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Chairman's Message

By Robert E. Harbaugh, MD, MA

Robert Harbaugh, MD

As we are all well aware, the International Subarachnoid Aneurysm Trial (ISAT) was recently published in the *Lancet*[1]. ISAT, a prospective, randomized trial comparing the functional outcomes of patients with ruptured intracranial aneurysms treated either with clipping or coiling, has been trumpeted as the definitive article on the safety of clipping versus coiling for ruptured intracranial aneurysms. The following message summarizes a letter to the editor of the *Lancet* and a position statement on ISAT from the AANS, CNS and the AANS/CNS Section on Cerebrovascular Surgery.

The results published in the *Lancet* article demonstrate that, for this particular subset of aneurysm patients cared for in these particular centers, patients treated with coiling fared better at one year than those treated with clipping *based on an evaluation using one specific outcomes measure*. The purpose of our letter, our position statement and this Chairman's Message is to indicate points that we believe warrant additional emphasis and clarification.

First, the investigators decided to evaluate the functional status of patients using a modified Rankin Scale score. It is important to keep in mind the rather subtle differences that exist between adjacent scores (Table 1). Of greater concern, the ISAT investigators analyzed the outcomes in two groups; scores of 0-2 and scores of 3-6. They only reported the statistical analysis comparing clipped versus coiled patients for scores of 3-6. For this group of patients, a statistically significant difference between clipping and coiling was seen at one year. If the ISAT investigators had analyzed the outcomes by looking at groups 0-1 or 0-3, no statistically significant difference between clipping and coiling would have been found. In fact, if we designate the groups as was done in ISAT (0-2 and 3-6) but subject the 0-2 group rather than the 3-6 group to statistical analysis, no statistically significant difference is found. It is only by doing the statistical analysis on the group of patients with scores of 3-6 that one can find a significant difference between clipping and coiling in this study. This is a pretty shaky foundation on which to build a revolution in the treatment of ruptured aneurysms.

It should also be noted that most ISAT centers were located in Europe (particularly England), Australia and Canada. Only two patients were entered into the study from a single U.S. center. The results from ISAT may not be applicable to patients in the United States where practice patterns, particularly in reference to the degree of sub-specialization of neurovascular surgeons in major centers, are different. We believe that a carefully planned and executed randomized trial in the United States would be of value.

Another important but unreported piece of information is how many practitioners in the ISAT performed craniotomies for aneurysm clipping and how many practitioners performed endovascular procedures for aneurysm coiling. The absolute risk reduction for coiling compared to clipping at one-year follow-up is only 6.9 percent. If the number of coiling cases per endovascular practitioner is significantly greater than the number of

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clipping cases per neurosurgical practitioner, better outcomes in the coiled patients could be completely explained by a difference in practitioner experience and expertise. The number of neurosurgical and endovascular practitioners in the study and the number of procedures each performed should be published.

Physicians and surgeons involved in the ISAT felt that one form of treatment was preferred in almost 80 percent of patients for whom records are available. Of 9,559 patients with ruptured intracranial aneurysms assessed for eligibility, only 2,143 were randomized. In those not randomized, more patients underwent clipping than coiling as treatment for their ruptured aneurysms. In other words, over the course of this trial, neurovascular teams in the participating centers felt that surgery was the best option for a majority of patients with ruptured aneurysms who were not randomized. Therefore, if an experienced vascular neurosurgeon recommends clipping as the best option for a patient, that patient should continue to be offered surgery as the treatment of choice. The results of ISAT do not apply to such patients, as they were not evaluated in the randomized trial.

We also await with interest the long-term follow-up data on these patients. It is crucial to determine whether or not coiling will be as effective as clipping in preventing re-bleeding over each patient's lifetime. During the relatively short follow-up of the interim ISAT report, 2.6 percent of endovascular patients suffered a hemorrhage following treatment compared to 0.9 percent of surgical patients. In addition, 139 patients treated by coiling required further treatment compared to 31 patients treated by clipping. Although re-bleeding rates more than one year after treatment have been low in both groups, if a differential rate of re-bleeding persists over time, the modest 6.9 percent absolute risk reduction with coiling at one year will disappear. As the authors note, these patients need to be followed for many years before legitimate conclusions can be drawn about whether coiling or clipping is the safer treatment for patients with ruptured intracranial aneurysms.

The ISAT report is an important step in defining the roles of endovascular and microsurgical treatment of patients with ruptured intracranial aneurysms. The concerns noted above are raised to remind all of us that much more study is needed to develop definitive medical evidence on this issue. To extrapolate the early results of this study to all patients with ruptured aneurysms would be a misinterpretation of the ISAT data and a serious disservice to our patients and our profession.

Table 1: Functional Health Status Outcomes at One Year in the ISAT Report

MRS Score	Questionnaire Response	Coiling (N=801)	Clipping (N=793)	P value
0	I have no symptoms and I cope well with life.	207	152	.0123
1	I have a few symptoms but these do not interfere with my everyday life.	217	220	.8421
2	I have symptoms which have changed my life but I am still able to look after myself.	187	178	.7596
3	I have symptoms which have significantly changed my life and prevent me from coping fully, and I need some help looking after myself.	80	106	.0745
4	I have quite severe symptoms which mean I need to have help from other people but I am not so bad as to need attention day and night.	24	32	.3392
5	I have major symptoms which severely handicap me and I need constant attention day and night.	21	25	.6320
6 (Dead)		65	80	.2485

Summary			
0-1	424	372	.1791
0-2	611	550	.2361
0-3	691	656	.5892
3-6	190	243	.0199

MRS = Modified Rankin Scale
Statistical analysis - chi-square with Yates continuity correction

[1] International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2,143 patients with ruptured intracranial aneurysms: a randomised trial. *Lancet*. 2002 Oct 26;360(9342):1267-74. PubMed

Notes From the Editor

By Robert M. Friedlander, MD, MA

Clearly the major current cerebrovascular news items are the results of the International Subarachnoid Aneurysm Trial and the reaction of the public, media and product manufacturers. As Robert E. Harbaugh, MD, eloquently described in his Chairman's Message, upon close examination of the available data presented in the ISAT, many critical questions still remain.

The most troubling concern to me is the interpretation provided to the general public of results that, although important, are preliminary from many points of view. Issues such as outcome assessment, volume of cases treated by each neurosurgeon or endovascular radiologist, and randomization criteria are only but a few issues that require clarification and further investigation. The nearly triple increased risk of rehemorrhage within the first year following coiling when compared to microsurgical clipping is an issue that raises significant concern.

