

# High-risk carotid endarterectomy: Fact or fiction

Antonios P. Gasparis, MD,<sup>a</sup> Lise Ricotta,<sup>a</sup> Salvador A. Cuadra, MD,<sup>a</sup> Daniel J. Char, MD,<sup>a</sup> William A. Purtil, MD,<sup>b</sup> Paul S. Van Bemmelen, MD,<sup>a</sup> George L. Hines, MD,<sup>b</sup> Fabio Giron, MD, PhD,<sup>a</sup> and John J. Ricotta, MD,<sup>a</sup> *Stony Brook and Mineola, NY*

**Objective:** It has been proposed that patients whose conditions do not meet North American Symptomatic Carotid Endarterectomy Trial inclusion criteria or have anatomic risk factors constitute a “high-risk” group for carotid endarterectomy (CEA) and might be candidates for primary carotid angioplasty stenting. Our objective was to review a consecutive series of isolated CEAs, identify the number of such patients at high risk, and determine whether their operations were associated with increased complication rate.

**Methods:** Consecutive isolated CEAs performed between June 1996 and June 2001 were reviewed. High-risk comorbidities included: age 80 years or more (n = 80), New York Heart Association class III/IV angina (n = 16), Canadian class III/IV heart failure (n = 4), myocardial infarct 6 months or less (n = 11), steroid-dependent or oxygen-dependent pulmonary disease (n = 4), and creatinine level of 3 or more (n = 13). Anatomic high risk was defined by: contralateral occlusion (n = 66), lesion above C<sub>2</sub> or requirement of digastric division (n = 53), reoperation (n = 29), and neck radiation (n = 3). Statistical analysis was with  $\chi^2$  analysis.

**Results:** Of 788 patients reviewed, 228 (29%) were classified as high risk by one or more of the previous criteria (63% comorbidity, 28% anatomy, 9% both). Presence of preoperative neurologic symptoms and postoperative results were similar across all patient groups. The total stroke and death rate was 1.1% for all the patients. Six patients had postoperative strokes (0.8%), and three patients died of myocardial infarcts (0.4%). The stroke and death rate was 1.3% in the high-risk group as compared with 1.1% in the normal-risk group ( $P = .51$ ).

**Conclusion:** The concept of the high-risk CEA must be critically reexamined. Although 29% of patients for CEA were high risk as defined by others, we found no evidence that this influenced the results after CEA. Patients with significant medical comorbidities, contralateral carotid occlusion, and high carotid lesions can undergo operation without increased complications. If a high-risk group exists, it is small and restricted to reoperation or radiated neck (4% in this series). With this possible exception, carotid angioplasty stenting should be restricted to randomized clinical trials. (*J Vasc Surg* 2003; 37:40-6.)

Cerebrovascular accident (CVA) is the third leading cause of death in the United States after heart disease and cancer.<sup>1</sup> In the United States, more than 500,000 new CVAs occur annually, and the incidence rate rises exponentially with advancing age.<sup>2</sup> A significant portion of these CVAs is caused by emboli arising from the extracranial carotid arteries.

Carotid endarterectomy (CEA) has been shown by several randomized prospective studies<sup>3,4</sup> to be safe and effective in significantly reducing the incidence of stroke in patients with symptomatic and asymptomatic extracranial carotid disease. In the current era of minimally invasive technology, carotid angioplasty stenting (CAS) has emerged and been explored as a potential alternative to the standard of care. Despite the fact that several early randomized studies were unsuccessful in establishing the benefits of CAS, proponents of this new technology have recom-

mended the application of CAS in a subset of patients who are considered to be at “high risk” to undergo CEA.

The definition of patients at high risk varies among authors. Many include patients excluded from previous randomized trials<sup>3,4</sup> (ie, age >80 years, medical high risk, contralateral occlusion, prior CEA). This would represent a 20% to 30% cohort of a contemporary carotid practice.<sup>5,6</sup> No data exist that clearly define any large group of patients at increased risk for complication after CEA. In an effort to determine whether this cohort accurately represents a group at increased risk to undergo CEA, we retrospectively reviewed our institutional experience of a contemporary series of isolated CEAs, identified the proportion of patients included as high risk in the published literature, and evaluated their outcome.

