

Hybrid procedure of a subclavian artery pseudoaneurysm by shrapnel injury: A case report

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ABSTRACT

In this article, we present a case of hybrid procedure in which a left subclavian artery pseudoaneurysm and arteriovenous fistula (AVF) by shrapnel injury was treated by endovascular procedure following an unsuccessful surgery. The patient who previously underwent emergent left femoral artery graft interposition due to shrapnel injury was referred to our department with a palpable mass starting from the left clavicle region to the arm and severe edema in his left upper limb. Computed tomography angiography (CTA) and peripheral arteriography (PAG) revealed a subclavian artery pseudoaneurysm and AVF. Pseudoaneurysm and AVF was repaired. Hematoma was evacuated. Repeated PAG showed extravasation with a persistent AVF. A stent graft was deployed into the subclavian artery. The patient was discharged without any complication. Follow-up CTA showed subclavian artery patency. In conclusion, endovascular interventions can be a treatment of choice as a hybrid procedure after an incomplete surgery or in high-risk patients owing to its easy periprocedural access and low risk.

Keywords: Arterial injury; endovascular; stent graft; subclavian artery.

Trauma is one of the leading causes of mortality and morbidity. Concomitant vascular injury increases the mortality and morbidity rates in trauma patients.^[1] Civilian trauma cases with vascular injury are associated with 3% of mortality rate.^[2] Thus, a thorough physical examination to detect vascular injuries and appropriate management of the pathology play a critical importance in trauma patients.

Herein, we present a case of hybrid procedure in which a left subclavian artery pseudoaneurysm and arteriovenous fistula (AVF) by shrapnel injury was treated by endovascular procedure following incomplete surgery.

CASE REPORT

A 38-year-old male patient who previously underwent emergent left femoral artery graft interposition due to shrapnel injury was referred to our department with a palpable mass starting from the

left clavicle region to the arm and severe edema in his left upper limb on postoperative Day 20. A 20×30 cm hematoma was palpable from the left clavicle to the left upper limb with the involvement of axilla on physical examination. Thrill was present in auscultation and the peripheral pulses were weak. There was an extension defect in his hand. Computed tomography angiography (CTA) and peripheral arteriography (PAG) revealed a subclavian artery pseudoaneurysm and arteriovenous fistula (AVF) (Figure 1a). The patient was initially scheduled for surgery, as a giant hematoma could compress the graft. A written informed consent was obtained from the patient.

The subclavian artery and vein was controlled proximally with a subclavicular incision and the hematoma capsule was incised. It was observed that the proximal part of the subclavian artery was shifted by capsule toward thorax and the normal anatomic exposure was absent. The pseudoaneurysm could be repaired with a midclavicular osteotomy. The proximal

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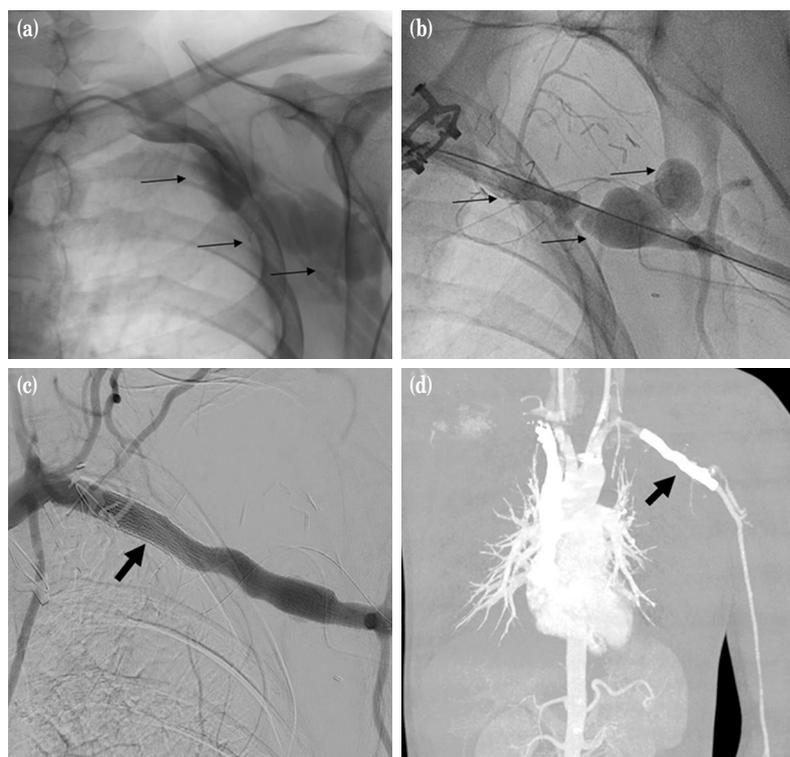


Figure 1. (a) Preoperative PAG; (b) Postoperative PAG; (c) Implanted endograft; (d) Follow-up CTA six months after implantation (thin arrows: Pseudoaneurysm sac; thick arrows: Endo-graft). PAG: Peripheral arteriography; CTA: Computed tomography angiography.

