Ocular Defects as Surrogate End-Points in Trials Comparing Carotid Endarterectomy and Stenting

The effect of carotid endarterectomy (CEA) and carotid artery stenting (CAS) on visual function has not been a specific end-point of most trials comparing CAS and CEA. Ischaemic lesions of the retina and optic nerve have been reported to occur in 15–46% of carotid patients, while carotid artery stenosis significantly reduces blood flow to the eye and orbit, resulting in the ocular ischaemic syndrome.1–5

Both CAS and CEA have been reported to prevent further episodes of amaurosis fugax, correct paresis of the pupil muscle, decrease neovascularization of the optic nerve head and iris, and improve blood flow to the orbital vessels.1–5 However, emboli generated during CAS and CEA may also cause ischaemic lesions of the ophthalmic artery, leading to transient or permanent blindness.6,7 Ophthalmic artery colour Doppler flow imaging, fluorescein angiography, and retinal photography have been used to detect new emboli generated during the carotid revascularization procedures.6

CAS is associated with a higher incidence of cerebral microemboli compared with CEA.8–10 These microemboli are major risk factors for postprocedural cerebral deficits.8–10 Although most of these microembolic events are not associated with deterioration in cognitive performance and functions, or may only be associated with a transient dysfunction, their long-term effects are uncertain.11 It has been suggested that subclinical infarcts on magnetic resonance imaging (MRI) are a risk factor for cognitive impairment.12 Furthermore, such microemboli may contribute to cognitive decline, vascular dementia, and Alzheimer’s disease,13,14 and may be associated with a higher (greater than threefold) risk of future stroke.15 Therefore, long-term follow-up with neurocognitive testing and repeated MRI imaging may be essential to provide better insight into the nature of these lesions.9,10

Although much attention has been given to the effects of CAS and CEA on brain circulation, the effects of CAS versus CEA on visual function are unknown. Improvement in blood flow following CEA/CAS can improve chronic ischaemia of the orbital vessels but, on the other hand, it may turn out that microemboli generated during CAS and/or CEA adversely affect visual function. Current or future trials comparing CAS and CEA may, therefore, provide a unique opportunity to investigate and report on this subject.

The Asymptomatic Carotid Surgery Trial-2 (ACST-2) is currently the largest trial to compare CAS with CEA in patients with severe asymptomatic carotid stenosis.16 Thus, it may represent a unique opportunity to investigate the effects of both procedures on the eye circulation and the retina. Potential differences between the two procedures may be used as another surrogate end-point on which the merits of each procedure could be judged. Finally, these results could provide additional useful data on the effects of carotid revascularization procedures in asymptomatic patients.

REFERENCES


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**Progressive compression, plantar load and calf venous pump**

Mosti and Partsch\(^1\) exhaustively demonstrated that a progressive compression improves calf ejection fraction (cEF) more than a classic regressive compression. These findings were convincingly ascribed to the higher pressure obtained at the calf “…where it is needed…”.

We are currently evaluating changes in ankle range-of-motion (aROM) and plantar load related to different compression devices. Our preliminary results suggest an additional possible explanation.

In fact, we observed that the higher the compression on the foot and ankle, the greater the reduction of the aROM and variations of both static and dynamic baropodometric findings (Fig. 1A,B). In turn, in an experimental model of progressive compression (CircAid Juxta-Fit applied without the underlying elastic anklet, with a pressure of about 50 mmHg at the calf with no compression of the foot and ankle), the aROM and baropodometry did not modify. Distribution of plantar load even improved in some cases (Fig. 1C).

The mean age of the patients in whom Mosti and Partsch calculated cEF after a standardized walking test was 53.7 ± 12.1 years, and 75% of legs were assigned to C-classes C3–C5. It is well known that ageing and severity of venous insufficiency per se reduce aROM, and that limited ankle flexibility and plantar abnormalities reduce the efficacy of the calf pump.

Accordingly, it could be speculated that, besides the positive effects of higher compression of the calf, the greater cEF obtained with progressive stockings also could be because of the lower “compression profile” of the foot and ankle, resulting in a more physiologic flexibility of the plantar and tibio-tarsal joints.

In turn, the higher compression exerted by regressive stockings on the foot and ankle could possibly further reduce their flexibility, so influencing gait dynamics and activation of pumping muscular chains. This would be especially true for older subjects and those with more severe venous insufficiency.

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**Figure 1.** A 63-year-old male. Baropodometric findings from the right foot in basic conditions (A), with multi-layer bandaging (B) and CircAid Juxta-Fit applied without the compression anklet (C).

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