Carotid endarterectomy in the UK: acceptable risks but unacceptable delays

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ABSTRACT – Carotid endarterectomy (CEA) is of benefit for stroke prevention in the presence of severe carotid stenosis, provided surgical morbidity and mortality are acceptably low. To assess the current performance of CEA in the UK, an interim analysis of 30-day postoperative outcome data, blinded to anaesthetic allocation, from the first 1,001 UK patients randomised in the GALA Trial (multicentre randomised trial of general versus local anaesthesia for CEA) took place and the time from last symptomatic event to surgery was recorded. The 30-day risk of stroke was 5.3%, myocardial infarction (MI) 0.4%, death 1.7%, and stroke, MI or death 6.4%. Median delay between symptoms and surgery was 82 days. These risks are similar to those reported in the large randomised trials of CEA, but current delays to surgery are excessive and must have substantially reduced the benefit of endarterectomy.

KEY WORDS: carotid endarterectomy, carotid stenosis, stroke, stroke prevention, transient ischaemic attack

Introduction

The results of large, randomised controlled trials have established the place of carotid endarterectomy (CEA) in the surgical treatment of severe recently symptomatic carotid stenosis.[1] More recently, the Asymptomatic Carotid Surgery Trial (ACST) reported modest benefit in asymptomatic carotid disease.[2] But clearly, for surgery to be of maximal benefit, the risk of perioperative major morbidity and mortality must be low. To reduce perioperative complications a number of processes of care have been assessed: intraoperative anticoagulation,[3] perioperative antiplatelet drugs[4,5] and patch angioplasty of the endarterectomy site[6] may all confer some benefit. A shunt to preserve ipsilateral cerebral perfusion during cross-clamping of the carotid arteries may also be beneficial.[7] Finally, there is some evidence, largely from non-randomised studies, that locoregional anaesthesia (LA) may be associated with fewer complications (stroke, myocardial infarction (MI) and death) than general anaesthesia (GA).[8] This last issue is being examined in the international, multicentre General Anaesthesia versus Local Anaesthesia (GALA) trial. Although ongoing, this trial provides an opportunity to examine the performance of CEA in the UK in the past five years, and specifically to examine the risk of serious postoperative complications, and the delay from cerebrovascular symptoms to surgery. This report is an analysis, blinded to type of anaesthesia, from the first 1,001 randomised UK patients who had surgery.

Methods

Centres undertaking ≥10 CEAs per surgeon per annum were invited to participate in the trial. When required, training in the technique of LA surgery was offered and surgeons performed ≥5 LA procedures before randomising patients in the study. Patients were excluded from the study if they or their surgeon/anaesthetist had a preference for a particular anaesthetic method, were unable to cooperate with awake neurological testing under LA, required simultaneous bilateral CEA, CEA in combination with another surgical procedure (eg cardiac surgery), or had already been included in the GALA trial.

Participating centres selected patients thought

Table 1. Method of assessment of carotid stenosis in the operated patients.

Imaging technique	n	%
Ultrasound alone	829	83
MR angiography alone	8	0.8
CT angiography alone	2	0.2
Catheter angiography alone	16	1.6
Ultrasound + MR angiography or CT angiography or catheter angiography	144	14
Ultrasound + MR angiography + catheter angiography	2	0.2

CT = computed tomography; MR = magnetic resonance; n = number.

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Table 2. Patient characteristics.

Characteristic		All Patients n	%
Age (years)	median (IQR)	71 (66–78)	NA
Sex	Female	314	31
	Male	687	69
Stenosis of operated artery (%)	0–69*	41	4
	70–79	278	28
	80–89	306	31
	90–99	376	38
Stenosis of contralateral artery (%)	0–69	674	67
	70–79	69	7
	80–89	68	7
	90–99	54	5
	100	119	12
	Unknown	17	2
Smoking	Current smoker	304	30
	Ex-smoker	534	53
	Lifetime non-smoker	163	16
Hypertension	Yes	693	69
	No	308	31
Diabetes mellitus	Yes	170	17
	No	831	83

*There were three patients with 35% stenosis (all described as <70% on the baseline data form). The remaining patients all had 50% stenosis or more. IQR = interquartile range; n = number; NA = not applicable.

Table 3. Indications for carotid endarterectomy.

