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Case Report

# Spontaneous pseudoaneurysm of profunda femoris artery following a musculoskeletal sports injury ☆

*Carly Troupe, BS*[a], *Charles Kitley, MD*[b,*]

[a] *University of Missouri School of Medicine, Columbia, MO 65212, USA*
[b] *Department of Radiology, University of Missouri, Columbia, MO 65212, USA*

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ABSTRACT

Pseudoaneurysms are relatively common entities encountered in clinical practice; however, pseudoaneurysms of the profunda femoris artery are rarely reported in literature. Due to the nonspecific presentation of pseudoaneurysms, diagnosis can be difficult and delayed. We report a case of a 14-year-old athlete diagnosed with spontaneous pseudoaneurysm of profunda femoris artery following a sports injury. Presentation, diagnostic workup, treatment, and complications are described.



## Introduction

Pseudoaneurysms are false aneurysms that involve injury to 1 or 2 layers of the affected vessel's wall [1]. Anatomically, arteries have 3 distinct layers which compose their wall: the tunica intima, tunica media, and tunica adventitia [2]. Pseudoaneurysms occur when there is injury to the arterial wall resulting in an abnormal aneurysmal outpouching of the artery, usually bound by only the intact outer tunica adventitia layer [1]. True aneurysms conversely involve weakening of all 3 layers of the arterial wall [1]. Pseudoaneurysms often present as a painful, pulsatile mass at the site of trauma with a bruit on auscultation or may alternatively be asymptomatic [1]. Complications include rupture, thrombosis, and ischemia of distal structures [1]. Imaging used to diagnose pseudoaneurysms most commonly consists of duplex ultrasonography (US) or computed tomography angiography (CTA) [1]. Occasionally, however, additional imaging modalities must be used to identify or delineate an aneurysm which is not observed with traditional methods. Our patient presented with left hip pain and was subsequently diagnosed with pseudoaneurysm of the profunda femoris artery only after imaging with angiography.

## Case report

We present the case of a 14-year-old athlete who presented initially with left hip pain of 1-week duration. The patient was

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* Corresponding author.
E-mail address: kitleyc@health.missouri.edu (C. Kitley).

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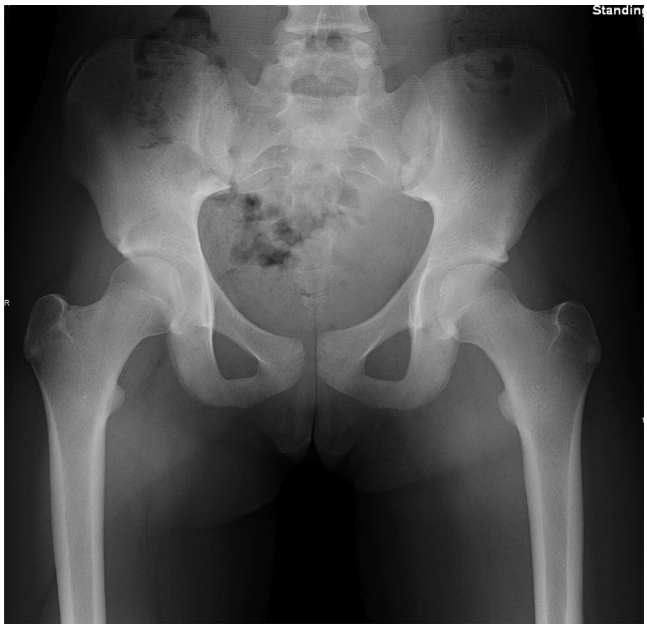


