Diagnosis and management of acute traumatic arteriovenous fistula

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Acute arterial injuries are often complicated by the development of an arteriovenous fistula (AVF). In the acute setting, an AVF may present at the same time as the arterial injury. A case of traumatic AVF in the thigh that presented with normal neurovascular examination findings

is reported. AVF was diagnosed by duplex scan and managed promptly. The authors suggest that duplex imaging together with arteriography, where appropriate, should be performed routinely when penetrating wounds are in close proximity to major vessels despite a normal clinical neurovascular examination.

Key Words: Arteriovenous fistula; Trauma

Acute arterial injuries can often be complicated by the development of an arteriovenous fistula (AVF). In the acute setting, an AVF may present at the same time as the arterial injury. There may be signs of bleeding followed by the development of shock, an expanding pulsatile hematoma, an absence of distal pulses and the onset of neurological deficiency. Careful examination reveals a pathognomonic machinery murmur and thrill over the site of injury. However, diagnosis of this entity may be overlooked if these physical findings are not present. Early diagnosis and prompt treatment of AVFs are necessary to avoid delayed complications.

The present case report describes an occurrence of traumatic AVF and emphasizes the importance of vascular imaging in patients with penetrating injury in the territory of major vessels, even if the clinical vascular examination is normal.

CASE PRESENTATION

A 27-year-old man presented with a stab wound from a kitchen knife in his left thigh and was admitted to the care of general surgeons. His medical history included Perthes disease of the left hip. He was hemodynamically stable on presentation. He had a 2 cm wound on the posterolateral aspect of his mid thigh with no active bleeding. There was no distal neurovascular deficit. The following day, his thigh had a disproportionate swelling in relation to the size of the wound, and he was referred to vascular surgeons. A duplex scan showed an AVF in the distal thigh region. Blood flow in the superficial femoral vein was pulsatile, with high-velocity flow in the distal thigh but low-velocity flow in the proximal superficial femoral vein. Digital subtraction angiography (Figures 1 and 2) confirmed an AVF between the superficial femoral artery and vein in the left distal thigh.

He underwent an exploration and repair of the AVF under general anesthesia. Through a medial incision in the distal thigh, the saphenous nerve was identified and preserved. Proximal and distal control of the superficial femoral artery was achieved and the fistula was identified, dissected and disconnected. Repair of the artery and vein was undertaken by interrupted 5/0 prolene sutures. A 5 mg glyceryl trinitrate

Figure 1) Digital subtraction angiogram showing an arteriovenous fistula between the superficial femoral artery and the superficial femoral vein

patch was placed on the thigh for 24 h. No heparin was used. Postoperative recovery was uneventful and he was discharged after five days. Subsequent duplex scanning confirmed closure of the fistula. At six-month follow-up, the patient was healthy with good distal pulses and no lower limb swelling.

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Figure 2) Angiogram showing a superficial femoral arteriovenous fistula

DISCUSSION

Low-velocity penetrating injuries from a knife or small-calibre missile are one of the major causes of acquired AVF. Only approximately 2% of post-traumatic AVFs resolve spontaneously (1). A traumatic AVF may remain completely asymptomatic with minimal manifestation of symptoms. Clinical signs have often been reported to be misleading in the diagnosis of nearly one-half of all AVFs (2). Mufti et al (3) reported that the presence of palpable peripheral pulses may not exclude a proximal arterial injury, as was the case in our patient. Key signs may be missing or overlooked in these patients with suspected vascular injury, so careful examination is of paramount importance.

Digital subtraction arteriography remains the gold standard for diagnosing AVF, but less invasive tools such as duplex or magnetic resonance imaging allow quick and enhanced accuracy of diagnosis (1,4). Although arteriograms are performed routinely when there is clinical evidence of vascular injury following penetrating wounds, they are not commonly performed in the presence of a penetrating wound with normal vascularity. In the present case, the patient had a normal vascular and neurological examination, and had a duplex scan followed by a digital subtraction angiography. The management algorithm for AVF is shown in Figure 3.

Post-traumatic fistulas should be surgically repaired as soon as possible (5). In the early stages, surgery is easier because there is no scar tissue or collateral circulation to complicate the dissection, and the anatomy is not distorted (6). Furthermore, potential hemorrhage and pseudoaneurysm formation is prevented (7). If our patient had been treated conservatively and

Figure 3) Sequential management algorithm for management of traumatic extremity arteriovenous (AV) fistulas

had not undergone surgery, he would likely have developed a chronic AVF with potential local and systemic changes that may have caused serious complications in the extremity of the injured limb.

Complications of AVFs include arterial and venous dilation proximal to the fistula, leg edema and ulceration (8). Serious complications such as fistula rupture, neuropathy, distal embolus and thrombosis can also occur frequently (9). In the case of longstanding fistula, cardiac overload develops, which may lead to cardiac failure and endocarditis. These changes may not be totally reversible after closure of the AVF and may require further operative intervention with a potentially poor outcome (10).

Early diagnosis and management of traumatic AVFs in the acute setting is recommended, and prevents subsequent complications. Although surgical closure of AVFs remains the gold standard, other treatment options include covered stent and coil embolization. These stents provide a less invasive choice for repairing the fistula, especially in hemodynamically unstable patients (11,12). In cases in which the axial vessels are involved, resection of the fistula and anatomical reconstruction is necessary. Crural arteries can be ligated or treated by percutaneous embolization.

CONCLUSIONS

We suggest that duplex imaging, together with arteriography when appropriate, should be performed routinely when penetrating wounds are in close proximity to major vessels, despite a normal clinical neurovascular examination (Figure 3), to detect AVFs and other occult vascular injuries.

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