CASE REPORT
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Stent-assisted Angioplasty for Symptomatic Radiation-induced Carotid Stenosis

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A 44-year-old woman presented with recurrent, transient episodes of left-side hemiparesis. She had received a radiation dose of 6120 cGy to her cervical region for parotid gland carcinoma 13 years previously. Cerebral angiography revealed a long, irregular tight stenosis involving the right extracranial internal carotid artery (ICA) and common carotid artery (CCA), measuring approximately 90% at the most severe narrowing according to North American Symptomatic Carotid Endarterectomy Trial criteria. Endovascular stent placement resulted in restoration of the carotid lumen to about 80% of its original diameter. She showed no further ischemic events during the follow-up period of 48 months. Our clinical and angiographic findings suggest that carotid stenting is considered a safe and effective treatment option in patients with radiation-induced carotid stenosis.

KEY WORDS : Radiation · Carotid stenosis · Stenting.

Introduction

Symptomatic radiation-induced carotid stenosis may develop in patients who have had previous therapeutic cervical irradiation, although its occurrence is relatively rare. Carotid endarterectomy may be possible, but endarterectomy for this pathology carries a significant risk of morbidity, because it is associated with fibrosis of the arterial layers and normal tissue planes as well as its tendency to involve extensive segments of the carotid artery[13]. Recently, with advances in intravascular technology and devices, carotid stenting has emerged as an effective and safe minimally invasive procedure for treatment of extracranial carotid atherosclerotic stenosis. We report a case of symptomatic radiation-induced carotid stenosis, successfully treated with carotid stenting.

Case Report

A 44-year-old woman presented with recurrent, transient episodes of left-side hemiparesis over a period of 3 months, despite treatment with warfarin. She had received a radiation dose of 6120 cGy to cervical region for parotid gland carcinoma 13 years previously. The diffusion-weighted image revealed abnormal small dotted hyperintensity lesion on right cingulate gyrus. Single-photon emission computed tomography (SPECT) and positron emission tomography (PET) were not performed. Cerebral angiography revealed a

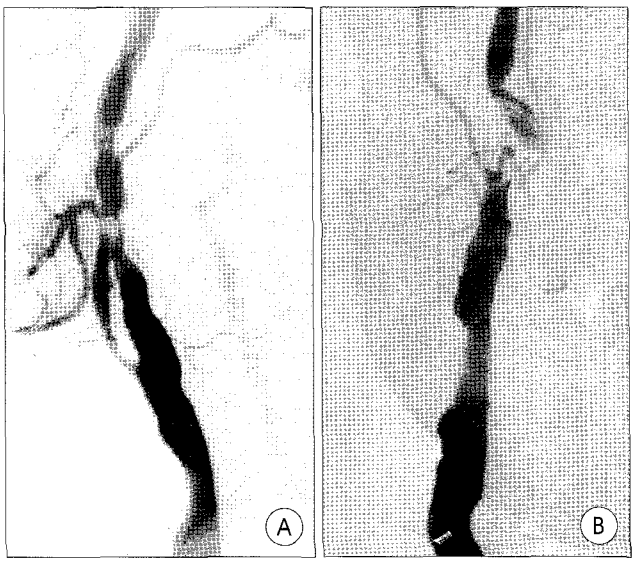

Fig. 1. Initial angiograms of the right carotid artery show a long, irregular stenosis involving cervical internal carotid artery and common carotid artery. A : Lateral view. B : Anteroposterior view.

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Fig. 2. Angiograms after stenting of the right common carotid artery show carotid lumen restored to approximately 80% of its original diameter. A : Lateral view. B : Anteroposterior view.

long, irregular tight stenosis involving the right extracranial internal carotid artery and common carotid artery, measuring approximately 90% at the most severe narrowing according to North American Symptomatic Carotid Endarterectomy Trial criteria (Fig. 1).

Aspirin (300 mg per day) and clopidogrel (75 mg per day) were given orally for one week before the procedure. The procedure was performed in the interventional radiology suite under local anesthesia, with continuous monitoring of the neurological status, electrocardiogram, heart rate, arterial pressure, and pulse oximetry. Percutaneous retrograde puncture of the common femoral artery was followed by insertion of a 0.035-inch guidewire and a No. 8 French sheath. A No. 8 French guiding catheter was then positioned at the origin of the CCA, and a preprocedural selective angiogram was performed to document and measure the lesion. Systemic heparin of 5,000 units was administered. A 7×40 mm Stent (SMART; Cordis) was employed after predilation with an angioplasty balloon of 8 atm. Stent was dilated with an angioplsty balloon of 10 atm after deployment. Completion angiography was performed to ascertain the patency of the intracranial branches. Good restoration of flow was demonstrated on angiographic follow-up studies. Stent placement restored the carotid lumen to about 80% of its original diameter (Fig. 2). The patient was monitored in the neurosurgical intensive care unit overnight as a routine practice. Aspirin (300 mg per day) and clopidogrel (75 mg per day) were given for 6 months after the stenting, and patient remained on aspirin.

