

December 2001

What's Inside

<u>Website Table of Contents</u>	<u>Inside front cover</u>
<u>Call for Nominations</u>	<u>Inside front cover</u>
<u>Editor's Column</u>	<u>Inside front cover</u>
<u>President's Message: Are You Connected...to the SCA?</u>	<u>page 1</u>
<u>Literature Reviews</u>	<u>page 2</u>
<u>SCA/IREF Research Starter and Mid-Career Grants</u>	<u>Outside back cover</u>

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Society of Cardiovascular Anesthesiologists

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What's Online (www.scahq.org)

From the Editor

December 2001 Newsletter

- [Calendar of Future Meetings \(SCA Online Meeting Registrations\)](#)
- [President's Message: Are You Connected..to the SCA?](#)
- [Literature Reviews](#)
 - [Effect of Sympathetic Reinnervation on Cardiac Performance After Heart Transplantation](#)
 - [Aprotinin, Blood Loss, and Renal Dysfunction in Deep Hypothermia Circulatory Arrest](#)
 - [Use of Risk Stratification to Identify Patients with Unstable Angina Likeliest to Benefit from an Invasive Versus Conservative Management Strategy](#)

[Password Protected Area for Members](#)

[SCA Virtual Library](#)

[CME On-line](#)

[Newsletter Archives](#)

[Acknowledgment of Industry Support](#)

[Fellowship Listings](#)

[Anesthesia & Analgesia Journal Link \(official journal of the SCA\)](#)

[John Nance, Keynote Speaker Bio \(Update on Cardiopulmonary Bypass Meeting, March 18-24, 2002, Snowmass, CO\)](#)

Call for Nominations

Dr. Daniel Thys, Chair of the Nominating Committee, has announced that nominations are being sought for the following positions:

Board of Directors (2) - Three-year term

In order to nominate a person, please forward to Dr. Thys, P.O. Box 11086, Richmond, VA 23230-1086, the following:

- A letter of nomination for a specific office
- Two letters from Society members seconding the nomination
- A "willingness to serve" statement from the nominee.

The deadline for nominations is January 1, 2002. The slate of candidates will appear on the SCA's Website (www.scahq.org) and eligible members will have 30 days to cast their vote for two board member positions.

Become immortalized in the online archives of the SCA by sending in a letter, response, or contributing an article to the SCA Newsletter! If you have been fortunate enough to have been president of the SCA or participated in the PRO and CON debates, you can also find your portrait displayed, together with your opinion, on the web site. Since May 1998, all letters, articles, and literature reviews that were published in the SCA Newsletter can be accessed online at www.scahq.org. Starting in 2002, Newsletter issues will be indexed also according to year, volume, and issue number to facilitate referencing and retrieval of the growing numbers of articles in the archive. The site-specific search engine on the SCA web site can even be used to find articles according to author, topic, or words in the text. This is a convenient feature that is far superior to the filing system employed in most homes, offices, or even at the SCA headquarters.

Last year we considered publishing only an electronic version of the Newsletter. The SCA Newsletter Committee, however, decided unanimously that SCA members would prefer paper. Paper is easier to read, can be stuffed into a scrub pocket, or left on the kitchen countertop. Nonetheless, mailings are costly. For that reason, the paper version of the Newsletter is now limited to 8 pages. While the paper version will still print the full text of articles, reference lists will be abbreviated or left out. The online version will have full text and full referenced citations. From time to time, to accommodate additional content, articles or letters may appear only on the web site.

The SCA Newsletter Committee encourages members to make use of the printed, electronic, and archived versions of the Newsletter.

Albert T. Cheung, MD
University of Pennsylvania
Chair, SCA Newsletter Committee

President's Message

Are You Connected... to the Society of Cardiovascular Anesthesiologists?

"The information highway will revolutionize communications even more than it will revolutionize computing."

