

# Arteriovenous Fistula Secondary to Recurrent Metacarpophalangeal Joint Dislocation: A Case Report

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## ABSTRACT

Acquired traumatic arteriovenous fistula in the hand is rare, and only a few cases have been reported in the literature. It should be considered as a possible complication when there is a persistent palpable lesion after the traumatic swelling in the hand has resolved. We report a case of a rare arteriovenous fistula secondary to recurrent metacarpophalangeal joint dislocation.

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## INTRODUCTION

Acquired arteriovenous fistula (AVF) is rare compared to congenital lesions in the upper limbs, where the former is secondary to penetrating or blunt trauma, surgery, invasive procedures, infection, arterial aneurysm or inflammation between large to medium-sized vessels.<sup>1–3</sup> Most traumatic AVFs are a result of penetrating injury (82%–98%).<sup>4–9</sup> Traumatic vascular injury after fractures, dislocations, or both of the upper limbs is rare, with a reported rate of 0.3% to 6.5%.<sup>5</sup> A careful search of the literature revealed seven upper limb AVFs secondary to blunt trauma: four phalanges,<sup>3,4,6</sup> two thumbs,<sup>7,10</sup> and one wrist.<sup>9</sup> The mechanism of each is shown in Table 1. Common sites for most AVFs are seen in the radial and ulnar arteries; those distal to these are extremely rare.<sup>1,4</sup> It has been postulated that the small caliber of a digital vessel makes a partial disruption difficult, and blunt trauma is more likely to produce a thrombus, whereas a penetrating injury is more likely to sever the vessel.<sup>8</sup>

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## CASE REPORT

A 65-year-old woman was referred with a gradually enlarging swelling over the dorsum of her left hand over the course of a few years with a preceding history of recurrent left third metacarpophalangeal (MCP) joint dislocation. This was associated with a 1 cm swelling on the dorsum of her left hand at the level of the distal third between the third and fourth metacarpal bones, and a palpable thrill. The ultrasound scan confirmed an AVF (Figure 1). Operative intervention was offered because it was enlarging and was becoming symptomatic with an ache.

Under general anesthetic, an incision was made over the dorsum of her left hand (Figure 2). Intraoperative Doppler was used to identify the feeding vessel, and this was then ligated. Total operative time was 30 minutes, and there was minimal blood loss. She was discharged the next day after an uncomplicated recovery. Histopathology confirmed an arterialized vein consistent with the diagnosis of traumatic AVF secondary to repeated dislocation. Her subsequent follow-up at 1 month showed complete resolution of her symptoms.

## DISCUSSION

Hunter was the first to describe AVF clinically in 1757.<sup>10</sup> The presentation of traumatic AVF varies depending on the subtypes, location, and extent of the vessels.<sup>11</sup> Disfigurement, pain, heaviness, edema, arterial insufficiency (paresthesia, pallor, pulselessness, hypothermia, cold intolerance), increased skin turgor, pulsation, and thrills have been reported.<sup>1,4,8,10,12</sup> Complications such as rupture and hemorrhage have not been described in the AVF of digital arteries.<sup>8</sup>

In traumatic AVF of the upper limbs, the progressive dilatation of the feeding artery and vein involved in the hyperdynamic circulation has resulted in reports of late sequelae such as congestive heart failure, proximal arteriovenous dilatation, and the risk of endocarditis.<sup>5,10</sup> Cardiac decompensation may occur gradually over several years because of increased cardiac output secondary to increased flow in the AVF.<sup>12,13</sup> Pain in the hand is often due to the proximity of the digital nerves but may be severe secondary to the steal phenomenon.<sup>1,12,13</sup> AVF may cause sensory disturbances due to the pressure effect on the

