Delayed Presentation of Traumatic Popliteal Artery Pseudoaneurysms: a Review of Seven Cases

J. D. Woolgar∗, D. S. Reddy and J. V. Robbs

Durban Metropolitan Vascular Service, Department of Surgery, University of Natal, Durban, South Africa

Objectives: to examine the management and outcome of patients with traumatic popliteal artery pseudoaneurysms with delayed presentation.

Materials: over a 2-year period 7 patients with traumatic popliteal pseudoaneurysms presenting to a tertiary referral unit after a delay of 1 month were reviewed.

Methods: a retrospective review of clinical records.

Results: the median interval between injury and presentation was 1.5 months (range 1–24 months). Penetrating trauma from gunshot wounds was the cause of the initial vascular injury in 6 patients and a stab wound in one. All patients had large pseudoaneurysms of more than 8 cm filling the popliteal fossa with variable degrees of fixed flexion deformity (FFD) of the knee. Severe FFD of more than 40° was noted in 2 patients and 3 others had mild flexion deformities of 10 to 20°. Six patients underwent repair of the pseudoaneurysm. One patient required an above knee amputation due to an infected false aneurysm. There were no deaths or graft related complications. Despite aggressive post-operative physiotherapy only 2 patients were able to completely straighten the leg at the time of discharge.

Conclusions: in patients with neglected popliteal artery pseudoaneurysms, morbidity is associated with the pre-operative degree of fixed flexion deformity of the knee.

Key Words: Popliteal artery; Pseudoaneurysm; Fixed-flexion deformity.

Introduction

Injury to the popliteal artery is well known to be associated with high rates of morbidity and limb loss. Penetrating wounds particularly those from stabs and low-velocity gunshots often lead to the formation of pseudoaneurysms. Usually many of these lesions are detected early and undergo immediate repair. However, delays in diagnosis and management may lead to chronic pseudoaneurysm formation. Most of the experience with popliteal pseudoaneurysms has come from reports detailing military injuries during the major conflicts of the 20th century. In civilian practice chronic pseudoaneurysms of the popliteal artery following trauma are rare and often arise as a result of missed injuries at the time of initial presentation. In our practice it is not uncommon for these to present several months after the initial injury and are often associated with much morbidity particularly when they are associated with contractures and fixed flexion deformities of the knee. This study reviews our experience with neglected popliteal pseudoaneurysms following penetrating wounds and the management options available.

Patients and Methods

Durban Metropolitan vascular service provides two main tertiary referral centers for the whole of the province of Kwa-Zulu Natal. Including certain areas of the Eastern Cape (formally Transkei) it serves a population of 8 to 9 million inhabitants. The Service has a large trauma load particularly from penetrating injuries due to the high incidence of interpersonal violence among the community.

All patients treated by the Durban Metropolitan Vascular Service since 1987 have been prospectively recorded on to a computerized database (FileMaker Pro 3.0; Claris, Santa Clara, CA, U.S.A.). Using information from this Database we conducted a retrospective review of all patients presenting to the Service over a 2-year period between 1998 and 2000 with...
traumatic popliteal artery pseudoaneurysms presenting after a 4-week delay.

A total of 7 patients were identified during the study period. All were male. The median age at presentation was 23 years (range 17–64). The median duration of symptoms prior to presentation was 1.5 months (range 1–24 months). Low velocity gunshot wounds were responsible for the majority of arterial injuries in 6 of the 7 patients. A single patient sustained a stab wound. Six patients were initially treated in rural or primary health care centres with only basic facilities. None of these patients had any formal imaging at the time of presentation and initial clinical findings were unknown.

Results

Details of presenting features and management of each case are summarised in Table 1. All patients presented with a large pulsatile mass greater than 8 cm filling the whole of the popliteal fossa. In 5 patients the infragenicular popliteal artery was involved, although 2 patients presented with false aneurysms of the supragenicular popliteal. None of the patients in the series presented with signs of limb threatening ischaemia and pedal pulses could be palpated in all. Of note was the presence of varying degrees of fixed flexion deformity (FFD) of the knee in these patients (Fig. 1). Severe FFD of 40° was present in 2 patients and 3 others had mild flexion deformities of 10 to 20°. Neurological deficits were present in 4 patients, including sensory impairment of the dorsum of the foot in one and foot drop in 2 patients. A single patient presented with total paralysis of the leg due to an infected false aneurysm.

Treatment

All patients were investigated pre-operatively with duplex ultrasonography and angiography (Fig. 2). Six of the patients underwent exploration and repair of the pseudoaneurysm. In one case a guillotine above knee amputation was performed for an infected popliteal false aneurysm associated with necrotising fasciitis of the thigh.

A medial approach was the preferred exposure in the 6 patients undergoing exploration and repair. In all but one patient a pneumatic tourniquet applied at the proximal thigh was used as an adjunct for providing vascular control. In order to keep the total limb ischaemic time to a minimum, the tourniquet was released as soon as the proximal and distal arterial clamps were applied. Evacuation of haematoma was followed by debridement and repair of the vessels. In 5 patients repair was effected with a reversed saphenous vein graft harvested from the contra lateral limb. In one patient a vein patch closure of the arterial defect was used. At the end of the procedure a gentle manipulation of the knee joint was attempted to improve the range of movement. There were no post-operative graft related complications or deaths in the series.

