Pseudoaneurysm of the External Carotid Artery Branch following Radiotherapy for Nasopharyngeal Carcinoma

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Rupture of irradiated arteries in patients with head and neck cancer is an uncommon complication. We present the first case of a pseudoaneurysm of the external carotid artery branch that developed after irradiation of nasopharyngeal carcinoma and was successfully treated by microcoil embolization therapy. Clinicians should be aware of this unusual complication to avoid a potentially erroneous management.

Key words: pseudoaneurysm – nasopharyngeal carcinoma – radiation – microcoil embolization – external carotid artery

INTRODUCTION

Radiotherapy is the major treatment for patients with nasopharyngeal carcinoma (NPC). The pseudoaneurysm has been increasingly recognized as a potentially life-threatening complication in patients following irradiation for NPC (1). A pseudoaneurysm of the external carotid artery branch following irradiation to the head and neck is rare and, to the best of our knowledge, has not been reported previously in patients with NPC. We describe a patient who after irradiation for NPC developed a pseudoaneurysm of the external carotid artery branch, which was successfully treated by embolization therapy.

CASE PRESENTATION

A 61-year-old man presented with sore throat that had lasted 2 days and visited the doctor on August 3, 2005. He denied any history of trauma or surgery in the head and neck area. He had received concomitant chemoradiotherapy for NPC with left neck lymph node involvement (T4N1M0, AJCC stage IVA, 1997) in May, 2001. Magnetic resonance imaging of head and neck before treatment revealed no lymph node involvement in right neck area. Radiotherapy had been given with a 3-dimensional external-beam radiation dose of 63 Gy to the head and neck region and reduced field boost of 70.2 Gy. Concurrent chemotherapy with cisplatin and 5-fluorouracil had been administered. The follow-up computed tomography (CT) in February 2005 before this admission had revealed no vascular anomaly or recurrent tumor. Nasopharyngoscopy showed a right hypopharyngeal bulging mass. CT of head and neck revealed an ill-defined soft tissue mass over the right hypopharynx extending into the extralaryngeal muscle and posterior pharyngeal wall extension and obliterating the sinus pyriformis (Fig. 1, arrow). A recurrent tumor was suspected. Furthermore, a well enhanced nodular lesion was noted within the hypopharyngeal tumor mass and pseudoaneurysm formation was suspected (Fig. 1, arrow head). Therefore, biopsy of the right hypopharyngeal mass was postponed. After reviewing previous radiation field and dose distribution, the radiation dose to the affected artery was 70.2 Gy with dose prescribed at 95% isodose level (Fig. 2). Conventional angiography was performed on 11 August 2005 and showed that extravasation of the right external carotid artery branch, the common trunk for the lingual and facial arteries, caused the pseudoaneurysm (Fig. 3A). Standard coaxial catheter system was applied immediately for trans-arterial embolization. A microcatheter (130 cm Progreat, Terumo) was catheterized into the
common trunk of right lingual and facial artery through a guiding catheter. A total of eight fibered platinum pushable microcoils (one 2×4 mm and seven 2×3 mm, Vortex, Target, Boston Scientific) were packed in the common trunk of right lingual and facial artery across the site of extravasation. Complete occlusion of the artery was achieved immediately after the embolization (Fig. 3B). Follow-up CT on 19 August 2005 revealed non-opacification of the pseudoaneurysm indicating successful embolization (Fig. 4), but a soft tissue mass was still present over the right hypopharynx. A recurrent tumor could not be excluded and the patient still complained of a sore throat. Biopsies of the right hypopharyngeal mass were performed twice, but pathological analysis found no malignancy. Close observation was suggested and no further treatment was done. Follow-up CT three months after embolization (Fig. 5) shows complete resolution of the right hypopharyngeal bulging mass. The sore throat subsided.

DISCUSSION

Pseudoaneurysm of the extracranial carotid arteries are rarely seen. Radiation (2), iatrogenic injury during surgery (3,4) and blunt or penetrating trauma (5) are the most important factors for the development of a pseudoaneurysm. The patient described here did not receive surgery and denied any trauma history in the head and neck area. We assume that the cause of the pseudoaneurysm formation in our patient was radiation vasculopathy. Although the mechanism of radiation-induced vascular injury is not clear, obliteration of the vasa vasorum, premature atherosclerosis, and weakening and necrosis of the arterial wall are known to be related to the radiation (6). Experimental studies suggest that damage to the endothelial cells can be observed as early as 48 h after radiation exposure in the acute stage (7). This results in increased permeability of the arterial wall and leads to accelerated atherosclerosis. In the subacute stage, morphological change in the irradiated artery is characterized by fibrosis of the media with focal necrosis and hemorrhage (7). These ischemic alterations are ascribed to injury to the vasa vasorum (7–9) and may, together with periventricular fibrosis, contribute to the rupture of irradiated large arteries and the pseudoaneurysm formation (7).

Embolization is an effective therapy in the management of hemorrhage as compared with surgery (10,11). Although the branch of the proximal external carotid artery is easily approachable by surgery, embolization was preferred in this patient due to increased operative risk in a previously irradiated field. In this case, inducing permanent thrombosis by microcoils embolization was a safe and effective treatment modality. It demonstrates the therapeutic role of embolization in the management of the external carotid artery branch pseudoaneurysm once more.

In the patients with advanced NPC, recurrence is common despite aggressive treatment and biopsies are frequently performed for histological diagnosis. In the presence of pseudoaneurysm, however, biopsies are contraindicated in order to avoid life-threatening complications, such as massive bleeding. CT is helpful to detect pseudoaneurysm and may be suggested before biopsies. In this patient, CT helped to exclude recurrent nasopharyngeal carcinoma three months after embolization. The low density material anterolateral to

Figure 1. Computed tomography reveals an ill-defined soft tissue mass at right hypopharynx (arrow). A well enhanced nodular lesion within the hypopharyngeal mass favoring pseudoaneurysm formation (arrowhead).

Figure 2. Isodose distribution in the head and neck region: the radiation dose to the affected artery was 70.2 Gy with dose prescribed at 95% isodose level.
the enhanced portion detected by CT previously (Fig. 1, arrow) may have been the organizing thrombus. Follow-up CT contributed to our differential diagnosis.

To the best of our knowledge, the formation of a pseudoaneurysm in the external carotid artery branch due to radiotherapy in NPC has not been reported previously. Clinicians should be aware of this unusual complication to avoid a potentially erroneous management.

**References**