



## Invited Commentary

## Hemodynamic Changes after Eversion Carotid Endarterectomy: A Reason for Concern?

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Eversion and reimplantation of internal carotid artery (ICA) was the latest technique introduced to perform carotid endarterectomy (CEA) different from the conventional CEA (cCEA) based on patch or primary closure. The two main preliminary concerns that initially prevented the extensive implementation of eversion CEA (eCEA), related to 1. the potential of leaving behind an unsafe carotid distal endpoint and 2. injuring cranial nerves (due to the peculiar extensive ICA dissection required with eCEA), were rapidly overcome as familiarity with the technique increased. Since the nineties eCEA has been extensively used as a comparable valid alternative to cCEA. Nevertheless a third relevant, still ongoing, distinctive issue between the two techniques relies on the differential effect after removal of the carotid atheroma with and without preservation of carotid sinus nerve during cCEA and eCEA respectively. Baroreflex sensitivity is suggested to increase after cCEA due to improved vessel compliance after plaque removal. Oppositely, the destruction of baroreceptor apparatus (carotid sinus nerve) during ICA dissection and transection required with eCEA, may likely result in decreased baroreceptor sensitivity and increased postoperative blood pressure values as suggested by Demirel et al. in this issue of *EJVES*.<sup>1</sup> With a prospective study Demirel et al. compared 37 eCEA and 27 cCEA for hemodynamic changes and showed that eCEA was associated with significantly increased systolic ( $p = 0.01$ ), diastolic ( $p = 0.008$ ) and mean ( $p = 0.03$ ) blood pressure, and higher heart rate ( $p = 0.03$ ) values on postoperative day 1 when compared to cCEA. Furthermore, baroreflex sensitivity increased after cCEA but dropped significantly after eCEA with changes persisting on the third postoperative day even though there was a trend toward recovery.

According to Demirel et al., these transient impaired hemodynamic changes did not allow any differential clinical outcome between eCEA and cCEA, probably also because the small number of patients and lack of randomization did not let the authors detect any difference.<sup>1</sup> Nevertheless, uncontrolled

hypertension is a major reason of cardiac and cerebral complications after CEA and, even if transient, cannot be neglected since blood pressure may be easily controlled with accurate hemodynamic monitoring and medical therapy adjustment. An excessive risk exposure hypertension-related in the first postoperative days is not justified especially because many patients are being treated for asymptomatic carotid stenosis where indications for CEA are today debated and only very low thresholds of perioperative risk can be accepted. Furthermore, currently, CEA has been increasingly applied early after neurological symptoms onset (within 48 h to two weeks) to many patients with symptomatic carotid stenosis: in this time frame, there may likely be higher cerebrovascular instability with lower brain ischemic tolerance and the impaired postoperative hemodynamics after CEA might result in a remarkable increased risk of cerebral complications. Despite ideal blood pressure thresholds have been established (systolic < 140 mmHg; diastolic < 90 mmHg) to reduce cardiovascular risk in patients with carotid stenosis under standard conditions,<sup>2</sup> there is still uncertainty in current multiple guidelines on how high/low blood pressure should be maintained during the hyperacute neurological symptoms phase to avoid additive cerebral ischemic risks.<sup>2,3</sup> This applies especially when the effect of hyperperfusion due to revascularization is counteracted by the risk of hypoperfusion during the first postoperative days after early CEA if hemodynamic instability occurs.

Should the more likely hemodynamic impairment be a reason of concern toward eCEA? The higher probability of elevated blood pressure in the first 3 operative days after eversion technique would not indicate inferiority of eCEA compared to cCEA: the message from the Demirel article is more likely that we should be aware about these changes and more careful in postoperatively monitoring of blood pressure during the postoperative days after CEA especially when eversion technique is used. Today CEA has become a very safe procedure with very low periprocedural risks and is often suggested as a one-day fast track procedure. Despite the technical simplicity and safety from a surgical standpoint, there still may be relevant medical concerns related to blood pressure control that need to be appropriately managed with vasopressors/antihypertensive drugs and may require at least 3 days of postoperative

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surveillance to avoid unexpected and unjustified stroke and cardiac complications.

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