- Bill Gates

Do you know that the SCA has e-mail addresses for only 30-40% of our members? I find this astounding since cardiovascular anesthesiologists are among the most technologically advanced and the most cutting-edge anesthesiologists in practice. I am sure this does not reflect an avoidance of the information superhighway by SCA members, but a lack of awareness of how important this "connection" is for our Society. Increasingly, we are staying in touch with our members through general e-mailing. These e-messages have a variety of objectives ranging from bringing an important political or economic message to the SCA membership's attention, all the way down to administrative matters such as notification of registration fee increases or approaching deadlines. The use of e-mail makes our communication with you much more efficient and timely. Without your e-mail address in the database, you won't receive these updates and reminders! So how can you get connected? The new dues notice that you will soon be receiving will include a spot to fill in your e-mail address, as well as office address, telephone number and fax number. Please take the time to fill in this information accurately, so that you will be properly placed in the SCA database. Alternatively, you can submit your e-mail address and full name to SCA@societyhq.com, and we will update your file automatically.

In 1998, the SCA committed itself to developing a presence on the World Wide Web. If you have not yet had the opportunity, please take some time to visit the SCA web page at www.scahq.org. The SCA web site contains a wealth of information for the practicing cardiovascular anesthesiologist, as well as for residents and fellows. From the Home Page, you can go to JOB POSTINGS which is a list of cardiovascular anesthesiologist jobs available throughout the country. Each job posting includes the contact person, salary, job requirement and job description. This link will be of particular interest to fellows in cardiovascular anesthesia. Residents interested in a cardiovascular fellowships should access the listing of CV fellowships throughout North America. Each listing includes chief of the cardiovascular program with contact information, salary and a most comprehensive list of the program specifics.

If you already have a job or fellowship, but would like to further your education, there are a variety of choices you can access at the SCA web site. Didn't make it to the Society of Cardiovascular Anesthesiologists Annual Meeting in Vancouver this past year? Many of the lectures were videotaped by Digiscript and can be accessed via a direct link between the SCA site and Digiscript. CME can be obtained after viewing each tape by completing an evaluation and submitting a fee. Similarly



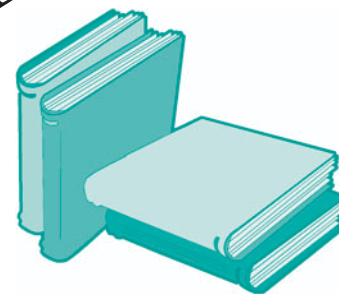
*Roger A. Moore, MD
President, 2001-2003*

education is available within the Member Section both with and without CME credit via the use of a number of vignettes developed by the Electronic Communication Committee under the direction of David Reich, MD. New vignettes will be added continually so that members may well want to return on a periodic basis to the SCA web site to view the new educational materials. If on-line education isn't for you, other educational opportunities are offered. For instance, the taping of the echo meeting lectures have been recorded on 31 tapes which can be purchased on-line at the SCA web site. In addition, there is a listing of all SCA meetings for 2002 with dates, and registration information available at just a mouse click away.

The SCA/American Society of Echo cardiology Task Force on inter-operative echo have also developed an updated report form for transesophageal echo. This report form is an attempt to standardize the

Continued on page 2

LITERATURE



REVIEW

Effect of Sympathetic Reinnervation on Cardiac Performance After Heart Transplantation

F.M. Bengel, P. Ueberfuhr, N Schiepel, S.G. Nekolla, B. Reichart, M. Schwaiger. *N Engl J Med* 2001; 345: 731-8.

Reviewer: Rose Christopherson, MD, PhD
Portland VA Medical Center
Oregon Health Sciences University

Background: Limited reinnervation of the heart may occur late after cardiac transplantation. Little has been known about the effect of reinnervation on exercise performance or cardiac function.

Methods: Twenty-nine patients who had undergone cardiac transplantation were studied. Positron-emission tomography and C-11 labeled hydroxyephedrine, a catecholamine analogue, were used to determine the degree of reinnervation that had occurred. Radionuclide angiography was used to determine global and regional ventricular function at rest and during standardized exercise testing. The results from these patients were compared to those from 10 healthy controls.

Results: Sympathetic reinnervation was present in 16 of the 29 patients who had undergone transplantation. It was mainly in the anteroseptal wall.

