

CAROTID DEBATE**Near occlusion of the internal carotid artery: interventional or conservative treatment?****Part III: Against the motion. Carotid near occlusion should be treated interventionally****Alexandros Giosdekos**

2nd Department of Vascular Surgery, Medical School, National and Kapodistrian University of Athens, Laikon Hospital, Athens, Greece

Near occlusion of the internal carotid artery (ICA) is a relative rare condition with an incidence of 0.5% to 2%.¹ The term pseudo occlusion of the ICA was first used by Lippman et al in 1970 and was defined as the presence of a very tight stenosis of the ICA with an extremely narrow residual lumen and a collapsed distal portion induced by hypoperfusion.² Angiographically, it resembles a thin string and several terms like 'string sign', 'pseudocclusion', 'incomplete occlusion', 'near occlusion', 'subtotal occlusion', 'slim sign', 'small distal ICA', 'poststenotic narrowing', 'lotus root sign', have been used to describe this entity. Near total ICA occlusion is defined by four angiographic criteria: (I) reduction in ICA diameter compared with the ipsilateral external carotid artery (ECA), (II) obviously reduced diameter of the ICA compared with the opposite ICA, (III) intracranial collaterals seen as a cross-filling of contralateral vessels or ipsilateral contrast dilution and (IV) delayed cranial arrival of ICA contrast compared with that of the ECA.³

The decision for revascularization in patients with near occlusion of ICA still remains controversial. The most recent European Society for Vascular Surgery (ESVS) Guidelines of 2017 on the management of carotid artery disease, recommended conservative treatment in symptomatic patients with a chronic ICA near-occlusion, unless associated with recurrent ipsilateral symptoms despite optimal medical therapy (level III and class C evidence).⁴ However, this recommendation is based on weak and outdated data, provided by a post hoc analysis of the North American Symptomatic Carotid Endarterectomy Trial (NASCET), European Carotid Surgery Trial (ECST) and VA309 by the Carotid Endarterectomy Trialists Collaboration (CETC), which showed no five year benefit of carotid endarterectomy (CEA) vs best medical treatment (BMT) for symptomatic pa-

tients with 95%-99% ICA stenosis. All these randomized controlled trials were performed in the 1990s, which is about 30 years ago. Furthermore, only 262 out of 6092 patients (4.3%) presented with near occlusion of ICA in the CECT group, while the study recorded only one death and eight events of 30 day stroke or death among the 148 patients with near occlusion of ICA who were treated by CEA. Moreover, although no benefit from CEA was recorded at five years, there was a trend towards benefit from surgery at the two year follow up (absolute reduction in risk of ipsilateral ischaemic stroke 5.6%, $p=.19$). Also, we need to highlight the fact that in the NASCET study, 33 of 114 (28.9%) of patients who had near occlusion ICA and were under BMT alone, ended up having CEA in the follow-up period, but they were analysed as 'BMT' group. For all these reasons, it is clear that patients with near occlusion have been significantly under represented and the real benefit of CEA in this group of patients is underestimated too.

Reviewing the literature, there are two recent meta-analyses trying to determine the optimal treatment approach for patients with near occlusion of ICA.^{5,6} In the most recent one, Antonopoulos et al. revealed a high stroke rate for patients with near occlusion of ICA who were treated with BMT only, while intervention seemed to be safe and effective.⁵ More specifically, the pooled stroke rate after CEA and CAS was 1.52% (95% CI: 0.09-4.02%) and 1.80% (95% CI: 0.61-3.40%) respectively but the pooled stroke rate after BMT was 8.39% (95% CI: 3.39-14.80%). Also, a significant reversed association was found between pooled stroke rate after CAS or BMT with publication year. These findings can be explained with the improvements of the endovascular techniques and the optimization of medical treatment over the last decades. Meershoek et al. conducted also a meta-analysis with similar outcomes, suggesting that BMT alone is not superior to CEA or CAS with respect to 30-day or 1-year stroke or death prevention in patients with near occlusion of ICA.⁶

In addition, we need to mention the difference between the near occlusion of the ICA with or without collapse of the distal ICA. Initially, near occlusion was defined in association with full collapse of the distal ICA, which is often referred to as a string sign. On the other hand, near occlusion without

Author for correspondence:

Alexandros Giosdekos

2nd Department of Vascular Surgery, "Laikon" Hospital

17 Ag. Thoma str. 11527, Athens, Greece

E-mail: alexgiosd@hotmail.com

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full collapse refers to a smaller calibre of the vessel than the original size but without having this characteristic threadlike appearance. Unfortunately, many studies in the literature have not separated these two different entities. Johansson et al. conducted a study, showing that patients with a symptomatic near occlusion of ICA with full collapse had a very high risk of ipsilateral ischemic stroke recurrence, whereas those without full collapse had a low risk.⁷ According to the authors, the 90-day risk of recurrent stroke was 0% for patients with near-occlusion without full collapse whereas for patients with near-occlusion with full collapse the risk was 43%. These findings also challenge the current ESVS guidelines which suggest BMT for these patients, without mentioning the difference between near occlusion with or without collapse.

Furthermore, total ICA occlusion will occur in 40% of the patients within 12 months and cerebrovascular or cardiac events are more frequent in patients with near total ICA occlusion, compared with patients with carotid artery stenosis.^{8,9} For all these reasons, it is obvious that these patients do not appear to constitute a high-risk group for surgery and should be included in future randomized trials of ICA interventions.

Regarding the patient presented in the current case report, this symptomatic 78-year-old male presented with near occlusion of the left ICA with full collapse of the ICA lumen distal to the stenosis (string sign). As mentioned above, patients with near occlusion of ICA with full collapse has a significant risk for recurrent stroke and BMT alone seems to be insufficient. Also, we need to take into consideration that the near total occlusion of ICA may progress to total occlusion with BMT alone, affecting the hemodynamic reservoir of the brain vascular bed, especially in the case of 50-69% stenosis of the contralateral carotid artery. It is more than obvious that operation (either by endarterectomy or stenting) in conjunction with BMT seems to be the best approach for this patient compared to BMT alone.

To sum up, all the 'messages' from the 'real world' non-randomized studies, demonstrate that intervention has a role in near occlusion of ICA, against the current consensus. This group of patients needs to be included in future RCTs of

ICA interventions, underlining the need for updated evidence and possibly revision of the optimal management of this specific group.

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