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Late Dacron Patch Inflammatory Reaction after Carotid Endarterectomy

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WHAT THIS PAPER ADDS

The microbiological and histopathological assessment performed in the cases, shows that not all Dacron patch reactions are secondary to infection. If this is confirmed in other case series, then a more conservative approach might be adopted, to avoid the high morbidity associated with re-intervention.

Objective: The aim was to analyse the incidence and presentation of carotid patch inflammatory reactions following carotid endarterectomy (CEA).

Methods: This was a cohort study using a prospectively maintained database. All patients who underwent elective CEA at a tertiary vascular centre between 2002 and 2016 were included. Computed tomography scan angiogram, duplex scan, and leucocyte scintigraphy were used to assess patients with suspected inflammatory patch complications. Re-intervention procedures and outcomes were noted. Histopathology and organisms cultured from the harvested material during re-intervention were assessed.

Results: During the study period, 633 patients underwent elective CEA. Fifty-one underwent eversion endarterectomy: 111 did not require a patch, whereas 471 patients had a patch repair. Four hundred and twenty eight had a Dacron patch repair and 43 a biological patch. Eight patients returned with late Dacron patch inflammatory complications (1.3% of all CEA and 1.9% of Dacron patch closures) after a period ranging from 18 months to 7 years (mean 4.1 $\pm$ 2.1 years). Seven of the eight patients underwent surgical re-intervention, and the eighth patient was deemed high surgical risk. One patient underwent a vein bypass, three had vein patch repair, one required internal carotid artery (ICA) ligation after patch excision, and two were managed by debridement, with omohyoid and sternomastoid muscle covering of the patch. The patient who required ICA ligation suffered a fatal stroke. The remaining patients had a satisfactory outcome. All patients showed evidence of foreign body reaction in pathological examination with no pathological organism cultured from swabs or tissue harvested during surgery.

Conclusion: Late wound complications after CEA may be related to inflammatory reaction of the Dacron patch rather than infection. Infection should be excluded first. Reconstruction with vein is effective. However, debridement with sternomastoid and omohyoid muscle covering of the patch may be considered in high risk patients after exclusion of infection with regular follow-up.

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INTRODUCTION

Carotid endarterectomy (CEA) reduces the long-term risk of stroke in patients with carotid artery stenosis.[1,2] Randomised trials have shown that a policy of routine patch closure (compared with routine primary closure) is associated with significant reductions in peri-operative stroke, early thrombosis, late restenosis, and late stroke.[3,4]

In systematic reviews, the synthetic patches (polytetrafluoroethylene [PTFE] and polyethylene terephthalate [Dacron]) conferred similar short- and long-term benefits, compared with autologous vein. These synthetic patches offer the added benefits of being readily available, preserving the long saphenous vein for future coronary or peripheral vascular reconstructions, and avoiding groin incisions. They have a lower incidence of early patch rupture.[5,6] Recently, bovine pericardial patches have been used as an alternative to PTFE and Dacron. Intermediate-term outcomes show similar rates of peri-operative bleeding, infection, and pseudoaneurysm formation with both Dacron and Bovine patch closures.[7]

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Prosthetic patch infection is a rare but well recognised complication following CEA.[8,9] Its incidence is reported to be around 0.5–1%. A total of only 130 cases have been reported in the world literature, which suggests that these cases are being under reported and probably not appropriately investigated.

The majority of cases present late, more than 6 months from the original surgery. Wound infection and abscess formation is the commonest mode of presentation in early cases, while chronic sinus discharge and false aneurysm formation are the commonest presentations in late cases.[10] The management of this complication must ensure the total eradication of the septic focus, while maintaining adequate brain perfusion.[8,9]

Prosthetic patch materials have been associated with failures, even in the absence of infection. Seromas and tissue reaction related to polyethylene terephthalate prostheses (Dacron), with no evidence of infection, have been extensively reported in the literature.[11,12] Numerous Dacron graft failures seem to be under reported.[13] The average time for graft failure was reported to range from 5.8 years and 7.4 years depending on the textile construction of the graft.[14] It is worth noting that reports commenting specifically on Dacron graft failure in carotids could not be identified in the literature.

