

## Case Report

# Therapy for Necrotic Fingertip Ischemia Secondary to Traumatic Arteriovenous Fistula

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### Abstract

**Background:** This is the first report on an accidental arteriovenous fistula of the upper limb. We discuss in this publication the clinical presentation, diagnostic process and treatment options of arteriovenous fistula (AVF) that can be conservative and interventional.

**Case presentation:** We are reporting a case of a 89-year old white man with a necrotic fingertip ischemia secondary to a traumatic AVF. A Doppler sonography showed an AVF between the metacarpal bones of the digits 1 and 2 and confirmed a hand and forearm vein dilation. A fistula ligation would be indicated as first-line therapy, which was rejected by the elderly multimorbid patient. Owing to risk of potential wound healing problems, lifetime medical management such as manicure of the right index is recommended. In case of injury, compression therapy should be performed. The follow up was without complication.

**Conclusion:** A fistula ligation is the therapy of choice in a patient with an arteriovenous fistula of the upper limb.

**Keywords:** Arterial steal syndrome; Arteriovenous fistula; Case report; Compressions therapy; Endocarditis, Fingertip; Lifetime medical manicure; Ligation; Ischemia; Necrotic fingertip; Traumatic

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**Citation:** Wilczynska J, Gruszczynski M, Nowak P, Nowak A (2023) Therapy for Necrotic Fingertip Ischemia Secondary to Traumatic Arteriovenous Fistula. J Angiol Vasc Surg 8: 108.

**Received:** August 21, 2023; **Accepted:** August 29, 2023; **Published:** September 05, 2023

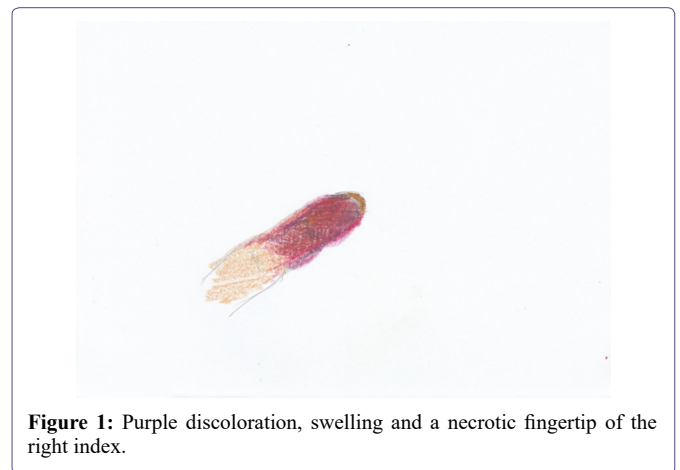
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### Background

This is the first report of an accidental upper Limb Arteriovenous Fistula (AVF). An AVF leads to arteriovenous short-circuit with consecutive steal phenomenon of the arterial blood supply resulting in hypoperfusion and ischemia as well as to a venous blood congestion due to increased blood volume by the arteriovenous bypass. The treatment of choice is operative. In this report, we are summarizing the diagnosis and management of an upper AVF.

### Case Presentation

An 89-year old white man, was found to have a purple discoloration, swelling and a necrotic fingertip of the right index (Figure 1), as well as a vein dilation on the right hand dorsum and, less pronounced, on the right forearm (Figure 2). The patient reported accidental pinching of fingers while sitting on a folding chair. The necrotic fingertip persisted for 3 years, the purple digit swelling since the accident. The other patient comorbidities were a mild Alzheimer's dementia, hypothyroidism and right knee arthrosis. A suspicion of a traumatic arteriovenous fistula was raised. A Doppler sonography showed an Arteriovenous Fistula (AVF) between the metacarpal bones of the digits 1 and 2 and confirmed a hand and forearm vein dilation (Figure 3). The patient rejected further assessment and treatment. Owing to risk of potential wound healing problems, lifetime medical management such as manicure of the right index was recommended. In case of injury, strong but careful compression therapy should be initiated. The one-year follow up was without complications.



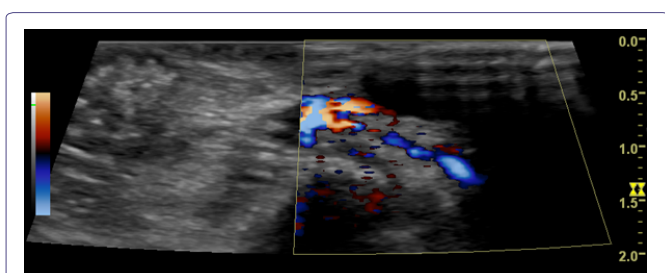
**Figure 1:** Purple discoloration, swelling and a necrotic fingertip of the right index.