## METHODS

During a 5-year period from June 1, 1996, to June 1, 2001, 788 consecutive isolated CEAs were performed at SUNY Stony Brook University Hospital and Winthrop University Hospital. Office charts and hospital records were retrospectively reviewed, and the data were used to classify these patients into either a normal-risk or high-risk group. The high-risk factors included physiologic risk and anatomic risk factors (Table I).

The physiologic risk factors included: 1, age 80 years or more; 2, recent myocardial infarct (<6 months); 3, New York Heart Association functional class III or IV; 4, Cana-

From the Division of Vascular Surgery, Department of Surgery, SUNY Stony Brook University Hospital<sup>a</sup>; and the Division of Vascular Surgery, Department of Surgery, Winthrop University Hospital.<sup>b</sup>

Competition of interest: nil.

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Reprint requests: Antonios P. Gasparis, MD, 888 Roxbury Dr, Westbury, NY 11590 (e-mail: agasparis\_md@yahoo.com).

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**Table I.** High-risk physiologic and anatomic factors

<i>Physiologic risk factors</i>	<i>No.</i>	<i>Anatomic risk factors</i>	<i>No.</i>
Age (y)	80	Contralateral occlusion	66
MI $\leq$ 6 months	11	Reoperation	29
NYHA class III/IV angina	16	Neck radiation	3
Canadian class III/IV CHF	4	High lesion	53
Steroid/oxygen COPD	4		
Creatinine level $\geq$ 3	13		

NYHA, New York Heart Association; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

dian Cardiovascular Association heart failure functional class III or IV; 5, severe pulmonary dysfunction defined as steroid or oxygen dependent; and 6, severe renal dysfunction defined as serum creatinine level of 3 or more. The anatomic risk factors included: 1, contralateral occlusion; 2, anatomically limited access defined by a lesion above C<sub>2</sub> on angiography or requirement of division of digastric muscle; 3, previous ipsilateral CEA; and 4, postradiation treatment stenosis. A patient was classified as high risk if one or more of the previous risk factors were identified, and each patient could be classified in more than one category.

Indication for CEA included the presence of a hemodynamically significant ( $\geq$ 50% diameter reduction) carotid stenosis in a symptomatic patient. Patients without symptoms who had high-grade carotid stenosis ( $\geq$ 70% diameter reduction) were also considered for CEA.

Myocardial infarction (MI), transient ischemic attack, stroke, and death were identified as primary events in both the normal-risk and the high-risk groups. MI was defined as a new Q wave on postoperative electrocardiogram or elevation of cardiac enzymes. Although routine evaluation for MI was not obtained after CEA in all patients, electrocardiogram and cardiac enzymes were evaluated whenever there was clinically suspicion of cardiac ischemia. Therefore, although some "silent MIs" may have been missed, they were not likely to be clinically relevant. Transient ischemic attack was defined as a new neurologic deficit that resolved within 24 hours, and stroke was defined as a new or progression of a neurologic deficit that lasted beyond 24 hours. Other comorbidities (ie, hematoma, cranial nerve injury) were not analyzed because we believe these results are not accurate in a retrospective chart review. Statistical analysis was performed with SPSS software (Corte Madera, Calif). Comparison of event rates between the two groups was made with  $\chi^2$  analysis with use of a two-tailed Fisher exact test when appropriate. A *P* value of less than .05 was considered significant.

## RESULTS

The patient characteristics in the two groups are outlined in Table II. Most patients in each group were white men with a history of tobacco use and hypertension. Symptomatic carotid disease was the operative indication in 38% of the normal-risk group and 43% of the high-risk group (*P* = .182).

**Table II.** Patient characteristics in normal-risk and high-risk groups

<i>Patient characteristics</i>	<i>Normal-risk group (n = 560)</i>	<i>High-risk group (n = 228)</i>
Male gender	308 (55%)	143 (63%)
White	532 (95%)	225 (98%)
Tobacco use	411 (73%)	171 (80%)
Hypertension	451 (80%)	174 (76%)
Symptomatic	212 (38%)	98 (43%)

CEA was performed solely on the basis of noninvasive carotid duplex scan imaging results in 58% of the patients. An additional diagnostic method was obtained in 42% of the patients (30% magnetic resonance angiography, 12% cerebral angiography).

