

rate of secondary procedures in the long-term period in patients treated with fenestrated stent grafts is not negligible,<sup>3</sup> and the chimney technique shows satisfying results in series with a small number of patients with a short-term follow-up.<sup>4</sup>

The Endurant stent graft is a new-generation device and we are expecting better long-term results in terms of migration, module disconnection, and fatigue of the materials than those offered by the first- and second-generation devices.<sup>5</sup> So, we confirm the cautious application in selected patients of endovascular aneurysm repair outside the Endurant-specific IFU.<sup>2</sup>

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## REFERENCES

1. Cross JE, Simring D, Harris P, Ivancev K, Richards T. Regarding "Evaluation of the Endurant stent graft under instruction for use vs off-label conditions for endovascular aortic aneurysm repair." *J Vasc Surg* 2011;54:1869.
2. Torsello G, Troisi N, Donas KP, Austermann M. Evaluation of the Endurant stent graft under instruction for use vs. off-label conditions for endovascular aortic aneurysm repair. *J Vasc Surg* (in press).
3. Troisi N, Donas KP, Austermann M, Tessarek J, Umscheid T, Torsello G. Secondary procedures after aortic aneurysm repair with fenestrated and branched endografts. *J Endovasc Ther* 2011;18:146-53.
4. Donas KP, Torsello G, Austermann M, Schwindt A, Troisi N, Pitoulis GA. Use of abdominal chimney grafts is feasible and safe: short-term results. *J Endovasc Ther* 2010;17:589-93.
5. Troisi N, Torsello G, Donas KP, Austermann M. Endurant stent-graft: a 2-year, single-center experience with a new commercially available device for the treatment of abdominal aortic aneurysms. *J Endovasc Ther* 2010;17:439-48.

doi:10.1016/j.jvs.2011.07.069

## Carotid artery stenting may be contraindicated in female patients with symptomatic carotid artery stenosis

Carotid artery stenting (CAS) has reported inferior outcomes compared with carotid endarterectomy (CEA) for the management of symptomatic carotid artery stenosis.<sup>1</sup> The 2011 guidelines by the American Heart Association/American Stroke Association (AHA/ASA) and several other associations recommended CAS as an "alternative to CEA for symptomatic patients" (class I; level of evidence B).<sup>2</sup> The AHA/ASA Guidelines used the Carotid Revascularization Endarterectomy versus Stenting Trial (CREST) to support this recommendation.<sup>3</sup>

CREST recently reported a subgroup analysis on the influence of sex on outcomes after CAS compared with CEA.<sup>4</sup> Although symptomatic men showed similar periprocedural stroke rates whether undergoing CAS or CEA (3.3% vs 2.4%, respectively; hazard ratio [HR], 1.39; 95% confidence interval [CI], 0.78-2.48;  $P = .26$ ), women assigned to CAS had >2.5-fold higher periprocedural stroke rates compared with those undergoing CEA (5.5% vs 2.2%, respectively; HR, 2.63; 95% CI, 1.23-5.65;  $P = .013$ ). Similar results were reported for periprocedural death rates. As the authors commented,

"women might be at higher risk of periprocedural stroke and death because of technical difficulties related to the fact that they have smaller internal carotid arteries than men; women, on average, have 40% smaller internal carotid arteries than men."<sup>4</sup>

Another recent report compared the outcomes of CAS vs CEA in women vs men using the Nationwide Inpatient Sample ( $n = 54,658$  procedures) during 2004 and 2005.<sup>5</sup> Although females had similar rates of perioperative stroke with males undergoing CEA (1.0% vs 1.0%, respectively;  $P = .9$ ) or CAS (2.7% vs 2.0%, respectively;  $P = .2$ ), symptomatic women had higher perioperative stroke rates compared with either asymptomatic females (3.8% vs 0.9%, respectively;  $P < .001$ ) or symptomatic men (3.8% vs 2.3%, respectively;  $P = .03$ ).<sup>5</sup> The conclusion reached was that "CEA may be the preferred treatment in female patients who warrant intervention for cerebrovascular disease, unless compelling reasons exist to perform CAS."<sup>5</sup>

Maneuvering CAS guidewires and catheters in the smaller female carotid arteries with "unstable" plaques may produce more microemboli than in males; these microemboli may account for the increased periprocedural stroke rates in symptomatic female patients undergoing CAS.<sup>4,5</sup>

The inferior results of CAS compared with CEA for symptomatic female patients,<sup>4,5</sup> therefore, indicate that CAS is not an acceptable "alternative" to CEA in this group of patients.

