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**Re: 'Transcranial Doppler Ultrasound Detection of Microemboli as a Predictor of Cerebral Events in Patients with Symptomatic and Asymptomatic Carotid Disease: A Systematic Review and Meta-Analysis'**

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## CORRESPONDENCE

### Re: 'Comparison of Total Arch and Partial Arch Transposition During Hybrid Endovascular Repair for Aortic Arch Disease'

We congratulate Kang et al. for their study comparing the results of hybrid procedures for total and hemi-arch replacement.<sup>1</sup> In comparing post-operative results, the aim is to assess complications with different proximal aortic landing zones. In general, the preference for total arch replacement over hemi-arch replacement in hybrid procedures is to set the proximal landing zone to 0, as neurologic complication rates and re-intervention for type IA endoleak are significantly increased when the proximal landing zone is set to zone 1 or 2, as in hemi-arch replacements.<sup>2–4</sup> In this context, the study by Kang et al. is encouraging for the practice of hybrid hemi-arch procedures.<sup>1</sup>

Another point we would like to raise with regard to the study by Kang et al. is that all patients had multiple procedures, probably because there was no hybrid operating room. Having been widely used recently, hybrid operating rooms allow surgeons to perform these hybrid procedures during the same session without the need for a second operation. Although there are disadvantages such as lengthy surgery time and additional contrast load, it gives the clinician the chance to handle endovascular complications simultaneously. Moreover, an antegrade approach to aortic arch reconstructions can be achieved by anastomosing a vascular graft to the ascending aorta. One of the risks of performing separate operations is rupture while waiting for the second procedure.<sup>4</sup> In the study by Kang et al.,<sup>1</sup> one patient waited for 133 days for the second operation. Did any patients die while waiting for the second operation? Sharing these details will add value to the study.

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### Re: 'Transcranial Doppler Ultrasound Detection of Microemboli as a Predictor of Cerebral Events in Patients with Symptomatic and Asymptomatic Carotid Disease: A Systematic Review and Meta-Analysis'

The recent paper by Best et al. has confused the issue of the usefulness of transcranial Doppler (TCD) embolus detection in carotid stenosis, by failing to separate asymptomatic from symptomatic carotid stenosis.<sup>1</sup> There is no point in carrying out TCD embolus detection in patients with symptomatic severe carotid stenosis; they would all benefit from urgent carotid endarterectomy (CEA) (or, to a lesser extent, from carotid artery stenting [CAS]). It is possible, but largely untested, that TCD embolus detection may be useful in identifying which patients with symptomatic moderate/mild carotid stenosis might benefit from intervention.

The principal benefit of TCD embolus detection is to identify among patients with asymptomatic carotid stenosis (ACS) the few (~10–15%) who could benefit from either CEA or CAS.<sup>2,3</sup> In a 2005 paper, only 10% of 319 patients with ACS had two or more microemboli during 1 hour of monitoring; their 1-year risk of stroke was 15.6% versus 1% for 90% of patients with no microemboli. More intensive medical therapy implemented in 2003 reduced the prevalence of microemboli from 12.6% before 2003 to 3.7% from 2004 to 2010. Despite more intensive therapy, the presence of microemboli still predicted a high risk after 2003 (Fig. 1).

A study in 468 patients with ACS has been validated by that of Markus et al. in 467 patients, and by meta-analyses that do not conflate asymptomatic with symptomatic patients.<sup>3–5</sup> Heterogeneity noted by King et al. is explained by two important differences among studies<sup>5</sup>: a positive test was defined as two or more emboli in a single 1-hour recording; the risk was somewhat lower in patients with one or more emboli on repeated TCD monitoring. Other methods in development are also promising, including ulceration on three-dimensional ultrasound, intraplaque hemorrhage on magnetic resonance imaging, and inflammation on positron emission tomography/computed tomography imaging.<sup>6</sup> No patient with asymptomatic stenosis should be subjected to stenting or endarterectomy without first being identified as being at higher risk than that of intervention. For the present, the best-validated way to do so is TCD embolus detection. There is no good excuse for not implementing TCD embolus

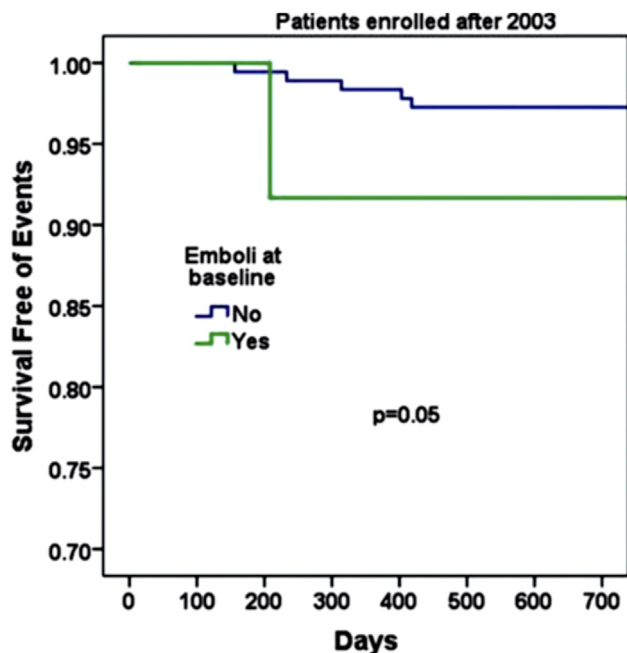
detection in patients with ACS. The cost of a TCD machine is approximately the same as the cost of only two stenting procedures, and training can be obtained easily.<sup>7</sup> Patients with ACS and no microemboli should receive only intensive medical therapy.<sup>8</sup>

### CONFLICT OF INTEREST

In 2016 the laboratory of J.D.S. received a 10% discount on repairs to a Spencer transcranial Doppler machine.

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**Figure 1.** Kaplan–Meier survival free of stroke, death, or transient ischemic attack by presence of two or more emboli, among patients enrolled after more intensive medical therapy was implemented in 2003. Note. Reproduced by permission of *The Journal for Vascular Ultrasound* from: Spence JD. Transcranial Doppler: Uses in Stroke Prevention. *JVUS* 39(4):183–187, 2015.

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