Overall, 228 patients (29%) were classified as high risk on the basis of the previous criteria. The presence of a physiologic risk factor accounted for high-risk classification in 63% and an anatomic factor in 28% of the group. Nine percent of the patients in the high-risk group had both physiologic and anatomic components (Fig 1).

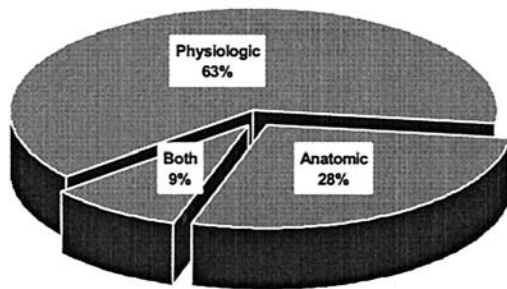
The operative characteristics in the two groups were similar (Table III). A patch was used for closure in 86% of the patients in the normal-risk group and 84% in the high-risk group. Most patients in both groups underwent general anesthesia and had a shunt placed during the procedure.

The 30-day rate of stroke and death was 1.1% in the entire group. There were a total of three deaths in the entire group, all of which were from a MI (none were patients at medical high risk). The event rates among the patients who met criteria of high risk were not statistically significant from the event rates in the normal-risk group (Fig 2).

## DISCUSSION

CEA is a firmly established procedure that underwent a long period of scrutiny before randomized prospective studies<sup>3,4</sup> solidified its role in extracranial carotid occlusive disease. CAS, on the other hand, is an advancing technology in its infancy with many promises. Early randomized trials<sup>7-9</sup> of CAS have either been associated with a high complication rate or been suspended. Although there have been several changes in stent technology since these trials (ie, lower profile devices, embolic protection devices) that have provided improved results in individual published series, data on CAS remain anecdotal.<sup>10,11</sup> Ongoing randomized prospective clinical trials<sup>12</sup> are underway to provide answers regarding the future role of CAS. Until these results are available, proponents of this new technology have recommended the application of CAS in a subgroup of patients that they consider high risk for CEA. The composition of this group and its relative size remain uncertain at present.

On the basis of conclusions of a multidisciplinary panel at a recent Montefiore Vascular Symposium,<sup>13</sup> five indications were proposed for CAS in patients needing treatment



**Fig 1.** Distribution for high-risk classification on basis of physiology and anatomy.

**Table III.** Operative characteristics in normal-risk and high-risk groups

Operative characteristics	Normal-risk (n = 560)	High-risk (n = 228)
Primary closure	77 (14%)	38 (16%)
Patch closure		
Vein	257 (46%)	118 (52%)
Synthetic	226 (40%)	72 (32%)
Shunt		
Yes	521 (93%)	222 (97%)
No	39 (7%)	6 (3%)
Anesthesia		
General	552 (98%)	224 (98%)
Local	8 (2%)	4 (2%)

of carotid bifurcation disease. These were: 1, high-risk status with symptoms; 2, recurrent stenosis; 3, previous radical neck dissection or cervical irradiation; 4, high bifurcation; and 5, indication for CEA in patient unfit for surgery. The terms high risk, high bifurcation, and unfit patient were not specifically defined. As a result, many proponents of CAS have used North American Symptomatic Carotid Endarterectomy Trial/Asymptomatic Carotid Atherosclerosis Study exclusion as their definition of a patient at high risk unfit for CEA and therefore a candidate for CAS. The purpose of this study was to review a contemporary carotid series of isolated CEAs, identify this high-risk subgroup as defined by others,<sup>5,6,14,15</sup> and determine whether there was truly an increased incidence rate of complications in this cohort.