Were any objective criteria used to include or exclude patients from randomization into the trial? How can a clinician use the preliminary data from this study to provide feedback to his or her own patients? Does this data apply to the United States where cerebrovascular surgery in large centers is a discrete subspecialty? As it currently stands, the ISAT results cannot be applied to specific patients being evaluated for therapy.

It will be critical to proceed with a clinical trial in the United States, with appropriate long-term follow-up in order to make any conclusions that may be used in our current practices. With the lack of such data, it is still imperative to critically evaluate one's own results and present them in concert with an experienced endovascular radiologist. This is a subject that will clearly occupy an important place in the evolution of our subspecialty. Important discussions of this topic will be taking place in the upcoming Joint Meeting of the AANS/CNS Section of Cerebrovascular Surgery and American Society of Interventional & Therapeutic Neuroradiology.

What Would You Do?

Contributed by M. Ross Bullock, MD, PhD

The patient is a 7-year-old African-American male. He first presented to medical care eight months ago with a mild right hemiparesis. A computed tomography scan revealed no abnormalities. Magnetic resonance imaging showed a small left internal capsular/thalamic lacunar infarct, without hemorrhage. The MR angiogram showed multiple aneurysms, and cerebral angiography was done. Approximately 23 fusiform intracranial aneurysms were demonstrated, ranging in size from 2 mm to 15 mm. In addition, there were angiographic stigmata consistent with "arteritis" with beading, and

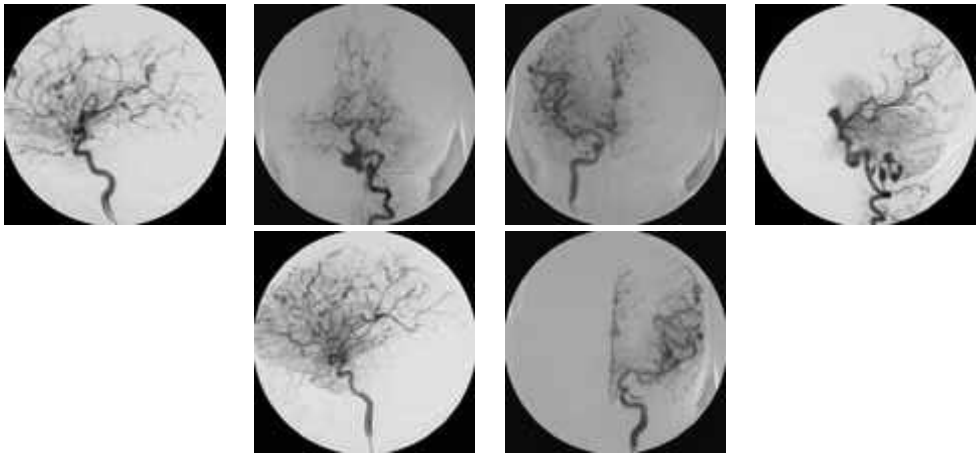
zones of mild focal stenosis.

He has no family history of intracranial aneurysms, polycystic renal disease, or other cardiovascular disorders.

Investigations reveal no abnormality of his systemic circulation or heart or great vessels. He does not have polycystic disease. He is small for his age -- in the third percentile for height. Skin biopsy reveals no abnormality of collagen synthesis, and a procoagulant screen was negative. He tested negative for HIV, and has no other systemic illness. A cerebral angiogram repeated five months after the first reveals approximately 50 percent enlargement of the aneurysms of the basilar trunk and pica.

What would you do?

Click image to view larger picture.



Please take a few moments to submit your response to this edition of What Would You Do? This case closes Feb. 28.

1. What are possible causes for these multiple intracranial aneurysms in this 7-year-old patient?

Which of the following management options would you choose for patients age 7, 20, 40, 60 or 80?

	7	20	40	60	80	Not Indicated
1. Excise a peripheral aneurysm for histology.	☐	☐	☐	☐	☐	☐
2. Insert a stent for the vertebral artery aneurysms.	☐	☐	☐	☐	☐	☐
3. Clip the pica aneurysm.	☐	☐	☐	☐	☐	☐
5. Antihypertensive therapy only.	☐	☐	☐	☐	☐	☐
6. Antiplatelet agent only.	☐	☐	☐	☐	☐	☐

7. Describe your practice:

- ○ General Neurosurgeon
- ○ Primarily Vascular Neurosurgeon

- Vascular Neurosurgeon and Interventional Neuroradiologist
- Interventional Neuroradiologist
- Other

Submit

What Would You Do?
Results and Expert Opinions

By Malini Narayanan, MD, MS and Robert M. Friedlander, MD, MA

Please note that the discussion of the results to this and all "What Would You Do" cases does not represent the opinion of the AANS/CNS Section on Cerebrovascular Surgery nor does it represent standard of care. No formal medical recommendation regarding any specific case can be provided by the below summary of opinions.

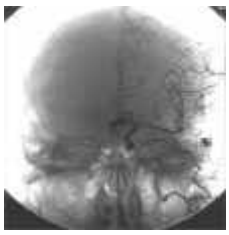
The Case

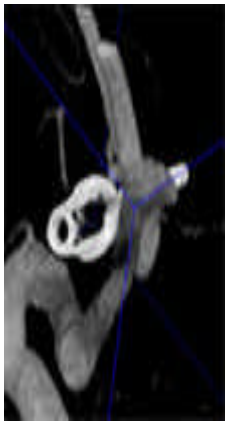
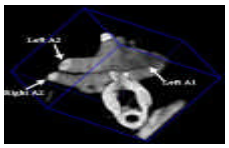
This case was presented in the Fall 2002 issue of *Cerebrovascular News*, available at http://www.neurosurgery.org/cv/newsletter/fall02/whatwouldyoudo.html.

A patient is referred to your office for a consultation. Seven months prior to this visit, the patient suffered a Hunt and Hess Grade III subarachnoid hemorrhage (SAH) from a ruptured anterior communicating artery aneurysm. He was operated on at another institution and the procedure was described as uneventful. He was discharged on post-SAH day 12 to a rehabilitation facility for short stay. He has completely recovered and has returned to his previous occupation as an attorney (or college student).