AVF was repaired primarily. Two separate giant hematomas were evacuated. The procedure was terminated due to prolonged surgical duration and massive blood loss during the operation. Repeated PAG on the day after surgery (postoperative Day 1) showed extravasation in the subclavian artery with a persistent AVF; however, there was no hematoma (Figure 1b). A flexible covered stent deployment was planned due to a high risk in redo surgery. Following brachial artery puncture, the 13 Fr sheath was inserted and 5,000 IU of systemic heparin was administered. The lesion was detected by arteriography and 10×100 mm flexible self-expandable covered stent (Viabahn) was deployed. Following stent deployment, 9×10 mm of balloon dilation was done. Patency was achieved (Figure 1c). Edema was improved. The patient was discharged without any complication. Repeated CTA showed an intact arterial vasculature in the follow-up visit at six months. No pseudoaneurysm formation was detected (Figure 1d). On physical examination, distal pulses were palpable in the upper left limb.

DISCUSSION

Vascular injuries accompanying trauma is associated with 3% of mortality rate in civilian

traumas.^[2] These types of injuries, particularly due to traffic accidents, sharp force injuries (SFIs), gunshot injuries and iatrogenic causes, can be the leading factors for morbidity and mortality. Furthermore, the localization and type of injury, the associated injuries and duration for management influence the morbidity and mortality rates.^[3,4] Burma et al.^[4] reported that SFIs were the leading causes of injuries in vascular associated traumas in a retrospective study including 175 patients. Morales-Uribe et al.^[5] also showed that gunshot injuries were the most frequent reasons among vascular injuries. The injury in our case was due to a shrapnel after a bomb explosion. We believe that the reason for different injury etiologies is due to different demographic specifications.

There are several treatment options for trauma-associated vascular injuries. Burma et al.^[4] reported 175 patients with traumatic vascular injuries. The treatment options included interposition with a saphenous or prosthetic graft, side-to-side anastomosis, primary repair, ligation of artery, and patchplasty. Fasciotomy was planned in 15 patients in early the postoperative period. Complications were bleeding (16.6%), wound infection (8.6%), mortality (6.3%), graft thrombosis (3.4%), peripheral neurological

deficit (2.9%) and amputation (2.9%). Immediate action for hemostasis is the mainstay of lifesaving. Covered stents can be used to reduce the mortality and morbidity rates in patients with high surgical risk factors.^[2] In another study, Morales-Urbe et al.^[5] treated all patients using endovascular methods and the cause of injury in most of the patients was a gunshot injury. The procedural success rate was 97% and morbidity and mortality rate was 2.7% in this group of patients who were mostly with cervical injury. In our case, we used an endovascular method due to unsuccessful surgical treatment. Graft patency was observed in the follow-up visit at six months. Saydam et al.^[6] presented a 14-year-old boy in whom a subclavian artery pseudoaneurysm due to war injury was treated with a self-expandable coated stent in the subclavian artery and reported stent patency at six months as assessed by Doppler ultrasound.

In our case, an alternative approach was followed due to excessive bleeding, prolonged periprocedural duration and anesthesia requirement, and increased infection rate during surgery. Blood loss and complication rates are lower in the endovascular procedures than open surgery. In addition, discharge periods are shorter, thereby, the hospital profit and patient comfort.^[7] Covered stent grafts are promising alternatives for open surgery, although their long-term results have not been well-established yet. Ugur et al.^[8] reported that they had successful procedural results in a total of 10 patients, in which seven patients were treated by stent grafting and three had coil embolization. Although there are no studies in contrast of these findings, it is often suggested that endovascular procedures are not suitable for total cut in SFIs due to the undetermined distal vasculature.^[2] Furthermore, it is contraindicated to occlude a major branch of an artery during endovascular procedure.^[7] Open surgery should be the primary procedure of choice.

In conclusion, it is important to provide an immediate action in vascular injuries. The mortality and morbidity rates can be reduced by early interventions and hemostasis, although the type and

location of injury and additional comorbid factors are also of utmost importance endovascular interventions can be a treatment of choice as a hybrid intervention after an incomplete surgery or in high-risk patients due to its easy periprocedural process and low risks. In the future, endovascular procedures can be an alternative to open surgery, if improved graft patency rates increase with the developing technology.

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