Endovascular treatment of an abdominal aortic pseudoaneurysm: a case report

Tratamento endovascular de pseudoaneurisma da aorta abdominal: relato de caso

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Abstract

A 17-years-old male student has received several gunshots and was submitted to exploratory laparotomy. After surgery, he complained of pain in the lower limbs and a pulsatile abdominal mass. An abdominal computerized tomography (CT) scan was carried out and revealed an abdominal aorta pseudoaneurysm of about 8 cm in the larger diameter between the celiac trunk and the superior mesenteric artery. An arteriography confirmed the diagnosis and he was submitted to the lesion embolization with cotton suture wires attached to metallic guide wire fragments. After six months, an abdominal aorta Doppler ultrasonography and a new abdominal CT scan were ordered and depicted flow inside the pseudoaneurysm. The patient was then submitted to a new endovascular embolization, and an 18 x 58 mm uncovered stent was placed. After six months from the last procedure, a new abdominal CT scan showed exclusion of the lesion.

Keywords: Aneurysm, false; embolization, therapeutic; aorta, abdominal.

Resumo

Um estudante de 17 anos, masculino, sofreu ferimentos por arma de fogo e foi submetido a uma laparotomia exploradora. No pós-operatório, queixava-se de dores em membros inferiores e de massa abdominal pulsátil. Realizou tomografia computadorizada (TC) de abdome, que evidenciou pseudoaneurisma de aorta abdominal de cerca de 8 cm no maior diâmetro, localizado entre o tronco celíaco e a artéria mesentérica superior. Uma arteriografia confirmou o diagnóstico e procedeu-se, então, a embolização da lesão com fragmentos de fio-guia montados com fios de algodão. Após seis meses, realizou ecoDoppler de aorta abdominal e nova TC de abdome, que evidenciaram fluxo no interior do saco do pseudoaneurisma. Foi, então, submetido a nova embolização endovascular e implante de stent não–revestido de 18 x 58 mm. Após seis meses do último procedimento, realizou-se nova TC de abdome que demonstrou exclusão da lesão.

Palavras-chave: Falso aneurisma; embolização terapêutica; aorta abdominal.

Introduction

Traumatic abdominal aortic injury is considered to be one of the most fatal among all vascular injuries, accounting for 50 to 78% of the mortality rate. About 30% of the victims are already dead on arrival at the hospital[1]. The technical advances, the development of new devices and the training of professionals turned the endovascular method into an excellent option for treating vascular injuries when the conventional surgical access is complex or too morbid for a polytraumatic patient[2]. In this paper, we report a rare case of traumatic abdominal aortic pseudoaneurysm treated by endovascular approach.

Study carried out at the Service of Vascular Surgery of Hospital Universitário Walter Cantídeo, Universidade Federal do Ceará (UFC), Fortaleza, CE, Brazil.

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No conflict of interest was declared concerning the publication of this article.

Received on Feb 6, 2010. Accepted on Apr 12, 2010.

J Vasc Bras. 2010;9(3):177-181.

Case description

On April 23, 2008, a 17-year-old male student was admitted at a local Hospital with five gunshot wounds (one on the right hand, one on the right arm, two on the occipital region and one on the back). He underwent immediate exploratory laparotomy. At operation, a bilateral retroperitoneal hematoma on zone II was found. Because there was no expansion of the hematoma and also because the patient was hemodynamically stable, the surgeon chose expectant management. In the postoperative period, the patient developed temporary paraplegia, recovering the movements of the lower limbs in a few days. However, he continued to have intense burning pain and sensation of weight on both legs. He was discharged from the hospital and referred to a specialized service for motor rehabilitation, where a Doppler ultrasonography of the aorta and contrast-enhanced computed tomography scan of the abdomen showed an abdominal aortic pseudoaneurysm between the celiac trunk and the superior mesenteric artery, measuring about 8 cm in diameter (Figure 1). He was then referred to our Service on June 5, 2008.

Physical examination at admission revealed a pale young man in good general condition, oriented and cooperative. Cardiac and pulmonary auscultations were normal. The abdomen was flat and symmetric, and had a previous xipho-pubic laparatomy scar, normal bowel sounds and the presence of a pulsatile mass and of epigastric 2+ in 6+ bruit without thrill at palpation. The upper and lower extremities presented normal pulses, without edema. Sensitivity, tonus and muscle strength were slightly reduced in the lower limbs.