Forty-eight months after carotid stenting, the follow-up CT study revealed a good flow through the stented segment

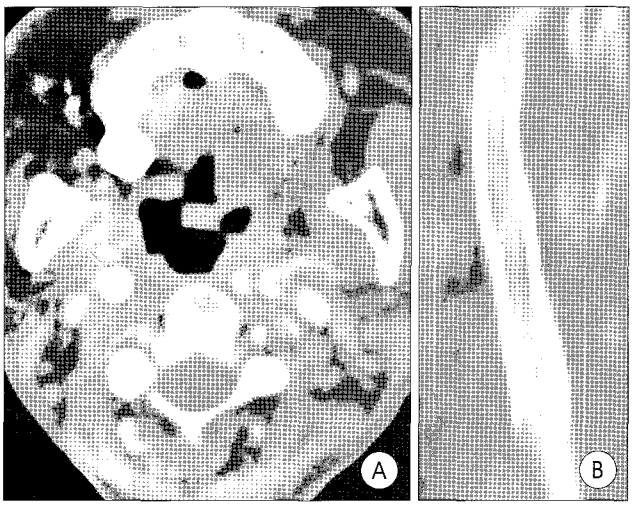

Fig. 3. 48 months after carotid stenting, the follow-up CT study reveal a good flow through the stented segments. A : Axial view. B : Lateral view.

(Fig. 3). The patient showed no further ischemic events over the follow-up period of 48 months.

Discussion

The incidence of significant carotid stenosis in patients who have received radiation therapy for head and neck cancer ranges from 30% to 50%[12].

Symptoms are subtle, thus undetected in most patients with carotid stenosis following neck irradiation. Nevertheless, patients with significant stenosis (>50%) are at increased risk for transient ischemic attacks and stroke. The onset of symptoms of this lesion has been reported to occur several months after irradiation. Asymptomatic patients with carotid stenosis may manifest carotid bruits.

Three types of radiation damage to the carotid artery after neck irradiation have been reported. Carotid rupture has been reported when radiotherapy was associated with radical neck dissection[6,10]. The second reported complication is an early arterial occlusion occurring within months after radiotherapy[4]. The third and most frequent lesion is the late development of atherosclerosis in the arteries included in the radiation fields[11,13]. This complication has been reported to occur more frequently in patients with nasopharyngeal or laryngeal carcinomas[2]. In this type of lesion, neurological symptoms occur several years after irradiation. This pathology is speculated to be accelerated atherosclerosis or panarteritis involving the irradiated regions[9]. Although histology of surgical specimens has shown atherosclerotic plaques with cholesterol crystals[1,9], angiographic findings differ from the nonirradiated cases. The stenoses are unusually long and affect arteries infrequently involved in standard atherosclerosis, such as the common carotid artery.

Although histopathological examination is lacking, we believe that our case is radiation-induced stenosis in origin, because of the history of cervical irradiation, and long, irregular stenosis involving cervical internal carotid artery and common carotid artery, which are clinical and radiological features that several authors have advocated in diagnosing radiation-induced carotid stenosis.

Because of the long segments affected by the lesion and severe fibrosis of the arterial layers, impeding adequate separation of the plaque from the media, endarterectomy is difficult in patients with radiation-induced carotid artery occlusive disease. In addition, radiation-induced cutaneous sclerosis and extensive scarring from the previous radical neck resection often make the surgical dissection for carotid artery exposure difficult. Subsequent wound healing complication and cranial nerve palsies can be problems[9].

Recently, with advances in intravascular technology and devices, carotid stenting has emerged as an effective and safe minimally invasive procedure for the treatment of extracranial carotid atherosclerotic stenosis. Several series of stent-assisted carotid angioplasty for radiation-induced stenosis have been reported. Cohen et al. reported a series of 8 patients treated with stents[3]. Procedural success was achieved in all patients. Ecker et al. reported a series of 5 patients[5]. There were no complications in any patient. In the four patients, the National Institutes of Health Stroke Scale score was 0. Ting et al. reported a series of 16 patients achieving a high technical success rate[14]. The occurrence of one post-operative stroke leading to death and one case of TIA represented a 11.6% neurological event rate.

Although stenting technique is not proven superior to the endarterectomy for the treatment of standard stenosis, we believe that stenting should be considered as a reliable treatment option for such pathology with predictable difficulties in neck dissection.

Conclusion

Carotid stenting is a safe and effective treatment option in patients with radiation-induced carotid stenosis.

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