



## Case Report

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**Dr. Kolade-Yunusa Hadijat Oluseyi**

*Department of Radiology,  
University of Abuja Teaching  
Hospital, Gwagwalada, Abuja,  
Nigeria*

## Correspondence:

**Dr. Kolade-Yunusa Hadijat Oluseyi**

*Department of Radiology,  
University of Abuja Teaching  
Hospital, Gwagwalada, Abuja,  
Nigeria*

# Chronic leg ulcer as a complication of post-traumatic arteriovenous fistula: colour doppler evaluation

*Kolade-Yunusa Hadijat Oluseyi\**

## Abstract

Arteriovenous fistula (AVF) can be either be iatrogenic, traumatic or congenital. Most femoral AVFs commonly developed secondary to penetrating injuries. This is a case of post traumatic femoral AVF in a 40 year old man who presented with chronic leg ulcer, is presented to illustrate the inherent danger in the delayed diagnosis and treatment of AVF and role of ultrasound in diagnosis. Review of the existing literature outlining the pathogenesis, clinical features and radiological therapeutic considerations as they relate to arteriovenous fistula.

**Keywords:** Chronic leg ulcer, Arteriovenous fistula, Colour Doppler.

## INTRODUCTION

Arteriovenous fistula (AVF) is described as an anomalous communication between an artery and a vein. Frequently the cause is either iatrogenic or traumatic but could also be congenital. Femoral AVFs almost always develop secondary to penetrating injuries from gunshot or stab injury and percutaneous vascular interventions.<sup>[1,2]</sup> Up to two thirds of patients with traumatic AVFs are diagnosed within a week of injury; however, a significant subset will present with delayed symptoms weeks to years later.<sup>[2]</sup> AVF present with a variety of clinical manifestations and often prove difficult to detect. The clinical sequelae of undiagnosed AVF are significant and include dilatation of the vessels, veno-lymphatic trophic complications, such as venous ulcerations and over time heart failure may occur.<sup>[3]</sup> The index patient presented with a chronic leg ulcer.

A case of post traumatic AVF in a 40 year old man who presented with chronic leg ulcer is presented to illustrate the inherent danger in the delayed diagnosis and treatment of AVF.

## CASE REPORT

A.A is a 40 year-old male who reported at the surgical outpatient department of a tertiary institution with complaints of pain in the right leg of 2 years duration and ulcer in the right foot of 1 year duration. Pain was aggravated with movement and relieved by taking analgesics. The leg ulcer and the associated pains had progressively worsened in the last six month prior to presentation. The pain was severe enough to prevent him from doing his daily work. About 10 years before presentation, he had a gunshot injury to the upper part of the right thigh that necessitated admission and suturing of lacerations in a peripheral hospital.

Physical examination revealed a young man, fully conscious, afebrile, not pale, with palpable inguinal lymph nodes. Examination of the right thigh demonstrated 5cm×4cm healed scar in the middle third of the medial aspect of the thigh. A thrill was felt in the region of the scar with a loud bruit on auscultation. There was no visible or palpable mass.

Musculoskeletal examination showed a 7cm × 6cm ulcer with an irregular margin seen over the lower lateral aspect of the right leg.

The cardiovascular examination showed displacement of the cardiac apex to the sixth intercostal space and presence of third heart sound. The dorsalis pedis pulse was reduce. Respiratory examination was normal. The heamogram, urinalysis and fasting blood sugar were all normal.

