

CAROTID ARTERY SURGERY: AN OPTION FOR THE STROKE PATIENT IN LANCASTER AND SOUTH LAKELAND?

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INTRODUCTION

Carotid artery surgery for stenosis of the carotid arteries has been carried out with increasing frequency since the first carotid endarterectomy was performed at St. Mary's Hospital in London in 1954 by Eascott and Robb.

In the USA it had become one of the commonest surgical procedures in the early 1980's with its advocates claiming that it was responsible for a fall in the overall incidence of strokes. However in Great Britain there has been a much more conservative approach by neurologists and surgeons so that even in 1991 only 1500 carotid endarterectomies were performed. This is because embolic transient ischaemic attacks (TIAs) or even complete carotid occlusion are not invariably followed by strokes. Although most vascular surgeons practising carotid endarterectomy have been convinced of the benefits of the operations in severely symptomatic patients with frequent TIAs, until recently there were no satisfactory studies to prove that any benefits of the surgery in preventing strokes were not outweighed by the significant risks of the surgery itself.

Two large international multi-centre trials, however, the European Carotid Surgery Trial and the North American Symptomatic Carotid Endarterectomy Trial have clearly demonstrated the benefits in symptomatic patients with severe stenoses in the carotid arteries (defined as 70%–99% linear reduction in diameter, Fig 1). The risk of ischaemic stroke in these studies was reduced by 75% in the 2–3 year post-operative period (Table 1).

	NON SURGICAL GROUP	SURGICAL GROUP
TOTAL PATIENTS	654	783
STROKE RATE % (2-3 yr follow-up)	23.8	12.4
STROKE RATE % (excluding surgical risk)	6.2	

Table 1 – Combined risk from the European and N. American studies

Allowing for the surgical risk (3.7 and 2.1% in these trials) surgically treated patients started to do better than the control groups after about eight months. If the surgical risk approaches 10% then this advantage is lost.

In Great Britain and Ireland there are about 130 vascular surgeons performing carotid endarterectomies and, at the last

audit in 1991, only 25 surgeons were operating on more than 20 carotids per year. It has been recommended that this type of surgery should be performed in a limited number of centres whose audited results are consistent with the results achieved in the best centres. In the light of these newest studies and recommendations it is important to examine the surgical option for patients in South Lakeland and Lancaster.

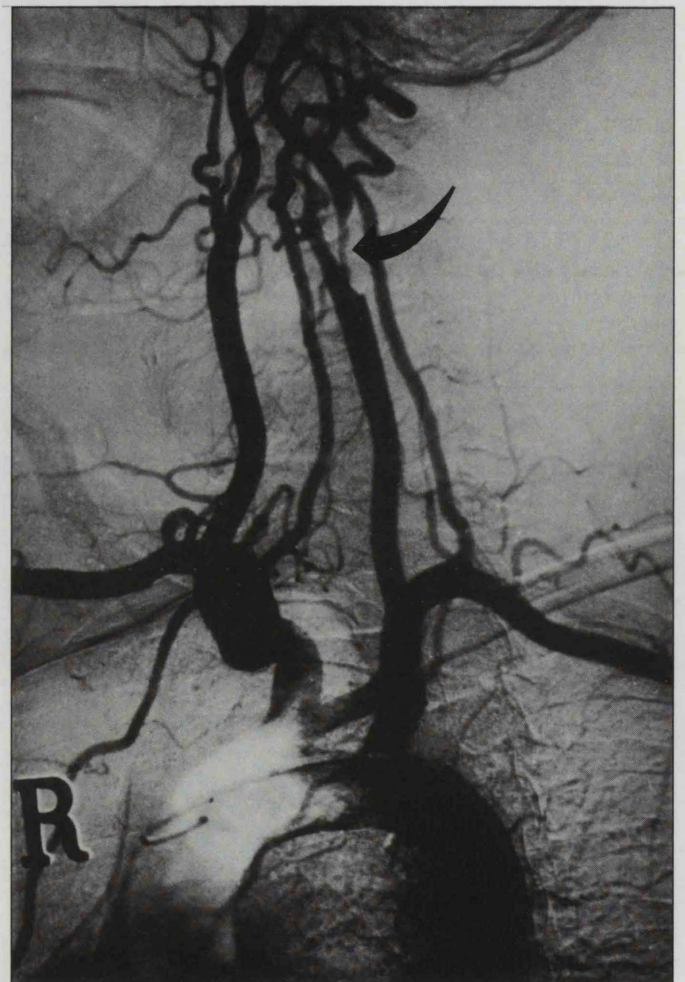


Figure 1 – Arch aortography of a patient with recurrent 'strokes' causing dysphasia and right sided weakness. It shows a tight stenosis (arrowed) of the left internal carotid artery

This paper reviews an audit (by PDS) of carotid endarterectomy carried out in Lancaster by one surgeon during the two year period 1991–1992; the period covered relates to the advent of a new computerised audit system.

