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COMBINATION OF ENDOVASCULAR BALLOON ASSISTED AND FISTULOPLASTY SURGERY IN THE MANAGEMENT OF COMPLICATED TRAUMATIC ARTERIOVENOUS FISTULA

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ABSTRACT

Arteriovenous (AV) fistula is one of Vascular anomalies with direct and indirect communication between arteries and veins without the interposition of a capillary bed. While some malformations arteriovenous are congenital, most are post-traumatic or iatrogenic. Serious complications such as bleeding, bacterial superinfection, and recurrent ulcerations can occur. We present the case of a 42-year-old male admitted to the hospital with active bleeding from the right leg and worsening since ± 3 weeks ago. He had a history of gunshot wound in popliteal region about 5 years ago and history of vein stripping due to chronic venous insufficiency in his leg 11 months ago. On the examination from his left lower leg, there was an active ulcer; the ulcer looked reddish and whitish, with active bleeding, he complained about the sensation of pain. The laboratory tests examined leukocytes: 14,460. CT Angiography of Lower Extremities with intravenous (IV) contrast revealed a left superficial femoral arteriovenous fistula (AVF). There was vein dilatation of the left superficial vein until the left common iliac vein, and vein dilatation of the lower left extremity superficial veins until the distal part of the leg. Focal eccentric thrombus was shown in the left common iliac vein resulting in moderate stenosis. Intraoperative, We did a hybrid procedure with a combination of endovascular procedure using balloon assisted to identify the AV Fistula lesion and open surgery to repair the lesion. After four weeks the ulcer healed.

Keywords: Endovascular, Fistuloplasty, Arteriovenous Fistula

1. INTRODUCTION

Arteriovenous fistulas (AVFs) are abnormal arteries and veins connections. While some arteriovenous malformations are congenital, the vast majority are post-traumatic or iatrogenic. Due to their scarcity, this makes diagnosis in peaceful countries even more difficult. [1] In addition, a broad range of clinical manifestations makes diagnosis difficult and oftentimes delayed. [2] These include pain, varicose veins, limb edema, tingling or audible bruit, diminished pulses distally, and decreased downstream pressure. When an arteriovenous fistula is extensive, steal syndrome and cardiac decompensation can occur. [3] We present the case of a ruptured popliteal AV fistula accompanied by an active ulcer and bleeding.

2. CASE REPORT

A 42-year-old male presented to the hospital with an active ulcer and active bleeding from the right leg and worsening since ± 3 weeks ago. There was a history of gunshot wounds in the popliteal region and history of Vein Stripping due to varicose veins in his leg 11 months ago. He confessed that he didn't regularly control post-operative and had been told that there were complications in his post-

operative condition; his disease condition was neglected by himself.

On the physical examination we found wide ulceration with active bleeding on the left lower leg; the ulcer wound looked reddish and white-ish, the bleeding wasn't that massive but kept going actively, and multiple necrotic areas. there was a pain sensation on palpation. (Figure 1)

Figure 1. Physical Examination (Left Lower Leg)

The laboratory findings; patient found with anemia (Hb: 7.6 g/dl), and sign of infection with elevation of Leukocytes count in: 14,460, and Diff Count: 0/3/63/26/8. The chemical blood test and haemostasis function were in the normal limit.

From CT Angiography of Lower Extremities with intravenous (IV) contrast revealed a left superficial femoral arteriovenous fistule (AVF) with a size of 1.45 x 1.46 x 1.28 cm. There was no contrast extravasation out of the vessels, showing that there was no rupture taking place. There was vein dilatation of the left superficial vein until the left common iliac vein, and vein dilatation of the lower left extremity superficial veins until the distal part of the leg. The left common iliac vein showed that a focal eccentric thrombus resulted in moderate stenosis. Enlargement of multiple

