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Carotid stenting for irradiation-associated carotid stenosis 3 years after previous carotid endarterectomy

頸動脈內膜切除三年後以頸動脈支架治療放射引起的頸動脈狹窄

Extracranial carotid stenosis is a known complication of external irradiation to the head and neck region. We report on a patient with previous carotid endarterectomy for irradiation-associated carotid stenosis. This patient developed symptomatic carotid stenosis over the ipsilateral common carotid artery proximal to the previous endarterectomy site 3 years later, and was successfully treated with carotid angioplasty and stenting. This case illustrates the importance of Duplex scan surveillance after carotid endarterectomy for patients with irradiation-associated carotid stenosis. The complimentary role of carotid endarterectomy and carotid angioplasty for managing such a patient is highlighted.

顱外頸動脈狹窄已被確定為頭及頸部外放射的併發症。我們報告一名曾經進行頸動脈內膜切除手術的患者，他因放射治療而引致頸動脈狹窄。三年後，這名患者在靠近先前動脈內膜切除、位於身體同側的頸總動脈處，出現明顯的頸動脈狹窄。我們以血管成形術和血管內支架為患者成功進行了治療。這病例闡明了病人因放射引起頸動脈狹窄，而進行頸動脈內膜切除手術後，以多普勒掃描作監察的重要性。本文同時介紹頸動脈內膜切除手術和頸動脈血管成形術，對治療這類患者的相輔作用。

Key words:
Carotid stenosis;
Radiotherapy, adverse effects;
Stents;
Ultrasonography, Doppler, Duplex

關鍵詞：
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Introduction

Extracranial carotid stenosis is a known complication of external irradiation to the head and neck region.[1,2] An accelerated atherosclerotic plaque is often located in an atypical position and affects an extensive segment of the common carotid artery.[2,3] This poses a special challenge to a vascular surgeon because the lesion may not be easily accessible and the plaque may be closely adherent, leading to difficulty in achieving an adequate cleavage plane for endarterectomy. Bypass or interposition graft may therefore be necessary.[1] Moreover, many patients who have previously been irradiated have also undergone major oncological surgery (resections or neck dissections). These previously performed procedures raise concerns about the difficulty of the dissection and the wound closure. Endovascular therapy with carotid angioplasty and stenting may be a more suitable alternative under these circumstances.[4] On the other hand, there have also been reports advocating the safety and efficacy of traditional carotid endarterectomy, even for previously irradiated patients.[5,6]

This report is of a patient who has previously undergone radiotherapy for nasopharyngeal carcinoma and who developed carotid stenosis that was treated with standard carotid endarterectomy. Symptomatic carotid stenosis was detected 3 years later over the ipsilateral common carotid artery proximal to the previous endarterectomy site at the level of the thoracic inlet. This was successfully treated with carotid stenting.

Case report

A 60-year-old man with nasopharyngeal carcinoma and neck lymph node metastasis received therapeutic external irradiation 7 years prior to this report. A dose of 6100 cGy was given in 26 sessions during a period of 2 months to the

nasopharyngeal space and the neck. Follow-up visits found no evidence of tumour recurrence. A significant left carotid stenosis was detected on surveillance Duplex scan 3 years later. Carotid angiogram showed a 90% stenosis of his left internal carotid artery just distal to the carotid bifurcation. Carotid endarterectomy was performed using general anaesthesia with cerebral protection using an inlay Jarvid shunt. There was no particular difficulty during the endarterectomy procedure and the arteriotomy was primarily closed. The patient recovered uneventfully with no perioperative or postoperative complications and had a regular Duplex scan every 6 months at postoperative follow-up visits. There was no evidence of recurrent stenosis until 40 months later, when Duplex scan showed a new stenosis of 80% over the left common carotid artery proximal to the previous endarterectomy site at the level of the thoracic inlet. While waiting for further investigation, the patient developed symptoms of ipsilateral transient ischaemic attacks, in the form of two episodes of transient right lower limb weakness. A repeat angiogram performed 1 month later confirmed an 80% stenosis over the proximal part of the left common carotid artery (Fig 1). The lesion was not present in the previous angiogram and the internal carotid artery over the previous endarterectomy site showed no evidence of restenosis. Carotid stenting was performed using local anaesthesia via a right transfemoral approach. An 8 mm x 41 mm Wallstent (Boston Scientific Corporation, Massachusetts, US) was deployed across the stenosis, followed by balloon dilatation with a 6 mm x 20 mm angioplasty balloon (Meditech; Boston Scientific Corporation, Massachusetts, US). The intra-operative angiogram showed a satisfactory result (Fig 2). The patient recovered uneventfully and was discharged after 2 days. There were no further neurological events and he remained well 12 months after the procedure with no evidence of restenosis on Duplex scan.