There were no hemodynamic differences between these 2 groups at rest. However, patients with sympathetic reinnervation had higher peak exercise heart rates (mean 143 +/- 15 vs. 121 +/- 13 (SD), $P < 0.01$). They also had a longer mean exercise time (8.2 +/- 1.2 minutes vs. 6.1 +/- 1.5 minutes, $P < 0.01$). Finally, they had significantly improved contractile response to exercise, similar to that of the healthy control group.

reporting of transesophageal echo data for all practitioners of transesophageal echo. As the task force continues to work on these forms, the updates will appear on the web site.

Old newsletters are also available to SCA members which include not only the words of wisdom from your current president and past presidents, but in addition, contain the pro and con interactions and literature reviews that have appeared in past issues. This information is provided in a searchable database, thereby providing easier access to information of interest. Finally, there is a membership directory available to members only. In order to access this, you must put in your user name and password. If you have forgotten these, you can obtain them by contacting headquarters at SCA@societyhq.com. There are many other features that can be accessed also by visiting the SCA web site, including the society's official journal *Anesthesia & Analgesia*. I invite everyone to visit our web site in the near future.

I leave you with the plea to "get connected." Make sure we have your newest e-mail address and please plan to visit the SCA web site and all its features available to you!

Roger A. Moore, MD
President, 2001-2003

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Conclusions: The authors concluded that heart-transplant recipients who had restoration of sympathetic innervation had improved response to exercise as measured by heart rate and contractile function.

Comments: The group of transplant recipients who had evidence of sympathetic innervation had undergone transplantation earlier, and had hearts from younger donors, than those who did not have evidence of reinnervation. Obviously, however, no potential recipient of a heart transplant would refuse the organ merely because the donor was elderly. The practical value of this paper for us may be in evaluating perioperative risk of patients who have undergone cardiac transplantation. While our anesthetic management of these patients should require little more than their performance at rest, their ability to increase heart rate and contractility could be very important in the more stressful postoperative period.

It would be wonderful if something could be done to enhance reinnervation for these patients. They are a tiny population, so such advances would likely come from the work and support of those with non-commercial interests, such as us.

Aprotinin, Blood Loss, and Renal Dysfunction in Deep Hypothermic Circulatory Arrest

Mora Mangano CT, Neville MJ, Hsu PH, Mignea I, King J, Miller C. *Circulation* 2001; 104 (suppl I): I-276-I-281.

Reviewer: Mark A. Chaney, MD
University of Chicago

Abstract Excerpt: The technique of deep hypothermic circulatory arrest (DHCA) for cardiopulmonary surgery is associated with increased risk for perioperative blood loss and renal dysfunction. Although aprotinin, a serine protease inhibitor, reduces blood loss in patients undergoing cardiopulmonary bypass, its use has been limited in the setting of DHCA because of concerns regarding aprotinin-induced renal dysfunction. These investigators assessed the affect of aprotinin on both blood transfusion requirements and renal function in patients undergoing cardiovascular surgery and DHCA. They retrospectively reviewed the records of 853 patients who underwent aortic or thoracoabdominal surgery at their institution between 1992

and 2000. 203 of these were subjected to DHCA and 183 survived for more than 24 hours. Preoperative patient characteristics and intraoperative and postoperative clinical and surgical variables were recorded in these 183 patients (44 received aprotinin, 139 did not receive aprotinin). Creatinine clearance was calculated for the preoperative and postoperative periods and renal dysfunction was prospectively defined as a 25% reduction in creatinine clearance. The association between perioperative variables, including aprotinin use, and renal dysfunction was assessed via ANOVA techniques. Regarding all patients, creatinine clearance decreased significantly after DHCA from 86 ml/min (before surgery) to 67 ml/min (after surgery) ($p < 0.01$). 70 of 183 (38%) patients developed postoperative renal dysfunction. Multivariate regression analysis identified five factors independently associated with a greater than 25% reduction in creatinine clearance: requirement for ≥ 5 units of packed red blood cells ($p = 0.0002$), ≤ 800 ml of urine collected in the operating room ($p = 0.0011$), nonuse of dopamine ($p = 0.043$), hematocrit $\leq 21\%$ ($p = 0.0343$), and ≤ 2100 ml of urine during the first 24 postoperative hours ($p = 0.0039$). Aprotinin did not increase the likelihood of postoperative renal dysfunction ($p = 0.951$) nor did it significantly decrease packed red blood cell transfusion requirements in either primary ($n = 107$, $p = 0.456$) or reoperative ($n = 76$, $p = 0.176$) procedures. During the operative period, the aprotinin group received a greater number of units of platelets (10.0 vs 6.6 units, $p < 0.012$), fresh frozen plasma (4.8 vs 3.1 units, $p < 0.03$), and cryoprecipitate (9.9 vs 5.4 units, $p < 0.002$) than patients not receiving aprotinin. The investigators conclude that the data suggest that administration of aprotinin to patients treated with DHCA does not increase the risk of renal dysfunction, that aprotinin may not ameliorate the problem of perioperative blood loss in DHCA, that patients with greater requirements for packed red blood cell transfusions or reduced urine production are more likely to have postoperative renal dysfunction, and that dopamine may provide renal protection in the setting of DHCA.

