Analysis

Standard statistical software programs (SPSS, ver. 28, SPSS; and SAS 9.4 Statistical Software, SAS Institute). Standard statistical software programs (SPSS, ver. 28, SPSS; and SAS 9.4 Statistical Software, SAS Institute).

Results

Study group: 257 patients referred (43 patients excluded, total 214 patients)
Age: mean: 77.9 +/- 9.1 (ATTR-CA, n = 108), 70.3 +/- 14.2 (LVH control group, n = 106)

Diagnosis of ATTR-CA was confirmed in 108 subjects. The median duration from PYP scan to echocardiography was 2.5 months. Patients with ATTR-CA were older with male predominance. 106 subjects served as controls with left ventricular hypertrophy (HCM, aortic stenosis, hypertensive concentric hypertrophy).

There are distinct echocardiographic features between ATTR-CA and non-cardiac amyloid left ventricular hypertrophy groups. Patients with ATTR-CA demonstrated reduced LVEF, LV end diastolic volume index, e' velocity, TAPSE, LA ejection fraction, GLS, PALS, LAVImax, and RVfw strain). There was an increase in LV mass index, LV RAS (relative apical sparing strain), RV RAS (relative apical sparing strain), and E/e'. The intraobserver and interobserver correlation coefficients for RVfw strain measurements showed consistency and reliability of the measurements.

RV strain for the ATTR-CA diagnosis:
LV RAS, GLS, e', PALS, TAPSE, and RVfw strain, age, and gender were independently associated with the diagnosis of ATTR-CA. As a standalone parameter, LV RAShad the highest diagnostic accuracy for ATTR-CA followed by RVfw strain. The sensitivity, specificity, and negative and positive predictive value of the Youden cutoff of -16% for RVfw strain were 65%, 88%, 84%, and 70% respectively. The addition of RVfw strain improved the accuracy of LV RAS for diagnosing ATTR-CA. 67% of patients with moderate LVH are likely to have ATTR-CA if RVfw strain > -16% in the absence of LV RAS.

RV strain for the outcome:
The median follow-up period was 38 months. 47 MACCE occurred (28 heart failure hospitalizations, 4 strokes, 15 deaths) in patients with ATTR-CA. MACCE occurred in 34 patients on tafamidis and was more common in patients who were older (79.8 +/- 8.1 years). The BNP level was higher in those with MACCE (TnI did not differ between groups). LVEF, LV end systolic volume index, e', GLS, PALS, LA EF, TAPSE, and RVfw strain were significantly reduced in the group having MACCE. RVfw strain ≥-16% remained a significant association with MACCE even after adjusting for age, comorbidities, BNP, and tafamidis treatment. The event rate was 57% in patients with RVfw strain ≥-16% versus 21% in those with RVfw strain <-16% (P<.001). The event rate was 58% in patients with LVEF <53% versus 25% in those having LVEF >53% (P<.001). The addition of RVfw strain to LVEF shows poor outcome with RVfw strain ≥-16% despite preserved LVEF > 53%.

Peak longitudinal RVfw strain pattern and its relationship with RV PYP:
The apex to base strain gradient in RVfw (RV RAS relative apical sparing) was significantly higher in the ATTR-CA group than in the LVH control group. However, RV RAS was not associated with MACCE. RVfw strain was 80% sensitive in detecting positive PYP, but specificity was only 47%.

