CASE REPORT
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Procedure-Induced Acute Common Carotid Artery Perforation Presenting With Airway Obstruction and Successful Treatment by Endovascular Stent Graft

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ABSTRACT

A 63-year-old female was admitted to our hospital for catheter ablation during atrial fibrillation. After catheter ablation, the patient was transferred to the cardiac care unit and mechanically ventilated due to dyspnea and hypotension. Imaging showed active bleeding from the right common carotid artery (CCA) with extensive hematoma into the mediastinum. She was successfully treated with a stent graft at the CCA. Further bleeding or neurologic sequel did not occur after treatment. **(Korean Circ J 2011;41:405-408)**

KEY WORDS: Carotid artery common; Stents; Endovascular procedure.

Introduction

The management of carotid artery injury has traditionally required operative intervention.[1] Unfortunately, the surgical approach for carotid artery repair yields unsatisfactory results including cerebral ischemia and it is associated neurologic morbidity and mortality.[2][3] Recently, the emergence of endovascular techniques offers an alternative to traditional surgical repair of select carotid lesions such as carotid pseudoaneurysm, dissection, fistulas, laceration associated with neurosurgery and blowout syndrome caused by malignancy.[2][4][5] To our knowledge, only one case of iatrogenic perforation with unstable hemodynamics had been reported, which was managed with a covered stent.[6] We report our experience with successful stenting for an iatrogenic perforation of the common carotid artery (CCA) with active bleeding and unstable hemodynamics.

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Case

History and pre-intervention evaluation

A 63-year-old female was admitted to our hospital for radiofrequency catheter ablation (RFCA) to treat chronic atrial fibrillation. Her past medical history included hypertension and a cerebrovascular accident 1 year before for which she had been taking warfarin, amiodarone and an angiotension receptor blocker. There was no history of diabetes, cardiac valvular disease or thyroid disease. She did not smoke or consume alcohol. She was alert and oriented. Auscultation of the neck showed normal carotid upstrokes.

The next day after admission, RFCA for chronic atrial fibrillation was successfully performed without in-lab complication. Ten hours after RFCA, she started having shortness of breath as well as painful swelling on the anterior part of her right neck and the symptoms were getting worse. Her right CCA was accidentally ruptured while attempting needle and sheath insertion to the right internal jugular vein. She was hemodynamically unstable (blood pressure 83/53 mmHg) and mechanically ventilated. Hematocrit had dropped from 37% to 26.8% in 4 hours. A computed tomogram (CT) of the neck revealed extensive hemorrhage around the right CCA which expanded into the mediastinum (Fig. 1). We consulted with otolaryngologist for an emergency operation. They recom-

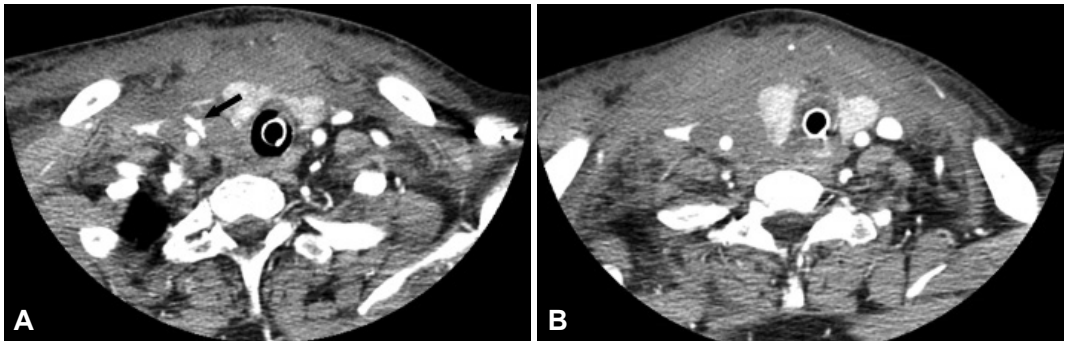

Fig. 1. CT of the neck after CCA injury. A: extravasation from CCA (arrow). B: extensive hematoma in the anterior cervical space with tracheal deviation. CCA: common carotid artery.