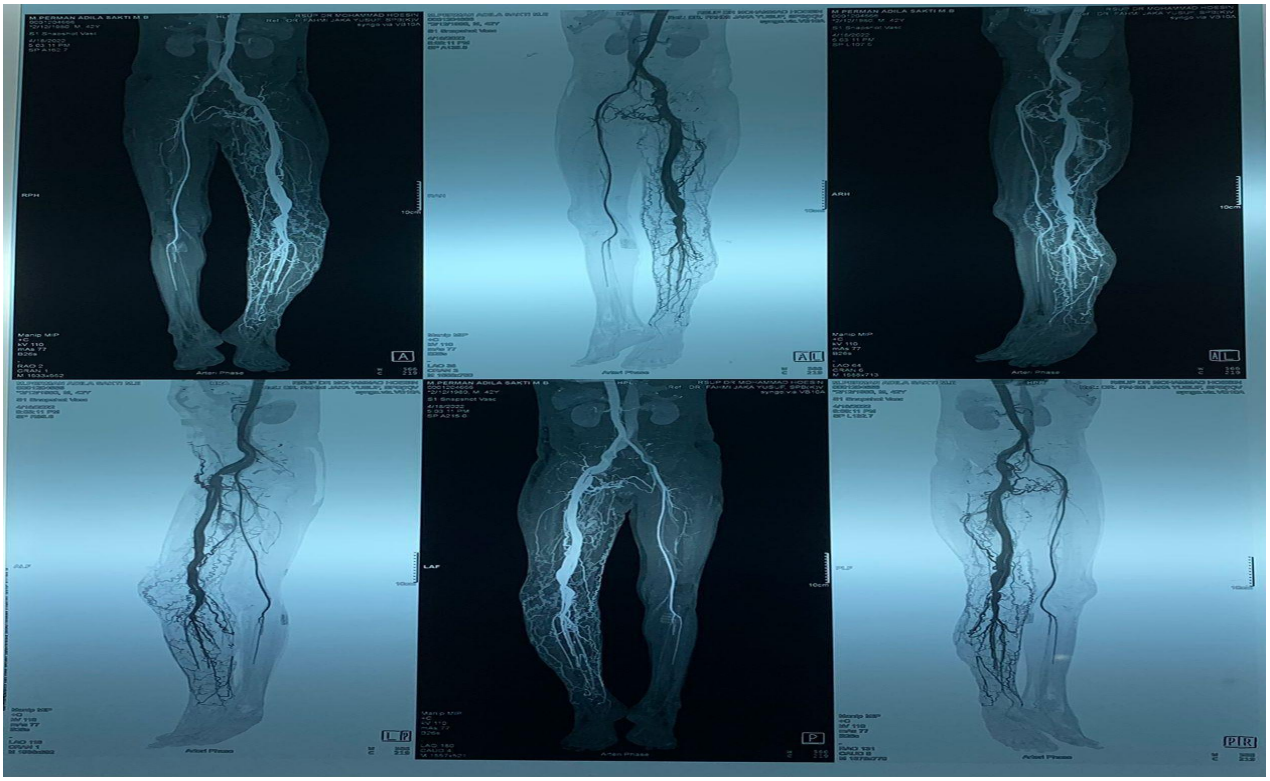


Figure 2. CT Angiography of Lower Extremities with IV Contrast

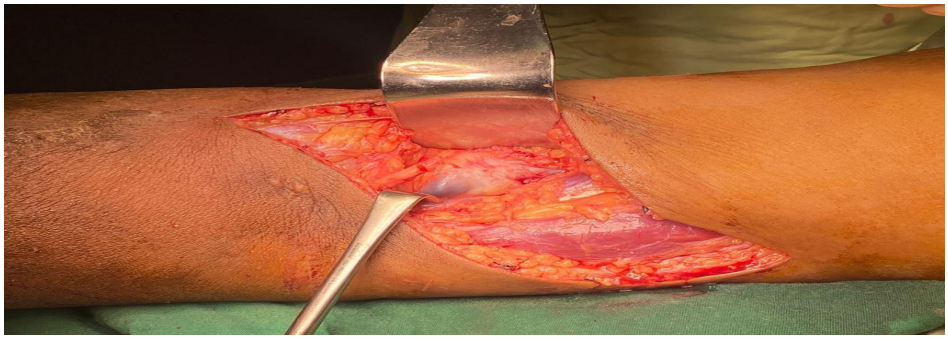
left inguinal lymph nodes was revealed with the highest size of 2.56 x 2.29 cm. (Figure 2)

The patient was operated in the Dr. Mohammad Hoesin Hospital Graha Operating Room electively on Wednesday, April 27th, 2022.