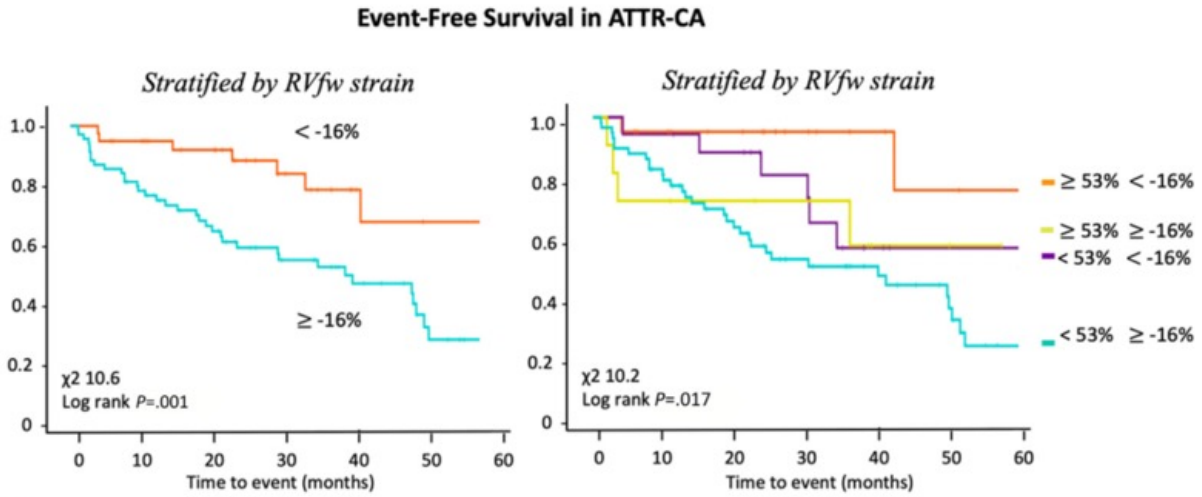


Figure 5 Major adverse cardiovascular and cerebrovascular event–free survival stratified by RVfw strain and MACCE-free survival stratified by RVfw strain and LVEF.

Conclusion

RVfw strain can aid in the diagnosis of ATTR-CA. Additionally, RVfw strain can provide insight into prognostic outcome, especially when coupled with LVEF independent of age and comorbidities. More data is needed regarding the use of RV PYP for the diagnosis and prognostication. Further research will be conducted on the impact of incorporating RVfw strain into diagnostic/prognostic algorithms for ATTR-CA.

Limitations

This was a single center study.

References

1. Echo Res Pract. 2020 Sep;7(3):39-48. doi: 10.1530/ERP-20-0024
2. Circ Cardiovasc Imaging. 2013;6:711–721. doi: 10.1161/CIRCIMAGING.113.000640
3. JACC Cardiovasc Imaging. 2014 Nov;7(11):1084-94. doi: 10.1016/j.jcmg.2014.07.012
4. J Cardiovasc Imaging. 2018 Sep; 26(3): 111–124. doi: 10.4250/jcvi.2018.26.e11
5. Esc Heart Fail. 2019 Sep;6(6):1128-1139. doi: 10.1002/ehf2.12518
6. Esc Heart Fail. 2022 Aug;24(8):1377-1386. https://doi.org/10.1002/ejhf.2504
7. Clin Man & Review TEE 2020: 649-664.
8. Curr Cardiol Rev. 2017 May;13(2): 118–129.
9. J Cardiovasc Magn Reson. 2020 22, 51.

Effect of Sevoflurane Anesthesia on Diastolic Function: A Prospective Observational Study

Sang Hyun Lee, MD, PhD, Hyun Joo Ahn, MD, PhD, Gyeong Min Kim, MD, MiKyung Yang, MD, PhD, Jie Ae Kim, MD, PhD, Sangmin M. Lee, MD, PhD, Burn Young Heo, MD, PhD, Ji Won Choi, MD, PhD, Jin Young Lee, MD, PhD, Heejoon Jeong, MD, and Jeayoun Kim, MD, PhD

Anesth Analg 2024;139:562–70

Reviewer:
Stavroula Nikolaidis MD
Baylor Scott and White Health

Background

The effects of sevoflurane on diastolic function are not well understood and have not been studied extensively. The existing studies have shown conflicting results and are not without methodological problems, such as: small sample size, use of non-standard variables of diastolic dysfunction, mixing of TTE and TEE measurements interchangeably, non-adequate exposure to sevoflurane, lack of standardized conditions, non-consistent blinding of the investigators or absence of comparison of the effects observed between individuals with and without diastolic dysfunction.

The study hypothesis was that sevoflurane improves diastolic function. The authors examined the changes in diastolic function before and after general anesthesia with sevoflurane, in patients with and without preexisting diastolic dysfunction.

Methods

This was a single center prospective observational study with a 2-arm parallel design of 60 patients who underwent laparoscopic cholecystectomy or right breast surgery, between 2/2018 and 10/2022. The changes in diastolic function after exposure to sevoflurane general anesthesia, in 34 patients with and 26 patients without preoperative diastolic dysfunction, were analyzed.