**Fig. 1 – AP pelvis radiograph without bony or soft tissue abnormalities.**

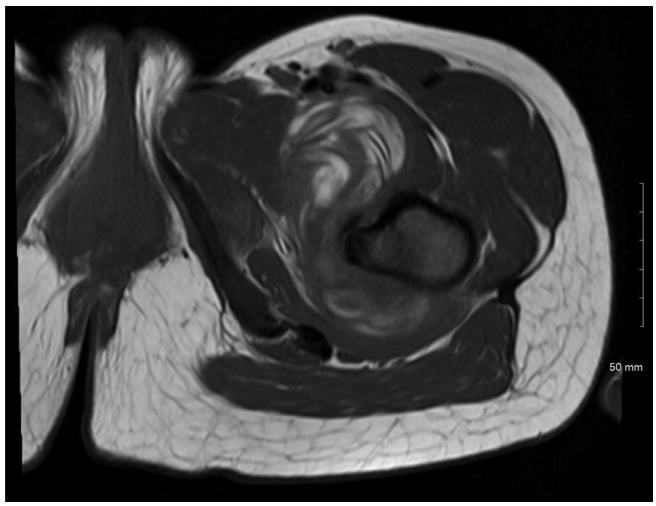


**Fig. 2 – Axial T1 image demonstrates a heterogeneous T1 mass in the left ischiofemoral space consistent with a soft tissue hematoma.**

at bat during a softball game when a sudden pop was felt in her left hip/inguinal region while swinging. The patient was immediately unable to ambulate and required assistance leaving the field. The patient's pain improved with rest over the next week, however recurred when they attempted to play softball again. The patient then presented to orthopedic clinic for evaluation. On exam, the patient's pain was localized to the left hip with no radiation, numbness, weakness, or paresthesia's but an antalgic gait was noted. Physical exam showed tenderness to palpation along the left hip flexor with intact strength and sensation to touch in the left lower extremity. Plain radiographs of the pelvis and hip were negative for any obvious soft tissue or osseous abnormalities (Fig. 1). At that time, the patient was diagnosed with strain of the flexor muscles of the left hip by orthopedics. Two weeks later, the patient noted persistent pain, and she returned to the orthopedic clinic. Magnetic resonance imaging (MRI) of the hip was ordered which showed an 8.8 × 4.6 × 9 cm mass at the iliopsoas myotendinous junction with imaging characteristics consistent with a hematoma, but no obvious source (Fig. 2). Physical therapy was recommended and follow up in clinic with repeat imaging in 3 weeks was ordered. Over the following weeks the patient had a few additional episodes of severe acute left hip pain associated with ambulation that resolved with acetaminophen and cyclobenzaprine.

Three weeks later, follow-up MRI noted increasing size of the suspected hematoma, and further work up was pursued. Coagulation disorders were excluded after obtaining labs and orthopedic oncology was consulted for evaluation and they did not note any features concerning for malignancy on imaging or exam. The patient was recommended to continue physical therapy and pain medications as needed with rest and further conservative measures. Over the following month, the patient continued to have intermittent pain and persistence of the hip mass, so interventional radiology (IR) was consulted. A percutaneous drain was requested to be placed directly into the hematoma as it was felt at that time that the hematoma was the primary cause of the patient's ongoing discomfort, and CT guidance was used to place a drain laterally into the hematoma via an approach which would minimize potential injury to major vessels (Fig. 3). In addition to the drain placement, 20 mg of tissue plasminogen activator (tPA) was injected into the drain to aid with lysis of the accumulated hematoma. The next morning the patient presented to the emergency department due to a syncopal episode after ambulating following drain placement the night before. CTA showed no vascular abnormalities or contrast extravasation during either arterial or venous phases, and only a slight decrease in size of the hematoma from prior MRI. Lab workup at that time revealed the patient's hemoglobin to be 7.4 g/dL compared with 12.7 g/dL prior to the procedure the preceding day, with a total of 2.5 L of sanguineous output since placement. The drain was clamped at that time and the patient was admitted to the hospital for observation overnight with discharge the following day after remaining stable during her overnight admission. The drain was then removed 3 days later. In subsequent days, the patient began having increasing pain again in the left groin and felt a fluctuant mass in the same region. IR was then consulted for evaluation to perform angiography to access for a cause of the hematoma reaccumulation given lack of focal vascular findings on all prior noninvasive imaging.

