

A dual life-saving approach: Thoracic endovascular aortic repair

Aynı anda iki hayat kurtaran yaklaşım: Torasik endovasküler aort tamiri

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ABSTRACT

Thoracic aortic transection is a high mortality event which usually occurs after motor vehicle accidents and is caused by separation of the aortic layers. In this article, we present a 33-year-old, 8 weeks and 5 days pregnant by *in vitro* fertilization, multi-trauma patient with thoracic aortic transection after a motor vehicle accident. The patient with a complete transection distal to the subclavian artery was successfully treated with thoracic endovascular aortic repair method under general anesthesia, taking all necessary precautions. The patient had a healthy delivery with no problems in follow-up visits. Not one, but two lives were saved with thoracic endovascular aortic repair. In conclusion, this report emphasizes that thoracic endovascular aortic repair is a fast and safe critical treatment method in the treatment of life-threatening aortic transections.

Keywords: Aorta, endovascular treatment, transection.

Traumatic thoracic aortic injuries account for one-third of motor vehicle accident deaths and are the second most common cause of trauma-related death. Between 80 and 85% of patients die before reaching the hospital and 50% of those who reach the hospital die within 24 h.^[1] Since these patients usually have multi-trauma, there are no clinical findings specific to aortic injury, mostly retrosternal and interscapular persistent pain. Survival of patients with traumatic aortic injury depends on early diagnosis and prompt and effective treatment.^[2] Stent repair of the damaged portion of the thoracic aorta, namely thoracic endovascular aortic repair (TEVAR), has recently become the current treatment of choice. The effect of radiation exposure during pregnancy depends on the gestational age of the fetus. Between two and seven weeks of gestation is

ÖZ

Torakal aort transeksiyonu genellikle motorlu taşıt kazaları sonrası gelişen ve aort katmanlarının ayrılmasıyla oluşan mortalitesi yüksek bir hadisedir. Bu yazıda 33 yaşında, tüp bebek yöntemi ile 8 hafta 5 günlük gebeliği olan, araç içi kaza sonrası torakal aort transeksiyonu tespit edilen multi travmalı bir olgu sunuldu. Subklavyen arterin distalinde tam transeksiyonu olan hasta genel anestezi altında, gerekli tüm önlemler alınarak torasik endovasküler aort tamiri yöntemi ile başarıyla tedavi edildi. Takip vizitlerinde sorun olmayan hasta sağlıklı doğumunu yaptı. Torasik endovasküler aort tamiri tedavisi ile bir değil iki hayat kurtulmuş oldu. Sonuç olarak, bu rapor, yaşamı tehdit eden aort transeksiyonlarının tedavisinde torasik endovasküler aort tamininin hızlı ve güvenli kritik bir tedavi yöntemi olduğunu vurgulamaktadır.

Anahtar sözcükler: Aort, endovasküler tedavi, transeksiyon.

the most radiation-sensitive period for the fetus. Fetal radiation exposure from angiography and fluoroscopy should only be performed in clinical emergencies.^[3]

In this article, we present a case of thoracic aortic transection after a car accident who was 8 weeks and 5 days pregnant by *in vitro* fertilization and was successfully treated with TEVAR.

CASE REPORT

A 33-year-old female patient who was two months pregnant with no previous medical problems was transferred to the Emergency Department (ED) after a severe vehicular traffic accident. On physical examination, subarachnoid hemorrhage in the left frontal region, right inferior and superior pubic ramus

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fracture, left inferior pubic ramus fracture, right 1st and 6th, left 3rd, 4th, 5th, and 6th rib fractures were detected. There was no abdominal pathology. No effusion or mediastinal enlargement was observed on chest radiography. Laboratory parameters showed no abnormal values. Treatment was started in the ED. The next day, the patient had confusion, hypotension and severe retrosternal pain. Thoracic computed tomography (CT) revealed a near complete transection of the distal left subclavian artery and the patient was rapidly transferred to our clinic (Figure 1a, b). On admission, the patient had confusion, right-left arm blood pressure difference, hypotension, and severe back pain. The patient was consulted with the Obstetrics and Gynecology Department for the condition of the baby. The patient's beta-human chorionic gonadotropin (b-hCG) value was determined as 26,400 mIU/mL. Approximately 14 h after the accident, examination and obstetric ultrasound performed by the gynecologist revealed that the baby was 8 weeks and 7 days, the fetal heart rate was 156/min and the amniotic fluid was normal. Since the patient required emergency intervention, abdominal protection with a lead vest and minimal doses of radiation and contrast media were recommended during fluoroscopy.