A first postoperative angiogram obtained six months after the presentation revealed a residual versus new lesion at the left A1-A2 junction. Of note, the patient has a hypoplastic right A1. No other vascular abnormalities were noted. The preoperative angiogram is not available. The patient does not smoke, is not hypertensive and is otherwise in good health.

Click image to view larger picture.

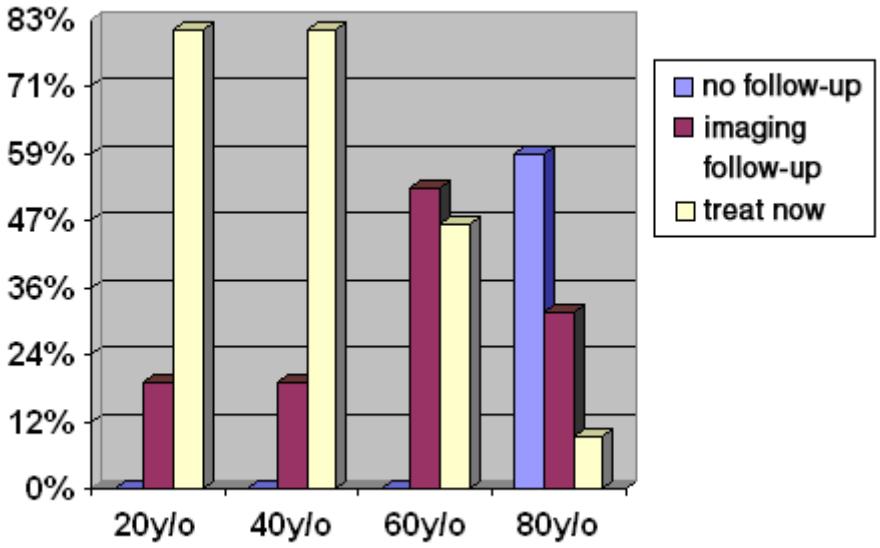


What would you do for a patient age 20, 40, 60 or 80?

1. No follow-up needed.
2. Imaging at regular intervals (angiogram, MRI/MRA, and/or CTA).
3. Treat now.
4. Treat only of it grows.
5. Clip.
6. Coil.

The Results



Results for this "What Would You Do?" case were generated from the survey's new online interactive format. Of the complete respondents, 59.5 percent identified themselves as general neurosurgeons, followed by equal numbers (12.5 percent) of the following groups: primary vascular neurosurgeons; vascular neurosurgeons also trained in interventional neuroradiology; and neurosurgical residents.

For patients age 60 and younger, all survey respondents chose either imaging follow-up or immediate treatment. For patients age 40 and younger, less than 80 percent chose to treat now and less than 20 percent chose imaging follow-up. For those in the 60-year-old group, there was a more even split between imaging follow-up (53.2 percent) and treatment (46.8 percent). In the 80-year-old group, the predominant choice was no follow-up (59.3 percent) followed by imaging follow-up (31.2 percent).

If imaging follow-up was chosen and the residual aneurysm was noted to increase in size, all (100 percent) respondents would treat patients age 60 and younger, and most (80 percent) would treat patients in the 80-year-old group. Treatment of choice for patients age 40 and younger was to clip (greater than 80 percent). For patients in the 60-year-old group, clipping and coiling were equally chosen (50 percent), and for the 80-year-old group, the predominant choice was coiling (67 percent).

Expert Opinions

Opinions on the management of this case have been provided by the following experts: Daniel L. Barrow, MD; Hunt Batjer, MD; Jacques Morcos, MD; and Howard A. Riina, MD.

Through his extensive experience and careful clinical follow-up, the late Charles Drake, MD, demonstrated that incompletely clipped intracranial aneurysms are not fully protected from future subarachnoid hemorrhage. In my opinion, the decision for the 20- or 40-year-old patient is relatively straightforward. With a life expectancy measured in decades, I believe this imperfect surgical result presents the patient with an unacceptably high risk of future subarachnoid hemorrhage and would recommend re-treatment. Because the patient has undergone a previous craniotomy, I would prefer to avoid reoperation and would initially consider endovascular therapy. Unfortunately, this residual aneurysm is very likely unsuitable for current endovascular techniques and reoperation would be necessary.

My colleagues and I have recently reviewed our experience over the past six years in

the reoperative management of 72 aneurysms that were incompletely occluded by an initial endovascular or surgical procedure. Thirty-five of these aneurysms had undergone attempts at surgical treatment and were known to have been incompletely clipped, presented with recurrent subarachnoid hemorrhage, or on follow-up imaging studies were discovered to have residual sac. Based upon that experience, I believe the residual aneurysm in this patient could be treated with a risk that is significantly less than the risk of future subarachnoid hemorrhage over the course of the patient's life. Several months after a craniotomy the approach will be more complicated and the surgeon must be prepared to encounter adhesions and scarring that disrupt the normal anatomic planes. However, with some patience and caution, this aneurysm could be adequately re-exposed and the residual aneurysm clipped.

I believe the decision for management of this residual aneurysm in an 80-year-old patient is even more straightforward. Having occluded the majority of the aneurysm and, very likely, the dome of the aneurysm at the site of rupture, I believe risk of this small residual aneurysm causing a subarachnoid hemorrhage within the typical life expectancy of an 80-year-old individual is less than the risks of reoperation. I would provide no specific follow-up for this patient.

The 60-year-old individual is the most difficult in terms of clinical decision-making. For the typical 60-year-old patient I would most likely recommend imaging at regular intervals beginning with a baseline computed tomography (CT) angiogram to be compared with the postoperative angiogram to determine if the residual aneurysm could be accurately identified. If so, I would follow up with CT angiogram on an annual basis and consider reoperation given any evidence of enlargement. If the residual aneurysm could not be adequately evaluated by this method, I would follow up with serial catheter angiography.

As with most surgical complications, the incomplete clipping of an intracranial aneurysm is a complication that is better avoided than managed. This represents one of the strongest arguments for the use of intraoperative angiography as it is much more desirable to identify the residual aneurysm at the time of the initial operation and not seven months later. With current high-quality intraoperative angiography, this residual aneurysm could almost certainly have been identified intraoperatively and corrected at that time. My colleagues and I recently published a prospective study in which we performed intraoperative angiography on 517 consecutive patients regardless of the size or site of their aneurysm. In this study, intraoperative angiography provided information that changed the operation in 12.4 percent of cases. Residual aneurysm (47 percent) was the most frequent finding leading to clip revision. Although the highest revision rates were identified on the proximal internal carotid artery, intraoperative angiography was able to identify a less-than-perfect result in any location. For the anterior communicating artery, 9.5 percent underwent some type of revision based upon the intraoperative angiogram.

