

Could hybrid treatments be an option for abdominal aortic pseudoaneurysms?

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Received: September 09, 2024 Accepted: September 19, 2024 Published online: October 17, 2024

ABSTRACT

Traumatic pseudoaneurysm of the abdominal aorta is a life-threatening and rare pathology that often occurs after blunt trauma or penetrating injuries. In suprarenal pseudoaneurysms, surgery is complicated by the classic approach, as access to the abdominal aorta is difficult due to the complex anatomy, with a high risk of bleeding. Therefore, hybrid solutions should always be considered in areas with a high risk of spontaneous rupture. In this case report, we presented a successful hybrid surgical option with endovascular aortic stent grafting and visceral debranching in a 20-year-old male patient with an abdominal aortic pseudoaneurysm.

Keywords: Aortic pseudoaneurysm, debranching, endovascular, hybrid treatment, traumatic injury.

Traumatic pseudoaneurysm of the abdominal aorta is a life-threatening and rare pathology that often occurs after trauma.^[1] After trauma, the clinical presentation may be asymptomatic, or symptoms may occur due to compression. However, the most feared situation is spontaneous rupture leading to death. Therefore, it should be treated quickly and with the most appropriate approach.

The part of the abdominal aorta where the pseudoaneurysm is located is extremely important for the surgical approach. In suprarenal pseudoaneurysms, the classic approach makes operation more difficult, as access to the abdominal aorta is difficult due to the complex anatomy, with a high risk of bleeding. Therefore, hybrid solutions should always be considered for suprarenal abdominal aortic pseudoaneurysms, where the risk of spontaneous rupture is high.^[2]

In this case report, we presented a successful hybrid operation in a patient who was diagnosed with a traumatic abdominal aortic pseudoaneurysm after complaining of abdominal pain on the postoperative Day 14.

abdomen. After laparotomy, the retroperitoneum was examined, and although there was a small amount of retroperitoneal bleeding, the vascular structures were found to be intact. The patient, who had been complaining of abdominal pain since postoperative Day 14, underwent computed tomography angiography (CTA). The CTA showed a 77×51×64 mm pseudoaneurysm originating from the abdominal aorta at the level of the celiac trunk (CT) and located in the left lateral retroperitoneum (Figure 1a, b). A written informed consent was obtained from the patient for pseudoaneurysm repair, and the patient was taken for reoperation. Under general anesthesia, the visceral arteries and the right common iliac artery were explored and released. A bypass to relieve the abdominal aorta was created from the right common iliac artery to the CT with an 8-mm Dacron graft. A bypass was then created from the CT graft to the superior mesenteric artery using an 8 mm Dacron graft. After the

CASE REPORT

A 20-year-old male patient underwent urgent surgery by a general surgeon for hemodynamic instability following a gunshot wound to the

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Citation:

Karaagac E, Iner H, Selcuk HO, Yalcin MC, Yilik L. Could hybrid treatments be an option for abdominal aortic pseudoaneurysms? *Cardiovasc Surg Int* 2024;11(3):217-220. doi: 10.5606/e-cvsi.2024.1730

