

The epic 1954 operation that led to one of surgery's major advances: carotid endarterectomy

John E. Connolly

Professor of Surgery, University of California, Irvine, CA 92697, USA

Corresponding address: John E Connolly, MD, Professor of Surgery, University of California, Irvine, CA 92697, USA

E-mail: jeconnol@uci.edu

Date accepted for publication 30 January 2004

Abstract

The first report of a successful operation for carotid stenosis in 1954 owes credit to the neurologist Fischer who noted that carotid disease is localized and thus could conceivably be bypassed or locally excised. With this knowledge Professor Pickering of St Mary's Hospital, London, wisely obtained a carotid arteriogram on one of his patients and suggested to Rob and Eastcott that they surgically correct the block. Their famous successful operation in 1954 startled the medical world. However, only after clinical trials conclusively showed the benefit of carotid endarterectomy in preventing stroke, was it widely accepted. Modern advances in the technique of the procedure are listed.

Keywords

Carotid; endarterectomy; clinical trials.

Introduction

The importance of the paper by Eastcott, Pickering and Rob which appeared in the *Lancet* in 1954^[1] is that although several operations to correct stenosis or occlusion of the internal carotid artery were subsequently reported to have preceded theirs, the St Mary's operation in 1954 was the first publication to appear in print and gave the greatest impetus to the development of carotid surgery.

It wasn't until 1951 that the neurologist Fischer^[2] noted on arteriography that the carotid vessels distal to disease at the bifurcation were normal, which suggested that local endarterectomy could be effective. He stated 'It is even conceivable that some day vascular surgery will find a way to bypass the occluded portion of the artery during the period of ominous fleeting symptoms. Anastomosis of the external carotid artery or one of its branches with the internal carotid artery above the area of narrowing should be feasible'.

Eastcott, Pickering and Rob

In 1954 Pickering, Professor of Medicine at St Mary's Hospital in London, had a 66-year-old female patient who was suffering intermittent attacks of right hemiplegia and left monocular blindness.

This paper is available online at <http://www.grandrounds-e-med.com>. In the event of a change in the URL address, please use the DOI provided to locate the paper.

He wisely obtained a carotid arteriogram which showed a significant stenosis of the left internal carotid artery. He then suggested to the Professor of Surgery, Charles Rob, that the lesion might be corrected by surgery. Felix Eastcott, who was his Assistant Director, then performed the operation with oversight by Rob. Before prepping and draping, the patient was covered with a rubber sheet and ice bags until the body temperature reached 28°C in an attempt to protect the brain during the period of crossclamping.

Previously, dos Santos of Lisbon in 1946^[3] and Wylie of San Francisco in 1951^[4] had successfully performed endarterectomies but not on the carotid artery. Subsequently, Eastcott, during a research fellowship in Boston, had performed carotid excision and reanastomosis on dogs. Thus, reviewing the arteriogram, he noted that the occluding internal carotid plaque was quite localized. He elected to resect a piece of the internal carotid artery along with the proximal external carotid, reanastomosing the common carotid to the distal internal carotid. The patient's symptoms were completely relieved and she lived for nearly 20 years after surgery. Rob and Wheeler^[5] published an account in 1957 of 27 additional carotid procedures performed at St Mary's Hospital in the 2 years after the epic 1954 operation. These early publications in the *BMJ* and *Lancet*, and the prominence of Charles Rob internationally, clearly signaled the importance of the *Lancet* report as a ground-breaking event leading to one of the major advances in vascular surgery. However, the operation's acceptance by the neurological community was slow and awaited controlled clinical trials.

Clinical trials

Clinical trials, both in Europe and America (1991-1995), clearly demonstrated the benefit of carotid endarterectomy over medical treatment in patients with recent hemispheric and retinal transient ischemic attacks or non-disabling strokes and high-grade ipsilateral carotid stenosis^[6-8]. Clinical trials also of asymptomatic patients with carotid artery stenosis of 60% or greater, whose general health made them good candidates for elective surgery, have shown a significantly reduced 5-year risk of stroke, compared to medical management, providing that the operative surgeon's perioperative morbidity-mortality complication rate was below 3%^[9].

Modern advances

Soon thereafter, thromboendarterectomy replaced arterial excision and carotid shunting replaced hypothermia^[10]. Other surgical advances have included patch grafting^[11] and eversion endarterectomy^[12]. Carotid stenting^[13], in place of endarterectomy, has recently been introduced and is gaining popularity, but its comparative place is not yet known.

References

1. Eastcott HHG, Pickering GW, Rob CG. Reconstruction of internal carotid artery in a patient with intermittent attacks of hemiplegia. *Lancet* 1954; 2: 994-6.
2. Fischer M. Occlusion of the internal carotid artery. *Arch Neurol Psychiatry* 1951; 65: 346-77.
3. Cid dos Santos J. From embolectomy to endarterectomy or the fall of a myth. *J Cardiovasc Surg* 1976; 17: 107-28.
4. Wylie EJ. Thromboendarterectomy for arteriosclerotic thrombosis of major arteries. *Surgery* 1952; 32: 275-92.
5. Rob CG, Wheeler HB. Thrombosis of internal carotid artery treated by arterial surgery. *BMJ* 1957; 2: 264-6.
6. North American Symptomatic Carotid Endarterectomy Trial Collaborators. Beneficial effects of carotid endarterectomy in asymptomatic patients. *N Engl J Med* 1991; 325: 445-53.
7. European Carotid Surgery Trial (ECST). Interim results for symptomatic patients with severe (70-90%) or with mild (0-29%) carotid stenosis. *Lancet* 1991; 337: 1235-43.
8. Rothwell PM, Gutnikov SA, Warlow CP. Reanalysis of the final results of the European carotid surgery trial. *Stroke* 2003; 34: 514-23.
9. Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. Endarterectomy for asymptomatic carotid artery stenosis. *JAMA* 1995; 273: 1421-8.
10. Connolly JE. The evolution of extracranial carotid artery surgery as seen by one surgeon over the past 40 years. *Surg JR Coll Surg Edinb Irel* 2003; 1(5): 249-58.

11. Rosenthal D, Archie JP Jr, Garcia-Rinaldi R, Seagraves MA, Baird DR, McKinsey JF *et al.* Carotid patch angioplasty: Immediate and long term results. *J Vasc Surg* 1990; 12: 326-33.
12. Kasprzak F, Raithel D. Eversion carotid endarterectomy: technique and early results. *J Cardiovascular Surg* 1989; 30(Supplement No 5, September-October): 49.
13. Hobson RW 2nd, Lal BK, Chakhtoura E *et al.* Carotid artery stenting: Analysis of data for 105 patients at high risk. *J Vasc Surg* 2003; 37: 1234-9.