Daniel L. Barrow, MD
Atlanta, Ga.

The dilemma posed by this case is likely one that will be seen increasingly in our practices based on the extremely low incidence of aneurysm recurrence following surgical clipping. Together with the demand by our hospitals and payers for cost containment, many practices simply do not repeat neuroimaging studies on aneurysms that intraoperatively are known to be well-clipped. The development of endovascular techniques has prompted a critical review of such new practices. Following coiling with a Guglielmi detachable coil, the frequency of residual aneurysm neck and subsequent aneurysm regrowth is strikingly different from that following open surgery. Clearly, patients must be followed after coiling with subsequent diagnostic imaging studies for at least five years and possibly forever.

The possibility of constructing an appropriate prospective trial looking at specific scenarios gives us the opportunity to more clearly define the issue of residual aneurysm, as this case clearly highlights. We have a fairly clear idea that the incidence of symptomatic recurrence following surgical clipping is extremely low and that the time period for recurrence typically is between seven and 30 years. However, we know little

about the issue of asymptomatic recurrence.

In this particular case, two possibilities exist: The recurring aneurysm is proximal to the aneurysm clip or a residual lobe of the aneurysm, a situation that was not recognized at the time of the initial surgery. In the anterior communicating area, it is not uncommon to see a remaining lobe of aneurysm projecting posteriorly and inferiorly, which is the most difficult area to expose surgically. In my review of this set of six-month postoperative images, I am a bit on the fence regarding this issue. Nevertheless, for the purpose of discussion I will consider both options. In my view the treatment is the same regardless of which situation we are faced with. I am presuming also that the ruptured portion of the sac was successfully ligated at the time of the original surgery. The successful outcome and lack of rebleeding over the past six months would certainly argue in favor of that scenario.

My perspective is colored by having had the opportunity to re-explore a number of previously coiled patients. These reoperative procedures are more difficult than the initial ones and potentially are associated with higher surgical morbidity.

If this lesion in question is a residual neck of a successfully clipped aneurysm fundus, I would advise the patient and family that while there is a structural defect in the clip reconstruction, the lesion is low risk based on existing data. I would recommend a follow-up angiogram in six months and if the lesion is stable, the next follow-up study would be in approximately two years. Using noncatheter angiography for the study of this particular problem with surgical clip or clips in place has been relatively nonproductive. It is likely that computed tomography angiogram will become a good way to follow these patients, but at the present moment it is not because clip artifact obscures the critical anatomy.

If one hypothesizes that we are dealing with a secondary sac from the anterior communicating complex, my recommendation would be exactly the same in terms of follow-up imaging. I would, however, advise the patient and family that we are dealing with an asymptomatic unruptured aneurysm with a yearly risk of hemorrhage that is quite low, and in this case 1 percent or less per year. Should the lesion change angiographically during follow-up, a repeat operation would be recommended at that time.

Hunt Batjer, MD
Chicago, Ill.

This is a male patient with no known cerebrovascular risk factors and with a history of a ruptured anterior communicating artery aneurysm, originally Hunt and Hess Grade III, who underwent clipping. At six months after surgery he is normal, and a routine angiogram shows what is most likely a residual aneurysmal sac at the left A1-A2 junction, pointing posteriorly. It would appear from the clip size that the original aneurysm must have been small. Although theoretically we cannot rule out a *de novo* aneurysm formation, it is unlikely in view of the short interval, the absence of vasculopathic factors, and mostly in view of the well-known predisposition of anterior communicating aneurysms to be more often than not an ectatic formation at an H-shaped quadrifurcation, rather than a well-defined berry formation with a narrow neck. The original aneurysm clearly had both an anterior and posterior representation and the surgeon only addressed the anterior bulge. The residual lesion arises from the posterior surface of the left A1-A2 junction.

Management options have to depend in part on the natural history of aneurysms after hemorrhage and incomplete clipping. The first potential conceptual error is to equate these lesions to unruptured "whole" aneurysms of the same size, extrapolate the results of the International Study on Unruptured Aneurysms to them, and erroneously conclude that their bleeding rate is minuscule and does not warrant treatment. Clearly, we are dealing with two very different lesions with very different growth patterns and time evolutions. Several studies have addressed the incidence and bleeding risks of residual aneurysms and some have attempted to differentiate "dog ears" from "residual dome-filling." This is clearly an artificial distinction as, particularly for the anterior communicating complex, the weakest point of the lesion may not be necessarily the tip

of the dome, but often a small translucent blister at the base. I would therefore consider, in our particular example, the natural history risks as continued growth and rerupture. The rupture rate is most likely considerably higher than that of a previously unruptured small aneurysm, and yet lower than that of an unsecured previously ruptured small lesion. One has to also factor in the added hemodynamic stress and impetus for continued growth posed by the atretic right A1, placing higher flow demands on the dominant left A1. In addition, the residual aneurysmal sac seems to be at the "hemodynamic inflow zone" of that sac.

The three treatment options are observation, coil or reclip. The case of an 80-year-old individual is straightforward as far as I am concerned. The natural history risks, beyond the first six months after incomplete clipping, are probably far exceeded by the risks of treatment. No treatment is recommended.

For the 20- and 40-year-old individuals, I strongly favor reclipping. I would do it from the side of the dominant A1 (left), to both better see the residual aneurysm and manipulate and possibly replace the old clip. In redo cases, unless the residual lesion has an extremely favorable configuration, it is often easier to start from scratch, reshape the aneurysm with judicious low current coagulation, and attempt to clip with the least number of clips under temporary occlusion of the A1. Our example may well be best suited -- after removing the old clip -- to a single curved clip with slimline blades, the concavity of which hugs the posterior surface of the left A1-A2 junction (placed behind, not in front of, the left A2, after a thorough preservation of hypothalamic perforators).

The arguments against coiling are as follows. The configuration has an unfavorable "neck-fundus" ratio. The lesion size is very small, probably less than 3 mm, and optimal coiling at this small size is (counterintuitively) difficult. I have witnessed a few intraprocedural ruptures in such cases, with or without balloon remodeling. The prospect of continued follow-up for possible recanalization exists.