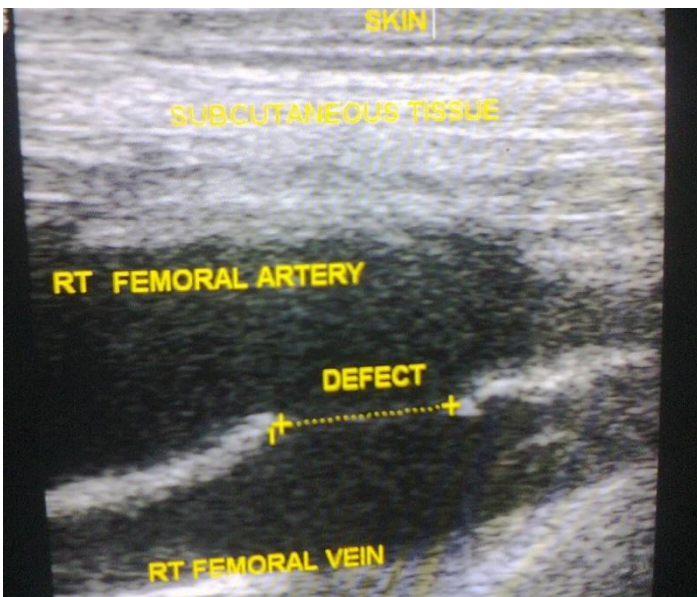
A presumptive clinical diagnosis of chronic right leg venous ulcer was made.

Plain radiography (anterior posterior and lateral view) of the right leg showed soft tissue defect and irregularity in the lateral aspect of the lower third of the leg (Figure 1).

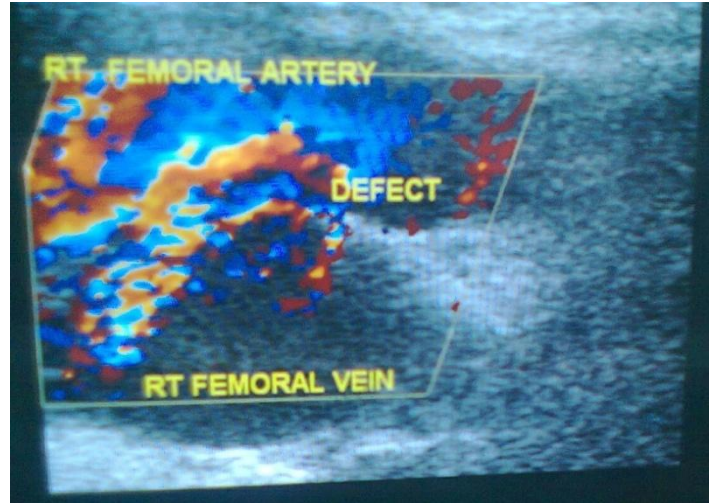
B mode sonogram study of the limb demonstrated a fistulous connection between the right femoral artery and right femoral vein in the middle third of the right thigh (Figure 2). Mosaic colour flow pattern was noted in this region with colour Doppler (Figure 3).



**Figure 1:** Plain x-ray of the right lower limb (AP and lateral view) showing soft tissue irregularity and defect (white arrows) in the lateral aspect lower third of the right leg.



**Figure 2:** Grey scale sonogram image showing a wide communicating defect between the walls of the femoral artery and the femoral vein



**Figure 3:** Colour Doppler showing mosaic colour flow pattern in the region of the fistula.

A radiological diagnosis of arteriovenous fistula was made.

The patient was referred to the plastic surgeons and he subsequently had surgery. The surgical findings revealed an AVF with fistulous communication at around middle third of the right thigh. There were dilated vessels proximal to the fistula. The lumen of the distal portion of the femoral artery was collapsed and adhesion tissue was seen at the site of fistulous communication. The fistula was closed and the leg ulcer healed gradually over a period of three months. Patient is alive and well.

## DISCUSSION

In AVF, blood flows directly from an artery into a vein bypassing the capillaries. When this happens, tissues below the bypassed capillaries receive less blood supply. Traumatic AVF may be difficult to diagnose as fistulas may form weeks to years after an injury.<sup>2</sup> The fistula in the patient was diagnosed 10 years after the gunshot injury. However, with increasing delay in diagnosis and treatment of AVF increases, the likelihood of full recovery decreases.<sup>2</sup> Hence, an effective means of AVF detection is of paramount importance.