On June 6, 2008, the patient was submitted to aortography, which showed an abdominal aortic pseudoaneurysm with its ostium between the origins of the celiac trunk and the superior mesenteric artery, as well as a metallic artifact on the L1-L2 projection (Figures 2A and 2B). On June 9, Seldinger retrograde puncture of the right femoral artery with placement of a 40-cm 6Fr sheath in the aorta was performed, besides selective catheterization of the pseudoaneurysm ostium and embolization with fragments of 0.035 guide wire, tied together with 3.0 cotton thread segments (Figure 3). Control aortography revealed significant reduction of the contrasted area and a

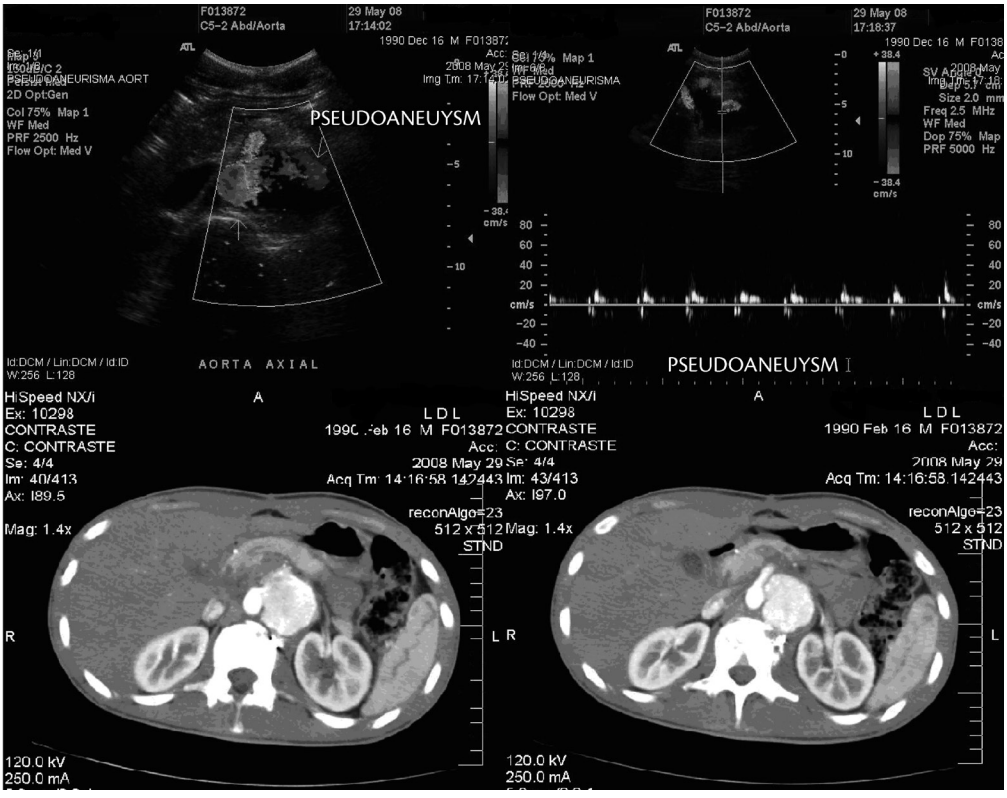

Figure 1 – Doppler ultrasound of the abdominal aorta showing interior flow of the hematoma (above); abdominal CT scan showing the pseudoaneurysm neck and its position (below)

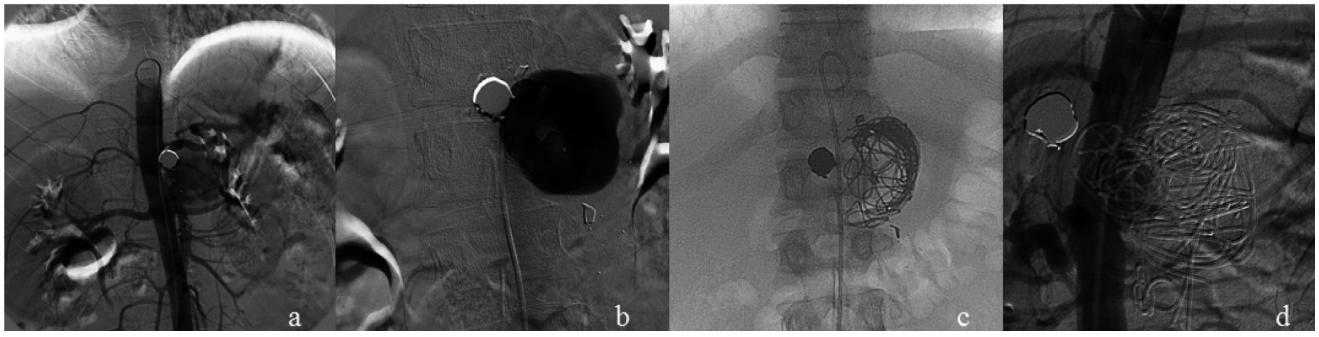

Figure 2 – Aortography showing the contrast flow to the interior of the pseudoaneurysm (A); selective catheterization of the pseudoaneurysm (B); embolization result (C); embolization result (oblique) (D).