Comments: While DHCA has proven to be life-saving for many children and adults, control of the adverse sequelae associated with the technique remains a formidable challenge. Coagulopathy remains a substantial problem

accompanying DHCA and the introduction of aprotinin in the early 1990s was an important addition to the armamentarium available to decrease postoperative bleeding in patients when using the technique. However, use of the drug in this setting has been associated with reports of thromboembolic events, renal dysfunction, and other end-organ damage, making use of the drug in this fashion somewhat controversial. The present investigation suggests that use of aprotinin is not associated with renal dysfunction in patients subjected to DHCA. Somewhat surprisingly, aprotinin did not decrease perioperative blood loss, as quantified by a number of measures (blood products transfused, hematocrit values, chest tube drainage). Importantly, aprotinin did not reduce blood transfusion requirements in either patients at increased risk (reoperations) or patients undergoing a primary procedure with DHCA. Lastly, patients administered dopamine, either alone or in combination with one or more inotropic/vasoactive drugs were less likely to exhibit renal dysfunction. Despite decades of ubiquitous use of dopamine for prevention of renal dysfunction, this investigation is the first to indicate, through multivariate analysis, that dopamine may provide renal protection in the setting of DHCA. The retrospective nature of this investigation most certainly limits the conclusions that can be generated from the data. Despite this fact, the investigation does provide some additional information on the somewhat controversial use of aprotinin in patients subjected to DHCA. The investigation also emphasizes the need for well-controlled (prospective, randomized, blinded, placebo-controlled) studies regarding the effects of aprotinin on the coagulopathy and renal dysfunction in patients subjected to DHCA and the potential clinical benefits of perioperative use of dopamine in this scenario as well.

Continued on page 4

Use of Risk Stratification to Identify Patients with Unstable Angina Likeliest to Benefit from an Invasive Versus Conservative Management Strategy

Solomon DH, Stone PH, Glynn RJ, et al. *J Am Coll Cardiol* 2001; 38:969-76

Reviewer: KW Tim Park, MD
Beth Israel Deaconess Medical Center
Harvard Medical School
Boston, MA

Background: There is an ongoing debate on how to best treat patients presenting with unstable angina or non-Q-wave myocardial infarction (NQMI). The VANQWISH (Veterans Affairs Non-Q-Wave Infarction Strategies in Hospital) trial suggested that an early invasive approach might be harmful (Boden WE et al. *N Engl J Med* 1998; 338:1785-92). On the other hand, the FRISC-II (Fast Revascularization during Instability in Coronary Artery Disease) (Lancet 1999; 354:708-15) and TIMI-18 trials (Cannon CP et al. *N Engl J Med* 2001; 344:1879-87) came to the opposite conclusions. With the debate unsettled, the American College of Cardiology/American Heart Association guidelines for management of acute coronary syndromes allow wide latitude in determining who may be appropriate for an early invasive therapy (Braunwald E et al. *Circulation* 2000; 102:1193-209). The authors of the current study hypothesized that the reason for the inconsistent results of the large clinical trials might be that not all patients with acute coronary syndrome are at equal risk for cardiac events and clinical factors at initial presentation may help categorize such patients and help determine the optimal management for each patient.

