Case report - Vascular thoracic

Endovascular treatment of pseudoaneurysm of the thoracic aorta from a firearm injury

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Abstract

A 24-year-old male patient was the victim of a firearm wound that penetrated the thorax. He arrived at another hospital hemodynamically unstable and was submitted to exploratory surgery by means of bithoracotomy. A lesion of the left branch of the pulmonary artery was detected, which formed a saccular image. Considering that the patient had already been submitted to a bithoracotomy and that a direct approach to repair would involve another thoracotomy within a short period of time, endovascular treatment was chosen in our hospital. The procedure was performed under fluoroscopy. A second computer-aided tomography indicated adequate treatment of the lesion, with no indication of an endoleak. He has undergone ambulatory follow-up for 36 months without any problem related to the procedure. While endovascular treatment of the aorta has developed enormously, multicenter studies are needed to better define the long-term results of this approach.

Keywords: Aorta; Pseudoaneurysm; Gunshot wounds; Penetrating wounds

1. Introduction

Lesions caused by firearm injury to the mediastinum are normally fatal; most patients die at the scene or upon admittance to an emergency unit [1]. Formation of an arteriovenous fistula or pseudoaneurysm of the aorta is not uncommon, and the currently accepted treatment is open surgery with exchange of the affected segment in the acute forms [2]. A more recent approach for such lesions is endovascular treatment, but the literature regarding this approach is limited [3]. Here we present a case study of a firearm injury in which the patient was successfully submitted to endovascular treatment for traumatic pseudoaneurysm of the thoracic aorta.

2. Case study

A 24-year-old male patient was the victim of a firearm wound that penetrated the thorax from right to left, crossing the medium mediastinum, and lodging in the left hemithorax. The patient arrived at another hospital hemodynamically unstable and was submitted to exploratory surgery by means of bithoracotomy. A lesion of the left branch of the pulmonary artery was detected and successfully repaired. No other lesion was observed during the intraoperative period. He was submitted for computer-aided tomography on the fifth postoperative day, and a lesion of the mid-thoracic aorta was detected, which formed a saccular image (Fig. 1). The patient was then brought to our tertiary hospital. Considering that the patient had already been submitted to a bithoracotomy and that a direct approach to repair would involve another thoracotomy within a short period of time (one week), endovascular treatment was chosen.

The procedure was performed under fluoroscopy by the right femoral artery and a 26 x 90-mm self-expanding stent (Braile Biomédica®) was deployed with full coverage of the pseudoaneurysm. The procedure was considered a success. A second computer-aided tomography indicated adequate treatment of the lesion, with no indication of an endoleak (Fig. 2). The patient was discharged from the hospital two days after the procedure. He has undergone ambulatory follow-up for 36 months without any problem related to the procedure.

3. Comment

Penetrating lesions to the aorta are rare, representing <1% of all lesions to the aorta [4, 5]. Several authors have compared endovascular treatment and open surgery of the aorta. In a comparative study, Brandt et al. demonstrated that endovascular surgery is
vascular treatment very attractive. In contrast, penetrating
ma, other lesions are generally treated first, making endo-
ity rates than does open surgery.
endovascular surgery presents lower mortality and morbid-
In brief, these authors showed that in the short-term,
lesions of the aorta. Open surgery in patients with blunt
1734.
stents in this population with extended life expectancy.
Another important consideration when treating penetrating
lesions of the aorta is that most medical centers have large
sheaths since they treat aneurysmatic lesions to the aorta,
which involve normal caliber aortas.
The follow-up of patients with stents in the thoracic aorta
due to blunt trauma is relatively short. Dake et al. reported
results of endovascular treatment for patients with thoracic
aortic aneurysms with an average follow-up time of
55 months. The actuarial curve with six years of follow-up
free of reoperation was 70 ± 15% [9]. These findings suggest
that the treatment is effective in the short-term, but does
not provide optimum long-term results.
In the case described herein, there were no further
complications within the 36-month follow-up.
The option for endovascular treatment was decided based
on the recent performance of a large bithoracotomy (one
week). Penetrating gunshot aortic lesions are rare, espe-
cially in the thoracic aorta. Yeh and colleagues reported a
successful endovascular repair of an actively hemorrhaging
gunshot injury to the abdominal aorta [10].
In summary, while endovascular treatment of the aorta
has developed enormously, multicenter studies are needed
to better define the long-term results of this approach.
This rare case was treated by endovascular approach
considering recent bithoracotomy and its implications.