Characteristic	All Patients n	%
Relevant cerebrovascular events		
Asymptomatic carotid stenosis	134	13
Symptomatic carotid stenosis:	867	87
Carotid stroke only	231	27
Brain TIA (carotid) only	303	35
Retinal infarct only	28	3
Amaurosis fugax only	146	17
Carotid stroke and brain TIA	58	7
TIA and amaurosis fugax	56	6
Other mixture of symptoms	45	5
Last event to surgery (days) median (IQR)*	82 (38–143)	NA

*The 134 asymptomatic patients, and 1 patient with an unknown date of last event are not included in this figure. IQR = interquartile range; n = number; NA = not applicable; TIA = transient ischaemic attack.

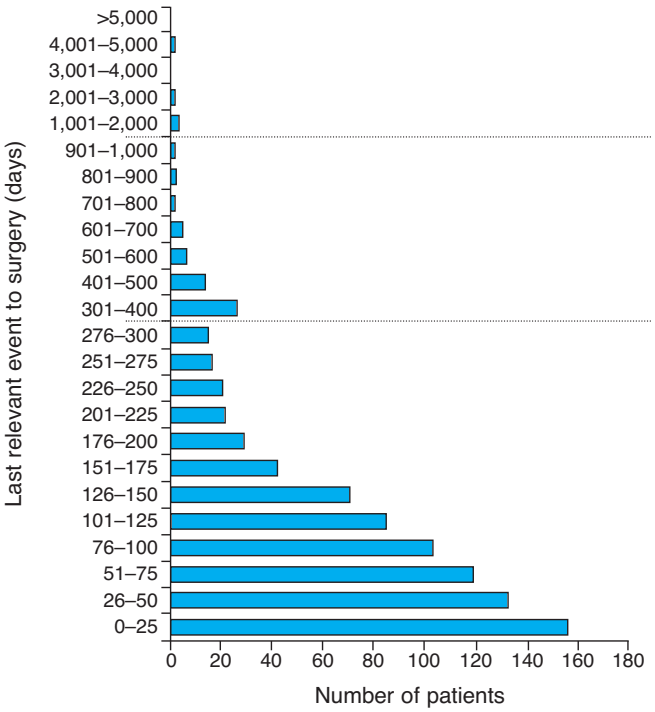

Fig 1. Interval between last relevant event and carotid endarterectomy for symptomatic patients (n=867).

suitable for surgery, which was performed according to their normal protocols for anticoagulation, intraoperative cerebral monitoring, endarterectomy technique and patch angioplasty. The method for measuring stenosis was left to the individual centres (so ensuring that LA and GA groups were similar at baseline at each centre and across the whole trial), but was generally performed by ultrasound (Table 1) and equivalent to the North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria.[1] Although largely applying to anaesthetic technique, certain broad guidelines were recommended.[9] While the GALA trial is not prescriptive in any of these processes of care, a carotid shunt was generally only to be deployed in LA patients if deemed necessary on the basis of awake neurological testing.

All patients were reviewed by an independent stroke physician about 30 days post-CEA and any surgical, neurological or cardiac complications were reported to the trial centre. Only one event of a particular type per patient was counted in the analyses. If a patient had multiple events of the same type, the event included in the analyses is the fatal one if there was one, and the first non-fatal one for all other patients. Strokes, including retinal infarction, were defined using the usual World Health Organization criteria of symptoms lasting at least 24 hours (transient ischaemic attacks (TIA) <24 hours). Myocardial infarction was defined by typical central chest pain, a rise in cardiac enzymes (not just troponin) and typical electrocardiogram (ECG) changes. All possible strokes, MIs and deaths were reviewed in the trials office

Table 4. Thirty-day outcomes after carotid endarterectomy.

