EDITORIAL

Intraoperative Quality Control of Carotid Endarterectomy

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Since its first description in the early 1950’s, the technique of carotid endarterectomy (CEA) has been continually refined in an effort to reduce the incidence of neurological complications. Considering the potentially disastrous consequences that may result from major residual defects at the endarterectomy site, many investigators have advocated routine completion imaging.1–7

Several techniques have been described, including completion angiography, angioscopy, and duplex ultrasonography. Completion angiography, perhaps the most widely employed quality control procedure, is considered the gold standard by many surgeons. However, angiography has its own morbidity including haemorrhage, arterial wall dissection, allergic reactions, embolisation, and exposure to radiation. Numerous studies suggest that completion imaging reduces the incidence of postoperative neurological events when compared to historical controls. For example, Scott et al. demonstrated a reduction in perioperative stroke rate (6.8% to 3.6%) which they attributed to the immediate revision of defects detected in 11% of patients undergoing completion angiography.15 In a retrospective study, Courbier et al. compared 206 CEAs performed without, and 100 consecutive CEAs performed with, intraoperative angiography and observed a reduction in neurological morbidity and mortality.16 Donaldson et al. also concluded that routine practice of a completion investigation contributes to their low rates of perioperative complications and restenosis.2 Roon and Hoogerwerf reported a statistically significant reduction in ischaemic neurological complications after introduction of completion angiography to their practice.3 Similarly, Lennard et al. reported that a policy of transcranial doppler and angioscopy has contributed to sustained reduction of intraoperative stroke risk following CEA.17

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However, the results of EVEREST suggests that this issue warrants further consideration. In the majority of studies cited above, outcome was evaluated in the study population as a whole, that is, in patients with and without defects, whether corrected or not. EVEREST showed that, in spite of surgical revision, patients with technical defects requiring revision had more neurological complications than those with no defects. Although the overall perioperative major stroke and death rate was very low (1.2%), patients with a positive completion angiography or angioscopy had an increased incidence of perioperative ipsilateral stroke with respect to patients with normal completion studies. Furthermore, patients with revised defects were almost 12 times more likely to experience a perioperative ipsilateral stroke when compared to patients with normal completion studies. Why does correction of technical defects not, therefore, reduce the incidence of neurological complications to the level experienced by patients with initially normal completion studies? Neurological damage could have occurred either before, during, or after performance of quality control. However, it is difficult to establish the temporal relationship between the onset of complications and the correction of defects in patients operated under general anesthesia. Some of the neurological events may have been related to the completion procedure. Despite a similar incidence of detected defects in patients undergoing completion angiography and angioscopy, a higher percentage of defects was corrected in patients undergoing angioscopy. One possible reason is that the carotid is still clamped during angioscopy. Logistic regression analysis revealed that, of a variety of anatomical and operative details examined for their influence on technical errors, only carotid plaque >2 cm on the internal carotid artery was an independent predictor of CEA defects.

In light of these data from over 1300 completion procedures in the setting of a multi-centre randomised trial, the attitude towards completion imaging should be re-examined. The vascular surgeon should be aware that the perioperative neurological prognosis of patients with defects warranting surgical revision is poor and that quality control procedures and possible correction of defects do not protect per se from an unfavourable early outcome. On the other hand, quality control should be encouraged because it provides the best and most complete surveillance of operative results. In conclusion, surgical excellence is mandatory to achieve satisfactory results after CEA and continued efforts to achieve initial technical perfection should be made, rather than considering the possibility of later correction.

References