Patients and methods

The notes of all the patients who had undergone carotid endarterectomy were reviewed. All the operations were

carried out under general anaesthesia using a simple plastic tube shunt (Javid) to maintain the cerebral circulation during the endarterectomy itself (Fig 2). Eighty percent of the arteries were closed with a vein patch when it was considered that direct closure of the arteries might narrow the lumen (Fig 2).

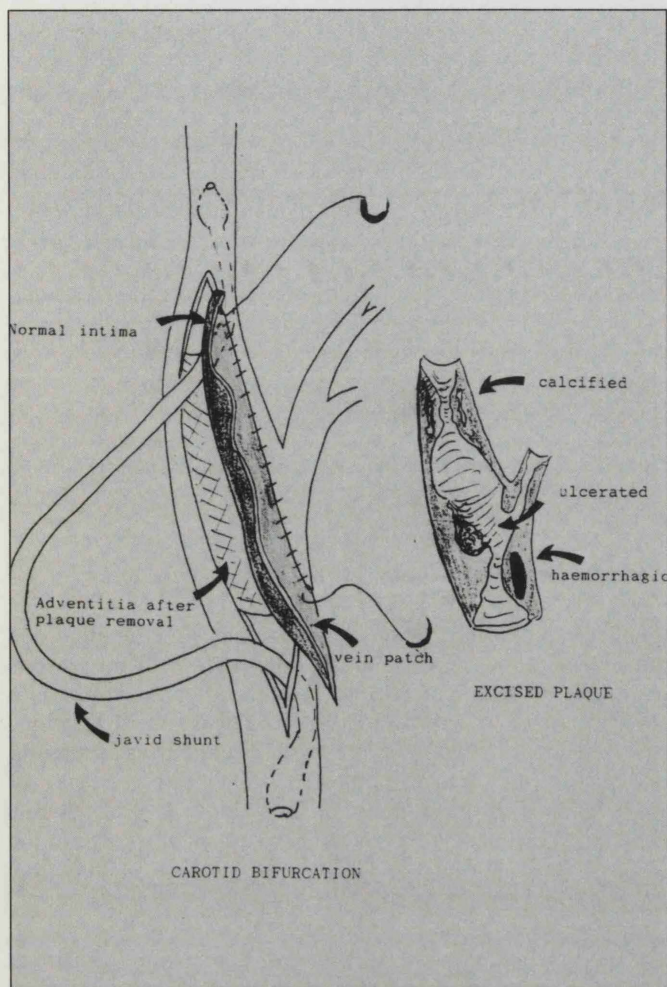


Figure 2 - Diagrammatic representation of a carotid endarterectomy and a longitudinal section of the types of atheromatous plaque removed.

34 patients (37 operations)	
SEX male 26 female 8	
AGE range 50-84 yrs (mean 68)	
INDICATION	
Symptomatic severe stenosis	25 (67%)
Symptomatic plaques	6 (16%)
Asymptomatic severe stenosis	6 (16%)
SYMPTOMS	
TIA's	23 (62%)
Stroke	6 (16%)
Amaurosis Fugax	8 (21%)
Non-hemispheric	5 (13%)
OPERATION SIDE	
Right	19
Left	18 (3 bil)
CAROTID CLOSURE	
Patch	31
No patch	6
INPATIENT STAY Range 3-9 days (median 6, mean 5.4)	

Table 2 - Lancaster carotid endarterectomies

Results of audit

The patient details are given in Table 2. Of 37 operations, 25 (67%) endarterectomies were performed for symptomatic severe stenosis. Six patients had operations for asymptomatic stenoses: four because they were to undergo other vascular procedures (coronary artery or aortic surgery), one because of anxiety and a bruit that was so severe that sleep was disturbed, and one because they had become fearful of a stroke which had happened to their partner whilst they were under investigation.