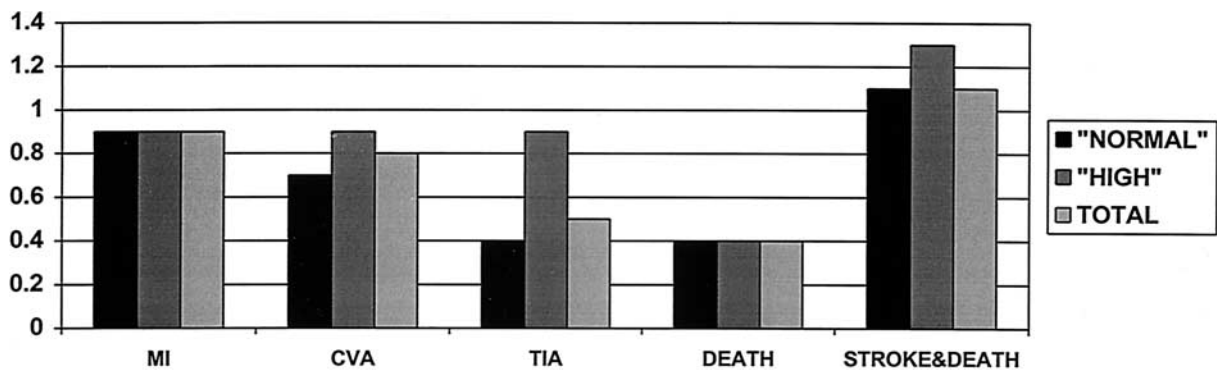
The high-risk factors that have been mentioned include physiologic and anatomic components. Sixty-three percent (143/228) of the patients at high risk were identified as such exclusively on the basis of physiologic factors. We did not find these patients to have a significantly higher complication rate (stroke and death rate of 1.3% versus 1.1%), and therefore, we believe they should not be precluded from undergoing CEA, a procedure with low physiologic stress. The option of a regional anesthetic for patients whose conditions are unfit for general anesthesia (ie, severe pulmonary dysfunction, severe coronary disease) has been shown to be a reasonable alternative.<sup>16</sup>

The cost/benefit ratio of CEA in the octogenarian population has been a controversial topic in the literature. This is a group that was excluded from previous clinical trials<sup>3,4</sup> by the study designers who thought the risk/benefit ratio would have a less favorable relationship as patients became older. Proponents of CAS have suggested these patients would be better served with a minimally invasive procedure because of a presumed increased risk of postoperative complications. However, in a recent article, Roubin et al<sup>17</sup> performed a 5-year prospective analysis on the immediate and late clinical outcomes of CAS and reported that in the subgroup of patients aged 80 years or older, the periprocedural complication rate was an alarming 16%. This is four times higher than a recently reported series<sup>18</sup> of more than 1000 octogenarians undergoing CEA (stroke and death rate of 3.6%). This higher complication rate of CAS in octogenarians may be attributed to increased incidence rate of periprocedural hypotension/bradycardia<sup>19</sup> or higher atherosclerotic load of the aortic arch in this group.<sup>20</sup> Thus, it appears that if octogenarians constitute a high-risk group for CEA, their risk from CAS may be even higher. Roubin et al<sup>17</sup> go on to suggest that the use of distal protection devices may improve periprocedural outcomes in this group; however, this remains speculative. At this time, CAS is not indicated in the very elderly outside clinical trials.

Patients with severe cardiac comorbidities may represent a high-risk group. In our series, the proportion of such patients is small (31/788). In a large part, this is a result of our tendency to screen patients for CEA, especially those with asymptomatic stenosis, for coronary artery disease. Patients who need both CEA and coronary revascularization are usually offered combined surgery. Patients who are neurologically asymptomatic and unfit for coronary surgery are observed. With this management algorithm, the actual proportion of high risk from cardiac disease is small (3.9%).

Patients who are treated with combined carotid and coronary intervention (CEA/coronary artery bypass grafting [CABG]) are a high-risk group that has been looked at as candidates for CAS. We believed including this group of patients into our study was not appropriate. These patients have been shown to have severe atherosclerotic burden, not only of the coronary and carotid system but also the aortic arch,<sup>20</sup> and should be evaluated separately. Two large studies<sup>5,6</sup> on high-risk CEA included patients undergoing combined CEA/CABG. Clearly, the morbidity and mortality rates of patients needing two simultaneous operations cannot be expected to be equivalent to those of CEA alone. Adding combined surgery to high-risk CEA unfairly increases complication rates in the CEA group. No prospective series of carotid stenting before CABG have been reported. The role CAS in patients who need CABG can only be answered with a prospective study comparing CEA/CABG with CAS followed by CABG.