Aim of the study

The primary endpoint is the prevalence and presentation of carotid patch failure after CEA.

Secondary endpoints include

1. 30 days post-re-intervention mortality
2. 30 days post-re-intervention stroke rate
3. organisms cultured from harvested material during intervention
4. histopathology of the harvested material.

MATERIALS AND METHODS

Ethical approval was sought and obtained from the institutional research ethics committee.

This was a cohort study using a prospectively maintained database. The study was conducted in compliance with the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)" guidelines.[15]

A prospective data record was maintained for all patients who underwent CEA in the institution between 2002 and 2016. Clinical, radiological, and operative information were prospectively entered into a vascular database (Vascubase 5.2, Consensus Medical, Richmond, BC, Canada). The data of all patients who were found to have a carotid patch complication during their follow-up were reviewed. Patient clinical notes were reviewed to obtain any data missing from the Vascubase. Radiological data were obtained from the institutional Picture Archiving and Communication System (PACS). Culture and sensitivity data and histopathological reports were retrieved from the institutional Patient Administration System (PAS).

Initial carotid endarterectomy technique

Patients underwent CEA, using systemic heparinisation, intravenous prophylactic antibiotics, and selective shunting. Patients with a small internal carotid artery (ICA) diameter were routinely patched. From 2002 to 2006 the InterVascular Hemacarotid patch (Datascope, Montvale, NJ, USA) was routinely used. From 2006 to 2014 the Ultrathin Hemacarotid patch (Maquet Getinge group, Rastatt, Germany) was used. From 2014 to early 2016 the XenoSure biologic vascular patch (LeMaitre Vascular GmbH, Sulzbach, Germany) was used. Three doses of intravenous Cefuroxime (1.5 g) were administered for antibiotic prophylaxis starting immediately prior to induction of anaesthesia and 8 hourly thereafter for 24 h as per the hospital antibiotic guidelines before 2012. All patients had cerebral venous oxygen saturation monitored by transcranial venous oxymetry as an indicator of cerebral circulation. A drain was routinely placed in all patients, and removed within 24 h.

Post-operative care after original CEA

Patients were monitored in theatre recovery for 3–4 h. Blood pressure was carefully monitored in a high dependency unit (HDU) for 24 h. The majority of patients were discharged after 36 h on aspirin, with instructions to return if any new symptoms or wound complications developed. Patients were routinely followed up by duplex scan 6 weeks after surgery and then at 6 monthly intervals for the first 3 years. Beyond that, patients were reviewed on an annual basis with a duplex scan until 10 years after surgery. On discharge, all patients were commenced on a low dose statin combined with aspirin.

Patients included in this study

Any patient with a suspected infection of their prosthetic patch was included in this review if they presented with a neck swelling, wound complications including sinus, or if they had an abnormal ultrasound scan at follow-up.

All patients had routine blood samples taken for haematology and biochemistry analysis, with aerobic and anaerobic blood cultures. Discharging wounds were swabbed for microbiological assessment. All patients were started on parenteral broad spectrum antibiotics, pending the swab results. Duplex ultrasound and computed tomography angiography (CTA) were carried out to exclude collections, pseudo-aneurysms, and to establish the patency of the internal carotid (ICA), external carotid (ECA), and common carotid arteries (CCA). Leucocyte scintigraphy was performed to confirm the presence of infection. Positron emission tomography/computed tomography (PET-CT) was not performed because this was not available in the unit.

Patients who were clinically fit for surgery were offered surgical debridement, with or without removal of the patch, depending on the extent of the reaction. Stump pressure was measured after carotid clamping, to assess the need for a shunt during patch excision and to test for vascular reserve. Mean arterial pressure (MAP) was kept $\geq$ 20% above baseline during cross-clamping. Any excised tissue

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