CASE REPORT

A Case Report of Blunt Aortic Arch Injury Treated by Immediate Stent-Grafting

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Introduction

Prosthetic vascular graft replacement using cardiopulmonary bypass has been recommended as the surgical treatment for blunt thoracic aortic injury. Recently, much interest has been shown in stent-grafting as a new management for thoracic aortic aneurysm.1 This new technique has also been used for treating ruptured aneurysms, including blunt aortic injuries. The usefulness of stent-grafting for aortic isthmus injury has been described in many reports.2,3 We herein present the first case of blunt aortic arch injury successfully treated by immediate endovascular stent-grafting.

Case Report

A 49-year-old man was injured when his car crashed into a parked truck. He was treated by volume resuscitation for hypotension at a local hospital, and his blood pressure returned to normal. Due to the presence of a wide mediastinal shadow on chest X-ray, computed tomography (CT) was performed. CT images revealed traumatic aortic arch and isthmus injuries, left hemothorax, massive pneumothorax, and subarachnoid hemorrhage (Fig. 1). He was transferred to our hospital for treatment of aortic injuries on the same day. On arrival, he was slightly drowsy (Glasgow coma scale, E3 V4 M5), and his blood pressure was maintained at around 100 mmHg by the use of nicardipine hydrochloride. X-ray examination showed fractures of the mandible and bilateral forearms. Following tracheal intubation, intra-arterial digital subtraction angiography (IADSA) was performed to evaluate aortic injuries. Aortic arch injury was located in the posterior portion at the level of the origin of the left common carotid artery, and the injury was considered to require surgical repair as soon as possible. Considering the severe brain and multiple injuries, endovascular stent-grafting was employed.

The patient was transferred to the operating room 19 h after the traffic accident. Prior to stent-grafting, ascending aorta to innominate and left common carotid artery bypass-grafting was performed to make a proximal neck of stent-grafting for the aortic arch injuries. A stent graft was constructed on the basis of findings on contrast CT images during arch-vessels bypass-grafting. A 38-mm UBE woven prosthetic vascular graft (UBE Corp., Ube, Japan), 16 cm in length was placed over 40-mm Gianturco Z-stents (Cook Inc., Bloomington, IN, U.S.A.) and held in position with 5-0 polypropylene tacking sutures. For cases of emergency surgery, the Z-stents have been modified and reconnected so as to have a rigid side and a flexible side longitudinally to enable them to fit the aortic tortuosity, and they also have a ringed wire as a stabilizer at a proximal end that prevents migration of the stent-graft during deployment. Graft construction took 20 min. The stent-graft was compressed into a proximal end of a 20-Fr. (i.e., 7 mm)-long introducer sheath (Cook Inc.). The stent-graft system was passed over the guide-wire
through an exposed right iliac artery and positioned at the desired location as determined by an intra-procedural DSA. After exact positioning, the sheath was moved downward and stent-graft was deployed so as to partially cover the orifice of the innominate artery (Fig. 2).

The patient’s postoperative course was uneventful except for the requirement of tracheostomy due to upper airway obstruction secondary to mandibular fracture. The patient was discharged one month after the operation. CT images showed that the pseudoaneurysm of the aortic arch had thrombo-occluded (Fig. 3).

Discussion

In blunt chest trauma, the most common site of aortic injury is distal to the left subclavian artery, referred to as the aortic isthmus. Therefore, aortic arch injury is rare and reportedly accounts for only 8% of blunt aortic injuries. Although exsanguinating hemorrhage
from blunt aortic trauma is the most frequent cause of clinical presentation and death, signs and symptoms of arterial occlusion are thought to be more frequent than massive hemorrhage in blunt aortic arch vessels. In the present case, no specific symptom was noted except for a wide mediastinal shadow on chest X-ray.

Standard prosthetic vascular graft replacement of the aortic arch requires cardiopulmonary bypass, which is potentially harmful for patients with severe brain injury. Timing of surgical treatment for traumatic aortic injury is still controversial. According to recent reports, aggressive anti-hypertensive management facilitates delayed repair in cases of multiple injury. Immediate surgical repair, however, is still the standard management for aortic injury. Aggressive antihypertensive management does not guarantee prevention of free rupture of an aortic pseudoaneurysm. There is no report of a large number of cases of aortic arch injury in which a common site of aortic arch tear is discussed. According to several case reports, the posterior portion at the level of the origin of the left common carotid artery seems to be a common site of arch tear, as was the case in our patient. This is an important factor to consider when performing endovascular stent-grafting for the aortic arch because a non-injured ascending aorta, preferably including the innominate artery, is necessary for bypass-grafting to arch vessels in order to obtain a proximal neck of sufficient length for endovascular stent-grafting.

To the best of our knowledge, the case described here is the first reported case of aortic arch injury in which immediate endovascular stent-grafting was performed. This combined surgical treatment is less invasive and more useful for patients with a blunt aortic arch injury complicated by severe brain injury.

References