It Is Time for Carotid Artery Stenting to Rise from the Ashes

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Published online: 9 March 2016

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This commentary was prompted by a recently published paper by Paraskevas and colleagues in the *Journal of Vascular and Endovascular Surgery*. Vascular surgeons seem to particularly like it, as it is being promoted in many online interventional and vascular therapy platforms.

Paraskevas et al. published a systematic review on stroke and death rates following carotid artery stenting (CAS) and carotid endarterectomy (CEA) in contemporary administrative dataset registries [1].

The authors are concerned about the liberalized indications for carotid artery stenting (CAS) by the AHA guidelines [2]. As a consequence of the CREST study results, the guidelines expand the indications for carotid stenting as an alternative to surgery (CEA) in patients with symptomatic carotid artery stenosis, in centers with a proven complication rate of less than 6 %, and to selective patients with asymptomatic carotid artery stenosis in centers with a proven complication rate of less than 3 %.

The authors found that in 72 % of the included registries and CAS, the 30-day combined complication rate (stroke and death) was higher than the threshold of 6 % for symptomatic patients, but in only 11 % for CEA. For asymptomatic patients, they found a complication rate of

less than 3 % in 43 % of CAS patients but in only 5 % of CEA patients.

The authors raise the suspicion that because registries present “real world data,” in the real world, carotid artery stenting usually has a higher complication rate than to be expected from randomized trials.

Unfortunately, this is not true. Registries mainly serve two aims: as a tool to perform a power calculation before starting a randomized trial, and as a post-marketing safety tool. Data from registries are notoriously unreliable as they are prone to biased information due to selective inclusion.

While this is an obviously weak conclusion with regard to statistics, taking into account the doubtful usefulness of registries, it is also yet another annoying effort to bad-mouth carotid artery stenting.

The history of interpretation of studies comparing CAS and CEA is a brilliant example for an anti-stent campaign, which worked out quite successfully. Surgeons made the medical community believe that complications in carotid artery treatment only consist of stroke and death, but do not take into account nerve palsy and wound complications, which can occur, however, in a considerable amount of cases after CEA but are more or less unknown after CAS. They also regularly fail to classify the severity of a stroke, whether disabling or not, and rigidly stick to their undifferentiated definition of complications, which is fine if we look at CEA alone. However, it is not equally applicable to CAS. Furthermore, minor strokes or TIA after CEA may remain unnoticed as they happen while a patient is still unconscious due to general anesthesia.

Focusing complication rates only on stroke and death is unfair to CAS and compares apples and oranges. In open surgery, ischemic events are not as intrinsic a risk. In an endovascular approach, however, occurrence of DWI

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lesions, TIA, and minor stroke is a relatively logical consequence, and a procedural event of the technique used. The striking question is does this matter?

In fact, it does not. We now know from long-term results of ICSS, of CREST, and also of (almost forgotten) EVA 3S and SPACE that the neurological outcome is equal for CAS and CEA [3, 4].

There are definitely more neurological events in CAS, but they represent largely minor strokes and do not result in a worse neurological outcome. It is certainly an unpleasant experience to suffer from a stroke even when escaping without sequelae but so is also suffering from wound infection, post puncture hematoma, or nerve palsy. We clearly have to differentiate minor and temporary from lasting and severe complications.

Furthermore, another good news from ICSS is that there is no difference in restenosis. Moreover, the disputed age dependency of CAS seems to have vanished [5].

So what remains to argue against CAS? Oh yes—DWI lesions [6]. Nobody knows what they do or whether they are dangerous, and there remains space for speculation. It is well known, however, that for a very long time this has not only been a privilege of CAS, but also of any angiographic procedure—even diagnostic procedures in the supraaortic vessels [7]. So far, no long-term major sequelae have been reported.

It is high time that all these facts be openly discussed with our symptomatic patients, and it is mandatory for surgeons, neurologists, and interventionalists to give them unbiased information on their choices. Therefore, CAS versus CEA is a perfect case for shared decision making.

Additionally, guidelines worldwide of course need to take the facts into account and require liberal revision of their definitions for indications.

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