small region next to the ostium which maintained discrete contrast flow (Figures 2C and 2D).

On the first post-embolization day, he developed a temperature of 38.4°C. On the second day, laboratorial exams showed anemia (hemoglobin = 9.56 mg). As the patient was hemodynamically stable and without abdominal pain, the expectant management was the treatment of choice. On the fourth day after embolization, he went through an evaluation by the Neurology Service, which disclosed pain and signs of neurological deficit, probably as a result of the gunshot injury on the cauda equina. The patient was discharged from the hospital and referred to physical therapy and ambulatory follow-up.

On June 30, 2008, he was submitted to a new CT scan; on October 23, to Doppler ultrasound of the abdominal aorta; on October 31, he underwent catheter aortography. All three examinations showed persistent flow into the aneurysmal sac. On October 29, he was submitted to a new embolization by means of puncture of the right and left femoral arteries and introduction of 10Fr and 6Fr sheaths, respectively. Embolization was performed with 10 fibrous coils, and guide wire segments were tied together with 3.0 cotton thread after the insertion of an uncovered self-expansible nitinol stent (18 x 58 mm) on the aorta, aiming at remodeling the ostium of the pseudoaneurysm and retaining the embolization material within the sac. The post-procedure arteriography did not show contrast in the aneurysm sac (Figures 4A and 4B). On the second postoperative day, he was discharged without complaints, without pulsatile abdominal mass and murmur. The patient is currently on follow-up with abdominal CT scans every six months, which have shown absence of flow in the pseudoaneurysm.

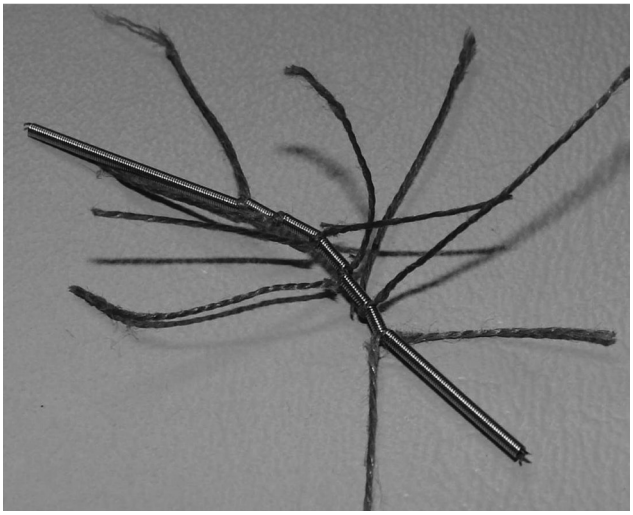

Figure 3 – Aspect of the embolization material

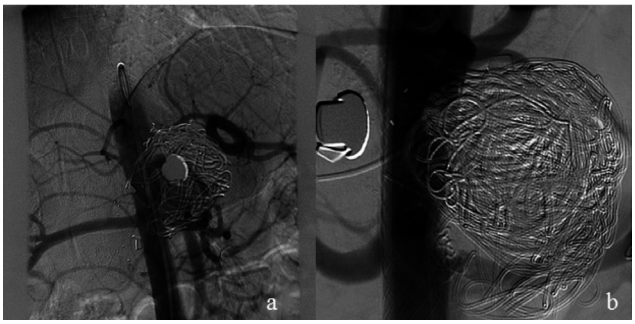

Figure 4 – Second procedure. Arteriography pre-embolization (A); control arteriography after embolization and stent position (B)

Discussion

Penetrating trauma is the most common cause of abdominal aortic injury. Thoracoabdominal vessel injuries are associated with high pre-hospital and hospital mortality rates[3]. In about 18% of the cases, bleeding is contained on the retroperitoneum and the patients are normotensive at admission[4]. Abdominal trauma may manifest as free intraperitoneal hemorrhage or as a contained retroperitoneal hematoma (pseudoaneurysm)[5].

