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Rupture infected pseudoaneurysm on brachiocephalic AV-fistula: emergency and definitive management

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ABSTRACT

Background: Vascular access bleeding is a rare event that can be fatal in hemodialysis patients. It requires emergency and surgical management to reduce the risk of ischemic events in the patient's forearm and reduce mortality risk.

Objective: To describe the clinical presentation, emergency and surgical intervention, and outcome of rupture-infected anastomotic pseudo aneurysm of the brachiocephalic arteriovenous fistula that underwent a definitive surgical procedure.

Case Description: A 55-year-old man presented with bleeding on the AV-fistula surgery site, accompanied with pain and swelling on his forearm that occurred 3 hours before admission to the hospital. The Patient had a history of brachiocephalic AV-fistula surgery 3 weeks earlier. On physical examination, It was found that the surgical site wound looked wet and swollen, with lots of necrotic tissue and pus and lost stitches. In Emergency Departments, the patient was administered intravenous normal saline fluids, bleeding inhibitors and pressure bandages to reduce ongoing bleeding. Then the patient had planned for immediate vascular reconstruction surgery. The brachial artery is repaired using great saphenous vein patch plasty.

Results: The patient's postoperative 30-days follow-up went well, and there was no sign of complication, such as pain, infection, paresthesia, bleeding at the surgical site or ischemia in the distal forearm.

Conclusion: Vascular access bleeding can be fatal to hemodialysis patients. Optimal treatment for the patient's life and hemodialysis access is a top priority. A good assessment of the condition of AVF and the choice of subsequent therapy greatly affect the patient's prognosis.

Keywords: brachiocephalic AV-fistula, definitive management, emergency management, infected rupture pseudoaneurysm.

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INTRODUCTION

Vascular access bleeding is a rare event that happens in hemodialysis patients. When it occurs, it can be fatal to the patient.¹ Bleeding can occur to several cause after arteriovenous Fistula construction surgery, such as infection at the surgical site, traumatic event or rupture of a pseudo aneurysm. This is also aggravated if the patient has a history of hypertension or a patient with a long history of hemodialysis.^{2,3} Bleeding at the vascular access requires surgical emergencies to reduce the risk of ischemic events in the patient's forearm and reduce mortality risk in the patient.^{4,5} The purpose of this case report is to present a 55-year-old man with bleeding on the AV-fistula surgery site, accompanied with pain and swelling on his forearm that occurred 3 hours before admission to the hospital.

CASE DESCRIPTION

A 55-year-old Man came to our ER because of bleeding on the arteriovenous fistula (AV-fistula) surgery site, accompanied with pain and swelling on his forearm that occurred 3 hours before admission to the hospital. He has been diagnosed with chronic renal failure and underwent hemodialysis for 1 year. The Patient had a history of brachiocephalic AV-fistula surgery 3 weeks earlier. He said that the wound still looked wet and was bleeding at first, on 3 hours earlier, it was bleeding profusely and felt painful.

On physical examination, arterial blood pressure was 150/80 mm Hg; body temperature was 36.5°C; pulse rate 76 beats/min; respiration rate 24 breaths/min. It was found that the surgical site wound looked wet and swollen, with lots of necrotic tissue and pus and lost stitches.

There was profuse and pulsatile bleeding from the surgical wound. The patient has been diagnosed with a ruptured pseudo aneurysm brachiocephalic anastomotic arteriovenous fistula.

While in the ER, the patient was administered intravenous normal saline fluids, bleeding inhibitors drug and pressure bandages to reduce ongoing bleeding, then the patient had planned for immediate surgery.

The patient then underwent vascular reconstruction surgery under general anesthesia. The first stage of the operation is to clean the operating area of debris and necrotic tissue to free the blood vessels tissue to be reconstructed.

It was found only a few salvageable arterial tissues remained. Then it was decided to do a reconstruction using a side-to-side vein patch plasty technique using a great saphenous vein (GSV) graft

(Fig. 1) taken from the patient's right leg. The GSV is trimmed according to the damaged blood vessel tissue size, then sutured continuously until the entire arterial tissue is completely covered. The

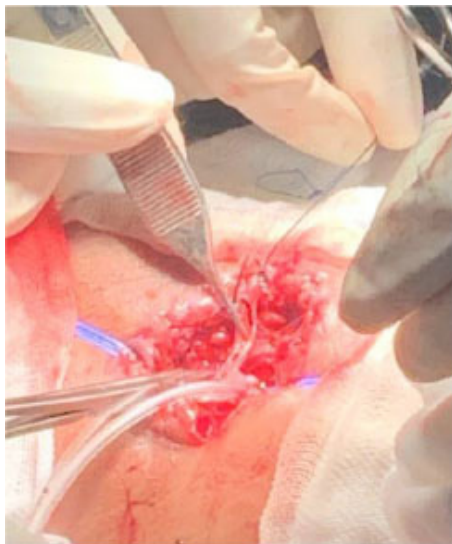


Figure 1. Operation Area, Green arrow pointed GSV graft.

tourniquet was removed, and no leakage was found in the suturing of this patch. The wound was cleaned with saline, and minimal bleeding was controlled.