Inclusion criteria: Patients 60 years or older, ASA I or II who agreed to sign the study consent.

Exclusion criteria: allergy to anesthetics, atrial fibrillation, tachycardia >120bpm, moderate or severe valvular disease, systolic heart failure, LVEF<50%, history of prior cardiac surgery, unstable hemodynamics or use of vasoactive medications during the TTE exam, and inability to obtain good quality echo measurements, due to poor acoustic windows (patient's habitus, lesions or tape).

TTEs were performed by anesthesiologists with at least 5 years of TTE experience. The preanesthetic TTE was either obtained during the preoperative visit, within a month prior to surgery, or on the day of surgery immediately prior to administration of anesthesia. The post operative TTE was obtained immediately after skin closure, at a 0.8-1 MAC of sevoflurane, on a non-paralyzed, spontaneously breathing patient, when tidal volume was 4-6 ml/kg, ETCO2 35-45 mmHg and vital signs within 20% of baseline.

The TTE exam was standardized: parasternal long- and short- axis as well as the apical 2- and 4-chamber views were obtained using the GE VIVID S70N platform and M5SC-D phased array 1.5-4.6 MHz probe.

TTE measurements included: LVEF by M-mode, mitral inflow (E and A velocities), mitral E deceleration time (DT), E/A ratio (E/A), tissue Doppler of the septal mitral annulus, e' velocity (e'), E/ e' ratio (E/ e'), Maximum velocity of the tricuspid regurgitation jet (TR Vmax) and left atrial volume index (LAVI).

Diastolic dysfunction was defined as septal e' < 8 cm/s on TTE.

The study was partially blinded: the anesthesiologist who performed the TTE identified diastolic dysfunction but stored the studies digitally for offline interpretation from blinded anesthesiologist who was presented with the TTE exams randomly.

The anesthetic was also standardized: Propofol 2 mg/kg, rocuronium 0.6 mg/kg, fentanyl 50-100 mcg with 100% FiO2 were used on induction of anesthesia either with endotracheal tube

or LMA. During maintenance of anesthesia, 40% FiO2 was used in an oxygen air mixture and sevoflurane was titrated to BIS of 40-50. Crystaloids were given IV at a rate of 2-3 ml/kg/h and standard ASA monitors were used.

Primary end point: percent change (Δ) of e' between baseline and sevoflurane anesthesia.

Secondary endpoints: Δ E/ e' , Δ LAVI and Δ TRVmax between baseline and sevoflurane anesthesia. Δs from patients with and without diastolic dysfunction were compared.

The sample size (60 patients) was derived from power analysis for 0.05% significance. Aside from the primary outcome, statistical analysis was exploratory for all secondary end points and no comparison adjustment was applied.

Results

In the baseline TTE, patients with diastolic dysfunction had lower e' and E/A ratio, higher E/ e' , and longer DT, compared to patients with normal diastolic function. LAVI was no different among the groups, and not enough patients had a measurable TR jet so TRVmax data were not adequate.

After exposure to sevoflurane, the primary outcome Δe' was significantly higher in patients with diastolic dysfunction, showing improvement of diastolic function, and not significantly different in patients with normal diastolic function.

From the secondary and other outcomes, Δ of E, E/A and DT showed improvement in diastolic function in patients with prior diastolic dysfunction while no significant change was found in patients with normal diastolic function.

Although LAVI showed improvement in the diastolic dysfunction group and not significant change in the normal group, this was not statistically significant. Changes in A and E/ e' were not significant in both groups, as shown below:

	Normal		**Diastolic dysfunction**	
Baseline TTE				
Median [IQR] e'	9 [8, 10]	6 [5, 7]	cm/sec	p<.0001
Mean [SD] E/ e'	9 [2]		10 [3]	p=.043
Median [IQR] E/A	1.0 [0.9, 1.3]		0.7 [0.6, 0.9]	p<.0001
Median [IQR] DT	172 [156, 193]		214 [186, 244] sec	p<.0001