We did angiography from the right femoral artery until the distal part of the left femoral artery right before the popliteal artery, and we did ballooning in the artery. Then, the patient was turned to a prone position, and an S-design incision was made in the left popliteal region (posterior of the left leg). The incision was deepened until the popliteal artery and vein were visible. We did the incision in the popliteal area because it was the highest minimal region before the suspected vessels bleeding; the bleeding happened in the varicose ulcer right in the middle part of the left lower leg (left posterior middle cruris).

Intraoperative, we found localized arteriovenous fistulas (AVF) around the popliteal region, and dilated yet stenotic left popliteal vein was revealed; a visible thrombus was shown inside the dilated vein (Figure 3a). We did an excision on the dilated part of the popliteal vein; the thrombus was evacuated. The fistule of popliteal arteriovenous was found due to a visible balloon in the artery part of the fistule.(Figure3b)

a.



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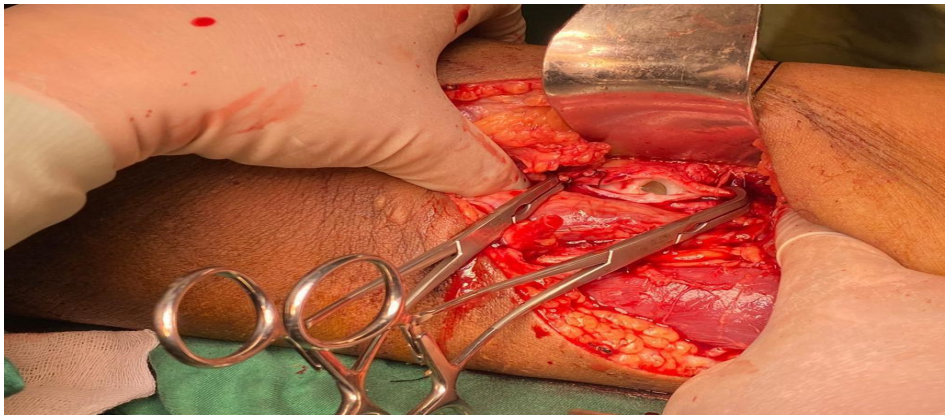

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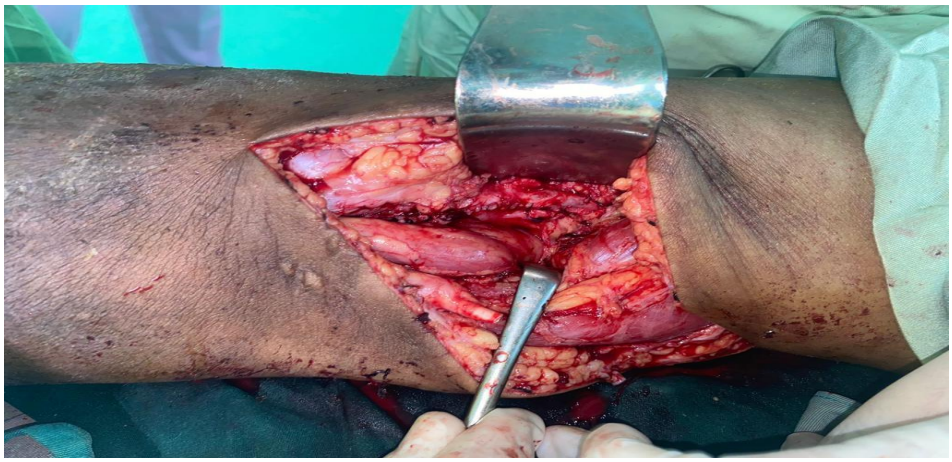

Figure 3. Intraoperative Findings

The AV fistule was stitched separately. The bleeding was controlled gradually using a tourniquet. Tourniquet tension was progressively lowered to observe if there was any re-bleeding or ruptured fistule after the stitches (Figure 3c); the bleeding stops at the lowest pressure of the tourniquet. The ulcer's bleeding stopped. We inserted a vacuum drain into the wound. Debridement was done around the ulcers.

The bleeding was taken care of; post-operative wounds were sued layer by layer. The balloon was removed. The operation

was finished. The operation we did was a Hybrid Procedure. After we saw the intraoperative findings, we diagnosed the patient post-operative with Rupture of the Left Popliteal AV Fistule due to Neglected Varicose Ulcer. After observation in the resuscitation room, the patient was transferred to a non-ICU ward.