Discussion

Irradiation-induced extracranial carotid stenosis has become a well-defined entity[1,2] since it was first reported by Heidenberg et al.[7] In the past, most patients with head and neck malignancies died before the development of atherosclerotic complications. With the improvement in long-term survival resulting from the use of radiotherapy as part of multimodality treatment of head and neck tumours, the long-term adverse effects of irradiation, especially accelerated carotid stenosis, have become apparent. Studies have shown that the prevalence of significant carotid stenosis was higher in an irradiated patient population than in a comparable control group with no earlier radiation exposure. Carmody et al[5] noted that 22% of the irradiated patients had significant carotid stenosis (≥70%), compared with 4% in the control group. Eighty percent of the patients with significant carotid stenosis in the irradiated group were symptomatic. It is also our experience that patients who have had radiation therapy have a high prevalence of significant extracranial carotid stenosis[8]; 11.7% of the 240 patients who had received external irradiation to the head and neck region were found to have significant carotid stenosis (≥70%).

The damage induced by radiotherapy is believed to be a combination of direct vessel wall damage leading to intimal proliferation, necrosis of the media, periadventitial fibrosis, and accelerated atherosclerosis, and indirect effects as a result of radiation-induced obliteration of the adventitial vasa vasorum. There is always a concern that the plaque may be closely adherent, making it difficult to achieve an

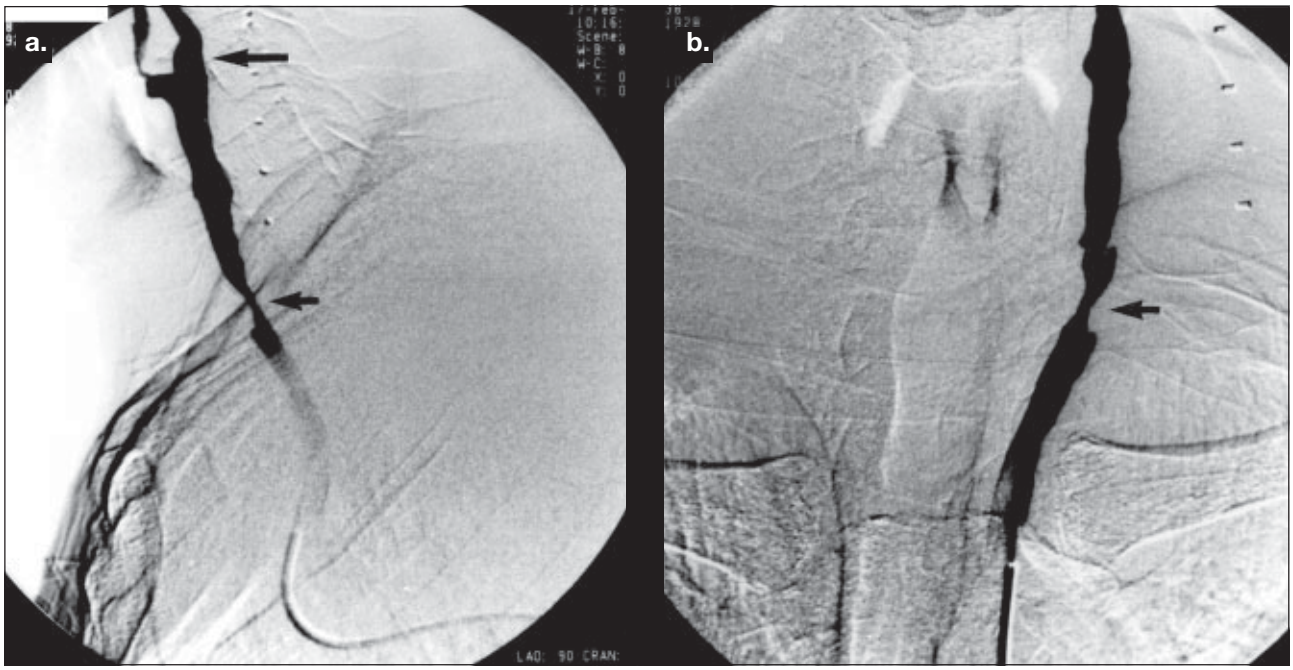

Fig 1. Carotid angiograms
(a) Lateral view and (b) anteroposterior view showing the recurrent carotid stenosis (short arrow) over the left common carotid artery at the level of the thoracic inlet. The internal carotid artery over the previous endarterectomy site (long arrow) shows no evidence of restenosis