References

[1] Parmley LF, Mattingly TW, Manion WC. Penetrating wounds of the heart
rupture: twenty-year meta analysis of mortality and risk of paraplegia.
MD. Chronic traumatic aneurysms of the descending thoracic aorta: mid-term
results of endovascular repair using first and second-genera-
Gunshot wounds to the thoracic aorta in the 90s: only prevention will
Endovascular management of a gunshot wound to the thoracic aorta. J
Trauma 2006;60:204–208.
surgery for the descending aorta: a case-control study. J Endovasc Ther
versus endovascular treatment of traumatic thoracic aortic rupture. J
aorta endoprosthesis: the final countdown for open surgery after
Transluminal placement of endovascular stent-grafts for the treatment
1734.
[10] Yeh MW, Horn JK, Schecter WP, Chuter TAM, Lane JS. Endovascular
repair of an actively hemorrhaging gunshot injury to the abdominal
eComment: Endovascular treatment of post-traumatic thoracic aorta lesions

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We read with interest the article of Petrucci and colleagues, and we congratulate the authors for precise diagnostics and successful correction of this type of pathology [1].

Trauma of the thoracic aorta, both for blunt trauma, or as in the reported case for penetrating wound, show a very high incidence of mortality. Hospital mortality rate after aortic open surgery is between 15 and 30% [2–3]. Endovascular management can be an alternative [4]. The authors successfully treated this thoracic aorta pseudo-aneurysm by the insertion of an endovascular prosthesis.

Between May 2005 and February 2007, we treated three patients with injury of the thoracic descending aorta, and concomitant haemothorax. All three patients had endovascular treatment. Size of the stent-graft was determined by contrast-enhanced CT and by angiographic images. At the end of the procedure, Digital Subtraction Angiography was performed in all patients to check stent-graft position, confirming complete pseudo-aneurysm exclusion and absence of endoleak. We used COOK® thoracic endoprosthesis in two patients, and in the third one, we used two ‘iliac’ stent grafts (COOK iliac extension endograft) due to the small diameter (18–16 mm) of the descending aorta. Technical success rate of stent graft placement was 100%. There was no operative or postoperative mortality nor postoperative paraplegia. All are regularly seen in the out-patient clinic. The follow-up ranges from 10 to 19 months.

The inclusion criteria to treat aortic injury with endovascular repair is dependent upon morphology of lesion, presence of concomitant injuries complicating open repair and availability of stent-grafts. The authors focused on the choice of an endovascular procedure, because the patient had already had a recent previous bilateral thoracotomy. We agree with this decision, and even more we think that in any case, even without previous thoracotomy, we would have treated the patient with an endovascular approach. In the patients we treated, in all of the three, there was associated haemothorax. We treated the patients anyway with endovascular approach, and we associated a video-assisted thoracoscopy to remove clotted residual blood from inside the chest. We think that treatment can be the same, both for blunt trauma and for penetrating thoracic aortic lesion, decreasing mortality and morbidity in comparison to open surgery.

The second point, as reported by Petrucci, is the difficulty in some cases to find a stent graft of small dimension, because most medical centers have large sheaths since they treat aneurysmatic aortic lesions. In the case of a small size aorta, it is possible, as we did in one case, to adapt other smaller size grafts like the ones for the iliac artery. In conclusion, we agree, endovascular treatment of thoracic aortic lesions shows a very interesting alternative to open surgery both in blunt traumatic and penetrating lesions. Further studies with larger number of patients and longer follow-up are required to better evaluate the efficacy and the reproducibility of this approach in the treatment of this pathology.

References