The case of the 60-year-old individual probably calls for a "golden mean" approach where an intermediate posture is taken. I would favor follow-up with a yearly angiogram (3-D rotational, if available) for about three years, and given no visible changes, would recommend no treatment. Any growth of the lesion would warrant reoperation for clipping.

Jacques Morcos, MD
Miami, Fla.

At Weill-Cornell Medical College and New York Presbyterian Hospital, we recommend that all patients undergoing treatment of an intracranial aneurysm have a postoperative angiogram before they are discharged. Many centers routinely perform intraoperative angiography to aid in clip placement. If residual aneurysm is found, appropriate therapy can be considered at that time.

In this case a functional individual has a small aneurysm at the level of the anterior communicating artery. Whether or not this represents residual aneurysm or a new lesion cannot be determined. Treatment options include doing nothing, endovascular therapy and open microneurosurgical clipping.

The findings of the International Study on Unruptured Intracranial Aneurysms (ISUIA)[1] remain controversial, and a considerable body of literature supports treatment of small aneurysms (< 10 mm). One major criticism of this study is that the findings simply do not fit clinical experience. Studies by both Juvela[2] et al. and Tsutsumi[3] et al. document rupture rates of small aneurysms (< 10 mm) that were considerably higher than those observed in the ISUIA cohort.

This patient has previously experienced a subarachnoid hemorrhage and has either a small aneurysm rest or a new aneurismal formation, approximately 2 mm, in the same location. Both situations are essentially unstable. If the lesion represents residual aneurysm, it poses significant risk of hemorrhage to the patient. If the lesion represents a new aneurysm that has appeared and grown 2 mm in six months, it also poses

significant risk of hemorrhage to the patient.

I would therefore recommend treatment of the lesion. Given the patient's previous craniotomy it would be reasonable to consider endovascular treatment. However, the small aneurysm size, poor morphology and lack of a true neck make it unsuitable for coiling. At the time of this writing the Neuroform stent (Boston Scientific) has become available. It is not clear, based on these images, if this flexible stent could be used to help obliterate this lesion. The coiling of small aneurysms in this location, however, carries with it a significant risk for aneurysm rupture, as there is little room to deliver the coils. It may be difficult to place more than one or two coils into the lesion due to its size. The endovascular option does need to be presented to the patient, but I believe it would carry a greater risk than surgery. If the patient insists on a nonsurgical option, an endovascular approach could be attempted. Prior to either treatment I would obtain a 3-D rotational angiogram to better delineate the local anatomy.

Microneurosurgical clipping would be the treatment algorithm more likely of success. Despite the patient's previous craniotomy, this approach would be of lower risk than the endovascular option and would be the therapy most likely to obliterate the lesion entirely. Surgery is made more difficult by the previous craniotomy, the existing clip and the small size of the aneurysm. However, direct visualization would allow correct clip placement. The basic tenets of aneurysm surgery and those particular to the anterior communicating complex should be strictly adhered to. This should be done without removing or repositioning the original clip, as the events of his previous surgery remain unknown. The presented images suggest that a mini-clip conformation could be applied to this lesion.

Howard A. Riina, MD
New York, NY

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Sixth Annual CV/ASITN Meeting in Phoenix Promises Controversial Scientific Sessions and Outstanding Practical Courses

By B. Gregory Thompson, MD

The AANS/CNS Section on Cerebrovascular Surgery and the American Society of Interventional & Therapeutic Neuroradiology have completed planning for the Sixth Annual Joint Meeting, which will be held in Phoenix, Ariz., at the Phoenix Civic Plaza Convention Center from Feb. 16 to 19, 2003. Annual Meeting Co-Chairs B. Gregory Thompson, MD, from the CV Section, and J.J. "Buddy" Connors III, MD, from the ASITN, have assembled an outstanding scientific program which will feature, among other highlights, four "state-of- the-art" practical courses, and five scientific plenary sessions which will emphasize current controversies in the management of patients with cerebrovascular disease.

This year's meeting will also mark the first time that the Society of Neurological Anesthesia and Critical Care (SNACC) has participated as a sponsor for the meeting. The Annual Meeting Committee has worked closely with leadership from SNACC during formation of the scientific program to bring the neuro-anesthesia/critical care perspective into many of the scientific symposia and luncheon seminars.

Five scientific plenary sessions and 19 luncheon seminars are scheduled, featuring renowned experts in the field of neurosurgery, interventional neuroradiology, neuroanesthesiology and neurological intensive care. The plenary scientific symposia promise to be particularly memorable, as leading experts will critically review and debate areas of current controversy, such as the appropriate treatment of unruptured aneurysms, and the "clip versus coil" controversy in the light of the recently published studies, the International International Study of Unruptured Intracranial Aneurysms (ISUIA) and the International Subarachnoid Aneurysm Trial (ISAT). Robert F. Spetzler, MD, always a provocative speaker, will give the sixth annual Luessenhop Lecture, accompanied by a 3-D video, "Surgical Management of the Perforators: The Real Key to Operative Success."

On Saturday, Feb. 15, an afternoon session has been developed in conjunction with the American Heart Association International Stroke Conference. This will be a very informative program, with emphasis on evaluation of vertebrobasilar insufficiency and treatment of cerebral aneurysms. Registrants for the CV/ASITN meeting are encouraged to register at the AHA Stroke meeting. CV/ASITN meeting attendees also will be offered additional continuing medical education credits and a special reduced one-day fee for registration on Saturday at the Stroke meeting, if they wish to attend.

Four special courses will take place on Sunday, offering additional educational opportunities for continuing medical education credit. They include:

Special Course 1, "Special Techniques in Microsurgical Aneurysm Surgery," is a limited-enrollment, full-day course which will be composed of two spectacular half-day practical sessions. The course will feature workshop lectures and 3-D demonstrations in the state-of-the-art surgical laboratories of the Barrow Neurological Institute.