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## REFERENCES

1. Paraskevas KI, Mikhailidis DP, Veith FJ. Mechanisms to explain the poor results of carotid artery stenting (CAS) in symptomatic patients to date and options to improve CAS outcomes. *J Vasc Surg* 2010;52:1367-75.
2. Brott TG, Halperin JL, Abbara S, Bacharach JM, Barr JD, Bush RL, et al. 2011 ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American Stroke Association, American Association of Neuroscience Nurses, American Association of Neurological Surgeons, American College of Radiology, American Society of Neuroradiology, Congress of Neurological Surgeons, Society of Atherosclerosis Imaging and Prevention, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, Society for Vascular Medicine, and Society for Vascular Surgery Developed in Collaboration With the American Academy of Neurology and Society of Cardiovascular Computed Tomography. *J Am Coll Cardiol* 2011;57:e16-94.
3. Brott TG, Hobson RW II, Howard G, Roubin GS, Clark WM, Brooks W, et al; CREST Investigators. Stenting versus endarterectomy for treatment of carotid-artery stenosis. *N Engl J Med* 2010;363:11-23.
4. Howard VJ, Lutsep HL, Mackey A, Demaerschalk BM, Sam AD II, Gonzales NR, et al; for the CREST Investigators. Influence of sex on

outcomes of stenting versus endarterectomy: a subgroup analysis of the Carotid Revascularization Endarterectomy versus Stenting Trial (CREST). *Lancet Neurol* 2011;10:530-7.

5. Rockman CB, Garg K, Jacobowitz GR, Berger JS, Mussa FF, Cayne NS, et al. Outcome of carotid artery interventions among female patients, 2004 to 2005. *J Vasc Surg* 2011;53:1457-64.

doi:10.1016/j.jvs.2011.06.119

## Reply

Ever since the Asymptomatic Carotid Atherosclerosis Study (ACAS) Study<sup>1</sup> reported that an increased perioperative stroke rate following carotid endarterectomy (CEA) in female patients greatly diminished or possibly eliminated the potential benefit of prophylactic CEA, there has been controversy and concern regarding the outcome of cerebrovascular interventions in female patients. In a subsequent large single-institutional study addressing this specific issue, men and women were found to have equal rates of perioperative myocardial infarction (MI), mortality and stroke following CEA.<sup>2</sup> However, the cohort of patients with the highest perioperative stroke rate was symptomatic female patients, with a stroke incidence of 3.0% following CEA.<sup>2</sup> Clearly, symptomatic women may represent a cohort of patients with increased risk.

The majority of the studies on this topic have compared the outcome of female patients to male patients. While these are worthwhile comparisons, one needs to keep in mind that it remains unclear whether the natural history and outcome of patients with severe cerebrovascular disease differs based on sex. It is certainly feasible that women with symptomatic severe carotid artery stenosis may have a worse outcome than corresponding male patients when treated with "best medical" or noninterventional therapies. It is possible, of course, that symptomatic female patients would be at a higher risk of future stroke compared with men if no intervention were performed, and would still benefit from cerebrovascular intervention as opposed to medical management. Hence, the truly important comparison is not female outcome vs male outcome, but rather female outcome *based on the treatment performed*: what is the best treatment for symptomatic female patients with severe carotid artery disease? Should symptomatic female patients be treated with CEA, or with carotid artery angioplasty and stenting (CAS)?