### Discussion

This is the first discuss of accidental upper-limb AVF [1,2], although accidental lower-limb AVFs have previously been reported [3]. This report include an arteriovenous short-circuit at the metacarpal level, a steal phenomenon of the finger's arterial blood supply resulting in hypoperfusion and ischemia of the tip, and venous blood congestion due to increased blood volume caused by the finger bypass. Ischemia can lead to progressive necrosis, wound healing, gangrene, and venous congestion, increasing the bleeding tendency in future injuries. Other accompanying symptoms include paresthesia, sensory loss, muscle weakness, and muscular atrophy [4].



**Figure 2:** Vein dilation on the right hand dorsum and, less pronounced, on the right forearm.



**Figure 3:** Doppler sonography shows an arteriovenous fistula (AVF) between the metacarpal bones of the digits 1 and 2 and confirms a hand and forearm vein dilation.

Upper-extremity AVF can result from trauma, degenerative vessel malformations, or iatrogenic interventions [1,2]. Traumatic AVF is rare, mostly occurring in the lower limbs [3]. Degenerative vessel malformations can be caused by cardiovascular calcification, particularly in patients who smoke, or those with diabetes mellitus, chronic kidney disease, arterial hypertension, or hypercholesterolemia [4]. Arteriovenous access for chronic hemodialysis is an example of iatrogenic intervention [5], moreover, accidental iatrogenic AVF can occur as a result of vascular interventions or operations [6].

Differential diagnoses such as carpal tunnel syndrome, tendinopathies, and arthropathies should be considered [6]. The diagnosis of AVF is based on clinical features and physical examinations. Patients with Distal Hypoperfusion Ischemic Syndrome (DHIS) often have cold fingers with pale or blue-purple discoloration. Distal radial pulses are typically palpable only when the AVF is manually compressed. Noninvasive investigations, such as digital blood pressure, Digital/Brachial Index (DBI) measurement, digital plethysmography, duplex ultrasonography, and transcutaneous oxygen saturation determination, are available to assist in the evaluation of patients with symptoms suggesting arterial steal syndrome. Advanced diagnostics, such as arteriography, are key tools in diagnosing and selecting a treatment strategy for DHIS. Alternatively, less invasive imaging techniques such as magnetic resonance imaging and computed tomography angiography may be used [4,6].

Treatment options include minimally invasive percutaneous and surgical interventions. Endovascular therapy with a cover stent or coil embolization is generally less invasive and an effective alternative for treating traumatic AVF in large arteries such as the iliac, subclavian, carotid, and tibial arteries. For digital arteries, surgical intervention is usually indicated. Untreated arterial steal syndrome can lead to weakness, ulcerations, and gangrene. Further, AVF treatment helps eliminate additional problems, such as cardiac failure, proximal arteriovenous dilatation, and, less frequently, endocarditis. Simple ligation and fistula resection are common procedures used to mitigate these problems. Additionally, as the feeding vessels should be obliterated, amputation is necessary in cases of necrosis and gangrene [1,5-8].

## Conclusion

Conservative nonsurgical treatment involves compression therapy to reduce blood flow into the fistula [9]. A fistula ligation is the therapy of choice in a patient with an arteriovenous fistula of the upper limb.

## List of Abbreviations

AVF: Arteriovenous Fistula

DHIS: Distal Hypoperfusion Ischemic Syndrome

DBI: Digital/Brachial Index

## Declarations

## Ethical approval and Consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must include a statement on ethics approval and consent (even where the need for approval was waived) and include the name of the ethics committee that approved the study and the committee's reference number if appropriate. Studies involving animals must include a statement on ethics approval. See our Editorial Policies for more information. Not applicable.

### Availability of supporting data

The present manuscript contains all supporting data.

### Competing Interests

The authors declare no competing interests.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Author's Contribution

Jolanta Wilczynska and Albina Nowak drafted the manuscript, all authors made significant contributions to the manuscript, read and approved it.

### Acknowledgement

Not applicable.

### Author's Information

Not applicable.

### Consent for Publication

This is a synthetic case report.

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