

Emergency thoracic endovascular aortic repair for traumatic thoracic aortic rupture can be life-saving

Travmatik torasik aort rüptüründe acil torasik endovasküler aort tamiri hayat kurtarıcı olabilir

Abdullah Özer¹, Yiğit Kılıç¹, Barış Mardin¹, Koray Akkan², Mustafa Hakan Zor¹

¹Department of Cardiovascular Surgery, Gazi University Faculty of Medicine, Ankara, Turkey

²Department of Radiology, Gazi University Faculty of Medicine, Ankara, Turkey

ABSTRACT

The thoracic aortic rupture in multiple trauma patients is often associated with a sudden deceleration after blunt aortic injury. Patients with blunt aortic injuries have high risks for paraplegia, stroke, and heart, kidney and respiratory failure. Thoracic endovascular aortic repair (TEVAR) enables a rapid control of bleeding and ensures rapid blood flow to the internal organs. Herein, we report a female case of a distal rupture of left subclavian artery and totally separated intimal and medial layers of the artery which was successfully treated with TEVAR procedure.

Keywords: Aortic rupture; emergencies; endovascular procedure; thoracic aorta; trauma.

ÖZ

Çoklu travma hastalarında torasik aort yırtığı, çoğunlukla künt travma sonrası ani deselerasyon ile ilişkilidir. Künt aort travmalı hastalarda parapleji, inme, kalp, böbrek ve solunum yetmezliği riski yüksektir. Torasik endovasküler aort tamiri (TEVAR) kanamanın hızlı kontrolünü sağlar ve uç organlara süratle kan akışının sağlanmasına olanak verir. Bu yazıda, TEVAR işlemi ile başarılı bir şekilde tedavi edilen sol subklavyen arterde distal yırtığı ve arterin intimal ve media tabakası tamamen ayrılmış bir kadın olgu sunuldu.

Anabtar sözcükler: Aort yırtığı; aciller; endovasküler işlem; torasik aort; travma.

Thoracic aorta ruptures which occur in patients with multiple traumas are frequently associated with acute development of deceleration after blunt trauma. The rupture site is at the distal part of the left subclavian artery in 90% of the cases.^[1] The remaining 10% occurs at regions such as the aortic root or the ascending aorta. Early diagnosis and treatment are crucial. If left untreated, the mortality rate is 85 to 90%.^[2]

The most commonly preferred surgical procedure includes the placement of an artificial vascular graft under thoracotomy. This surgical procedure is highly invasive and, despite the improvements in anesthesia,

surgery and perioperative mortality and morbidity rates still remain high.^[3]

Herein, we report a female case of a distal rupture of left subclavian artery and totally separated intimal and medial layers of the artery which was successfully treated with thoracic endovascular aortic repair (TEVAR) procedure.

CASE REPORT

A 42-year-old female patient was consulted for urgent intervention for a thoracic aortic rupture due to a car accident. A contrast-enhanced computed

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Correspondence: Abdullah Özer, MD. Gazi Üniversitesi Tıp Fakültesi Kalp ve Damar Cerrahisi Anabilim Dalı, 06500 Beşevler, Ankara, Turkey.
e-mail: dr-abdozer@hotmail.com

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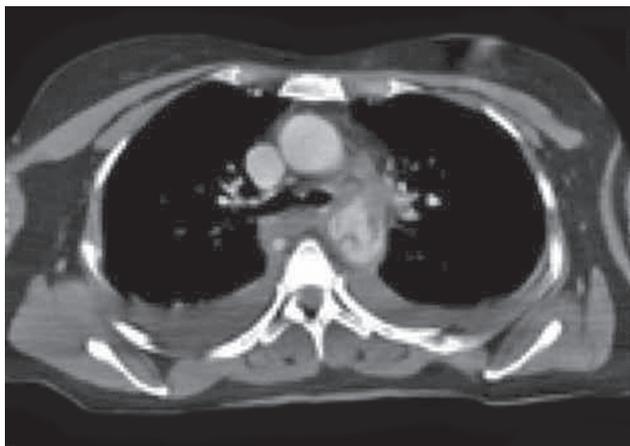


Figure 1. Preoperative computed tomography (axial plane).

tomography (CT) showed a distal rupture in the thoracic aorta, immediately after the left subclavian artery, the intima and media of the artery were entirely separated, and the integrity of the vessel was maintained by only the adventitial layer (Figure 1 and 2). The measurements were performed on coronal and sagittal reformatting, three-dimensional, and maximum intensity projection (MIP) images, and it was decided that a sufficient proximally landing zone was present for TEVAR procedure. The patient was prepared for a TEVAR procedure under



Figure 2. Preoperative computed tomography (sagittal plane).

emergency conditions. In combination with general anesthesia and endotracheal intubation, and after lining and covering of the appropriate surgical field, an incision was made in the right femoral region, and the right common femoral and deep femoral arteries were identified.

