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Endovascular Management of Radiotherapy-Induced Injury to Brachiocephalic Artery Using Covered Stents

Noelia Maria Cenizo, Jose A. Gonzalez-Fajardo, Maria A. Ibanez, Victoria Gastambide, Miguel Martin-Pedrosa, Vicente Gutierrez, James Taylor, and Carlos Vaquero, Valladolid, Spain

Actinic vascular lesions tend to be stenotic-occlusive lesions. In this article, we present 2 exceptional cases of pseudoaneurysms caused by radionecrosis of the supra-aortic trunks. Both patients were treated by a retrograde carotid approach and deployment of a self-expanding covered stent. Proper exclusion of the pseudoaneurysm was attained in both cases; the first patient remained asymptomatic 12 months later; the second patient died of mediastinitis. Compared with conventional surgery, endovascular management is a viable, less invasive alternative in select patients, especially in life-threatening cases.

CASE 1

A 75-year-old woman was admitted with a bleeding lesion due to a radiotherapy-induced ulcer of the upper left hemithorax. She had a history of left breast cancer treated with mastectomy and radiotherapy 36 years before. Examination of the ulcer bed showed a hematoma that was the result of recent bleeding. Surrounding tissues presented with high-grade of fibrosis. The left clavicle was exposed and showed significant radionecrosis. She also had paresis of her left arm caused by a brachial plexus neuritis. Intraoperative angiography through a right common femoral artery puncture revealed active bleeding at the origin of the innominate artery (Fig. 1A). The distal common carotid artery (CCA) was chosen as the access route. Because of the patient's life-threatening condition, surgical control of the right CCA was made under general anesthesia; a 12F sheath was placed through retrograde puncture of the artery. A hydrophilic 180-cm (0.035 inch) guidewire (Radiofocus, Terumo, Leuven, Belgium) was passed through the lesion and into the aortic arch; it was then exchanged for a stiffer wire, an Amplatz-Super-Stiff (180 cm [0.035 in.], Boston Scientific, Miami, FL) using a diagnostic catheter (IMAGER, Boston Scientific, 5F, Natick, MA). A Wallgraft endoprosthesis (12 × 50 mm, Boston Scientific Corporation, Galway, Ireland) was then deployed from the origin of the innominate artery and distally, covering the arterial rupture completely and also from the origin of the right subclavian artery (RSA). A final arteriogram showed no active bleeding and retrograde enhancement of the RSA through collateral circulation. The patient displayed a warm right extremity but no pulses (Fig. 1B). She was given 5000 units of heparin intraoperatively and discharged 5 days later with double antiplatelet therapy for 3 months, followed by aspirin 100 mg per day indefinitely. A follow-up computed tomography (CT) 19 months later showed correct endoprosthesis position and sealing of the lesion (Fig. 1C). The right arm remained asymptomatic. A consultation with the

Hospital Clinico Universitario de Valladolid, Valladolid, Spain.

Correspondence to: Noelia Maria Cenizo, Angiología y Cirugía Vascular, Hospital Clinico Universitario de Valladolid, Avda. Ramón y Cajal 3, 47003 Valladolid, Spain; E-mail: noecen@yahoo.es

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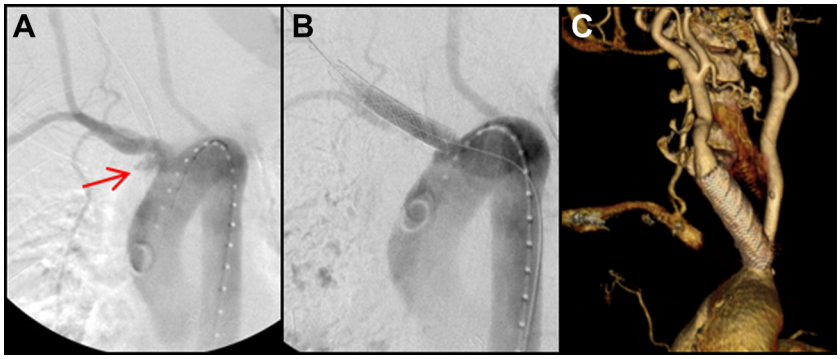