Methods: The authors performed a retrospective analysis of data collected during the Thrombolysis In Myocardial Infarction (TIMI) IIIB trial. The TIMI-IIIB trial was a randomized, prospective trial of patients with unstable angina or NQMI, comparing early invasive management and conservative medical management in improving cardiac outcome. Whereas patients in the invasive arm of the study underwent cardiac catheterization and other

interventions within 48 hours of enrollment, patients in the conservative arm had cardiac catheterization and revascularization only if there was evidence of ongoing ischemia despite maximal medical therapy, consisting of bed rest, oxygen, beta-adrenergic blockade, a calcium channel blocking agent, a nitrate, heparin, and aspirin. The trial enrolled 1,473 patients, mostly white, middle-aged, and male. Using MI or death within 42 days as the primary outcome, various clinical factors on presentation were examined for their predictive value. Predictive factors with P values < 0.2 on the initial analysis were then entered into a multivariate analysis and those variables with P values > 0.2 in the multivariate analysis were removed. Variables with odds ratios (OR) > 1 in the multivariate analysis were assigned risk scores: 1 point for OR of 1.01 to 1.5, 2 points for OR of 1.51 to 2.0, etc. The risk scores were then summed up to create five categories of risk-stratification from very low to very high. All patients were stratified according to their risk categories and treatment assignment (invasive vs. conservative) and the 42-day and 365-day MI or death rate in each group was examined.

Results: The final multivariate model included advanced age (1 point for age 51-59, 3 points for 60-69, and 5 points for ≥ 70), ST segment depression ≥ 0.1 mV in at least two contiguous leads (2 points), creatine kinase MB fraction ≥ 5 IU/ml (1 point) and a history of complicated angina within 2 months (2 points). Complicated angina was defined as rest, nocturnal, accelerated, or prolonged (> 20 min) episodes of angina. Within each treatment arm, higher risk scores predicted higher 42-day and 365-day cardiac event rates. For patients with risk scores ≥ 7, the early invasive strategy led to significantly lower cardiac event rates than the conservative strategy. On the other hand, for patients with risk scores < 7, there was no significant difference between the different treatment arms.

Comments: As the authors themselves point out, there were several limitations to the study. First, the study was a retrospective analysis of a trial previously carried out and the subgroups in the study were defined post hoc. Second, the TIMI-IIIB trial took place from 1989 to 1992, when the medical regimen did not include the use of glycoprotein IIb/IIIa inhibitors or low molecular-weight heparin and coronary stenting was not used in those who underwent cardiac catheterization.

Inclusion of these modalities might affect the relative benefit of the medical vs. invasive treatment strategies. Despite these limitations, this study helps explain the conflicting results of the recent trials. The VANQWISH trial, which did not find an advantage with early invasive therapy, enrolled patients up to 72 hours after presentation, so that those patients with the most severe acute coronary syndrome, who would have been most likely to benefit from an early invasive intervention, might not have entered into the trial. On the other hand, the FRISC-II trial enrolled only patients with ST segment depression or elevated CK-MB, i.e., high-risk patients who are most likely to benefit from an early invasive management. Not surprisingly, they found a benefit from an early cardiac catheterization.

In addition, this study provided a paradigm for stratifying patients with acute coronary syndromes. An application of the paradigm may be in stratifying patients with unstable angina or uncorrected coronary artery disease presenting for major noncardiac surgery. It is apparent that not all of these patients with uncorrected CAD will benefit from a cardiac catheterization and/or revascularization, prior to undergoing the proposed major noncardiac surgery. Correctly identifying those patients who will benefit from revascularization is important, since the immediate post-revascularization period may represent a high-risk period for subsequent noncardiac surgery (Kaluza GL et al. *J Am Coll Cardiol* 2000; 35:1288-94) and the noncardiac surgery may need to be delayed for a month or longer. A scheme for risk stratification may be developed and applied in order for the practitioner to selectively catheterize and revascularize a subgroup of patients with uncorrected CAD, while sending the rest directly to the noncardiac surgery.

Impact of Intraoperative Transesophageal Echocardiography Among Patients Undergoing Aortic Valve Replacement for Aortic Stenosis.

Nowrangi SK, Connolly HM, Freeman WK, Click RL. *J Am Soc Echocardiogr* 2001;14:863-66.