The clinical manifestations of AVF are the 'steal blood' phenomenon, congestive heart failure, or distal ischemia.<sup>4</sup> This can occur few weeks or months to more than 50 years after the injury. Due to the steal phenomenon, blood flow to the extremities may be compromised, evidenced by reduced or absent distal peripheral pulses<sup>4</sup> and patients may present with intermittent claudication. The dorsalis pedis pulse was reduced in the patient however there was no history of intermittent claudication. In the presence of a significant steal, critical limb ischemia can result into ischaemic ulceration. Ischemia and skin ulceration may occur as a result of blood stealing through the fistula and venous insufficiency.<sup>4</sup> The leg ulcer in this patient could probably be due to ischemia resulting from steal blood phenomenon or venous insufficiency.

AVF typically presents with a pulsatile hematoma, bruit, or thrill<sup>5</sup>; however, these characteristics may be hidden behind apparent signs of varicose veins and chronic venous insufficiency, which might suggest post thrombotic syndrome.<sup>6</sup> Machinery murmur has been noted in most patients presenting soon after AVF formation and in virtually all patients presenting later after AVF formation.<sup>2</sup> This patient presented with right leg ulcer associated with pain, bruit and thrills were picked on examination.

Currently, the diagnosis of an AVF can be made using angiography, duplex and color Doppler sonography, MRI, and CT.<sup>[7]</sup>

Sonography, because of its color Doppler facility and multiplanar capability, is an easy and elegant way of showing AVF. Optimizing the color Doppler settings can frequently lead to an accurate and quick diagnosis. However the pitfall of ultrasound lies in its operator dependency and also, on color Doppler imaging, the fistulous communication may be obscured by high-velocity blood impacting the opposite vein from the artery, resulting in perivascular vibration<sup>[8]</sup> seen as a mosaic of color artifact extending into the adjacent soft tissue (also known as tissue bruit).

The criteria for the diagnosis of AVF by color Doppler ultrasound include low- and high-resistance flow in the supplying artery. Normal arterial waveforms have a typical triphasic high-resistance pattern, whereas AVF arterial waveforms have a very low resistance pattern. High-velocity arterialized wave form in the draining vein, and turbulent high-velocity flow spectrum at the junction of the artery and vein are also seen in AVFs. Visible connection between the artery and vein can also be appreciated.<sup>[9,10]</sup> The above findings were found in the index case where B mode and Doppler ultrasound (Duplex) was the only imaging modality used to diagnose this condition in this patient.

Although conventional angiography has been the most definitive diagnostic technique but it poses the risk of an invasive procedure. Angiography shows early venous opacification during the arterial phase. Though invasive, angiography is useful in identifying the arteries feeding the fistula and in elaborating a vascular map for endovascular treatment.<sup>[10]</sup> This procedure was not done in this patient because the facility is not available in our centre.

It has been suggested that CTA may actually be superior to conventional angiography as the preliminary diagnostic tool.<sup>[4,11]</sup> Computed tomographic arteriography (CTA) is emerging as a new way to study arterial anatomy, with the additional advantages of being noninvasive and it is a technique that allows evaluation of different body areas simultaneously.<sup>[12]</sup> When compared to angiography, CTA is minimally invasive, rapid, and accurate, and is less expensive than conventional angiography; however CTA is also operator-independent.<sup>[13]</sup> CT and MR angiography typically show early contrast filling in the vein during the arterial phase. CTA and MRA were not done for the index case because of financial constraint.

Apart from surgical treatment of limb AVFs, these defects can also be safely treated endovascularly, either by embolization or stent grafting. Implantation of endovascular metallic or covered stents has been shown to be an effective and safe method for the closure of AVFs.<sup>[12]</sup> The interventional radiologist has a great role in placement of this stent as well as in embolization of the vessel which can be done under ultrasound, computed tomography and fluoroscopy guidance.

## CONCLUSION

In a resource, limited setting like ours the use of ultrasound in the diagnosis of AVF of the femoral artery cannot be overemphasized. This imaging modality was the only investigation used in this index patient to diagnose this condition. The success of management of this condition depends on proper evaluation of which radiology plays a prominent role.

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