

# Posterior Tibial Artery Pseudoaneurysm following Orthopedic Surgery: a Rare Complication

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## Abstract

Increase in trauma and aging in recent decades has been associated with an increase in orthopedic operations in the limbs and their concomitant iatrogenic vascular complications. Although vascular injuries during orthopedic operations are uncommon, timely diagnosis and treatment is essential. These injuries can occur due to laceration, compression, or traction of the vessels in proximity to bony structures such as vertebrae, hip and knee joints, and long bones. Primary signs are bleeding or ischemia. The best results will be obtained with prompt diagnosis and treatment; otherwise, there is a risk of complications such as pseudoaneurysm or limb loss.

The presented case is a 22-year-old male with a history of right tibial fracture following a motorcycle accident one year before, which was treated with internal plate fixation. Following the operation, an enlarging mass developed in the posterior aspect of his leg. Upon evaluation, it was noted that a screw used for internal fixation had injured the posterior tibial artery and led to tibial artery pseudoaneurysm. Surgical treatment was done. Such a complication has not been reported in the literature. In the presence of even minimal ischemia following bone trauma, vascular evaluation and angiography before any orthopedic operation is critical, and it is recommended that management in such cases be performed in centers where reconstructive vascular surgery is available (*Iranian Heart Journal 2008; 9 (1):55 -60*).

**Key words:** pseudoaneurysm ■ complication ■ internal fixation ■ fractures

Today, with an increase in life expectancy and aging, we are witnessing an increase in traumatic injuries and with them, elective and urgent orthopedic operations such as internal fixation of long bones with plates, knee and hip arthroplasties, and vertebral disc operations are on the rise. Although vascular injuries following these operations are uncommon, their complications are significant and their morbidities such as limb loss and long-term functional deficits are disastrous.

Other factors have a less common role in these injuries.<sup>2</sup> Attention to the possibility of their occurrence and prompt diagnosis and treatment are important in decreasing the morbidity and complications of vascular injuries during orthopedic operations.<sup>3</sup>

### Case presentation

A 22-year-old male sustained a right tibial bone fracture in a motorcycle accident in June, 2005 (Fig. 1). Internal fixation with a tibial plate and screws was performed.

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Following the operation, a pulsating mass developed in the posterior leg, and it gradually enlarged to reach a final diameter of 15 by 20 centimeters. This painful and huge mass led to limitation in movement of his knee and toes.



**Fig. 1.** Large, pulsating mass was apparent in the patient's right calf.

Angiography was performed one year after the operation, and pseudoaneurysm of the posterior tibial artery was diagnosed (Fig. 2). Following diagnosis, the patient was scheduled for operation. During the operation, direct penetration of the artery with a screw was detected as the etiology (Figs. 3, 4). Resection of the pseudoaneurysm and repair of the arterial wall was performed, and the patient was discharged 3 days after the operation. In the follow-up one-month after surgery, there was no complication and no deficit in motor and sensory function in the extremity (Fig. 5).



**Fig. 2.** Angiography demonstrating leak of dye into the false aneurysm cavity from the posterior tibial artery.



**Fig. 3.** Surgical photo depicting pseudoaneurysm.



**Fig. 4.** Pseudoaneurysm contents



**Fig. 5.** Postoperative view

## **Discussion**

### **Literature review**

In a retrospective study by Wilson and colleagues from 1997 to 2002, 27 vascular injuries due to orthopedic surgery were reported, with an incidence of 0.005 percent. The most common operation was knee arthroplasty, followed by total hip arthroplasty and wrist reconstruction, and the least common was fixation of long bone fractures. In 62 percent, there were clinical signs of acute ischemia documented with Doppler flow assessment, 14 percent bleeding during orthopedic surgery, 14 percent non-healing, and 10 percent edema of the extremity. Diagnosis of vascular injury was delayed in 25 percent of cases. Arterial thrombosis was the most common abnormality (78%); avulsion laceration (11%) and pseudoaneurysm (11%) were other vascular abnormalities seen. Venous injury was seen in only one patient. Treatment included venous bypass grafting in 56 percent, primary repair in 11 percent, and thrombectomy and thrombolysis in 7 percent. One case of death due to septic shock and three cases of limb loss (14%) were reported.<sup>4</sup> In a retrospective study by Freischlag and colleagues in California from 1978 to 1988, 11 vascular injuries due to orthopedic surgery were reported. Two cases were due to laminectomy, 3 hip arthroplasties, 3 internal fixations of lower limb fractures (2 tibial

plateau fractures and one comminuted fracture of the distal femur), 2 closed fixations of humeral fractures, and one was due to flexion contracture release of the hip. Arteries involved were the following: 3 iliac, 3 popliteal, 2 brachial, 1 femoral. There were also two cases of iliac vein injuries. Treatment was primary repair in 4 cases, saphenous vein bypass in 5, venous patch in 1, and primary venous repair and Greenfield filter placement in the inferior vena cava in 1 case.<sup>5</sup>

In the study and review of literature by Papadoulas and colleagues in 2002 in Greece, 98 cases of vascular injuries following lumbar disc operations were reported with an incidence of 1-5 in 10000. The most common vascular injury was from L4-L5 disc surgery. Primary presentation was shock due to injury to retroperitoneal vessels. Primary complications were pseudoaneurysm and arteriovenous fistula. The preferred method of treatment of late complications (pseudoaneurysm and arteriovenous fistula) was suture of the arterial lumen internally together with interposition graft. Recently, endovascular techniques are recommended and may be accompanied with a decrease in morbidity and mortality.<sup>6</sup>