Reviewers: Kimberley E. Culp, MD,
Albert T. Cheung, MD
*University of Pennsylvania
Philadelphia, PA*

Background: Intraoperative transesophageal echocardiography (IOTEE) provides a wide variety of anatomic, functional, and diagnostic information that is useful for the care of cardiac surgical patients, but there have been few clinical studies that describe what information derived from IOTEE was useful and how it was applied. This study examined the clinical impact of IOTEE in patients undergoing aortic valve replacement (AVR) for aortic stenosis (AS) to determine if IOTEE affected intraoperative surgical decisions. In particular, the ability of IOTEE to determine the need for mitral valve repair or replacement (MVR) in patients with co-existing mitral regurgitation (MR) and AS was examined.

Methods: A retrospective review was conducted for all patients who underwent AVR for AS using IOTEE from January 1993 to December 1996 at the Mayo Clinic in Rochester, MN. Preoperative transthoracic echocardiography (TTE) reports and pre- and post-cardiopulmonary bypass IOTEE reports were reviewed to assess the severity of AS and MR. Postoperative TTE studies performed prior to hospital discharge were also reviewed.

Results: In the interval studied, IOTEE was performed in 464 out of 1273 (36%) patients undergoing AVR for AS. Patients who had congenital heart disease, aortic regurgitation, or prior valve surgery (n=81) were excluded in the analysis. The final study group consisted of 383 (223 male, 160 female; mean age=69 years). Combined AVR and MVR was performed in 54 patients (14%). In 48 of these patients, MVR was planned prior to operation. In 6 of these patients, MVR was unplanned, but performed based on the IOTEE findings. In 25 patients scheduled for both AVR and MVR, only AVR was performed because of

the IOTEE findings. Postoperative TTE examination verified the appropriateness of the intraoperative decision to not perform a MVR in addition to AVR in 24 out of the 25 patients who had AVR only, despite having been scheduled for both AVR and MVR. In the one patient with moderate-to-severe MR on postoperative TTE, the decision not to perform MVR was made in the operating room because the patient was elderly and the IOTEE demonstrated a mitral valve annulus that was heavily calcified and not amenable to repair. In addition to determining the need for MVR, IOTEE findings in 19 patients (5%) were reported have an impact on the operation that was performed. Two out of 7 patients with a patent foramen ovale (PFO) detected by IOTEE had the PFO surgically closed. Abnormal cardiac masses, a fibroelastoma and a left ventricular outflow tract accessory chordae, were detected and excised in 2 patients. Thrombus was detected and removed from the left atrial appendage in 5 patients. IOTEE measurements were used to determine aortic homograft size in 10 patients.

Conclusions: The study found that IOTEE assessment of the mitral valve changed the scheduled operation in 13% of patients undergoing AVR for AS. Additional IOTEE findings had a major impact on surgical management in another 5% of patients.

Comments: The findings of this study provided important details on how information obtained by IOTEE was being utilized to influence the operation and surgical management of patients undergoing AVR. In the majority of cases where IOTEE influenced surgical management, the ability of TEE to quantify the severity of MR, detect structural abnormalities of the mitral valve, and measure the aortic valve annulus size was necessary. Although only 36% of patients undergoing AVR had IOTEE at the time of the study, the authors reported that IOTEE use for AVR at their institution had increased to 66% by 1999. This increase in IOTEE use can be interpreted as growing recognition of the importance of IOTEE for the routine conduct of AVR. A strength of the study was that it addressed specifically the evaluation and surgical management of MR in patients with AS using IOTEE. A limitation of the study was that only short-term outcomes based on postoperative TTE examinations were analyzed. Additional studies demonstrating that operative decisions based on IOTEE findings also predicted long-term operative success and outcome would provide additional support for the routine use of IOTEE as a diagnostic tool for cardiac surgical procedures.



The National Board of Echocardiography
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SCA / IREF Research Starter and Mid-Career Grants

Eligibility & Application Format (New Award Deadline and Criteria)

Eligibility

1. Member of Society of Cardiovascular Anesthesiologists.
2. M.D. or Ph.D. degree.
3. Rank of Associate Professor, or less.
4. Principal Investigators on active NIH grants (or other national peer-reviewed grants) are not eligible.
5. Previous SCA Research Starter Grant recipients are eligible.
6. Previous SCA / IREF Research Mid-Career Grant recipients are not eligible for additional awards.
7. Eligible research projects should be completed within three years after award of grant.
8. Grants will be judged compared to peers (starter versus mid-career).