The patient's postoperative 30-day follow-up went well, and there was no sign of complication, such as pain, infection, paresthesia, bleeding at the surgical site or ischemia in the distal forearm.

DISCUSSION

Acute blood loss through vascular access can be a life-threatening problem. Blood loss through AVF can be from aneurysms, stenosis and subsequent rupture, infection or trauma.⁶ In our center, we found that 2.86% (65 patients) out of 2273 patients from 2018 to 2020 who underwent AV fistula procedures had a pseudo aneurysm complication. A full-thickness tear or laceration of an artery initiates a pseudo aneurysm in AVE. Histologically, the internal elastic lamina is absent, and only adventitia is present.⁷ Pseudo aneurysms

may be from the anastomosis and reflect leaking of blood outside the lumen peri operatively as a result of surgical technique or occur later as a complication of infection.⁸ In the presence of infection, it leads to rupture and fatal hemorrhage.²

In our case, bleeding at the surgical site of the AV fistula suddenly occurred without any history of previous trauma. On physical examination at the AVF site, the patient's wound appeared swollen and wet, accompanied by necrotic tissue and pus. There is also pulsatile bleeding from the surgical wound. The presence of infection post-operatively can hinder the healing process of the surgical wound. In the case of vascular surgery, surgical site infection was very risky for massive bleeding because of the loose stitches and open wounds directly connected to arteries.^{9,10}

The patient was then treated with a pressure bandage on the bleeding arm to stop the bleeding. Advanced Trauma Life Support (ATLS) recommends compression as the first-line treatment for bleeding extremity wounds; an example of this treatment may include the application of a tight bandage directly over a wound.^{11,12} The use of tourniquets at the upper lesion of the wound as a bleeding inhibitor is still a matter of debate. Although it can effectively reduce bleeding, the side effects of using a tourniquet can aggravate patients. Ischemia-reperfusion injury, skeletal muscle injury, and associated secondary end organ damage can occur following revascularization of a limb following prolonged tourniquet-induced ischemia. Activation of inflammatory responses systemically often leads to a complex cytokine cascade or storm that perpetuates inflammatory reactions in remote organs, which can clinically manifest as multiple-organ dysfunction.¹³

The patient was administered intravenous fluids to prevent shock due to profuse bleeding. Administration of intravenous infusion of crystalloid solutions (e.g., normal saline or lactated Ringer's) is purposed to support blood pressure. Before blood products are administered, up to 2–3 L of the crystalloid solution may be given. Insert two or more large-bore (≥ 16 -gauge) intravenous catheters. If the patient is in a state of shock,