Fig. 1. (**A**) Intraoperative angiography showing active bleeding at the innominate artery origin (*arrow*). (**B**) Final arteriogram demonstrates no active bleeding and retrograde enhancement of RSA through collaterals. (**C**) Follow-up CT 19 months later showing a correct endoprosthesis position and sealing of the lesion.

plastic surgery department was made; flaps commonly used to reconstruct the anterior chest could not be used, and therefore, amputation of nonfunctional left upper limb was needed to cover the skin defect. The ulcer had essentially healed on the first follow-up visit at 3 months.[1]

CASE 2

A 71-year-old woman presented to the emergency department with a bleeding lesion at the level of the suprasternal notch due to a radiotherapy-induced ulcer. Twenty-seven years earlier, she underwent surgery for thyroid cancer and received postoperative radiotherapy. A chest CT showed a pseudoaneurysm of the innominate artery origin (3×4 cm) connected to the overlying skin through a cutaneous fistula, manubrium sterni radionecrosis, and RSA thrombosis (Fig. 2A). We deployed a Wallgraft endoprosthesis (14×70 mm) using a right CCA open access, covering the origin of the pseudoaneurysm and the ostium of RSA, which was already thrombosed because of radiation. Angiographic control showed complete exclusion of the pseudoaneurysm (Fig. 2B). The thoracic surgeon was consulted, and because of the patient's high-risk characteristics (i.e., severe chronic obstructive pulmonary disease, cor pulmonale, right phrenic paralysis), aggressive surgical treatment of the mediastinitis was not recommended. The patient received local treatment for the ulcer and antibiotic treatment empirically before the cultures were collected with piperacillin/tazobactam (4/0.5 g intravenously/every 8 hours). Cultures of the ulcer grew *Enterobacter cloacae*, which is susceptible to the antibiotic used. This bacteria was also susceptible to sulfamehtoxazole/trimethoprim, which was

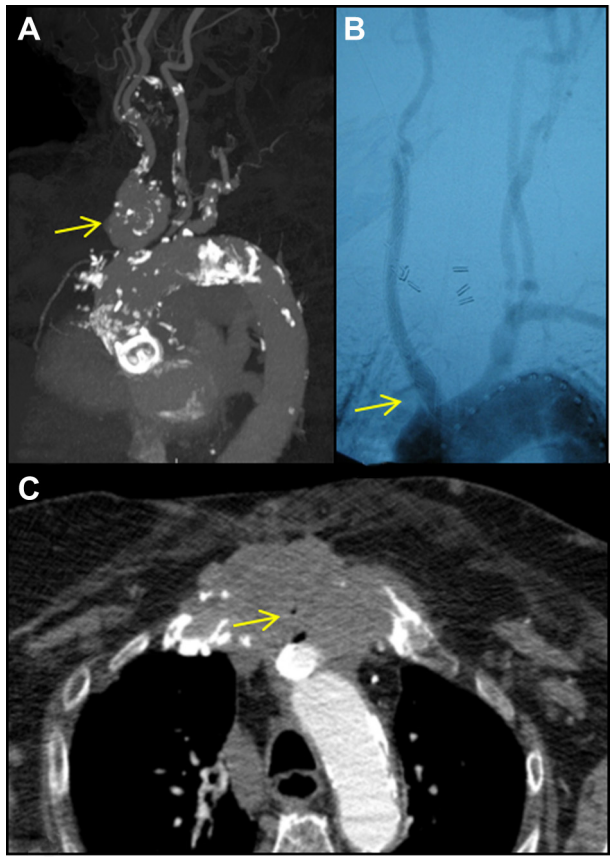

Fig. 2. (**A**) Preoperative CT showing a pseudoaneurysm of innominate artery origin. (**B**) Angiographic control showing complete exclusion of the pseudoaneurysm sac. (**C**) Control CT showing air bubbles in the mediastinum.

prescribed as oral treatment when the patient was discharged (800/160 mg/every 12 hours for at least for 3 months). Unfortunately, 2 months later, she returned to the hospital with worsening of the ulcerated area. The new CT showed no endoleak but