With these issues in mind, Drs. Paraskevas, Mikhailidis, and Veith have authored a provocative letter stating that "CAS is not an acceptable 'alternative' to CEA in this group of patients." Their concern stems from the recent AHA/ASA Guidelines,<sup>3</sup> which do clearly recommend CAS as an "alternative to CEA for symptomatic patients." Dr. Paraskevas and his coauthors cite subsequent literature from the Carotid Revascularization Endarterectomy Versus Stenting (CREST) trial,<sup>4</sup> as well as a recently published review of the Nationwide Inpatient Sample (NIS)<sup>5</sup> to support their conclusion regarding the inferior outcome of CAS in symptomatic women. As seen in the Table below, the CREST trial reports a periprocedural stroke rate in symptomatic women of 7.5% for CAS vs 2.7% with CEA ( $P < .03$ ).<sup>4</sup> The long-term rate of stroke in symptomatic women from the CREST report is 10.4% with CAS, vs 6.9% with CEA ( $P = .18$ ).<sup>4</sup> Finally, the review of the NIS reports a periprocedural stroke rate in symptomatic women of 6.2% with CAS vs 3.4% for CEA ( $P = .1$ ).<sup>5</sup>

In summary, data from both a large randomized prospective trial and an extensive national database clearly suggest a poorer outcome following CAS in symptomatic female patients. Based on the existing literature, as delineated above, I share the authors' concern regarding the appropriateness of CAS in symptomatic female patients. Of course, an individual treatment decision with regard to a particular patient must take into account many specific details, including both anatomic factors and patient comorbidities. However, the existing literature appears to show that CEA may be the preferred treatment in female patients who warrant intervention for symptomatic cerebrovascular disease, unless compelling reasons exist to perform CAS.

**Table.** Representative periprocedural stroke rates reported in the literature in symptomatic women undergoing carotid endarterectomy and carotid artery angioplasty and stenting

Stroke rate in symptomatic women	CEA	CAS	P value
CREST, perioperative <sup>4</sup>	2.7%	7.5%	0.03
CREST, long-term <sup>4</sup>	6.9%	10.4%	0.2
NIS <sup>5</sup>	3.4%	6.2%	0.1

CREST, Carotid Revascularization Endarterectomy Versus Stenting; NIS, Nationwide Inpatient Sample.

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## REFERENCES

1. Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. Endarterectomy for asymptomatic carotid artery stenosis. *JAMA* 1995;273:1421-8.
2. Rockman CB, Castillo J, Adelman MA, Jacobowitz GR, Gagne PJ, Lamparello PJ, et al. Carotid endarterectomy in female patients: are the concerns of the Asymptomatic Carotid Atherosclerosis Study valid? *J Vasc Surg* 2001;33:236-40; discussion 40-1.
3. Brott TG, Halperin JL, Abbara S, Bacharach JM, Barr JD, Bush RL, et al. 2011 ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease: Executive Summary A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American Stroke Association, American Association of Neuroscience Nurses, American Association of Neurological Surgeons, American College of Radiology, American Society of Neuroradiology, Congress of Neurological Surgeons, Society of Atherosclerosis Imaging and Prevention, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, Society for Vascular Medicine, and Society for Vascular Surgery Developed in Collaboration With the American Academy of Neurology and Society of Cardiovascular Computed Tomography. *J Am Coll Cardiol* 2011;57:1002-44.
4. Howard VJ, Lutsep HL, Mackey A, Demaerschalk BM, Sam AD 2nd, Gonzales NR, et al. Influence of sex on outcomes of stenting vs endarterectomy: a subgroup analysis of the CREST. *Lancet Neurol* 2011;10:530-7.
5. Rockman CB, Garg K, Jacobowitz GR, Berger JS, Mussa FF, Cayne NS, et al. Outcome of carotid artery interventions among female patients, 2004-2005. *J Vasc Surg* 2011;53:1457-64.

doi:10.1016/j.jvs.2011.07.066

## Regarding "Repairing immediate proximal endoleaks during abdominal aortic aneurysm repair"

Rajani et al<sup>1</sup> retrospectively reviewed data of 72 infrarenal abdominal aortic aneurysm (AAA) patients with an intraoperatively diagnosed type Ia endoleak requiring a Palmaz stent or covered stent graft cuff placement. They concluded that both methods appear to be durable long-term options to facilitate endovascular exclusion of AAA, with the results that no recurrent type Ia endoleak developed in the Palmaz stent group and three reinterventions were required in the cuff group. Given the lack of data assessing long-term outcomes of cuff and Palmaz (Cordis, Miami Lakes, Fla) stent placement after immediate type Ia endoleak, we