After discussion of the procedure with the patient and her parents, the patient was brought to the IR suite and her right common femoral artery was accessed and a 5F vascular sheath (Terumo, Somerset, NJ) was placed. The contralateral left common femoral artery was catheterized using a 5F Kumpe catheter (Angiodynamics, Latham, NY) and diagnostic arteriography was performed of the proximal left common femoral, superficial femoral, and profunda femoral arteries which revealed brisk filling of a previously unidentified 1.7 cm pseudoaneurysm arising from a small muscular branch aris-


**Fig. 3 – Axial CTA with drain in ischiofemoral hematoma. No enhancing aneurysm noted from adjacent arterial vasculature.**

**Fig. 4 – Digital subtraction arteriogram demonstrates a 1.7 cm saccular pseudoaneurysm arising from a branch of the deep femoral artery.**

ing off of the profunda femoral artery, along the inner thigh adjacent to the site of the patient's (Fig. 4).

Given the location of the pseudoaneurysm, a 2.4F Progreat microcatheter (Terumo) and 0.016 Fathom microwire (Boston Scientific, Marlborough, MA) were used to select the vessel supplying the pseudoaneurysm, and additional angiograms were performed to evaluate the anatomy of the vessel and aneurysm origin (Fig. 5). After determining the injured vessel supplied only a small muscular territory of the inner thigh, the vessel was embolized successfully using 1 cc of a Gelfoam slurry along with two 2 mm × 4 cm Azur microcoils (Terumo). Follow-up angiography revealed no further filling of the pseudoaneurysm from either the feeding artery or surrounding branches arising from the profunda femoris or superficial femoral artery (Figs. 6 and 7). The catheters were then removed, and after achieving hemostasis at the access site using manual compression the patient was monitored for 6 hours prior to discharge to home while remaining in stable condition after successfully ambulating. In the following weeks after the procedure, the patient had intermittent left inguinal/groin pain that steadily improved. The patient underwent physical therapy and follow up MRI illustrated diminishing size of hematoma (Fig. 8). No postprocedural complications were noted. The patient was able to return to school and eventually sports with no limitations in physical activity.

## Discussion

Spontaneous pseudoaneurysms of the profunda femoris artery due to musculoskeletal sports injuries are uncommon but have been reported in the literature. Most reports of profunda femoris pseudoaneurysms are secondary to femoral fractures, iatrogenic complications following orthopedic procedures, or due to blunt traumatic injuries [3,4]. Many times

**Fig. 5 – Subselective digital subtraction arteriogram shows a small muscular branch arising from the deep femoral artery which supplies the pseudoaneurysm.**

diagnosis of these pseudoaneurysms is delayed due to non-specific symptoms described by patients. Reported symptoms range from persistent hip pain, thigh swelling, presence of a pulsatile mass, unexplained anemia, or are they are otherwise asymptomatic [1,3,4]. Pulsatility of the aneurysm may be difficult to appreciate on exam due to surrounding soft tissue hematoma or thrombus formation within or around the pseudoaneurysm itself [3]. A high index of suspicion must be realized to avoid a delay in diagnosis and treatment.

As seen in this case, the definitive diagnosis of a profunda femoris pseudoaneurysm often follows a prolonged clinical course. Duplex US is commonly the first imaging modality utilized for workup and it has been noted to have over 90% sensitivity in diagnosing pseudoaneurysms [3,5]. If US is inconclusive or negative and there is still a high index of suspicion, then CTA is generally performed to aid in visualization and treatment planning [3,5]. In the case of our patient, there was initial suspicion for a musculoskeletal injury which prompted MRI evaluation. MRI revealed a mass presumed to be a hematoma, but no evidence of a pseudoaneurysm was noted despite the use of IV contrast. Later during the workup, a CTA was obtained to further evaluate for vascular injury, but that exam was negative as well. Both of these imaging modalities did not reveal a pseudoaneurysm, yet the patient continued to be symptomatic. An angiogram was then pursued which revealed our final diagnosis of pseudoaneurysm.