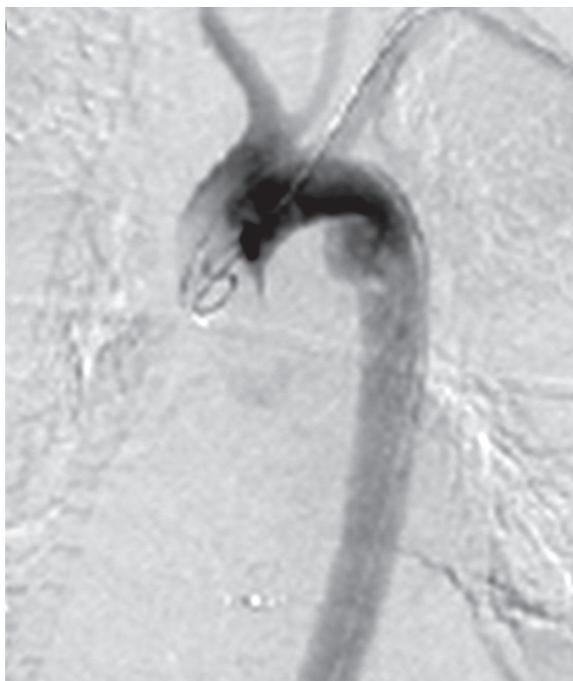


Figure 3. Preoperative digital subtraction angiography.



Figure 4. Postoperative digital subtraction angiography.



Figure 5. Postoperative computed tomography (sagittal plane).

A 5-French (F) introducer sheath (Terumo, Tokyo, Japan) was placed after an incision of the femoral artery, and a 5-F vertebral catheter (Terumo, Tokyo, Japan) was delivered to the ascending aorta with the help of a hydrophilic coated guide-wire (Terumo, Tokyo, Japan). The hydrophilic soft guidewire was, then, exchanged with a 300 cm long back-up Meier stiff guidewire (Boston Scientific, USA) through the catheter lumen, and the catheter was retrieved. A pigtail catheter (Terumo, Tokyo, Japan) was used for imaging and also for marking the place of the left subclavian artery, which was placed in the aortic arch via the left brachial artery access (Figure 3). The C-arm of the angiography system (Innova 3100 Angiography System, General Electric, USA) was turned to left-oblique projection for 40 degrees to visualize the ostia of supra-aortic vessels, as well as the proximal landing zone. After maintaining the systolic arterial blood pressure of the patient under 100 mmHg with intravenous medication, a 30×150 mm Valiant stent-graft system (Medtronic, Minneapolis, MN, USA) was placed distally to the left subclavian artery covering the ruptured part of the thoracic aorta under the guidance of angiography. The diameter of the aorta at the site of lesion was oversized 20% by the implanted graft system. The digital subtraction angiography images after the procedure showed that the left subclavian artery was open proximally. There was no sign of leakage at the site of the graft

(Figure 4). Then, the guide-wires and catheters were removed and the femoral artery incision was closed. A Hemovac drain was placed subcutaneously, hemorrhage control was performed, and the layers of incisions at the femoral region were properly closed. No complications occurred during the procedure. The patient was postoperatively taken to the intensive care unit, and she was extubated. Control CT scan showed the proper placement was made (Figure 5). The patient also had additional complications associated with multiple traumas and was discharged from the intensive care unit on postoperative Day 12.

DISCUSSION

Traumatic thoracic aortic ruptures have a high mortality rate.^[4] Therefore, it is necessary to treat this condition with conventional surgery or TEVAR. However, comparison of those two treatment options indicates that surgery has higher mortality rates compared to TEVAR. Davidović et al.^[5] reported a mortality rate of 25% in their series of open surgery. Xenos et al.^[6] performed a meta-analysis on 17 retrospective cohort studies and reported a mortality rate of 14% in the open surgery group and 2% in the TEVAR group. In another study, Canaud et al.^[7] compared the interventions for thoracic aortic rupture and documented that the mortality rates associated with surgery were 11.4% in the conventional surgery group and 0% in the TEVAR group. In addition, TEVAR appears to have more short-term benefits and a shorter hospitalization time after operation, compared to open surgery.^[8]

The first impact of aortic rupture in patients is shock due to the hemorrhage with a critically high rate of mortality.^[9] Patients who survive the shock undergo a second impact, which is a systemic inflammatory response syndrome. Over time, this can lead to multiple organ dysfunction syndrome. Moreover, coagulopathy due to hypothermia and massive transfusion may induce a systemic inflammatory response syndrome.^[9] Endovascular treatment can reduce reperfusion injury by ensuring the continuity of the distal circulation throughout the process.

In conclusion, since traumatic thoracic aortic rupture is a condition with a high mortality rate, emergency treatment is imperative. The treatment can either be performed with open surgery or TEVAR. We conclude that performing TEVAR without losing time may be life-saving. However, TEVAR procedure

may have to be terminated, and open surgery may still be necessary due to the operation or inherent factors of the patient. Therefore, the patient must have surgery in a place where both procedures can be performed conveniently. Otherwise, morbidity and mortality rates may increase.

Declaration of conflicting interests

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