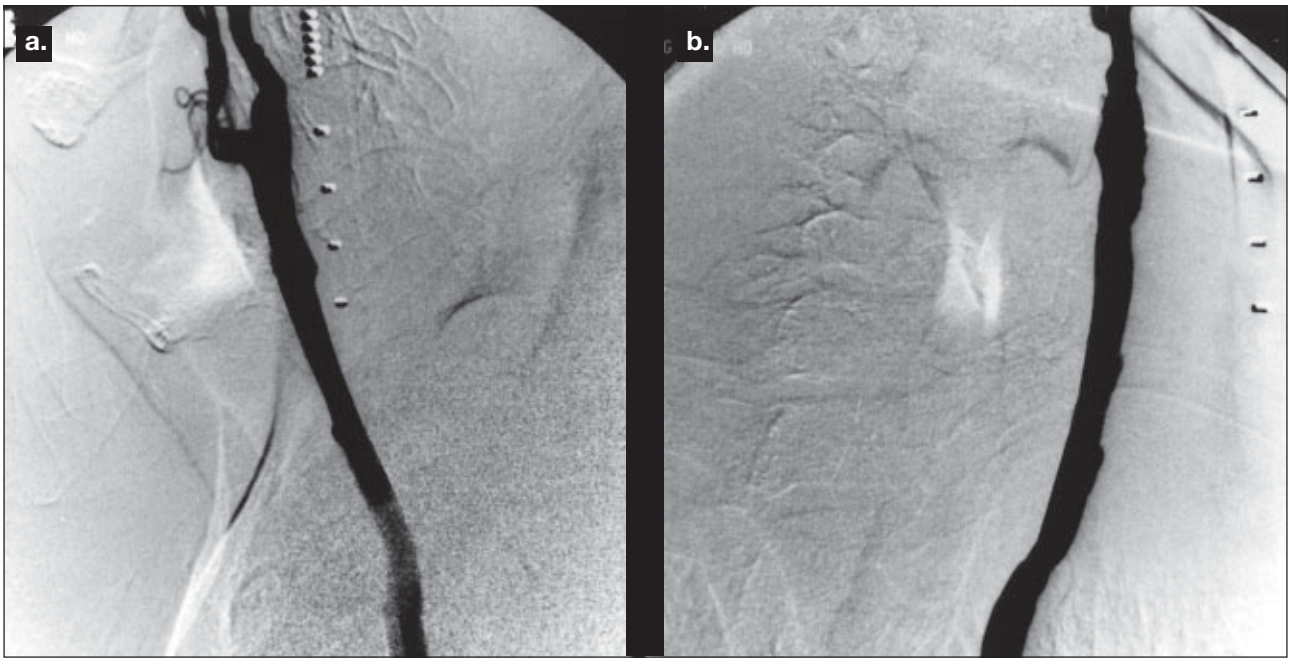

Fig 2. Carotid angiograms
(a) Lateral view and (b) anteroposterior view after carotid stenting

adequate cleavage plane for endarterectomy, thus making traditional carotid endarterectomy unsuitable for this group of patients. Despite these difficulties, the safety and efficacy of carotid endarterectomy for patients post-irradiation have also been described.[5,6] In the study by Kashyap et al,[6] 26 carotid operations were performed for 24 patients who had previously undergone radiation therapy to the head and neck region, including 20 standard carotid endarterectomy procedures. No deaths or strokes occurred within 30 days of the operations. No strokes were seen at follow-up between 1 and 156 months.

The patient in this study was also initially operated with standard carotid endarterectomy with no major difficulty. It is, however, interesting to note the new lesion of carotid stenosis at another site proximal to the previous endarterectomy after 3 years. This illustrates the unique characteristic of the accelerated atherosclerosis associated with irradiation, which can occur at atypical sites and in a short interval and highlights the importance of postoperative surveillance for post-irradiated patients who are prone to accelerated atherosclerosis. Although Duplex scan is replacing angiography as the routine preoperative investigation of choice for patients with carotid stenosis, preoperative angiogram should still be performed for post-irradiated patients in order to delineate the possible unusual anatomic location of irradiation-associated carotid stenosis and to allow the surgeon to prepare an alternative approach if required.

With the increasing experience and interest in carotid angioplasty and stenting, this treatment modality is increasingly practised, although the safety and long-term benefits remain to be proven. The procedure may be a suitable option for the treatment of patients at high risk such as those who have had previous irradiation to the head and neck. For the patient described in this report, the new stenosis was over the common carotid artery at the level of the thoracic inlet, which cannot be approached easily using traditional open surgery. Endovascular intervention may be a better option in this situation. Traditional carotid endarterectomy and percutaneous carotid angioplasty and stenting are complimentary treatments for carotid stenosis and their applicability were well illustrated in this patient. While carotid endarterectomy could be safely performed even for post-irradiated patients, carotid angioplasty and stenting have a role in the management of carotid stenosis, especially for recurrent disease and when the lesion is inaccessible.

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