Anatomic risk factors included contralateral carotid occlusion, a high bifurcation, reoperation, and postradiation stenosis. The major support for increased morbidity of patients with contralateral occlusion comes from post hoc



	MI	CVA	TIA	DEATH	STROKE&DEATH
<b>"NORMAL"</b>	5 (0.9%)	4 (0.7%)	2 (0.4%)	2 (0.4%)	6 (1.1%)
<b>"HIGH"</b>	2 (0.9%)	2 (0.9%)	2 (0.9%)	1 (0.4%)	3 (1.3%)
<b>TOTAL</b>	7 (0.9%)	6 (0.8%)	4 (0.5%)	3 (0.4%)	9 (1.1%)
<b>P value*</b>	1.00	1.00	.33	1.00	.723

Fig 2. Rate of perioperative event in normal-risk and high-risk groups. TIA, Transient ischemic attack.

analysis of the North American Symptomatic Carotid Endarterectomy Trial data.<sup>21</sup> In these data, the relation of shunt use and stroke in patients with contralateral occlusion was not reported. The conclusion that the presence of a contralateral carotid occlusion increases stroke risk cannot be supported by our data and is at best speculative. There were a total of 66 patients with contralateral occlusion in our series, with no incidence of stroke or mortality. Recent reviews have shown that both indications for CEA and complication rates in this subset of patients should not differ from the rest of the population. In fact, Mattos et al,<sup>22</sup> in a study of 478 patients (66 of whom had contralateral carotid artery occlusion), showed a perioperative stroke rate of 3% in patients with an occluded contralateral carotid artery versus 2.9% in patients with a patent contralateral carotid artery. Similarly, they found no differences in the late stroke rates of patients undergoing CEA with an occluded versus patent contralateral carotid artery. Mackey, O'Donnell, and Callow<sup>23</sup> reported similar results in 670 patients undergoing CEA, 63 of whom had contralateral carotid occlusion. Their perioperative stroke rate of 5% in patients with an occluded ICA was similar to the control group (3%), and there was no difference in late stroke rates. It is likely that liberal use of intraoperative shunts minimizes the morbidity of contralateral occlusion.

The incidence of a high bifurcation and its association with increased stroke rate is poorly described in the literature. Our definition of high lesion was based on angio-

graphic criteria or, in most patients, review of the operative report. We recognize this is a subjective characterization. Nonetheless, our conclusion that high lesions rarely appear to make CEA more complicated is validated by our data. We acknowledge that there are some lesions that cannot be addressed with standard CEA techniques; however, they are exceedingly rare. In no case were we forced to abandon CEA because of cephalad extension of disease. In our series, 53 patients (6.7%) were found to have a high bifurcation, 16 patients on the basis of the presence of a lesion above C<sub>2</sub> on cerebral angiogram and 37 on the basis of required division of the digastric muscle to obtain distal exposure of the internal carotid artery for a satisfactory endarterectomy. Our experience parallels that of Hans, Shah, and Hans<sup>24</sup> and Hobson et al<sup>25</sup> who found high lesions in 4% and 1% of patients, respectively. As in those series,<sup>24,25</sup> we did not find an increased incidence rate of stroke or death (0/53) in patients with a high bifurcation.

The incidence rate of recurrent stenosis after CEA has been estimated between 6% and 18%.<sup>26,27</sup> Reoperation has been reported with an increased risk by some authors,<sup>28,29</sup> and other more contemporary series<sup>30,31</sup> have achieved morbidity rates that approach those of primary operation. We have previously reported<sup>26</sup> that most recurrent lesions remain asymptomatic for 3 to 5 years. We believe that asymptomatic recurrent carotid stenosis must be managed on a case-by-case basis, with attention to the location and cause of the lesion and the status of the contralateral carotid

artery. Routine repair of unilateral asymptomatic fibrous restenosis, with CEA or CAS, is a matter of continued controversy. Most patients who have multiple medical comorbidities or have a limited life expectancy will remain asymptomatic and could be observed, and patients at good risk who have a significant life expectancy could be considered for repair. With this algorithm, we have performed 29 redo CEAs over the last 5 years with no stroke or death in this group.