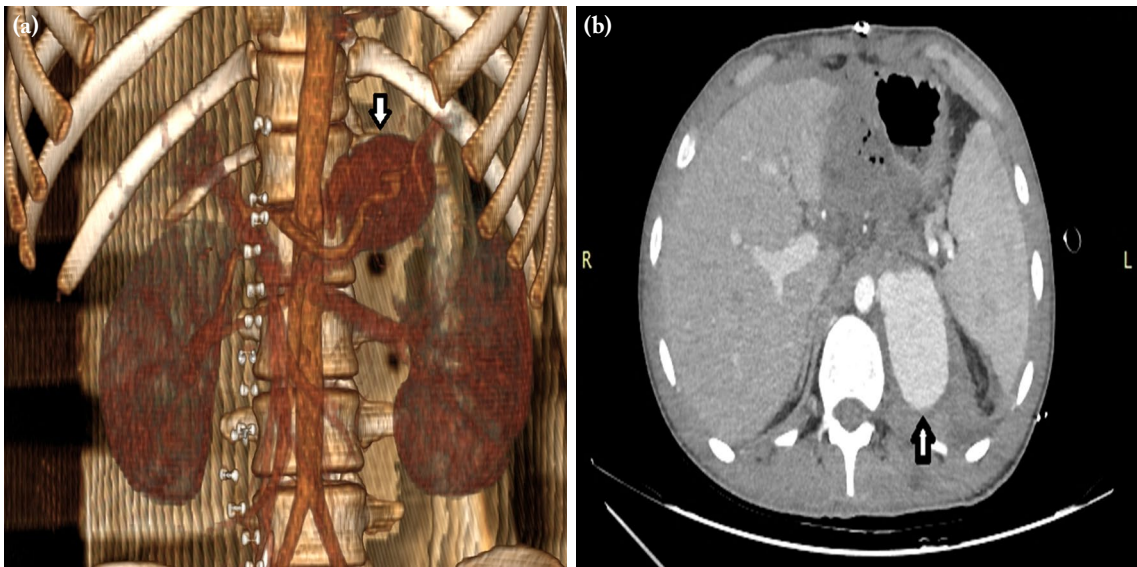


Figure 1. (a, b) Preoperative CTA images of traumatic abdominal aortic pseudoaneurysm at the level of CT. The tip of the white arrow shows aortic pseudoaneurysm.

CTA: Computed tomography angiography; CT: Computed tomography.

visceral debranching procedure, the CT and superior mesenteric artery were ligated. A 20×20×82 mm endovascular aortic stent graft was then placed in the suprarenal region to contain the pseudoaneurysm sac. A control angiography was performed (Figure 2). After hemostasis, the operation was completed. The

patient was transferred to the ward two days later. The patient's control CTA (Figure 3a, b) revealed that the pseudoaneurysm sac was thrombosed, and the debranching grafts were patent. The patient was discharged on postoperative Day 10. The patient's follow-up treatment has been continued routinely.

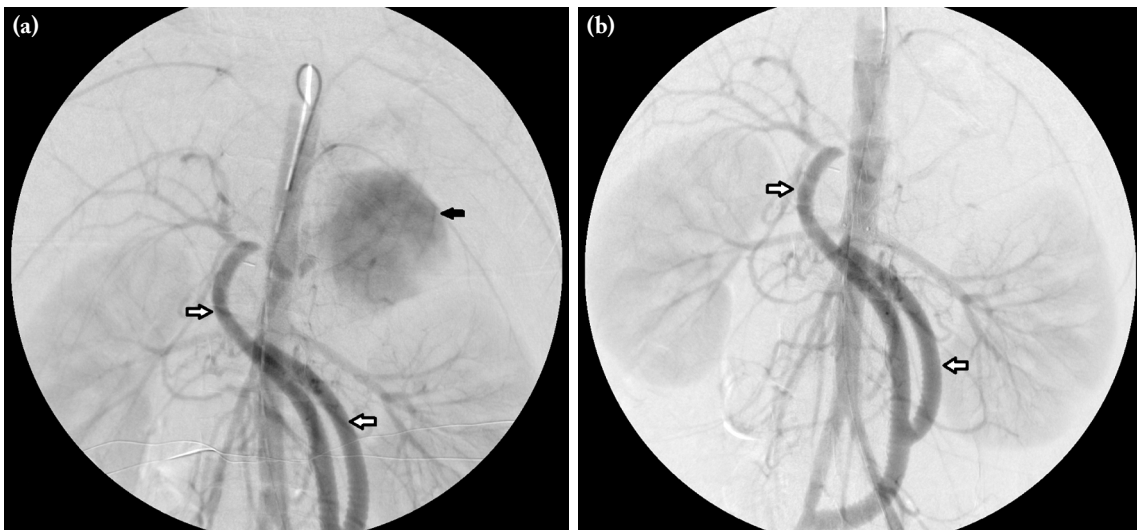


Figure 2. Intraoperative angiographic images of the hybrid procedure. **(a)** Angiographic image of the aortic pseudoaneurysm after visceral debranching. **(b)** Angiographic image of the successful hybrid procedure. The tip of the white arrow shows patent debranching grafts, while the tip of the black arrow shows pseudoaneurysm sac.