The complications were as follows:

- There were two deaths. The first death occurred in a patient who had an uneventful endarterectomy for severe symptomatic stenosis but was readmitted two weeks later with a secondary haemorrhage due to an infected wound; during its repair the patient suffered from a massive stroke from which he died two weeks later. The second death was in a patient who had severe bilateral carotid stenosis and endarterectomy was requested by the cardiac surgeons before undertaking coronary artery bypass for severe angina. Four hours after surgery the patient suffered a myocardial infarct; during the associated hypotensive episode he had a severe stroke due to bilateral carotid thrombosis from which he died 24 hours later.
- There was one stroke. The patient, with recurrent frequent TIAs due to a severely ulcerated plaque, woke up from the operation with a paralysed right arm; this had completely recovered three months after his operation. He has had no further TIAs and is now able to drive a car and carry out full normal activities.
- Minor complications included two wound haematomas and two patients with very labile blood pressure post-operatively.
- There was one late complication. This was the occlusion of an endarterectomised carotid almost one year post-operatively; there were no neurological consequences and it was only confirmed by a follow-up ultrasound scan.

Correlation of ultrasound, angiographic and operative findings has shown that non-invasive studies can be relied on in the majority of cases to classify stenoses broadly into minimal (<50%), moderate (50-69%) and severe (70-99%) categories.

Discussion

This small series has been reviewed because it coincides with the introduction of a more complete audit system than was available in the previous thirteen years that carotid endarterectomies had been carried out in Lancaster. Independent audit of such operations is essential if we are to assess accurately the level of benefit that is to be obtained when the rate of surgical morbidity and mortality is so critical to the outcome/benefit equation.

The mortality/morbidity of 5% is within the guidelines for acceptable operative complication rates if a significant benefit in the terms of major stroke prevention is to be achieved. A small technical complication rate is almost inevitable and the patient with an infected arteriotomy site is an example of this. However, selection policy is important and should improve both with increasing local experience and in the light of future randomised trials. The case of the patient who died due to bilateral carotid thrombosis, consequent to a perioperative myocardial infarct, illustrates

this. Arrangements have now been made for similiar patients to be treated by synchronous carotid and coronary artery surgery. One such procedure has been carried out without incident this year.

At Lancaster the correlation of duplex scans of the carotids with arteriography and with operative findings shows a steady improvement over the past two years—particularly since the availability of colour duplex; arteriography is still needed quite frequently in patients with moderate to severe stenosis. With greater experience and radiological specialisation, the majority of patients should eventually require only the non-invasive duplex ultrasound scan. The majority of these operations was performed for severe symptomatic stenosis which the combined studies show will clearly benefit from such surgery as long as the major incident rate remains below 5%. The value of the operation in preventing strokes in patients with mild or moderate stenosis is as yet unproven although multicentre trials are underway to consider this question. Patients with retinal ischaemia and more than 20% stenosis show a high incidence of ulcerated and haemorrhagic carotid plaques (see Fig 2) as the source of the emboli and the danger of progressive visual loss justifies operation.

There are, however, other benefits of the operations which are more difficult to quantify; for example the benefit that severely symptomatic patients obtain from relief of disabling unpredictable episodes of transient ischaemia; or the improvement, sometimes dramatic, that occurs at present unpredictably in patients with residual symptoms after strokes. The implication of the findings of the multicentre trials is that all patients with TIAs or ischaemic strokes referable to the carotid artery territory, should be considered as potential candidates for surgery. This includes those patients with amaurosis fugax, retinal infarction, dysphasia, hemiparesis and hemisensory loss. If the patient is fit enough for surgery then endarterectomy should be considered even over the age of 80. Obvious contraindications are recent myocardial infarction, unstable angina or poorly controlled hypertension, all of which are associated with adverse surgical outcomes. Clinical examination is insufficient for screening these patients since 30% of patients with even severe stenosis have no carotid bruits. The carotid arteries should therefore be visualised by duplex ultrasonography and doppler analysis. CAT scanning is useful in demonstrating the site and nature of cerebral infarcts. Where moderate or severe stenosis is suggested this can be followed by angiography. Angiograms should also be performed in those patients with apparent occlusion of the internal carotid on ultrasound as this can be a false finding in very severe stenosis, 'pseudo-obstruction'. Two-plane X-ray studies also allow accurate determination of the degree of stenosis.