	Normal		**Diastolic dysfunction**	
Primary outcome:				
Median [IQR] Δe'	0 [-18, 11]	30 [6,64]	%	p<.0001
Secondary and other outcomes:				
Median [IQR] ΔE	7 [-15, 17]	39 [22, 57]	%	p<.0001
Median [IQR] ΔA	-24 [-31, -14]	-16 [-29, 0]	%	p=.144
Median [IQR] ΔE/A	30 [5, 59]	74 [40, 104]	%	p=.002
Med. [IQR] ΔE/ e'	12 [-9, 22]	11 [-16, 26]	%	p=.853
Median [IQR] ΔDT	6 [-11, 20]	-8 [-29, 5]	%	p=.010
Med. [IQR] ΔLAVI	-4 [-20, 10]	-15 [-31, -3]	%	p=.091

Discussion

In previous animal studies, sevoflurane anesthesia led to worsening of diastolic function. In previous human studies an improvement in diastolic function with sevoflurane was observed instead. So how does sevoflurane affect diastolic dysfunction? The discrepancy seen between prior animal and human studies and several methodological problems seen in prior studies (such as; a relatively small sample size, use of TTE or TEE interchangeably, non-standardized conditions or exposure to sevoflurane and non-adherence to the last guidelines of 2016 for the diagnosis of diastolic dysfunction) made obvious that more research is needed. In this single center prospective observational study with 2 arm parallel design the investigators used standardized

techniques, larger sample size and followed the recommendations of the most recent guidelines for the diagnosis of diastolic dysfunction. The results were consistent with previous trends: sevoflurane improved diastolic function in patients with diastolic dysfunction, but diastolic function remained unchanged in normal patients. Whether improvement of diastolic function with sevoflurane anesthesia can lead to improved outcomes or what is the clinical significance, is unknown. The mechanism by which sevoflurane affects diastolic function is also not well understood.

Limitations

Standardized conditions were used. Can the same results be replicated in real everyday scenarios?

Healthy patients undergoing low risk procedures were studied. How does sevoflurane affect diastolic function in sicker patients undergoing complex procedures?

Not all diastolic parameters showed improvement so further studies are needed.

Conclusions

Sevoflurane improved diastolic function in patients with diastolic dysfunction and did not affect diastolic function in normal patients.

References

1. Filipovic M, Wang J, Michaux I, Hunziker P, Skarvan K, Seeberger MD. Effects of halothane, sevoflurane and propofol on left ventricular diastolic function in humans during spontaneous and mechanical ventilation. Br J Anaesth. 2005;94:186–192.
2. Filipovic M, Michaux I, Wang J, Hunziker P, Skarvan K, Seeberger M. Effects of sevoflurane and propofol on left ventricular diastolic function in patients with pre-existing diastolic dysfunction. Br J Anaesth. 2007;98:12–18.
3. Bolliger D, Seeberger MD, Kasper J, et al. Different effects of sevoflurane, desflurane, and isoflurane on early and late left ventricular diastolic function in young healthy adults. Br J Anaesth. 2010;104:547–554.
4. Skeehan TM, Schuler HG, Riley JL. Comparison of the alteration of cardiac function by sevoflurane, isoflurane, and halothane in the isolated working rat heart. J Cardiothorac Vasc Anesth. 1995;9:706–712.
5. Humphrey LS, Stinson DC, Humphrey MJ, et al. Volatile anesthetic effects on left ventricular relaxation in swine. Anesthesiology. 1990;73:731–738.
6. Graham MR, Thiessen DB, Mutch WA. Isoflurane and halothane impair both systolic and diastolic function in the newborn pig. Can J Anaesth. 1996;43:495–502.
7. Pagel PS, Kampine JP, Schmeling WT, Warltier DC. Alteration of left ventricular diastolic function by desflurane, isoflurane, and halothane in the chronically instrumented dog with autonomic nervous system blockade. Anesthesiology. 1991;74:1103–1114.
8. Pagel PS, Warltier DC. Negative inotropic effects of propofol as evaluated by the regional preload recruitable stroke work relationship in chronically instrumented dogs. Anesthesiology. 1993;78:100–108.
9. Pagel PS, Kampine JP, Schmeling WT, Warltier DC. Reversal of volatile anesthetic-induced depression of myocardial contractility by extracellular calcium also enhances left ventricular diastolic function. Anesthesiology. 1993;78:141–154.
10. Harkin CP, Pagel PS, Kersten JR, Hettrick DA, Warltier DC. Direct negative inotropic and lusitropic effects of sevoflurane. Anesthesiology. 1994;81:156–167.
11. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiogr. 2016;29:277–314.