In the study by Stone and colleagues in 2006 in Virginia University, thrombin injection under ultrasonography guidance was mentioned as the treatment of choice for iatrogenic femoral pseudoaneurysm.<sup>7</sup>

Al-Whouhayb and colleagues in London reported the first case of pseudoaneurysm of the profunda femoris artery due to orthopedic operation of a femoral bone fracture in 2005.<sup>8</sup>

Mendes and colleagues in 2005 in Spain reported cases of endovascular treatment of vertebral artery pseudoaneurysm following transarticular posterior internal fixation.<sup>9</sup>

Hamilton and colleagues in 2004 in San Francisco reported a case of pseudoaneurysm of the deep plantar artery following arthrodesis due to hallux valgus (one month after operation). They treated it with the

ligation of the artery and resection of the pseudoaneurysm.<sup>10</sup>

Adovasio and colleagues in 2003 in Italy reported two cases of external iliac artery pseudoaneurysm following surgery of infected hip prostheses. Both were treated successfully with endovascular methods.<sup>11</sup>

Ozdemir and colleagues in 2003 in Turkey reported a pseudoaneurysm of the dorsalis pedis artery due to iatrogenic orthopedic injury that was treated successfully with artery ligation and pseudoaneurysm resection.<sup>12</sup>

In the study by Afshar-Fard, Mozaffar, and Fadaee-Naeni in 2004 in Shahid Beheshti University in Iran, among 106 cases of femoral artery pseudoaneurysm, 29 cases (28%) were due to diagnostic and therapeutic interventions (21 diagnostic and 8 therapeutic). There was hypertension in 24 and diabetes in 11 cases. In 10 cases, arterial ligation was performed (according to the position of the pseudoaneurysm); and in 19 cases, primary repair of the artery was performed. In none of 29 cases was there a need for later amputation. Six cases had ischemia following ligation; they were treated with anatomical bypass in 5 cases and extra-anatomical bypass in one case.<sup>13</sup>

## Results

The most common mechanism of vascular injury following orthopedic operations is arterial laceration, followed by traction injury of the artery.<sup>4</sup> The most common presentation of vascular complications is signs and symptoms of acute ischemia, including pain, pallor, and paresthesia together with decreased or absent pulses or a significant change in Doppler signals. Other signs include perioperative bleeding, non-healing wound, and edema of the extremity.<sup>5</sup> Diagnosis of vascular injury may be made after some period of delay following surgery.<sup>4</sup> The most common vessel injured during orthopedic operations in the extremities is the popliteal artery in 44 percent of cases.<sup>4</sup>

Thrombosis and occlusion are the most common arterial complications. Other complications include laceration, avulsion, and pseudoaneurysm.<sup>4</sup> In most cases, only one artery is involved.<sup>1</sup> The risk of iatrogenic complications increases significantly in reoperations.<sup>5</sup>

In the study by Wilson and colleagues, although managements were varied according to type and location of injury, most patients (71%) needed bypass grafting and 47 percent needed complementary procedures (such as thrombectomy in 20%, fasciotomy in 20%, endarterectomy in 13%, and toe amputation in 7%). Later complications including peroneal nerve paralysis, necrosis, and amputation were more common if there was a delay in diagnosing vascular complications due to orthopedic operations.

Although rare, vascular complications can occur following emergency or elective orthopedic operations. Delay in diagnosis is the first factor responsible for later morbidity and mortality. The orthopedic surgeries associated with vascular injuries are mostly spinal and hip operations and fracture/dislocation repairs of long bones of the limbs due to the anatomic position of the arteries and/or traction applied during these operations.

Previous risk factors in patients such as peripheral vascular disease, hypertension, diabetes, intermittent claudication, smoking, and previous vascular operations have a major role in the occurrence or fate of these vascular injuries.

Manipulation of atheromatous vessels during operations can lead to intimal disruption and progress toward thrombosis. Previous operations or injuries near the area of orthopedic operations increase the chance of vascular complications. Vessel entrapment in scars or contractures and improper dissection in previous surgery are among further causes of vascular complications. Prompt diagnosis of vascular injuries during operation may be difficult because of bleeding during orthopedic surgeries, hypothermia and

vasoconstriction. So, a careful examination of the patient immediately following surgery is important.

The other mentioned mechanism for vascular injuries during orthopedic operations is the thermal injury of adjacent vessels due to orthopedic techniques, including the use of methyl methacrylate, which can lead to thrombosis and ischemia.<sup>14</sup> The mechanism of injury during the fracture/dislocation of the extremities is mostly due to the fracture itself, closed or open reduction maneuvers, use of internal fixators, displacement of sharp fractured segments of bone, or hematoma following fracture that disrupts anatomy and increases the chance of iatrogenic vascular injury.<sup>15</sup>

There has thus far been no report of direct vascular injury from a screw, which renders the case presented in this article interesting.

### Conclusion

Vascular injuries following orthopedic surgeries can occur following laceration, compression, or traction in the areas adjacent to vessels in the surgical field. There has been no report of direct screw penetrating injury of vessels. In the presented case, this rare occurrence is reported and it can be added to the well-known etiologies of vascular injuries during orthopedic operations. Rapid diagnosis and treatment can lead to favorable long-term outcomes, but delay can lead to irreversible consequences.

Angiography can be vital in the diagnosis of cases of mild ischemia. In the presence of risk factors, the authors recommend vascular evaluations before orthopedic surgery to decrease vascular complications.

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