The morning session, "Skull Base Approaches: What Every Neurovascular Surgeon Should Know," will be directed by Jacques J. Morcos, MD, and Joseph M. Zabramski, MD, and will feature a star-studded lineup of surgical experts, such as Steven L. Giannotta, MD, Robert F. Spetzler, MD, Chandranath Sen, MD, Thomas A. Kopitnik, MD, and John Diaz Day, MD, among others. Following lunch, the topic will be "Microvascular and Bypass Reconstruction for Unclippable/Uncoilable Aneurysms." David W. Newell, MD, and B. Gregory Thompson, MD, will direct this session, which will feature an all-star faculty including Laligam N. Sekhar, MD, Neil A. Martin, MD, Michael T. Lawton, MD, and Winfield S. "Wink" Fisher III, MD, among others. The afternoon course will conclude with a 3-D video demonstration by Dr. Spetzler, and a limited number of participants may elect to do a special additional two-hour microsurgical anastamosis practical lab with rats.

Special Course 2, "Acute Stroke: Interventional Management," is a half-day morning course which will be directed by J.J. "Buddy" Connors III, MD, and Lee R. Guterman, MD. This course will emphasize the practical aspects of endovascular management of acute stroke. Speakers including Thomas A. Tomsick, MD, will report on recent IV Trials (e.g., Rheopro), novel neuroprotectants, and new mechanical interventional devices for stroke.

Special Course 3, "Critical Care Management in the Neurological ICU," will be directed by Joshua B. Bederson, MD, and will feature contributions from several outstanding faculty from both the CV Section and SNACC. This course has been highly in demand in past years so registrants should sign up early.

Special Course 4, "Endovascular Management of Aneurysms" is a half-day afternoon course directed by Alex Alejandro Berenstein, MD, and Robert H.

Rosenwasser, MD. This extremely popular course will rapidly review a series of key practical issues, including a review of currently available coils, research on liquid embolics, flow dynamics, preembolization and postembolization anticoagulation management, and techniques (such as stenting and balloon protection) for giant aneurysm treatment. The course will feature national and international luminaries such as Michel E. Mawad, MD. On Monday morning the scientific program will get a jump-start in Scientific Symposium I with what promises to be a spirited discussion of the recently published ISAT and ISUIA studies. Andrew Molyneux, MD, and Richard Kerr, MD, principal investigators of the ISAT trial, will describe the initial results of that study, and then S. Claiborne Johnston, MD, and Philip E. Stieg, MD, will debate whether the study should now resolve the clip versus coil question. CV Section Chair Robert E. Harbaugh, MD, will then follow with further critical analysis of the ISUIA and ISAT studies.

Subsequent scientific symposia during the next two days will address other controversies in the treatment of midgrade cerebral arteriovenous malformations, acute stroke, and intracranial atherosclerotic disease. Defining the standard of care for intraprocedural cerebral monitoring and cerebral protection also will be debated, with contributions from some outstanding SNACC faculty. The final plenary scientific session on Wednesday morning will conclude with a special seminar, the "Prevention and Treatment of Complications in the Management of Cerebral Aneurysms," which will include the Luessenhop Lecture by Dr. Spetzler.

There will be more than 225 oral and poster abstract presentations at the meeting this year. In addition, more than 40 exhibitors are expected to display their wares and the latest advances in technology.

The social program for this meeting includes all the advantages of a midwinter visit to the sunny desert Southwest. The meeting's opening reception on Sunday evening on the terrace at the Crowne Plaza Phoenix Downtown will celebrate a midwinter respite in balmy Phoenix with Southwestern cuisine, a steel drum band, and flamenco dancers. Another first this year will occur on Tuesday evening, Feb. 18, when Dr. Harbaugh will host a cocktail reception for all CV Section members who are also interventionalists. For meeting attendees who are able to stay after the final morning session on Wednesday, Feb. 19, golf tee times will be made available upon request.

Advance registration, housing materials, and more information are available now at http://www.neurosurgery.org/cv/meetings Submit your Housing Form without delay. Reservations will be confirmed directly by the Crowne Plaza Phoenix Downtown.

52nd CNS Annual Meeting

Murat Gunel, MD

Outstanding Scientific Program

The 52nd CNS Annual Meeting was held in Philadelphia Sept. 21-26, 2002. Under the leadership of Robert E. Harbaugh, MD, our section's chair, Robert Friedlander, MD, prepared an outstanding scientific program.

Among the highlights of the meeting was the presentation of the Galbraith Award to Richard Clatterbuck, MD, for his abstract on the potential role of controlled release of the nitric oxide donor DETA-NO in preventing experimental vasospasm. M. Gazi Yasargil, MD, delivered the Charles Drake Lecture the same afternoon. Prof. Yasargil's reflections on neurovascular surgery and his philosophical approach in interpretation of historical development of microvascular surgery attracted a large audience and reminded us of our field's long heritage.

Posters and open papers also were discussed. The papers presenting the preliminary results of the highly controversial trials that compare microsurgical clipping to coiling for treatment of aneurysms raised heated controversy. As our section is getting ready for the start of a fair trial examining this subject, the importance of appropriate trial design

with sufficient length of follow-up is emphasized.

The scope of cerebrovascular surgery is changing rapidly. With the introduction of endovascular techniques, the practice of microvascular surgery is becoming more and more focused on complicated cases. Among the major tools available to the microvascular surgeon for treating complicated lesions are bypass surgery and microvascular reconstruction. One of the practical courses offered during the weekend covered not only the theoretical aspects of bypass surgery, but also hands-on experience on laboratory animals. Other neurovascular courses included the surgical and endovascular treatment of aneurysms directed by Drs. Kopitnik and White, and critical care for neurovascular disorders directed by Drs. Bederson and Elliott.

During the special course on cerebrovascular disorders, Drs. Spetzler, Batjer, Day and Samson discussed when not to operate on aneurysms and vascular malformations. This approach proved extremely useful in selecting patients appropriate for surgery.

The spectrum of oral and poster presentations ranged from pediatric intracranial aneurysms to natural history of cavernous malformations to serum markers that predict the onset of vasospasm after aneurysmal subarachnoid hemorrhage. The presentations on the natural history and treatment paradigms of Spetzler-Martin Grade IV and Grade V arteriovenous malformations resulted in a debate regarding whether partial treatment of these difficult AVMs resulted in reduced versus increased risk of bleeding. We will have to wait until our next meeting to hear more about this and other controversies.

The Sixth Joint Meeting of the AANS/CNS Section on Cerebrovascular Surgery and American Society of Interventional & Therapeutic Neuroradiology will be held in Phoenix, Ariz., Feb. 16-19, 2003. We look forward to an exciting program and interesting discussions and hope to see you there.