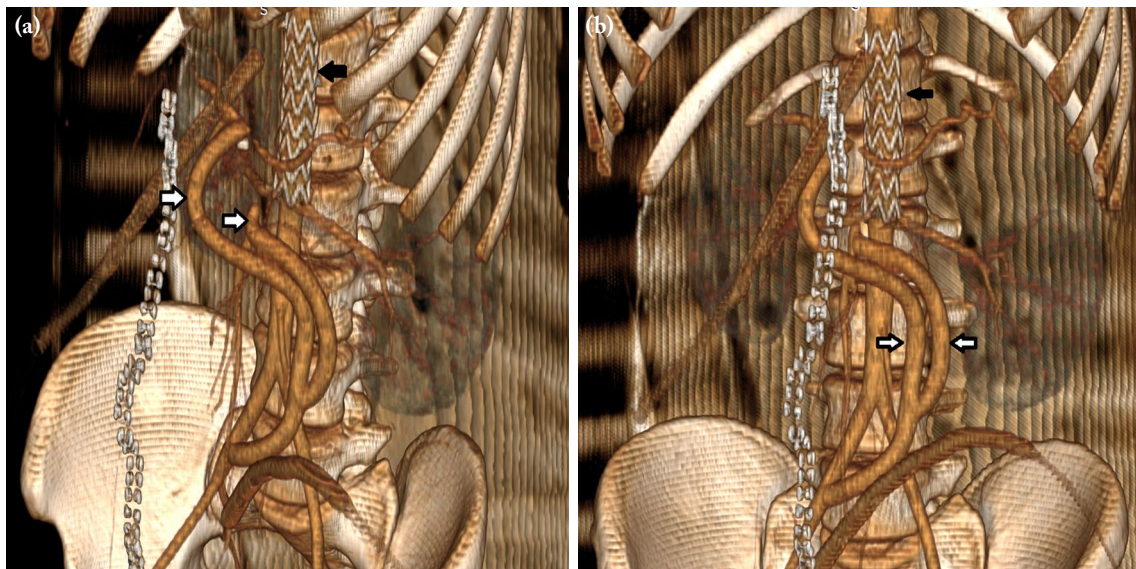


Figure 3. (a, b) Postoperative CTA images of the hybrid procedure. The tip of the white arrow shows patent debranching grafts, while the tip of the black arrow shows endovascular aortic stent graft with no endoleak. CTA: Computed tomography angiography.

DISCUSSION

Penetrating abdominal aortic injuries still have a high mortality rate despite the rapid intervention of the trauma team. This type of injury may be associated with rupture and massive hemorrhage leading to death, and it is also known to be limited to the development of a pseudoaneurysm due to the retroperitoneal location of the abdominal aorta. Although aortic injury is not clearly recognizable on initial exploration, the presence of retroperitoneal hemorrhage at the time of exploration should raise suspicion. In such cases, it is possible to detect severe and potential pathologies, such as pseudoaneurysm, with CTA during follow-up.^[3]

In a pseudoaneurysm that develops due to penetrating abdominal aortic injury, a variety of clinical findings, such as abdominal pain, pulsatile hematoma in the abdomen, bile duct obstruction, and ileus, can be observed.^[4] These clinical findings are exacerbated depending on the size of the pseudoaneurysm sac. The time interval between the initial trauma and the onset of clinical symptoms can vary from a few days to years. Although it is difficult to make a diagnosis in the late phase, particularly if there is a suspicion in the early phase, patients should be examined with modern imaging techniques without wasting time. In the initial examination,

CTA is preferred due to its high sensitivity in making a diagnosis. Computed tomography angiography not only provides information on the location and size of the lesion but also serves as a guide for surgical planning.

Graft interposition can be performed during open surgical repair of a pseudoaneurysm.^[5] In suitable patients, repair with endovascular stent grafts or coil embolization should always be considered. However, hybrid procedures with endovascular aortic stent grafting and debranching may be a solution in cases where open surgery presents high risk due to the location of the pseudoaneurysm and where endovascular treatment alone is not suitable due to the visceral arterial structures.

Open surgical repair of pseudoaneurysms adjacent to visceral arterial structures is associated with a high mortality rate due to the difficulty in controlling the aorta and the risk of massive bleeding. Therefore, the use of various treatment procedures in high-risk cases has come to the fore with the developments in endovascular surgery. In a case series published by Scali et al.,^[6] it was found that fenestrated endovascular treatment can also be used in pseudoaneurysm repair. Although pseudoaneurysm treatment is possible with this method, the technical difficulties, the risk of branched stent thrombosis, and the endoleak risk

should not be disregarded. Hybrid treatments offer us an alternative to minimize these risks.^[2] In the hybrid treatment, which we preferred in this case, visceral debranching is first performed on the common iliac arteries, which represent a safe area. Afterward, the bypassed arteries are ligated from the aorta, and the hybrid procedure is rapidly completed by inserting the endovascular aortic stent graft. In this way, pseudoaneurysm repair is performed with less risk than open surgical repair, and patency of the visceral arterial structures is guaranteed.

In conclusion, pseudoaneurysms that develop due to penetrating abdominal aortic injury are a life-threatening pathology that can lead to death even before symptoms appear. In case of doubt, the diagnosis should be made using modern imaging techniques, and the optimal treatment protocol tailored to the patient should be determined. It should be kept in mind that hybrid treatment with endovascular aortic stenting and debranching may be the solution in high-risk cases.

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

Author Contributions: Conception or design of the experiment(s), or collection and analysis or interpretation of data: E.K., H.I. Drafting the manuscript or revising its intellectual content: E.K., H.I., O.S., M.C.Y.; Approval of the final version of the manuscript to be published: L.Y.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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