Postradiation carotid stenosis is even a more rare indication for CEA in most series; approximately 100 patients with carotid disease that occurred after neck irradiation have been described in the literature, and most have been isolated case reports. The largest reported series comes from Kashyap, Moore, and Quinones-Baldrich,<sup>32</sup> with 24 patients undergoing 26 carotid artery operations. No strokes or deaths occurred within 30 days, and six patients had temporary cranial nerve injuries. Friedell et al<sup>33</sup> reported on 10 patients who underwent 11 procedures for carotid stenosis after neck radiation with no complications. In our series, only three patients underwent CEA for post-radiation stenosis and no complication was encountered. Our data are insufficient to comment on the role of CAS in patients with neck irradiation. These two groups of patients (reoperation and radiation-induced stenosis) are the only ones that can be defined before surgery and have been shown by some authors to have an increased morbidity after CEA. Although CAS may better serve these patients, the absolute number of such patients is small.

The concept of the high-risk CEA must be critically reexamined. Although 29% of patients for CEA were high risk as defined by others, we found no evidence that this influenced the results after CEA. Patients with significant medical comorbidities, contralateral carotid occlusion, and high carotid lesions can undergo operation without increased complications. If a high-risk group exists, it is small and restricted to reoperation or radiated neck (4% in this series). With this possible exception, CAS should be restricted to randomized clinical trials.

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## DISCUSSION

**Dr William D. Jordan, Jr** (Birmingham, Ala). I thank you for the presentation. I thought your data were excellent and they add to literature that has been presented before. I ask you two questions.

First, we have a lot of information about these high-risk patients, but the data are mostly presented to the surgeons. How would you propose we help disseminate this information to our nonsurgical colleagues, specifically neurologists, family practice doctors, primary care internists?

Secondly, while we have had some caution in our surgical area at UAB about stenting, we still do select some patients for stenting. I would like to know how you decide who should be stented, rather than undergo open surgery or be maintained on medical therapy.

**Dr John J. Ricotta.** I think other than trying to get these kind of data on the Stroke meetings or at the Heart Association or get them into publications that our colleagues read, I am not sure what else we can do. And at least I have not seen a great interest in this on the part of our cardiology or neurologic colleagues in terms of acceptance on their programs.

We have stented, I think, between the two institutions, I think we have had six or eight people that have been stented in that time period. So, we are fairly restrictive about it.

I think the people that I would stent would be a symptomatic recurrence or somebody with an asymptomatic recurrence who has a contralateral occlusion. I am not sure that stenting an asymptomatic, particularly an asymptomatic early recurrence, is particularly helpful because those people have a pretty benign course anyway. So, a unilateral, early recurrence, I probably would just observe. One with a contralateral occlusion, I might stent, or a symptomatic patient that was a recurrence, I might stent, if it was early. If it was late, I would be inclined to operate on it because those people have degenerative atheromas. And I think the radiated patients are a reasonable group to stent, although there are people—George Andros has written a nice paper—and there are a number of people that have written papers that have suggested you could operate on these radiated people safely. You probably can stent them safely, too. So, those are the two groups.

We had one patient that I sent for a stent who had unstable angina and already had a coronary, had nonreconstructible disease and a symptomatic lesion, but that is one person in 5 years.

**Dr Takao Ohki** (Bronx, NY). First of all, I believe that your high-risk definition derived from cardiology literature in which the high risk is ill defined. I think you derived those definitions from the bogus publication from the cardiology literature. I would like to make it clear that unlike the cardiology papers that you have quoted, the industry-sponsored and the NIH-sponsored clinical trials have a stricter high-risk definition, of which, age 80, which was part of your high-risk definition and comprises about one third of your high-risk cohort, is not included in any of those currently ongoing high-risk clinical registries or trials. So, that is one point I would like to make. If you take out the age 80, one third of the

patients, the overall flavor or the conclusion might be slightly different.