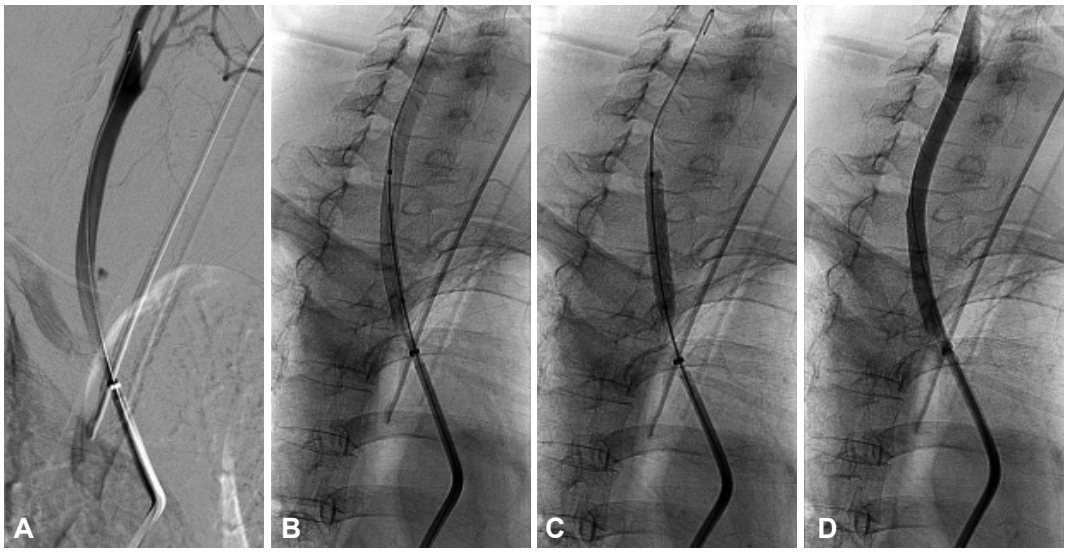

Fig. 2. Stent graft placement to treat an iatrogenic CCA injury. A: contrast material injection from the guiding catheter shows extravasation from the right CCA. B: stent graft with balloon catheter advancing to lacerated segment of the CCA. C: ballooning with stent graft and successful stent insertion. D: final angiogram shows successful sealing of perforation without blood-leakage. CCA: common carotid artery.

mended elective operation the following morning because they believed intubation to keep her airway from obstruction. However, her symptoms and vital signs deteriorated rapidly during observation. The size of subcutaneous hematoma around neck and shoulder was getting bigger and we decided emergency stenting for the perforated carotid artery was necessary.

Endovascular procedure

A 7 French (F) sheath was inserted into the right femoral artery. Heparinization was performed during the intervention with an active clotting time kept between 250 to 300 seconds. A 5F Headhunter diagnostic catheter (Cook, Bloomington, IN, USA) was placed in the right CCA. Angiography showed bleeding from the proximal right CCA (Fig. 2A). A 0.035-inch stiff Amplatz wire (Cook, Bloomington, IN, USA) was used to exchange a 7F Shuttle guide sheath (Cook, Bloomington, IN, USA) into the right CCA. The 7F Shuttle guide sheath (Cook, Bloomington, IN, USA) was positioned at the proximal right CCA. A Jostent peripheral stent graft (5×28 mm; Abbott, Abbott Park, IL, USA) was hand-mounted onto an Ultrathin diamond balloon catheter (6×40 mm; Natick, Boston Scientific, MA, USA). The stent graft mounted balloon was advanced to the injured segment of the CCA (Fig. 2B) and was positioned at the level of the injured CCA. After a control angiogram was obtained, the stent graft mounted balloon was inflated to 15 atm (Fig. 2C). The balloon was then deflated while negative pressure was applied, and the balloon was removed. A final angiogram showed total closure of the ruptured portion of the CCA (Fig. 2D) and the patient had no neurologic changes after the procedure. She was extubated in 5 days after stenting and discharged 10 days after stenting without any complications. She was followed carefully in the outpatient department and was given aspirin and clopidogrel. Follow-up CT showed a decrease in the extent of hematoma around CCA and in the mediastinum 25 days after procedure (Fig. 3).