Outcome

Mean follow-up was limited to 1.5 months (longest 3 months). Following surgery it was noted that in the 3 patients with mild fixed flexion deformity (10–20°) there was immediate improvement in knee function with reduction in the flexion deformity by at least 10°. However, only 2 patients were able to completely straighten the knee joint at the time of discharge despite aggressive physiotherapy. The 2 patients with severe pre-operative flexion deformities (>40°) fared less well despite physiotherapy with only modest improvement in mobility and knee function. Both declined further corrective surgery and at the time of discharge were mobile on crutches. Of the 4 patients presenting with associated neurological deficits, two with mild sensory impairment showed some improvement in the first month following surgery. However, those with peroneal nerve palsies and foot drop showed little if any recovery.

Discussion

Pseudoaneurysms are a well-described complication of popliteal arterial trauma. Although more common following penetrating injuries they have often been described as a result of blunt trauma. Military conflicts have provided much of the experience in the management of these lesions. During World War II, Shumacker reported that popliteal false aneurysms comprised 21 (17.6%) of 119 traumatic arterial aneurysms. In 1975, Rich et al. reported 28 popliteal pseudoaneurysms out of 296 traumatic false aneurysms from the Vietnam Vascular Registry.

In civilian practice, the incidence of traumatic popliteal pseudoaneurysms is small and estimated to be 0–3.5% of all popliteal aneurysms. There have been several case reports in the literature describing these
Table 1. Summary of clinical features and management

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
<th>Case 5</th>
<th>Case 6</th>
<th>Case 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>17</td>
<td>23</td>
<td>64</td>
<td>18</td>
<td>56</td>
<td>56</td>
<td>19</td>
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<tr>
<td>Sex</td>
<td>Male</td>
<td>Male</td>
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<td>Male</td>
<td>Male</td>
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<td>Male</td>
</tr>
<tr>
<td>Site of injury</td>
<td>Infra-genicular popliteal</td>
<td>Supra-genicular popliteal</td>
<td>Infra-genicular popliteal</td>
<td>Infra-genicular popliteal</td>
<td>Infra-genicular popliteal</td>
<td>Supra-genicular popliteal</td>
<td>Infra-genicular popliteal</td>
</tr>
<tr>
<td>Nature of injury</td>
<td>GSW</td>
<td>GSW</td>
<td>GSW</td>
<td>Stab</td>
<td>GSW</td>
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<tr>
<td>Duration (months)</td>
<td>8.5</td>
<td>10</td>
<td>24</td>
<td>1.5</td>
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<td>1.5</td>
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<tr>
<td>Diameter (cm)</td>
<td>15°</td>
<td>45°</td>
<td>Nil</td>
<td>40°</td>
<td>20°</td>
<td>45°</td>
<td>20°</td>
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<tr>
<td>Neurological deficit</td>
<td>Foot drop</td>
<td>Foot drop</td>
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<td>Foot drop</td>
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<tr>
<td>Operative management</td>
<td>Repair with RSVG</td>
<td>Repair with RSVG</td>
<td>Repair with RSVG</td>
<td>Repair with RSVG</td>
<td>Repair with RSVG</td>
<td>Repair with RSVG</td>
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<tr>
<td>Outcome</td>
<td>Able to straighten knee. Persistent foot drop</td>
<td>Improved; residual FFD of 30°</td>
<td>Complete recovery</td>
<td>Improved; residual FFD of 25° with foot-drop</td>
<td>Above knee amputation</td>
<td>Necrotising fascitis. Prolonged ICU stay</td>
<td>Vein patch repair</td>
</tr>
</tbody>
</table>

GSW, gun-shot wound; RSVG, reversed saphenous vein graft; FFD, fixed-flexion deformity.
with pseudoaneurysms of the popliteal artery secondary to penetrating trauma comes from centers in regions with high levels of civilian violence. In our own environment a total of 88 traumatic false aneurysms out of 550 patients with lower limb arterial injuries were seen over a 10-year period. In Northern Ireland, Barros D’Sa reported an incidence of 4.4% for all arteriovenous fistulae and false aneurysms occurring as a result of missile-induced injuries. Many of these lesions occur as a result of missed injury at the time of initial presentation and it is not uncommon for them to present months to years after the initial insult. The potential for traumatic pseudoaneurysms to cause complications is well recognised. Neuropraxias of the brachial plexus are not uncommon as a result of expanding axillary or subclavian arterial pseudoaneurysms. However, there are few if any references in the literature to the disabling fixed flexion deformities associated with popliteal pseudoaneurysms.

In general, pseudoaneurysms arise as a result of a partial laceration of the vessel with escape of blood from the lumen into the surrounding soft tissue. It is still unclear as to the mechanisms involved but progressive expansion of the aneurysm occurs over a varying period that may take several hours or even months. Rich noted that 47% of these patients presented after 30 days.

The popliteal fossa is a relatively confined space anteriorly by the femoral condyles and the proximal tibia and the hamstring and gastrocnemius muscles from above and below respectively. Expansile haematomas in this area take the route of least resistance namely the posterior wall. As successive layers of laminated thrombus and fresh clot fills the popliteal fossa, progressive flexion of the knee occurs to accommodate the mass. Fibrosis and shortening of the knee flexors and cruciate ligaments coupled with joint capsule shrinkage inevitably happens. The end result is a stiff frozen knee joint and a leg that cannot be fully extended.

Repair of the vascular lesion is best performed via a medial approach to the popliteal artery. This allows further extension of the incision and greater exposure of the vessel either proximally or distally should the need arise. The presence of clot and thrombus within the popliteal fossa often results in chronic inflammatory changes and fibrosis of the perigenicular muscles with thickening of the vessel wall in and around the aneurysm sac. This may cause difficulties in the dissection of the vessels in this region and it is for this reason that a proximal thigh tourniquet is recommended as an adjunct in gaining control of...
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References

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