CASE SERIES

Post-traumatic arteriovenous fistulae of the extremities: A case series

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Abstract

Post-traumatic arteriovenous fistulae (AVF) can lead to congestive heart failure and limb ischaemia. The objective of this study was to determine the presentations, interventions, and outcomes (morbidity and mortality) of the patients treated with traumatic AVF at a university hospital between January 1995 to December 2018. Nine patients (M: F 8:1) with median age of 30 [IQR 24.5] years were included in the study. They presented as 'missed injuries' with median delay of 4 [IQR 55.25] months. Most had penetrating injuries and presented with painful limb swelling, pain, and venous ulcer. Superficial femoral and popliteal were the most involved vessels. Seven (77.7%) patients had surgery, while 2 (22.2%) had endovascular interventions. Open arterial reconstruction was performed with interposition vein in 4 (44.4%) or with prosthetic grafts in 1(11.1%) patient. There was no peri-operative morbidity or 30-day mortality. All patients had smooth recovery with limb salvage rate of 100%.

Keywords: Trauma; arteriovenous fistula; lower extremity

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Introduction

Only 1-2% of trauma patients have vascular injuries and out of them very few present with AVFs, which are the abnormal communication between artery and vein and is caused mostly due to penetrating injuries. More than half of all post-traumatic AVFs occur in the lower extremity.[1] Failure of spontaneous regression after two weeks is an indication for intervention as undetected or untreated AVFs can lead to signs of chronic venous insufficiency and cardiac failure. Treatment options involve surgical repair or endovascular intervention. Little has been reported on this topic in loco-regional literature. The objective of the study was to determine the presentations, interventions, and outcomes (morbidity and mortality) of patients treated with traumatic AVF at a university hospital.

Case Series

The study was a chart review of patients with traumatic AVF managed between January 1995 to December 2018 at the Aga Khan University Hospital, Karachi (Pakistan). All patients with traumatic AVF who had undergone either endovascular or surgical interventions were included in the study. Patients with incomplete records were excluded from the study.

After obtaining exemption from institutional review committee (2019-0986-2473), patients were identified using ICD-9 coding system and medical records of patients were reviewed for patient demographics, clinical presentations, indications of intervention, preoperative CT findings, type of surgery and perioperative morbidity, and total hospital stay. This was recorded on a specially designed proforma. The outcomes measures were the perioperative morbidity and 30-day mortality.

Standard surgical technique was used to treat these patients. Both the artery and the vein were controlled proximally and distally. Systemic intravenous heparin was given before applying clamps. The fistulous site was identified and disconnected. Arterial continuity was restored by using either autologous vein or Polytetrafluorethylene (PTFE) grafts. Data analysis was performed on SPSS version 22. Continuous variables were expressed as mean±SD/median [IQR]. Categorical variables were expressed as frequency (%).

Nine patients (8 males and 1 female) with median age 30 [IQR 24.5] years were managed over the study duration. The patients' details are given in Table.

Seven (77.7%) patients had AVF in the lower extremity, 8 (88.8%) had penetrating injuries with bomb blast in 3(33.3%) and gunshot in 3(33.3%) as mechanism of injury. Superficial femoral and popliteal vessels were involves in 3(33.3%) and 2(22.2%) patients respectively. Median delay from initial injury to presentation was 4 [IQR 55.25] months. Five (55.5%) patients presented with limb pain and swelling, while 2(22.2%) had recurrent bleeding and one (11.1%) patient had non-healing venous ulcer. One patient presented 20 years after missed diagnosis was missed and he was being treated for varicose veins. Seven (77.7%) patients were treated with surgery and 2 (22.2%) patients had endovascular interventions. Arterial repair was done with vein in 4(44.4%) or with prosthetic grafts in 1 (11.1%) patient. Arteries were ligated in 2 (22.2%) patients; one was performed in a patient with ulnar arteriovenous fistula who had patent radial artery which was good enough to

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Table: Patient's details with traumatic arteriovenous fistula of the extremities.