The results from the surgical trials show that the patients who receive the best medical treatment of risk factors have the best results from surgery. Treatment of hypertension, hyperlipidaemia and antiplatelet therapy are all indicated⁽⁷⁾. Aspirin should be started as soon as possible before surgery and continued indefinitely afterwards; a dose between 75 mgs and 300 mgs daily is suitable. Symptomatic patients with moderate stenosis should be considered for randomization within carotid endarterectomy surgical trials.

The implication of this more aggressive policy for carotid stenosis, which is being recommended to clinicians, is that more patients need referral and appropriate investigation since 60% of strokes are due to carotid artery lesions. Whilst the number of operations compares favourably with the

LANCASTER POPULATION	200,000
ALL TIAS AND NON-DISABLING STROKES	168
NO. OF PATIENTS UNDER 75	108
NO. WITH 'CAROTID' DISTRIBUTION	86
NO. WITH STENOSIS	70% 18

Table 3 – Approximate yearly estimate of incidence of TIAs and strokes with need for endarterectomy in Lancaster (8)

LANCASTER RESULTS		
NUMBER EXPECTED		
OPERATIONS DONE	37	36
MAJOR STROKE/DEATH RATE	3%	2-4%

Table 4 – Lancaster results compared with expected outcome over the two year period

number expected (Tables 3 and 4) this hides the fact that one third of the Lancaster operations were performed for reasons other than symptomatic severe stenosis; therefore there is a shortfall within the district of approximately six operations per year if all the patients with symptomatic cerebral ischaemia had been referred. The extra costs of investigations and operations for this wider range of patients should be balanced by the cost of the strokes prevented in the 10% of patients who would have had strokes within three years without their surgery.

The statement on behalf of the Association of British Neurologists emphasises that screening of the "stroke" patient and referral of those found to have severe carotid stenosis for surgery is mandatory. A local screening service for these patients is also recommended otherwise the referral rate for these life-threatening conditions is severely reduced. As an example of this need, before abdominal aortic aneurysm repair was introduced to Lancaster it was thought to be an uncommon condition whereas 30–40 patients with aneurysms over 5 cms are now treated annually.

There is the equipment and the expertise for the investigation of these patients both in the Royal Lancaster Infirmary and the Westmorland General Hospitals and there is the capacity to expand this service as the increasing sensitivity of the non-invasive screening will continue to reduce the need for invasive investigations such as arteriography. Therefore from the results reviewed in this paper it appears appropriate to continue to provide a carotid screening and endarterectomy service for the 'stroke patient' in Lancaster and South Lakeland for which sequential audit will be needed to guarantee the quality and effectiveness of the service.

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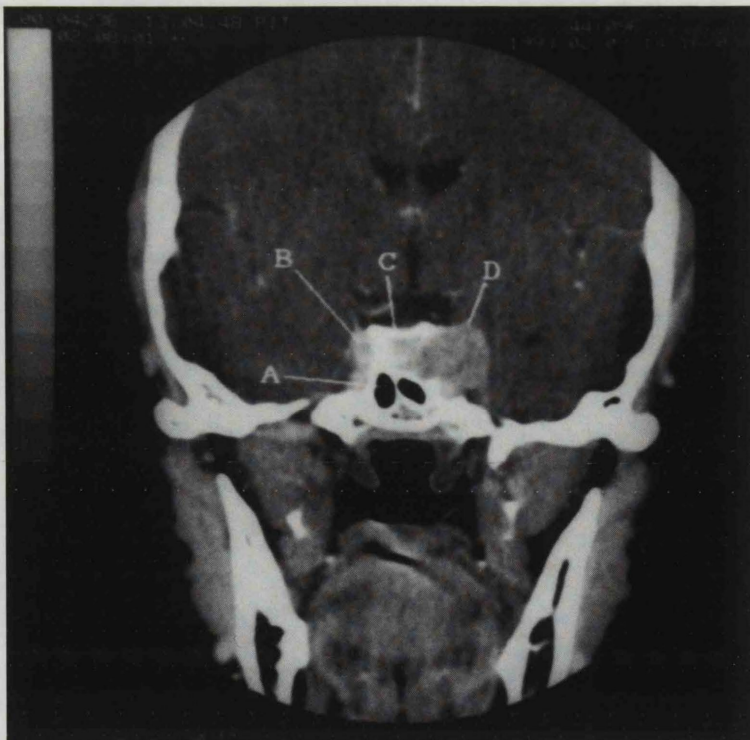
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Quiz



1. What is this examination?
2. What abnormality is shown?
3. What are the structures marked A, B, C, D?

Answers on page 310