	Symptomatic n=867 (%)	Asymptomatic n=134 (%)	Overall n=1,001 (%)
TIA	38 (4.4) 95% CI 3.2 to 6.0%	5 (3.7) 95% CI 1.6 to 8.4%	43 (4.3) 95% CI 3.2 to 5.7%
Stroke including retinal infarct:			
All	45 (5.2) 95% CI 3.9 to 6.9%	8 (6.0) 95% CI 3.1 to 11.3%	53 (5.3) 95% CI 4.1 to 6.9%
Minor (Rankin 0–2)	23 (2.7) 95% CI 1.8 to 3.9%	2 (1.5) 95% CI 0.4 to 5.3%	25 (2.5) 95% CI 1.7 to 3.7%
Serious/disabling (Rankin 3–5)	10 (1.2) 95% CI 0.6 to 2.1%	3 (2.2) 95% CI 0.8 to 6.4%	13 (1.3) 95% CI 0.8 to 2.2%
Fatal	12 (1.4) 95% CI 0.8 to 2.4%	3 (2.2) 95% CI 0.8 to 6.4%	15 (1.5) 95% CI 0.9 to 2.5%
MI	3 (0.4) 95% CI 0.1 to 1.0%	1 (0.7) 95% CI 0.1 to 4.1%	4 (0.4) 95% CI 0.2 to 1.0%
Death	13 (1.5) 95% CI 0.9 to 2.5%	4 (3.0) 95% CI 1.2 to 7.4%	17 (1.7) 95% CI 1.1 to 2.7%
Stroke or death	51 (5.9) 95% CI 4.5 to 7.7%	9 (6.7) 95% CI 3.6 to 12.3%	60 (6.0) 95% CI 4.7 to 7.6%
Stroke/MI/death	54 (6.2) 95% CI 4.8 to 8.0%	10 (7.5) 95% CI 4.1 to 13.2%	64 (6.4) 95% CI 5.0 to 8.1%

No statistically significant differences between symptomatic and asymptomatic carotid stenosis. CI = confidence interval; MI = myocardial infarction; n = number; TIA = transient ischaemic attack.

where a short summary, blinded to local or general anaesthesia, was prepared for audit by a neurologist and cardiologist. The severity of any stroke was assessed at about six months after the event by the patients' general practitioner, using the modified Rankin scale.

Results

Between June 1999 and November 2004, 1,289 patients were randomised. Of these, 248 were non-UK, and a further 40 were UK patients who did not go on to have surgery. The remaining 1,001 were recruited from UK centres and operated on. Patient characteristics and indications for surgery were typical for CEA at the present time; patients were rather older than in the randomised trials (Tables 2 and 3).[4] The long period between last symptomatic event and surgery is notable: median 82 days, interquartile range 38–143 (Fig 1). Overall, 53 patients (5.3%, 95% confidence interval (CI) 4.1 to 6.9%) had a stroke or retinal infarct within 30 days of surgery (Table 4). Of these, 25 (47%) were minor (Rankin 0–2), 13 (25%) serious or disabling (Rankin 3–5), and 15 (28%) were fatal. Sixty-four patients (6.4%, 95% CI 5.0 to 8.1%) had a stroke, MI or died within 30 days of surgery.

Discussion

For symptomatic carotid stenosis, the pooled analysis of individual patient data from the European Carotid Surgery Trial (ECST), NASCET and Veterans' Affairs trials found a significant benefit from CEA for patients with ≥70% stenosis, despite a combined risk of perioperative stroke and death of 6.2%.[1] For asymptomatic carotid stenosis (≥70%) ACST demonstrated some benefit from immediate surgery with a 30-day risk of stroke and death of about 3%.[2] Data from our study confirms that these target event percentages are being met at least for symptomatic carotid disease in the UK, while the status of surgery for asymptomatic disease is less clear but our numbers as yet are small (only 10 major events). Thus, although data regarding the impact of anaesthetic technique on outcome following carotid surgery will not be available until after recruitment ends, it is reassuring that the 30-day outcomes fall well within the margins of an acceptable risk:benefit ratio for symptomatic disease. The delay between last symptomatic event and surgery, however, is of very serious concern. A further analysis of the pooled data from the ECST and NASCET confirmed that benefit from surgery was greatest within two weeks of the last ischaemic event: the number needed to undergo CEA to prevent one stroke was five for patients randomised within two weeks versus 125 for those randomised later than 12 weeks.[10] Such late surgery may therefore confer no

benefit at all, missing the early high-risk period of preventable stroke. Patients in the UK must be assessed, investigated and referred for surgery far more quickly if CEA is to be an effective intervention. This will require a fundamental change in the way that TIAs and strokes are managed in primary care, by emergency physicians and others.

List of GALA trial collaborators

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Ethical approval

Northern and Yorkshire Multi-centre Research Ethics Committee reference MREC/3/3/10, date 22/04/2003.

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