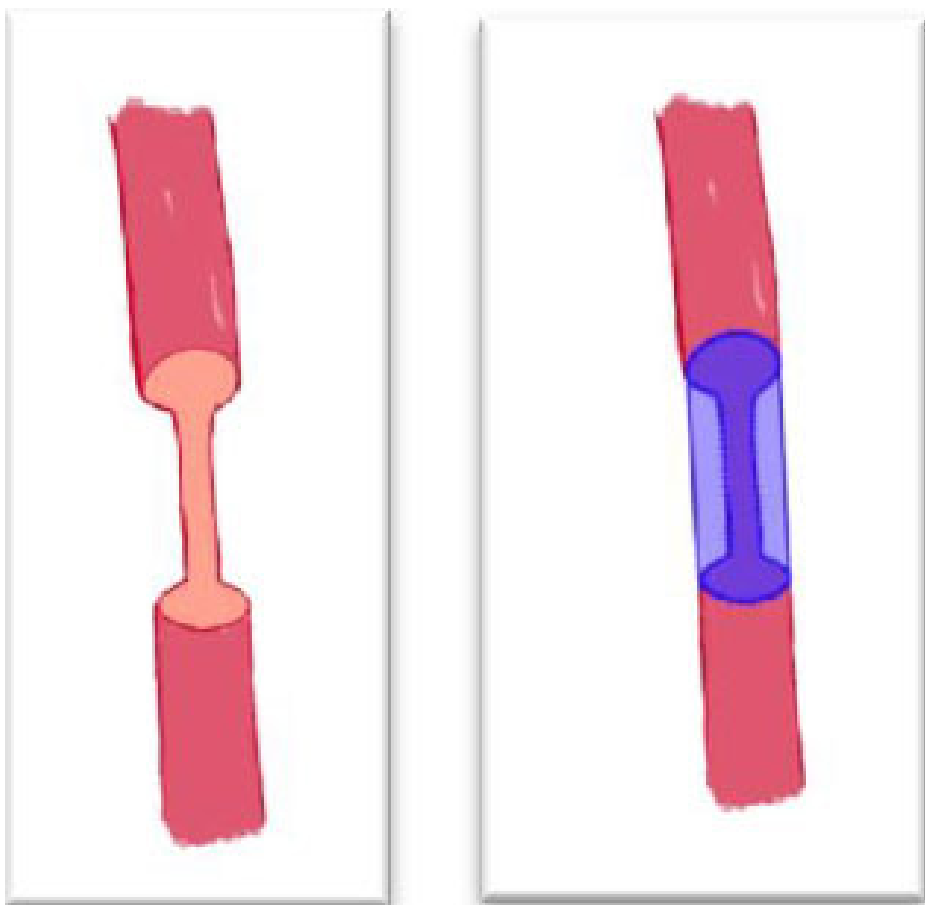


Figure 2. (Left) Damaged Brachial Artery after trimming; (Right) Brachial Artery after interpositions GSV patch. Blue sheath indicated GSV graft.

pairing two infusion lines simultaneously is recommended.¹¹ At the time of insertion of an iv catheter, it is advisable to check the complete blood count so that blood can be prepared if there is a decreasing hemoglobin level.¹¹ The use of tranexamic acid (TXA) as a bleeding inhibitor has been studied in cases of acute bleeding. The mechanism of TXA in trauma patients with significant hemorrhaging was the inhibition of fibrinolysis, leading to improved hemostasis.¹⁴ Research by The CRASH-2 collaborators showed that administering tranexamic acid in acute bleeding can reduce the risk of mortality in patients. Administration of 1 gram of tranexamic acid in the first 3 hours after bleeding occurs is more beneficial because it reduces massive blood loss and reduces the risk of early coagulopathy due to bleeding that occurs.¹⁵

In emergency cases, the option of immediate surgery is necessary. Ligating blood vessels may be considered to reduce and control bleeding that can be life-threatening. Another option is to perform open vascular reconstruction and salvage the created AVF. This option is considered if the vascular tissue is superior damage.^{2,8} The option to use an endovascular technique is contraindicated in the presence of infection.²

In this case, open vascular reconstruction surgery was performed to salvage fistula access to hemodialysis. Unfortunately, the patient's cephalic vein tissue was completely damaged, then the goal of surgery was to improve the function of the brachial artery. Primary surgical repair and interposition vein grafting are recommended, especially with arterial defects over 1 cm. Arterial resection with end-to-end anastomosis can be done if the resection of the pathologic zone can be limited to 3 cm.⁷ In our case, the part of the damaged vessel was 3 cm in length with the edges of the vessel tissue being frail due to infection and necrosis. After trimming to remove damaged and fragile arterial tissue, the missing arterial tissue reached 4.5 cm, so it was decided to use the vein patch plasty technique. The autologous vein we use is the Great Saphenous Vein (GSV). The great saphenous vein patch is suitable for this surgery because it is proper by the vein's diameter, length and thickness,

and the use of autogenous material plays an important role in reducing the risk of infection.¹⁶ Serkan et al. said there is a rule of thumb in harvesting GSV. The length of the harvested GSV is equal to 2 times the length of the blood vessel to be reconstructed.¹⁷

CONCLUSION

Damage of the AV fistula made for hemodialysis access is a disadvantage for the patient considering this access is intended for life support, and complications that arise after that are life-threatening. Optimal treatment for the patient's life and hemodialysis access is a top priority. A good assessment of the condition of AVF and the choice of subsequent therapy greatly affect the patient's prognosis.

DISCLOSURE

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No funding was received for the study.

Conflicts of Interest

The authors have no conflicts of interest.

Author Contribution

All authors contributed equally in the writing of this article

Ethic Approval

This study had been ethically approved by ethical commission.

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