Requirements

1. Title Page.
 - a. Title of research plan.
 - b. Proposed starting date.
 - c. Name of applicant, academic degrees, faculty rank.
 - d. Name of co-investigators, academic degrees, faculty rank.
 - e. Sponsoring institution in which research will be performed.
 - f. Name, address, and telephone number of responsible department chief.
 - g. Name, address, and telephone number of responsible financial officer of the sponsoring institution.
2. Curriculum Vitae of the applicant, including other grant support.
3. Letter from the department chief indicating the following:
 - a. Assessment of the applicant's research and other professional accomplishments.
 - b. The availability of institutional/departmental support. This may be in the form of matching funds or may take the form of salary support of personnel (other than the primary investigator), supplies, animals, special and permanent equipment, and other necessary expenses, as well as salaries for technical personnel.
 - c. The availability of suitable facilities and/or patients.
 - d. A guarantee that the principal investigator on the application should have at least 40% nonclinical (research) time, should the "grant" be awarded.
 - e. The agreement to return all unused funds if the applicant fails to complete the project within three years.
4. Letters of support should be provided by all co-investigators.
5. All active and pending (applied for or received) research support for all projects must be detailed on a separate page(s). Detail potential areas of overlap with current grant. (Questions should be addressed to the Chairman of the Research Committee.)
6. **For Starter Grants:** Letters of support should be provided by the scientific mentor(s). Obtaining a scientific mentor is encouraged, but not mandatory.

Budget

1. The budget should not *exceed* \$40,000 (\$20,000 per year for a maximum of two years). One-year projects (for a total of \$20,000) and two-year projects (for a total of \$40,000) will be considered.
2. The budget should list all proposed expenditures for the project and indicate the amount and breakdown for specific items requested from the SCA/IREF, and the amount and breakdown for specific items provided by the institution as matching funds.

3. The budget may include salary support for technicians, research nurses, and other research personnel, equipment, and/or supplies. Other costs must be itemized and justified.
4. No part of the grant may be used for salary support of the principal investigator (or fellows or residents), travel or tuition expenses of the principal investigator, patient costs (except to pay for pertinent laboratory studies), consultant costs, alterations and renovations. Ideally, institutions should not request overhead costs.

Research Plan

(limit to 7 double-spaced pages, not including references)

1. Introduction (1-2 pages).
 - a. Objective and specific aims of the research proposal.
 - b. Background. What are the reasons for undertaking this study and what need will it fill? Any preliminary research of the principal investigator should be explained. Significant publications related to the applicant's project should be cited.
 - c. Rationale of the applicant's approach to the objective described above, and justification of this approach as the best way to answer this question.
2. Methods/Design (3-5 pages)
 - a. Indicate the specific techniques, animal species, etc. that will be used.
 - b. Explain the types of experiments to be done.
 - c. Sample size calculation (power analysis) - list and justify the number of each type of experiment that will be required.
 - d. Note the type of data that will be obtained and the methods of statistical analysis.
 - e. Point out the problems and limitations that may develop.
3. Significance (1 page). Summarize the importance of this research and indicate the potential for further studies and future applications of the derived information.
4. Study Approval (1 page). Include a statement of approval of studies involving human or animal subjects by the appropriate institutional committee. (The application may be submitted before approval is obtained, with a letter of explanation. However, no award will be made until notification of institutional approval is received.)
5. Related Studies (1 page). Include a listing of all other studies being performed on the study population.
6. Other Grants (1 page). Include a listing of all grants received, pending, or proposed as an investigator or co-investigator. Include a statement of the relationship to the present grant.

The original and ten copies of the **application should be postmarked no later than March 15**. The award will be announced at the Annual Meeting. The grant period of 12 or 24 consecutive months can begin on any date from July 1 to July 1 of the next year.

Send applications to:

Chairman, Research Committee
Society of Cardiovascular Anesthesiologists
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