Endovascular Corner

Transvenous Obliteration of Traumatic Direct Carotid Cavernous Fistula

by Alexander M. Norbash, MD and **Kai U. Frerichs, MD**

Most direct traumatic carotid cavernous fistulae can be obliterated via a transarterial approach with detachable silicone balloon embolization. Rarely, if the transarterial route cannot be used because of a small or inaccessible arterial rent, a retrograde transvenous approach may be utilized.

Presenting symptoms ordinarily include ophthalmoplegia and visual decline from malignant intraocular hypertentsion related to retrograde pressurization of the ophthalmic veins. Similarly, in some cases cortical veins may also become passively congested via retrograde filling of the sphenoparietal sinus, resulting in venous hemorrhages, focal motor deficits, or seizures. Urgent treatment may be indicated in the latter cases, and also if vision in the affected eye is threatened.

The Case

This 25-year-old female was involved in a roll-over motor vehicle accident and sustained fractures of the skull base, including the clivus, temporal bone and clinoids, in addition to a traumatic rupture of the right globe. Proptosis, chemosis and ophthalmoplegia of the left eye was noted. Intraocular pressures were elevated despite a lateral canthotomy.

A cerebral angiogram was performed revealing a direct connection between the left cavernous internal carotid artery and cavernous sinus with retrograde filling of the superior and inferior ophthalmic veins (Figure 1). It also showed brisk outflow from the cavernous sinus into the inferior petrosal sinus.

Click images to view larger picture.

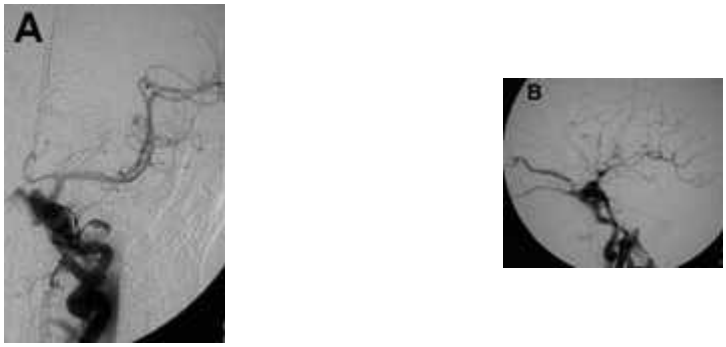

Figure 1: Preembolization left carotid angiogram in anteroposterior [A] and lateral [B] projections.

An initial attempt to engage the fistula transarterially failed due to the inopportune orientation and size of the fistulous communication. Transvenous embolization was then carried out in two stages. In the first stage, the left superior ophthalmic vein and cavernous sinus were superselected via the facial and angular vein using the venous phase of the carotid angiogram for roadmapping. Coil embolization was carried out of the anterior cavernous sinus back into the superior ophthalmic vein with the coil mass also conforming to the distal inferior ophthalmic vein, effectively eliminating retrograde pressurization of the ophthalmic venous complexes. A partial embolization of the cavernous sinus via the inferior petrosal sinus also was carried out and continued during stage two on the following day to complete obliteration of the fistula, while preserving patency of the parent vessel (Figure 2).

Click images to view larger picture.

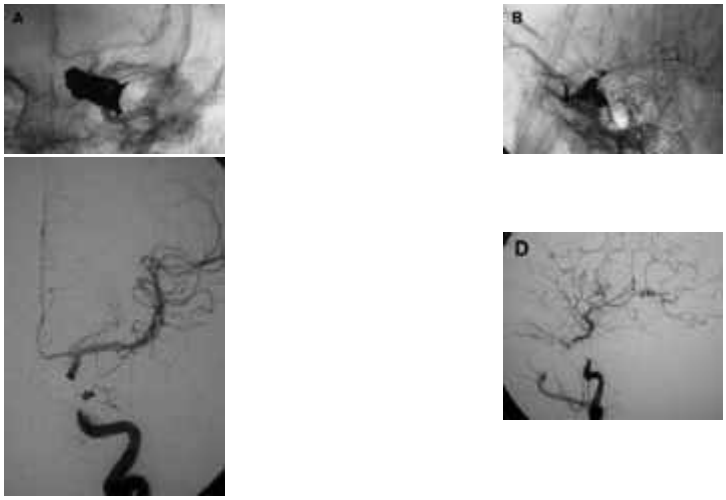

Figure 2: Postembolization left carotid angiogram in unsubtracted anteroposterior [A] and lateral [B] and subtracted anteroposterior [C] and lateral [D] projections. Note also improved filling of the intracranial branches.

Conclusion

This case illustrates that in rare cases, transvenous embolization of direct carotid cavernous fistulas may be feasible. Under certain circumstances this may have to be done urgently.

Technology Report

By J Mocco, MD Robert J. Dempsey and E. Sander Connolly, Jr., MD

Brain Physiology Monitoring

Recent advances in brain physiology monitoring technologies are bringing previously unattainable physiological parameters and their minute-to-minute changes to the forefront of common neurointensive care unit and OR management. One of the most highly investigated new technologies is the cerebral tissue oxygenation monitor. Numerous recent studies have been performed in an effort to better understand the reliability, clinical utility, and prognostic significance of brain tissue oxygenation ($PtiO_2$).

The human brain comprises 2 percent of the body's weight, yet it utilizes 20 percent of the oxygen consumed by the entire body. Of the brain's cells, neurons are the most sensitive to oxygen deprivation, with oligodendrocytes, astrocytes and microglia following in order of increasing ability to withstand anoxia. Oxygen delivery to the brain is dependent on diffusion down a concentration gradient from air to blood (which is facilitated by the presence of hemoglobin) to tissue. The $PtiO_2$ monitor is helping to provide a better understanding of the normal and ischemic physiology that regulates oxygen delivery and consumption-information that is crucial to our increasing efforts to improve outcomes after brain injury/ischemia.