Since systemic heparin was to be administered to the patient during the procedure, the opinion of the Neurosurgery Department was requested for the presence of subarachnoid hemorrhage. The subarachnoid hemorrhage was minimal and limited

and there would be no harm in administering heparin 5,000 U. The risks of the procedure, particularly for the infant, were explained to the patient and her relatives. Written informed consent was obtained from the patient.

After the necessary measurements were made on CT, the patient was quickly taken to the angiography unit for the TEVAR procedure. Abdominal protection was performed with a lead vest and barrier to protect the baby from radiation effects. Under general anesthesia, the right femoral artery was prepared as the access route and a pigtail catheter was inserted percutaneously from the left femoral artery for imaging. Hypotension was avoided as much as possible with volume replacement considering the condition of the baby and systolic blood pressure was maintained at 110 to 120 mmHg.

A 30×100 mm Valiant™ thoracic stent graft (Medtronic Inc., MN, USA) was successfully placed to close the transection. To determine the location of the graft and to check after the graft was opened, a total of two shots were taken without using magnification and keeping the tube as far away as possible. A total of 55 mL of iodinated contrast material was used during the procedure and the procedure was completed with a total radiation rate of 113.42 mGy. Since the transection started approximately 5 cm distal to the left subclavian artery, the left subclavian artery was not closed. The patient was extubated and taken to intensive care unit. Postoperative obstetric controls performed by the

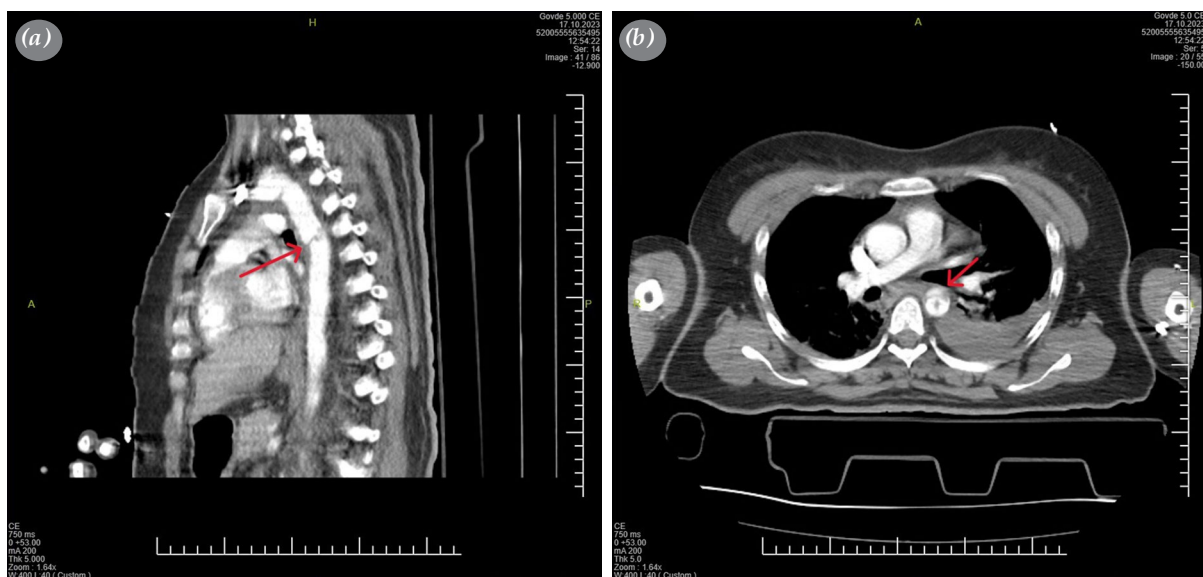


Figure 1. (a) Sagittal CT image of near complete transection. **(b)** Axial CT image of transection.

CT: Computed tomography.



Figure 2. First month after TEVAR control CT image.

TEVAR: Thoracic endovascular aortic repair; CT: Computed tomography.

Obstetrics and Gynecology Department showed that the baby was healthy. The patient was discharged after the recovery period and CT scan performed at one month showed that the aorta was completely healthy (Figure 2). The patient delivered her baby with a normal healthy delivery approximately seven months after the procedure.

