A 51-year-old man was transported to the emergency department by emergency medical services after being struck by a motor vehicle. Physical examination showed an edematous, painful left knee with predominant superior medial swelling. He was neurovascularly intact distally. Radiographs showed a Schatzker type II tibial plateau fracture and heterotopic ossification over the medial distal femur (Figure 1), and laboratory test results revealed mild anemia. A computed tomography scan showed the fracture, hemarthrosis, and moderate soft tissue swelling.

During the first night, his hematocrit dropped from 25.1% to 21.1%. The next morning, he reported increased pain. Serum fracture blisters appeared over the medial proximal tibia, and swelling had progressed to his ankle. Joint aspiration removed approximately 100 mL of hemorrhagic fluid and provided moderate pain relief.
Over the next 3 days, the patient’s hematocrit continued to decrease. Serous fracture blisters spontaneously drained, and a large compressible, nonpulsatile hematoma underlying them and extending approximately 5 cm superiorly up the thigh became apparent. Because of its size and the patient’s falling hematocrit, a vascular insult was suspected.

A computed tomography angiogram revealed a 17×12×5-cm hematoma (Figure 1) with a pseudoaneurysm arising from a distal branch of the descending geniculate artery, displacing the vastus medialis and adductor group of muscles laterally. The patient promptly underwent selective embolization by interventional radiology and expansion of the hematoma was successfully halted. The previously noted heterotopic ossification was immediately adjacent to the hematoma and a direct blow to this area may have caused the arterial injury in a pincer-like fashion.

The patient was brought to the operating room the following day because of nonviable skin overlying the hematoma. The hematoma was evacuated and the wound was debrided until viable tissue appeared at the margins. The entire wound measured 14×9 cm and was full thickness to fascia (Figure 3). A knee-spanning external fixator was applied for provisional stability. The wound was copiously irrigated with sterile saline, and negative-pressure wound therapy (V.A.C. Therapy System; Acelity, San Antonio, Texas) was applied.

The patient underwent irrigation and debridement twice more, followed by external fixator removal, open reduction and internal fixation, and split-thickness skin grafting. His remaining hospital course was uneventful. He returned to the emergency department multiple times for recurrent intoxication and the authors were thus able to obtain follow-up. At 6 months, there was no evidence of wound breakdown. His knee range of motion was 0° to 100°, and he only reported mild intermittent knee pain. He was neurovascularly intact distally, and radiographs showed complete healing of the fracture.

**Discussion**

Pseudoaneurysms are well documented in the literature. Although they can
arise throughout the vasculature, they are more prevalent in the lower extremities.\textsuperscript{1,2} After blunt trauma, as in the current patient, incomplete damage to the arterial wall gives rise to a hematoma often in the vicinity of impact. High-energy injuries—most often encountered during wartime—can result in lesions distant from the site of impact because of dissipation of the high-energy cavitation wave along the length of the extremity.\textsuperscript{1} Pseudoaneurysms have been recorded in the setting of both penetrating and blunt trauma with and without fracture,\textsuperscript{2,3} arthroscopy,\textsuperscript{4} internal and external fixation,\textsuperscript{5,6} total knee arthroplasty,\textsuperscript{7,8} and suction drainage.\textsuperscript{9} Their incidence and multiple etiologies warrant careful consideration for patients in the acute setting with prolonged pain and progressive swelling, especially when there is ongoing blood loss.

What makes the current case unique is the associated fracture pattern and origin of the pseudoaneurysm. To the authors’ knowledge, this is the first documented pseudoaneurysm arising as a direct complication of a tibial plateau fracture. Furthermore, geniculate artery pseudoaneurysms are extremely rare. Most arise as complications from total knee arthroplasty,\textsuperscript{7,8} while the few other cases have been documented following blunt force trauma\textsuperscript{10,11} and internal fixation.\textsuperscript{12}

The most concerning feature of pseudoaneurysms is their often silent presentation. Rich et al\textsuperscript{2} found that the diagnosis can be delayed from 1 to 30 days. Although more than 80\% present as a pulsatile mass with an audible bruit,\textsuperscript{2,3} more difficult are those—like the current pseudoaneurysm—that present as a subtle, slowly expanding mass. In such cases, clinicians have misdiagnosed these as soft tissue sarcomas.\textsuperscript{13} Other case studies have revealed similar lesions in which late diagnoses resulted in peripheral neuropathy,\textsuperscript{14} pathological fractures,\textsuperscript{15} and—as in the current case—occult hemorrhage.\textsuperscript{2}

Although mass effect is of significant concern, resultant vascular compromise or venous obstruction distal to the lesion is uncommon. Julien et al\textsuperscript{7} described a case of a superior medial geniculate artery pseudoaneurysm mimicking a deep venous thrombosis after total knee arthroplasty. Although there are no documented cases of lower extremity pseudoaneurysms directly causing deep venous thromboses, their similar symptomatology warrants careful differentiation. In the current case, the mass effect of the large hematoma damaged the overlying skin and the resulting blood loss caused a profound anemia, which suggested the underlying diagnosis.

The 2 standard diagnostic imaging methods are Doppler ultrasonography and contrast angiography. For injuries in which the vascular lesion is located out of ultrasound range or severe disruption of overlying soft tissue architecture precludes effective Doppler resolution, contrast angiography is the preferred method.\textsuperscript{16} Although readily available, testing the ankle-brachial index would only be expected to be helpful in rare cases with compromised distal circulation and is therefore not routinely recommended. Previous cases have shown that selective embolization provides optimal hemostasis without compromising surrounding or collateral flow.\textsuperscript{17} The current patient did not have limb ischemia, and viable tissue was easily found at the margins of the soft tissue wound. Thus, the authors’ debridement could be limited to the immediate area overlying the hematoma.

**CONCLUSION**

Because of the associated complications following a missed diagnosis, prompt diagnosis and treatment is crucial. The current case illustrates that these lesions can arise from relatively benign fracture patterns and from uncommon vessels. In the setting of acute trauma, a worsening anemia, and no obvious source of blood loss, vascular imaging is warranted.

**REFERENCES**


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*Figure 3: Intraoperative photographs of the left medial knee showing the impending skin necrosis (A) and immediately after the evacuation of the hematoma (B).*