Management and treatment of pseudoaneurysms depend on their size and location. In the case of pseudoaneurysms of the profunda femoris artery, endovascular treatment is typically preferred [3,5]. In hospitals that do not have access to endovascular specialists, pseudoaneurysms of large size, or pseudoaneurysms incapable of being embolized, open surgical repair or US-guided compression can be utilized [5]. Endovascular therapies include US-guided thrombin or *N*-butyl cyanoacrylate (NBCA) injections, endovascular stent insertion across the aneurysm neck, or coil embolization as demon-

**Fig. 6 – Subselective digital subtraction arteriogram following embolization with Gelfoam and microcoils without evidence of residual pseudoaneurysm enhancement.**

**Fig. 7 – Postembolization digital subtraction arteriogram of the left proximal leg without evidence of residual pseudoaneurysm enhancement.**

strated in this case [3–5]. The success rate of the different therapies is important to consider and have varied success rates according to the literature. US-guided compression alone is reported to have a success rate of 63%-88% [6], while US-guided thrombin injection and NBCA injection have success rates of 93%-100% and 90%-94%, respectively [7–10]. Stent placement is reported to have greater than a 90% success rate, but stent patency after placement varies throughout literature [12,13]. The success rate of endovascular coil embolization is reported to be 93% [7,11].

Complications of pseudoaneurysms include a risk of rupture resulting in anemia and possible exsanguination [1,3]. Bleeding into surrounding tissues also poses risk of developing compartment syndrome if not quickly recognized and controlled [1,3]. Pseudoaneurysms can also compress the adjacent femoral vein which increases the risk for development of subsequent deep vein thrombosis [1,3]. Another complication is experiencing a distal embolic event resulting from thrombus which can form in the pseudoaneurysm lumen migrating into the adjacent artery which can result in acute limb ischemia [1,3]. AV fistula formation is also a rare but potential complication of untreated pseudoaneurysms [3].

## Conclusion

Recognition of profunda femoris pseudoaneurysms following a musculoskeletal sports injury can be difficult to diagnose as illustrated in our patient. Patient presentations due to pseudoaneurysm formation can vary significantly, and etiologies of pseudoaneurysm formation can differ significantly due to mechanism of injury. Profunda femoris pseudoaneurysms as a consequence of acute trunk and hip torsion is one potential

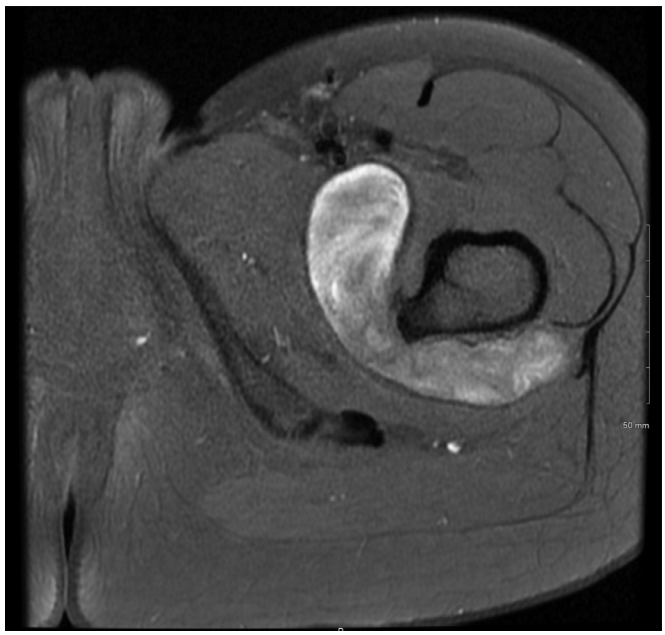

**Fig. 8 – Post-treatment axial fat-saturated T1-weighted MRI shows decrease in size of the previously visualized ischiofemoral space hematoma.**

etiology as described. To our knowledge, this is a rare etiology. Imaging workup including US, CTA, and angiography may be required for accurate diagnosis, and endovascular treatments are the main stay of therapy when available. Various complications can occur if left undiagnosed to include rupture, embolization, venous compression, and ischemia. We hope that this case illustrates a rare but unique etiology of pseudoaneurysm formation, the difficulties of diagnosing pseudoaneurysms in certain vascular territories, and a treatment approach that can be utilized in most similar cases of profunda femoris artery pseudoaneurysm.

## Patient consent

Written, informed consent was obtained from the patient for publication prior to submission of this manuscript.

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