Post-operative, the patient was followed up in the non-intensive ward. We followed up on the patient progress for 4 days. The patient was treated with Isotonic IVFD solution and IV drugs such as an empiric antibiotic (Ceftriaxone), potent anti-inflammatory drug (Methylprednisolone), and analgetic (Painloss), and another medication such as Omeprazole IV.

Postoperative blood tests were checked on Thursday, April 21st, 2022. The result was; Hb: 9.6, Ht: 30, Leukocytes: 11,610, and Platelets: 346,000. The chemical blood test showed that; Ur/Cr: 19/0.69, Na/K: 142/4.0, and BSS: 133. The patient received 1 bag of red blood (PRC 200 cc) and another 1 bag the day after the post-operative blood tests were checked. After the last bag of red blood transfusion, patient Hb was re-checked, resulting in Hb 9.9 postoperative transfusion. The overall blood test results were not so bad.

Post-operative vacuum drain on the patient was observed and evaluated; the production decreased slowly (around 40-50 cc per 24 hours), and the hemorrhage production changed to haemoserous production, showing progression until the latest day. The distal fingers' oxygen saturation of lower extremities was checked. The overall distal fingers oxygen saturation of both right and left leg were around 97-99%, implying that the saturated oxygen around the distal body part was sufficient enough.

(a) (b)

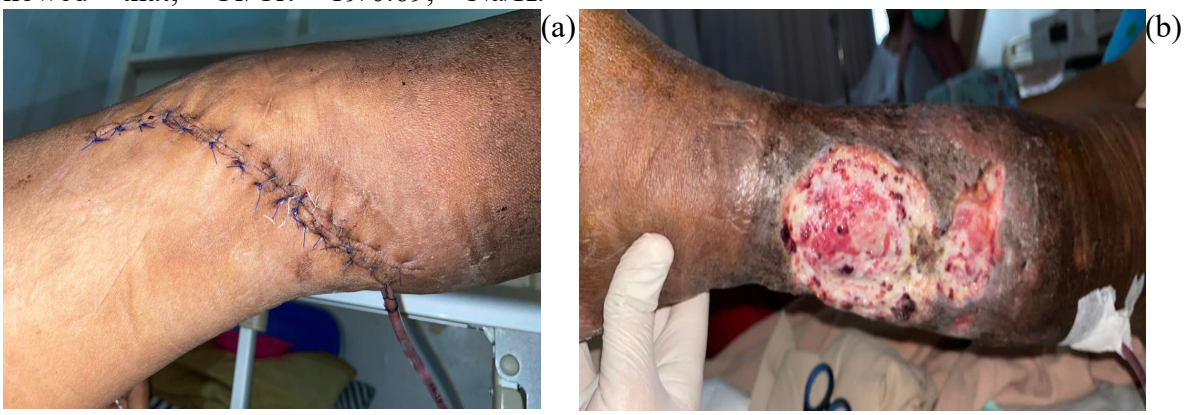

Figure 4. Post-operative Wound

The patient was educated to do progressive mobilization. The post-operative wound was evaluated; we changed the wound's cover on the 3rd day post-operative or if there was any leakage from it. The stitched wound was dried-good (Figure 4a), and the

ulcer wound started to show a granulation process (Figure 4b), implying healing progressed. We plan to educate the patient to do walking-mobilization, and remove the urinary catheter and the wound drain; soon, we might plan to discharge the patient to their home if the recovery progress improves each day.

3. DISCUSSION

We presented the case of a popliteal AV fistule with a neglected varicose ulcer. An Arteriovenous (AV) fistula is one Vascular anomaly with direct and indirect communication between arteries and veins without the interposition of a capillary bed.[4] The most severe complication of AV fistula is the bleeding due to the large vessel diameter, and high pressure can also be life-threatening. Trauma with bacterial superinfection and recurrent ulcerations are further possible consequences. [5]