Discussion

Carotid artery stenting has been considered as a viable alternative to carotid endarterectomy in selective patients with

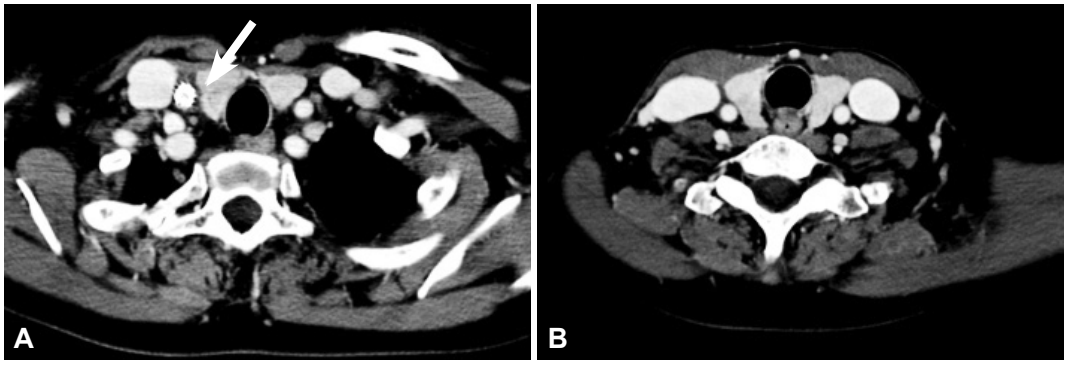

Fig. 3. Follow-up CT after treatment. A: stent graft without vascular leakage in right common carotid artery (arrow). B: markedly decreased amount of the soft tissue hematoma in the right lower neck.

carotid artery stenosis due to improvement of equipment and techniques.[7] Studies of carotid artery injury, however, have been reported sporadically and the role of endovascular therapy has not been defined. Our successful experience suggests the possibility to expand the role of endovascular therapy in compromised patients with iatrogenic carotid injury.

The carotid artery injuries can be caused by trauma (blunt, penetrating, and iatrogenic), cancer or cancer treatments and spontaneous dissection. Although the incidence of carotid artery injury is unclear, approximately 6% of all penetrating trauma to the neck and less than 1% of blunt neck injuries have carotid artery injury.[8][9] The incidence of cancer-related carotid artery rupture, which is defined as carotid blowout syndrome, has been reported to be 4% after radical neck dissection.[10] Iatrogenic carotid artery injury is not infrequent during transsphenoidal surgery. Of 958 neurosurgeons who responded, 12% reported that they had experienced carotid artery injury during transsphenoidal surgery.[11]

Although traumatic carotid artery injuries occur rarely, their mortality rates have been reported from 17% to 40% and significant neurologic complication rates range from 40% to 80%.[8][12][13] Because of high mortality and morbidity, carotid artery injury needs emergency treatment. Traditionally, the ligation of the traumatized carotid artery has been used during past 60 years. However, regardless of the underlying cause of carotid artery injury, mortality rates from open surgical repair have been reported from 20% to 50% and the rate of serious neurologic complications after surgical treatment has been unacceptable.[2][3][14]

Regardless of etiology, the clinical morphologic type of carotid artery injury could be classified followings: perforation or rupture, obstruction, pseuoaneurysm, fistula and dissection. Except for perforation or rupture with hemorrhage or expanding hematoma, others do not generally require surgery. The natural history and optimal treatment for these types remains unclear. Although anticoagulation is associated with good clinical outcomes after blunt trauma, conservative treatment are likely to fail in most types of injuries.[15][16] Some studies have reported that about 30% of dissections progress to pseudoaneurysms, which fail to resolve with conservative therapy and increases the risk of embolic stroke.[15-17] Therefore, recent advances in endovascular techniques have been alternatives to high-risk surgical therapy and conservative therapy. For perforation or rupture of carotid artery, endovascular procedures such as embolization and stents have gradually replaced the previous surgical techniques.[2][18] A recent review article suggested acceptable results after treatment with covered stents in patients with pseudoaneurysm.[19] In addition, successful treatment with endografts in carotid blowout syndrome has been reported in potentially contaminated fields.[5] The endovascular stenting for internal carotid injury was successful in 76.1% of patients and only 3.5% of patients had new neurologic dysfunction after stent placement.[2]

The endovascular therapy has been usually chosen to eliminate fistulas, aneurysms or stenosis with maintenance of normal patency of the cerebral arteries in stable patients. The endovascular stents for iatrogenic carotid artery injury have been rarely used in emergencies or for patients with unstable vital signs. Emergent carotid artery stenting has been reported in cases of acute carotid artery dissection and in perforations complicating an elective carotid artery stenting.[4][20] Similarly, our experience suggested that endovascular therapy using a covered stent might be a therapeutic choice in emergency patients with iatrogenic carotid artery injury. The advantage of minimally invasive stent placement and preserving arterial patency would make this technique alternative to existing surgical repair for emergency patients with carotid artery injury.

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