By definition, a pseudoaneurysm is a tense, pulsatile and expansive hematoma. Also called "traumatic

aneurysm", it arises when three layers of the artery are lacerated or ruptured, determining blood leakage through the laceration, without flow interruption inside the blood vessel. The surrounding tissues restrain the hematoma and a pseudocapsule is formed around the arterial wall. Its continuous expansion may cause complications due to the compression and inflammatory process on neighboring structures (veins, hollow organs and nerves) and, finally, rupture of the pseudoaneurysm, with severe hemorrhage, hypovolemic shock and death[6].

Our patient, who suffered gunshot wounds, presented a pseudoaneurysm in the region described as zone II (retroperitoneal region, involving kidneys and renal vessels)[4]. Hematomas in this region increase the suspicion of renal vessel lesion, which was not confirmed in this case. As a general rule, retroperitoneal hematomas resulting from penetrating traumas require exploration of the adjacent kidney (Huey Long rule)[7], except when it is a stable perirenal hematoma in a patient whose preoperative CT scan does not show urine extravasation or in case of stable retrohepatic hematoma[5]. The prognosis of penetrating abdominal aortic injuries is significantly better than that of thoracic aortic injuries, probably because the retroperitoneal tissues contain the hemorrhage[4].

The intervention technique may be electively selected for patients who are hemodynamically stable and present with traumatic pseudoaneurysm[8]. In the last decades, endovascular techniques have been more often used for the management of traumatic lesions[9]. Since 1972, when Margolies et al. performed the embolization of a traumatic hemorrhage[10], the techniques and materials used in endovascular embolization have shown excellent results with minimal invasion.

Catheter embolization is indicated for injuries of inaccessible arteries[11]. In this case, the pseudoaneurysm was located between the celiac trunk and the superior mesenteric artery, an area of difficult access by conventional surgical techniques, especially concerning proximal and distal vessel control.

The factors that influenced the choice of endovascular technique in the reported case were:

1. young patient (18 years old);
2. hemodynamic stability;
3. topography of the injury (difficult surgical access);
4. peritoneal cavity with previous approach (with possible adhesions between organs);
5. forty-five days with hematoma on the retroperitoneum (likely necessity of fibrous areas' dissection[12]).

The embolization materials may be fluid or solid. As examples, one may mention: clots with or without additives, absorbable gelatin sponge, liofilized dura mater, particles of polyvinyl alcohol (PVA), microspheres (acrylic copolymer with porcine gelatin), polymerized glue, ejectable or detachable coils covered or not with thrombogenic synthetic fibers, detachable or non-detachable balloons and tampon-like occlusion devices[8]. In this patient, we used embolization devices (fragments of 0.035 guide wire + segment of 3.0 cotton wire) in order to occlude the pseudoaneurysm, which was partially achieved on the first embolization and completed through embolization with fibrous coils and apposition of uncovered stent.

Uflacker reports that the first model of coils for embolization was made of guide wire segments without the inner wire, mechanically twisted, with a wadding of wool on its extremity. After the development of the Gianturco coils, the necessity for materials for occlusion of large-caliber vascular systems, arteriovenous fistulas and aneurysm has raised. The same author described 100% of success in the occlusion of large-caliber vessels using artisanal large springs for embolization that were 20 cm long, and Dacron® thread wadding attached to it, on 3-cm intervals. These modified guide wire segments were used to treat high-debt and large-caliber arteriovenous fistulae. This material was described as 10 to 15-cm guide wire with the flexible inner wire removed, but with its shape irregularly modified, angled or twisted to wad in the interior of the vessel[13].

The stent was used to obtain a better remodeling of the pseudoaneurysm neck, which became larger due to the amount of embolization material injected in its interior. Besides that, it also had the function of avoiding the migration of this material to the aortic lumen. In this patient, a stent a little larger than necessary was used (18 x 58 mm), once it was the only stent available in our hospital that was compatible with the procedure.

Hospital discharge two days after the procedure and without complaints demonstrates the efficacy of the method in managing the injury and reducing the postoperative morbidity.

We conclude that the endovascular method for embolization of traumatic injuries (pseudoaneurysm) was successful in the reported case and that, in selected patients, this technique may be the first therapeutic option, thus increasing the range of vascular trauma treatments.

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Statistical analysis: N/I
Overall responsibility: EHN and AAC
Financing information: N/I
*All authors have read and approved the final version of the paper submitted to the J Vasc Bras.