AV Fistulas can be congenital or acquired. [6] In our case acted, it is an acquired iatrogenic AV Fistula. There are some conditions in which Iatrogenic AV fistulas could occur e.g., after knee joint operations, endoscopic dissection of insufficient perforating veins, and other vascular surgical interventions. [7] AV fistulas can be located anywhere on the body, most commonly seen on the lower extremities, followed by upper extremity manifestations and shoulder girdle. Ulceration of the skin overlying an arteriovenous fistula on the lower extremity mainly occurs if there are insufficient veins. [8]

In our case, there was a history of vein stripping due to varicose veins in his leg 11 months ago. The patient confessed that he didn't regularly control post-operative. Fistulas of the extremities may present with signs of venous hypertension, including varicosities, pain, and swelling, regardless of etiology. If a fistula has existed for an extended period of time, there may be a significant size difference between the two limbs. [9] Cutaneous AVFs may manifest as a pink stain, a mass, dilated veins, unequal limb size, or skin ulceration. Patients may experience limb heaviness that is exacerbated by immobility and alleviated by elevation. Approximately one-half of patients suffer from pain. [10] On clinical examination of the left lower leg, there are signs of cutaneous AVFs: wide ulceration, the ulcer wound looks reddish and white-ish, the bleeding wasn't really that massive but kept going actively due to large vessel diameter and high pressure, and sensory/pain (+) on the left lower leg. [5] The pain could be the result of ischemic tissues or nerve compression.[9,10] On the laboratory finding was found leukocytes:

14,460 (leukocytosis), which indicates a bacterial infection on the ulceration. [11]

Beyond the clinical evaluation from history and physical examination, Computed tomography angiography (CTA) and magnetic resonance angiography (MRA) are supporting examinations to diagnose AVFs. [12,13] Both CTA and MRA demonstrate early contrast filling during the arterial phase in the affected vein. Although MRA may not be an option in trauma or post-trauma patients due to residual metal, CTA is a dependable, non-invasive, and readily available initial diagnostic test. Motion artifact and reliance on contrast timing in the fistula are disadvantages of CTA.[14]

Selective angiography is the gold standard and has demonstrated greater precision than CTA. [15] It is the most invasive evaluation of an AVF, but it pin points the exact location of arteriovenous communication encompassing vascular anatomy, flow dynamics, and treatment mechanism. [16]

The purpose of AVF treatment is to disconnect and shut the fistula while preserving vital blood flow. Direct primary repair, reconstruction (autogenous or prosthetic graft, or bypass), and endovascular are all viable methods for completing the repair. [17] Endovascular surgery has the advantages of a shorter operating time, a lower risk of bleeding, less postoperative pain, and fewer complications. [18] Additionally, hospital stays are shorter. The procedure involves the placement of stents, coils, or gel. However, there are restrictions, such as the possibility of a "stent" fracture in the vessels at the joints. [13,14,19] Therefore, it is inappropriate to position them at these levels. In addition, there is a risk of limb ischemia or pulmonary embolism at the level of complications. [8]

Multiple treatment options exist; however, management can vary between different centres. Only when endovascular treatment is not an option is surgical treatment recommended. [20] It involves ligating or resecting the arteriovenous fistula and then performing veno-venous and arterio-arterial anastomosis. [3] Autogenous (usually saphenous vein) grafts, synthetic grafts, venous ligation, bypass, or complex reconstruction involving one or more of the techniques as mentioned earlier can be used to make repairs. [8] The saphenous vein autologous graft necessitates a vein of 3-8 mm, the absence of lower extremity venous insufficiency, and the absence of vein thrombophlebitis. [17]

4. CONCLUSION

Arteriovenous Fistula is a vascular anomaly that can lead to severe complications, for example, bleeding,

bacterial superinfection, Chronic venous insufficiency of the extremity and recurrent ulcerations and secondary infection on the skin. [21] Active ulcer is caused by the high pressure of vessels around the AVFs, Ulceration of the skin is mainly caused by insufficient veins which can be caused by focal eccentric thrombus resulting in moderate stenosis. [22] The goal of AVF treatment is to isolate and close the fistula while preserving vital blood flow in the affected limb. [23] However, it is possible to stabilize the patient's circulation and significantly increase their chance of survival through prompt intervention. [24] The hybrid operation technique with balloon assisted not only makes the operation become easier with small incision directly to the lesion on the target vessel but also makes that there was no need of blood transfusion because of small amount of blood in the operation time and length of stay in the ward becomes more effective. [25]

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