My question is, John, I think I have recognized a difference in tone before you did endograft for AAA and after you do it yourself now. And I think we will see the same difference in tone once you start doing carotid stenting. The endpoint you have used in your study was stroke and death. And I agree that if the endpoint was stroke and death, there might be little difference, especially if you include age 80 and other bogus factors. But there are other endpoints than stroke and death. For example, if you look at length of stay, the struggle for both the patient and the surgeon, the risk of cranial nerve injury and so forth, and if there is a better way to treat those subset of patients that are truly high risk, I think we should try to embrace the technology and not try to say that there is no such thing as a high risk.

**Dr Ricotta.** I think the point of this paper was to try to indicate that the very broad definitions of high risk that are being used in the literature by people that do carotid stenting as a rationale for extending that procedure to large numbers of patients outside of clinical trials is flawed.

Now, I do not disagree that there is probably a high-risk group of patients. I think that that goes without saying. But I think that it is probably only 4% or 5% of the patients that people see in a normal practice. And it certainly is not consonant with the level of carotid stenting that we are seeing in the community.

So, I would agree, number one, that we should be doing prospective randomized trials. And if you have the equipoise to send an asymptomatic patient to a prospective randomized trial, I think that you should do that. And I have no problem with that. And I have no problem, certainly, with the CREST trial. But I think that what is happening is there are a lot of patients that are having carotid stents based on the rationale that they are in a high-risk subgroup, and they really are not in a high-risk subgroup. Those patients can be offered surgery very well and very easily.

Once it is demonstrated that this technology is efficacious, I think that it should and would be embraced. The difference between a carotid endarterectomy and an open aneurysm and a stentgraft versus a carotid endarterectomy and a carotid stent is a very different kettle of fish.

**Dr Frank W. LoGerfo** (Boston, Mass). I do just have one quick comment related to this and that is to keep in mind that we are talking here about the potential of 100,000 stents at roughly \$4000 apiece. That is a \$400 million force that is behind the scenes here. So, it is easy to suddenly decide that you have some high-risk patients because of the ways in which that can work to coerce you. The bottom line is this operation works extremely well, it is extremely safe for our patients. And when we say we have patients who are too high risk for surgery, we tell the world that surgery is risky and we take away from our patients a very safe procedure. So, think carefully about your involvement in these studies. I have no problem with prospective randomized trials, that is exactly what we should do.

**Dr Ali AbuRahma** (Charleston, WV). One of the most commonly quoted problems with cardiologists regarding carotid endarterectomy is the incidence of cranial nerve injury. Did you look into this subset of patients who had redo surgery, high cervical lesions, or neck radiation to see if any of these patients had a higher incidence of cranial nerve injury that would justify carotid stenting?

**Dr Ricotta.** We did not look at that subset in terms of cranial nerve injury. That would be, in my mind, the reason to do those patients with a stent.

**Dr Michael S. Conte** (Boston, Mass). We recently looked at our own results in our division with very similar findings as you have. The only question I would ask is whether you looked at long-term outcomes in the high-risk patients? We have noticed some difference in long-term survival in the cohort with multiple comorbidities, which does not necessarily bear on which procedure you choose, but whether or not one should do anything at all in some of these asymptomatic patients with multiple high-risk factors. So, did you look at the long-term survival or long-term stroke-free survival?

**Dr Ricotta.** Looking at the long-term stroke-free survival was not part of this study, but I would agree with you, Mike, that asymptomatic patients need to be able to survive for a certain period of time to achieve a benefit. At the same time, once they survive the surgery, they immediately achieve that benefit. And my experience with elderly patients is that sometimes they would rather die than have a stroke and do push us to do surgery sometimes.

**Dr Peter R. F. Bell** (Leicester, United Kingdom). I agree with your conclusions. We, in fact, published a paper a few years ago that showed that the over 80 do just as well as those under 80.

And secondly, the high-risk patients who cannot take anesthesia can have local anesthesia if necessary. You did not mention that. Did any of your patients have local anesthesia?

**Dr Ricotta.** My preference is to do the high-risk patients with local anesthesia. But this was a group, I think there were five or six surgeons in the group, and I think I am in the minority. But that is my preference.

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