No.	Age(years)/ Gender	Injury type	Interval between injury and Treatment (months)	Site (Artery and Vein)	Presentation	Treatment
1	25 /Male	Stab	4	Brachial	Arm Pain and Swelling	Repair of the artery with Interposition vein graft
2	30 /Male	Glass cut	6	Ulnar	Arm swelling	Ligation of artery
3	17/ Male	Gunshot	1.5	Anterior tibial	Recurrent Bleeding	Covered metallic stent
4	35/ Male	RTA	84	Superficial Femoral	Pain in Popliteal Fossa	Ligation of the artery
5	5.5/ Male	Bomb Blast	30	Superficial Femoral	Palpable thrill thigh	Repair of the artery with Interposition vein graft
6	23/ Male	Bomb Blast	1	Popliteal	Pain and Swelling of Thigh	Repair of the artery and vein with interposition graft
7	45/ Male	Bomb blast	4	Superficial Femoral	Leg Swelling and pain	Artery Repair with interposition PTFE graft
8	44/ Male	Gunshot	2	Posterior tibial	Recurrent Bleeding	Multiple coils placed proximal and distal to aneurysm
9	52/ Male	Gunshot	240	Popliteal	Leg ulcer venous	Repair of the artery with Vein graft +Ligation of the vein

RTA= Road traffic accident

provide arterial supply to hand and one in a patient with superficial femoral artery who was a below knee amputee. Patient had severe blunt leg trauma seven years back that resulted in below the knee amputation. Patient presented with progressively increasing painful swelling in the popliteal fossa due to AVF which was missed at initial injury. Two (22.2%) patients had endovascular interventions: one patient had a covered stent placed in the anterior tibial artery (ATA), while in the other patient ATA was angio-embolized with multiple coils. Both the patients presented with active bleeding. All patients had smooth recovery and resolution of the symptoms. There was no peri-operative morbidity and 30-day mortality.

Discussion

Traumatic arteriovenous fistulae can cause congestive heart failure[2] and limb ischaemia if left untreated. These are mostly due to penetrating trauma but can also happen after blunt trauma.[3,4] The diagnosis may be missed initially and the presentation is delayed for days, weeks or years after the initial injury. The most common presenting symptoms of these are pain, swelling,[5] thrill, bruit or a pulsatile mass. Unusual presentations can be bleeding episodes and non-healing venous ulcer.[6] Absence of spontaneous regression within a two-week period is an indication for intervention. Surgical repair is effective and durable for long-standing post-traumatic AVF but can be challenging due to venous hypertension and surrounding scar tissue.[7] Endovascular treatment is a safe and effective alternative to surgery. Morbidity and mortality are in the range of 5-10%. Other than covered stents, coil embolization can be deployed to occlude the AVF. The most commonly used materials for embolization are coils, micro-coils or Gelfoam. In the setting of AVF, coil may be the most appropriate agent as they allow precise embolization.[8] The main contraindications are absence of proximal and distal landing zones, discrepancy between the proximal and distal diameters of the vessels, and inability to catheterise the target vessels. Surgery is also needed in case of failure or complications of endovascular therapy. Mazlum Sahin et al reported 27 patients with traumatic AVF who were managed with endovascular treatment as the first approach with surgery reserved for patients who were either haemodynamically unstable or had contraindication/failure to endovascular treatment.[9] The reason for choosing surgical option in the low-to-middle income countries is non-availability of endovascular services in most of the institutes and the infrequent availability of stent-grafts, coils, and gel foams in most of the facilities. Siddique K et al reported 10 patients with traumatic AVF treated surgically with good outcomes.[10] The present case series showed that patients presenting with missed traumatic AVF were young, and most had penetrating trauma. Diagnosis was delayed for a median period of four months. Surgery with ligation of vein and maintaining arterial continuity was the most common treatment modality. Selected patients were treated with endovascular means. The limb salvage rate was 100%. The limitations of this study are that it was a retrospective study, and from a single centre with limited number of patients. Despite this, it described the presentations and outcomes of patients with post-traumatic AVF of extremities.

Conclusion

Traumatic AVF of the extremities were mostly due to penetrating injuries and were detected months after the initial injury as being 'missed injuries'. Most common presentations were limb swelling and pain, recurrent bleeding and venous ulcer. Surgery is an effective way of dealing with this condition with minimal perioperative morbidity and durable results in LMICs where endovascular services are lacking.

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