**Table 1. Mechanisms of Hand Arteriovenous Fistulas**

Location	Author	Mechanism
Phalanges		
Left middle finger	Kadono et al (2000) <sup>3</sup>	Caught in door
Left index finger	Kadono et al (2000) <sup>3</sup>	Caught in door
Left index finger	Gormus et al (2003) <sup>4</sup>	Caught in door
Left ring finger	Harrison et al (2003) <sup>6</sup>	Crush injury
Thumb		
	Suzuki et al (1980) <sup>7</sup>	Crush injury
	May et al (1984) <sup>10</sup>	(metacarpophalangeal joint laceration and dislocation)
Wrist		
	Verbeke et al (1999) <sup>9</sup>	Volleyball

contiguous nerves, and in addition, it may also exert pressure on other vital structures in the upper limb.<sup>1,12,14</sup> Acute muscle compartment syndrome has been reported in lesions of the arm and forearm, rather than the hand.<sup>12</sup>

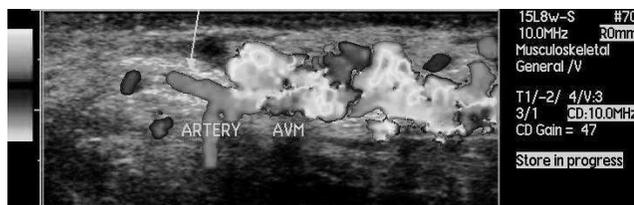
### Investigation

The diagnosis of traumatic AVF is usually clinical.<sup>5,11</sup> Duplex scan is the mainstay investigational method for diagnosis.<sup>5,8,15</sup> Additional tests such as conventional angiography, magnetic resonance imaging, or magnetic resonance angiography may be needed for decisions in more complex cases.<sup>5,11,12,15,16</sup>

### Management

The treatment can be conservative with regular follow-up for asymptomatic lesions and where cosmesis is not an issue.<sup>9</sup>

Surgical ligation excision, with or without reconstruction depending on the adequacy of arterial perfusion, is the most successful treatment for traumatic AVF of the upper limb.<sup>1,4,7,8,14</sup> Early treatment of the traumatic AVF of the upper limb is recommended for symptomatic lesions and avoidance of potential complications.<sup>8</sup> It has been suggested that for lesions in the proximal part of the



**Figure 1. Ultrasound scan showing arteriovenous fistula on the radial aspect of the left third metacarpophalangeal joint. Multiple dilated veins demonstrate arterialized waveforms within the dorsal aspect of the left hand overlying the second and third metacarpal head region.**



**Figure 2. Incision over dorsum of left hand and the arteriovenous fistula isolated.**

finger, those in manual workers and young patients, reconstruction of the artery to restore blood flow should be considered to provide a more physiologic condition and prevent cold intolerance and tissue loss.<sup>8</sup> Ligation of the main feeding artery needs to be performed carefully as it may cause ischemic necrosis of the phalanges distally.<sup>12</sup> This is because proximal arterial ligation will result in redirection of blood flow through the collateral circulation, with a potential reduction in arterial supply to the normal distal peripheral vascular bed, which may precipitate distal ischemia.<sup>13</sup> Incomplete resection and surgical ligation of the main feeding artery will result in a high recurrence rate.<sup>13</sup> There is no place for embolization for AVF in the hand due to the risk of distal ischemia and subsequent necrosis.<sup>2,12-14</sup>

Endovascular techniques with stent grafts, superficial laser ablation, cryotherapy, curettage, and cautery without shunt removal are described in the treatment of congenital lesions and not the traumatic AVFs in the hand.<sup>2,4</sup>

### CONCLUSION

Traumatic AVF of the distal upper limb is rare, and only a few cases have been reported. This is the first known report of a traumatic AVF in the dorsum of the hand secondary to blunt trauma from recurrent MCP

dislocation. It should be considered as a differential diagnosis when there is a persistent palpable lesion after the traumatic swelling has resolved. Complete and early surgical excision is the treatment of choice as it is effective and safe and often provides definitive cure and prevents complications.<sup>4,5,8,14</sup>

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