DISCUSSION

Blunt trauma is the primary etiology of traumatic thoracic aortic injuries. The diagnosis of traumatic aortic injury is usually made within 4 to 18 h after injury.^[1] In this case, the diagnosis of transection was made approximately 12 h later. Aortic transection is a life-threatening emergency characterized by tear formation in the inner layer of the aorta and the most common symptoms are hypotension, back pain, and altered consciousness.^[4] Prompt and effective treatment is critical for the life of the patient. In particular, in multi-trauma patients with rib, pelvic and acetabular fractures like our patient, the diagnosis may be difficult. The aorta is usually injured at the isthmus, the weakest point of the aortic arch.^[5] It is recommended to consider and exclude the possibility of thoracic aortic injury in patients with motor vehicle accidents.^[2]

It has been reported that chest X-rays are not sensitive enough and laboratory tests are not useful in the diagnosis of aortic injury. Thoracic CT angiography is recommended as the gold standard

for diagnosis.^[3] Therefore, thoracic CT should be performed, particularly in severe vehicle accidents. Although emergency surgical treatment used to be the only treatment option, this method has a mortality rate of up to 42% in patients with multiple traumas, leading to complications such as severe paraplegia, respiratory distress, and infection.^[6]

The major advance in the treatment of traumatic aortic injuries is the widespread use of TEVAR. While the mortality rate in open surgery is 23.5%, the mortality rate of TEVAR is reported to be 7.2%. The rate of reintervention after TEVAR in traumatic cases was reported to be 1.8%.^[1] Since the use of TEVAR, there has been a 50% decrease in mortality from blunt traumatic aortic injuries.^[7] While selecting the graft, 10 to 20% over sizing according to the aortic diameter at the landing site and stents shorter than 150 mm are recommended. In our case, we closed the transection with a 100-mm graft without complications. Some studies have shown the efficacy and safety of TEVAR in blunt thoracic aortic trauma.^[4,8] However, we could not find a case in the literature similar to our patient who had a first trimester pregnancy and underwent TEVAR. Most of the cases in the literature consist of patients with type B dissection in the advanced gestational week and underwent TEVAR after emergency cesarean section.

Potential effects of radiation on the unborn fetus include intellectual disability, intrauterine growth restriction, organ malformations and childhood cancers. The risk depends on several factors, including the week of gestation at which radiation exposure occurs, the dose of radiation absorbed, and the cellular repair mechanisms of the fetus.^[9] The first trimester (particularly two to seven weeks) is the period, when the fetus is most sensitive to radiation. According to the United States (US) National Council on Radiation Protection and Measurements, fetal radiation exposure of less than 50 mGy is considered negligible, while levels exceeding 150 mGy significantly increase the risk of abnormalities.^[9] Fluoroscopic procedures have been reported to exceed the threshold for induced malformations and require increased vigilance.^[10] The use of lead and shielding has been reported to significantly reduce fetal exposure to radiation and can be used as reassurance.^[11] In our case, we completed the procedure with a threshold value of 113.42 mGy by using lead shielding and minimal exposure.

There is no evidence that the iodinated contrast agents we used in the procedure are teratogenic. The

development of hypothyroidism has been reported as the most likely risk.^[9] The US Food and Drug Administration (FDA) classifies iodinated contrast media as pregnancy Category B drugs, as they are considered safe for pregnant women and nursing mothers.^[12] The American College of Obstetricians and Gynecologists (ACOG) recommends the use of iodinated contrast media in situations that affect the life of the mother and fetus.^[13] Iodinated contrast media can be used in pregnancy, particularly in vital diagnostic situations, since they are tolerated and the frequency of side effects is low. One of the main reasons for proceeding with the procedure despite the risks in this case was that the patient was 33 years old and pregnant for the first time after *in vitro* fertilization.

Vascular surgery guidelines have also reported that treatment of aortic transections with TEVAR prolongs survival and reduces the risk of renal failure, spinal cord ischemia, graft and systemic infection compared to open surgery or no treatment.^[14]

In conclusion, thoracic endovascular aortic repair in the treatment of aortic transection stands out as a rapid, safe and minimally complicated treatment method, particularly in experienced centers. It is a treatment modality which can be used safely and provides long-term survival, particularly in young and pregnant patients as in our case. A more multidisciplinary approach is required in pregnant patients and guideline recommendations should be taken into consideration. As in this case, we recommend thoracic endovascular aortic repair as a treatment method which can save not one, but two lives at the same time and can be used safely in pregnant women in life-threatening situations.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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