Early work examining the utility of the $PtiO_2$ monitor has centered on demonstrating the consistency, reliability, and normal ranges for the data generated by monitors. Dings et al. demonstrated the accuracy of this technology, with only a 1 percent error during in vitro testing[1]. Animal, and later human, studies have shown that, after an initial 30-minute to two-hour equilibration period, values are extremely consistent and respond in a reliable manner to various physiological manipulations. This equilibration period has been attributed to microtrauma suffered by the brain when inserting the monitor itself. Interestingly, there is a great deal of variability in the baseline $PtiO_2$ levels from individual to individual. Baseline reported values have ranged from approximately 15 mmHg to 45 mmHg. This data is confounded due to the fact that there is underlying disease in all patients receiving the $PtiO_2$ monitor and it is therefore difficult to define a true normal level. In swine the baseline $PtiO_2$ was demonstrated to be 41.9 ± 11.3 mmHg[2]. It is likely that the variability observed is inherent to the technology. The PtiO2 monitor samples an area on the order of 7 mm^2. $PtiO_2$ varies according to a given area of brain's cellular composition and its relationship to capillary beds. It is probable that much of the variability in the $PtiO_2$ values is due to sampling error depending on the microenvironment in which the monitor is placed. One might predict that in future studies the relative change in $PtiO_2$ may be more important than any absolute number.

Currently, investigators are at work attempting to understand the prognostic significance and possible clinical relevance of the $PtiO_2$ monitor. Questions that have yet to be definitively answered are whether there is a prognostic value to the $PtiO_2$ level or a therapeutic value to maintaining the $PtiO_2$ above a certain threshold. Presently the data is unclear. A rabbit model of ischemia has identified a $PtiO^2$ of < 8 mmHg as the critical threshold for injury[3]. Doppenberg et al. found a $PtiO_2$ < 19 mmHg to be correlated with poor outcome in head injured patients, while other investigators

have found lower levels necessary to predict poor outcome[4]. Further studies are clearly necessary in order to better identify the critical level of $PtiO_2$.

A particularly relevant application of this technology is the intraoperative use of $PtiO_2$ levels to better identify temporary occlusion time thresholds. Two recent papers have already demonstrated the ability to utilize $PtiO_2$ monitors intraoperatively and have providing some interesting preliminary data, although more thorough studies are indicated[5,6]. A second exciting application of this technology is in the early detection of vasospasm in poor grade subarachnoid hemorrhage patients. It seems likely that the addition of decreasing $PtiO_2$ levels to the vasospasm detection armamentarium will be invaluable in those patients for whom the clinical exam is an unreliable tool.

As a better understanding of $PtiO_2$ in stroke, trauma, and the perioperative brain is achieved, the use of $PtiO_2$ monitors will likely become instrumental in the care of neurosurgical patients, or at the very least, they will contribute to the advancement of our understanding of the basic physiology upon which our patients' outcomes depend.

1. Dings et al. Clinical experience with 118 brain tissue oxygen partial pressure catheter probes. *Neurosurgery*. 1998 Nov;43(5):1082-95. PubMed
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Resident Research Award in Cerebrovascular Disease*

The AANS/CNS Section on Cerebrovascular Surgery congratulates Malini Narayanan, MD, Brigham and Women's Hospital, as the 2002 recipient of the Resident Research Award in Cerebrovascular Disease.

Award details include:

- Up to $15,000 Support of Specific Research Proposal
- Residents in North American Training Programs
- Research Related to Cerebrovascular Disease

Application Deadline: March 1, 2003

For information and the online application, go to

http://www.neurosurgery.org/sections/grants/index.asp#residentcv or contact:

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Funded through the AANS/CNS Section on Cerebrovascular Surgery

Cerbrovascular Funding Opportunities Are a Mouse-Click Away

A central resource for cerebrovascular funding sources sponsored by the American Academy of Neurological Surgeons Section on Cerebrovascular Disease is currently available online.

This Web site, continually updated with new funding possibilities, is under the direction of Robert Dempsey, MD, at the University of Wisconsin. Subscribers to the Web site receive automatic e-mail messages with links to access new opportunities or changes made to previously posted opportunities.

The address is http://funding.neurosurg.wisc.edu.

AANS/CNS Section on Cerebrovascular Surgery Membership Recruitment

By Frank Culicchia, MD

The purpose of the AANS/CNS Section on Cerebrovascular Surgery (SCVS) is to advance education, research, and patient care in the area of cerebrovascular disease. Through its activities and educational programs, the SCVS strives to promote awareness among all neurosurgeons of opportunities for clinical practice and research in the area of cerebrovascular surgery to improve and advance patient care.

The section's leadership has established relationships with other specialties involved in the management of cerebrovascular disease to provide a broad focus in advancing cerebrovascular surgery. This is most evident at the annual meeting of the SCVS. Held in conjunction with the American Society of Interventional and Therapeutic Neuroradiology, the annual meeting focuses upon discussions, presentations, and practical courses of the most advanced methods of treatment, as well as those under development in the specialty of cerebrovascular surgery. Involvement of critical care, cerebrovascular anesthesiology and cerebrovascular neurology brings together an integrated team at our annual meeting, truly advancing education and stimulating research.

Membership allows for discounted registration to the annual meeting, an online newsletter, and e-mail updates on developments within the field of cerebrovascular surgery. The success and the strength of the AANS/CNS Section on Cerebrovascular Surgery to improve care to our patients lies within its membership. Browse the Web page www.neurosurgery.org/cv. Download, complete and return the application at www.neurosurgery.org/cv/cvapp.pdf (PDF 68KB) to become a member.

AANS/CNS Section on Cerebrovascular Surgery Officers

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Chair-Elect	Warren R. Selman, MD
Secretary	Philip E. Stieg, PhD MD
Treasurer	Robert H. Rosenwasser, MD
Membership Chair	Frank Culicchia, MD
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Newsletter Mission Statement

The newsletter is distributed to all members of the AANS/CNS Section on Cerebrovascular Surgery. The purposes of the newsletter are to:

- Promote communication among section members.
- Promote communication among the section's Executive Council and the members.
- Promote coordinated activities and a common purpose within the section.
- Inform the membership of research, educational, and employment opportunities.
- Inform the membership of new technical developments in the treatment of cerebrovascular disease.
- Promote research, patient care, and educational activities of the section.

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The *Cerebrovascular News* editor would like to thank current and past contributors for their assistance and efforts.

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Letters to the Editor

One of the main purposes of *Cerebrovascular News* is to promote communication among members of the AANS/CNS Section on Cerebrovascular Surgery. Your insights, questions, and comments increase the section's value for everyone. Please send your input to Robert M. Friedlander, MD, MA, editor, *Cerebrovascular News*, at rfriedlander@rics.bwh.harvard.edu.

Thank You, Sponsors

The AANS/CNS Section on Cerebrovascular Surgery and the American Society of Interventional & Therapeutic Neuroradiology wish to thank the following companies for their generous support of the section's 2003 Annual Meeting.

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