

Ruptured Pseudoaneurysm of Branch of Profunda Femoral Artery during Revision Total Hip Arthroplasty: a Case Report

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ABSTRACT

A ruptured pseudoaneurysm is a rare but potentially fatal complication during revision total hip arthroplasty. We report a case of a 46-year-old female with a rupture of a pseudoaneurysm at the branch of the left profunda femoral artery during revision total hip arthroplasty. The patient presented with dislocation of the left total hip arthroplasty, which failed closed reduction. During the revision surgery, a massive pulsatile bleeding occurred, which required an emergent vascular surgeon consultation to repair the ruptured pseudoaneurysm. It was later confirmed to be located at the branch of the left profunda femoral artery. Although rare, we recommend performing pre-operative CT angiography and consulting with a vascular surgeon before attempting revision total hip arthroplasty in patients with atypical symptoms, such as unusual thigh swelling and unexplained anemia.

KEYWORDS:

profunda femoral artery, revision total hip arthroplasty, rupture pseudoaneurysm

INTRODUCTION

With more than 1 million procedures performed worldwide, total hip arthroplasty (THA) is considered one of the most common orthopedic procedures¹. The total number of procedures performed each year is expected to increase for both primary and revision THA²⁻³. Vascular injury following hip arthroplasty is a devastating complication that results in patient morbidity and mortality. There is a reported incidence of vascular injury of 0.04% for primary THA and even higher at 0.19% for revision THA⁴. Pseudoaneurysms are a rare subset of vascular complications caused by damage to vessel wall integrity, leading to the development of a compartment of blood-fed arterial structure

that is not enclosed by the arterial wall⁵. In this article, we present a case of pseudoaneurysm rupture of the profunda femoris artery (PFA) during revision THA.

CASE REPORT

A 46-year-old female was referred to our hospital with an irreducible dislocation of her left THA. One year prior, she had been in a severe motor vehicle accident and was diagnosed with a close fracture of the left pelvis and acetabulum with posterior hip dislocation. She underwent open reduction and internal fixation with plates and screws at the left acetabulum and closed reduction with internal fixation with sacroiliac screws at her left pelvic. Three months after

the index operation, she continued to experience pain in her left hip. The hip joint aspiration and follow-up radiograph showed infection of her left hip. She underwent multiple debridements and implant removal and received antibiotics. At a 1-year follow-up after debridement, her clinical and laboratory findings showed improvement of the infection, and she was referred to our arthroplasty unit for a THA of her left hip. Three months prior to her current presentation, she underwent an uneventful hybrid THA (figure 1) and was sent to a rural hospital for easier follow-up care and post-operative physical therapy.

On her current presentation, she reported experiencing sudden pain in her left hip while attempting to move from the bed. She was then transferred to a rural hospital, where an orthopedic physician diagnosed her with a left THA dislocation (figure 2) but failed to perform a closed reduction of the hip. Subsequently, she was referred to our hospital for further evaluation and management one week later.

Upon arrival, physical examination showed shortening and swelling of her left leg, but distal neurovascular appeared to be intact. Plain radiographs showed a posterior dislocation of the left THA, with no subsidence of the femoral stem and acetabular cup position remaining the

same as on the early postoperative radiograph. Her hemoglobin level was 9.4 g/dL, white blood cell count was 8,800 cells/cumm and platelet count was 388,000 cells/cumm. A CT scan of her hip revealed retroversion of the femoral stem, which could be the cause of the dislocation. After optimizing the patient's condition and preoperative planning over ten days, we decided to perform an open reduction and femoral stem revision, the patient was placed in a lateral decubitus position. The skin was incised through the previous surgical scar from the index THA, and a lateral approach was performed. The displaced femoral head was visible, and a large hematoma was found distal to acetabular cup (figure 3). During hematoma evacuation, a massive pulsatile bleeding had occurred. A vascular surgeon was immediately consulted intraoperatively, the suspected pseudoaneurysm at branch of profunda femoris artery was found and repaired. After successful repair, the hip was reduced and distal vascular flow was evaluated by ultrasound, which showed good blood flow. Total estimated blood loss was 9,000 ml, six liters of crystalloid, five units of packed red cells and six units of fresh frozen plasma were required to resuscitate the patient intraoperatively. The patient was transferred to the ICU for close monitoring for 2 days.



Figure 1 Early postoperative radiograph for left hybrid total hip arthroplasty



Figure 2 Left total hip arthroplasty dislocation 3 months after index total hip arthroplasty

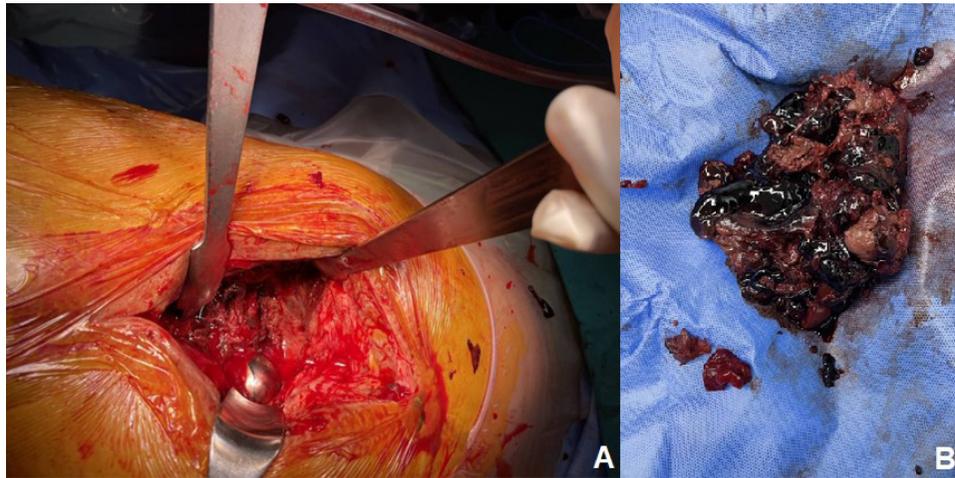


Figure 3 The displaced femoral head was found intraoperative (A). A large hematoma was located distal to acetabular cup and subsequently evacuated (B).

Computer Tomography Angiography (CTA) of the lower limbs showed a 0.5 x 0.7 cm pseudoaneurysm at the branch of the left profunda femoral artery (figure 4). Two weeks after the operation, the patient was stable and allowed to walk only by toe-touch with a walking aid, and she was discharged from the hospital. At the 2-month follow-up, the patient's clinical condition had improved. She could walk with a walking aid without pain or abnormal swelling in her thigh, and her hip remained stable. An appointment was made for a 6-month follow-up to evaluate the hip stability and CTA of the lower limbs.

DISCUSSION

Vascular injury during THA is considerably rare but can cause devastating complications such as persistent limb ischemia, amputation, and death⁶. These vascular injuries consisted of thromboembolic complications, vessel lacerations, arteriovenous fistulas and pseudoaneurysms⁷. Pseudoaneurysms occur after a localized arterial wall injury, which causes local blood to pool in the injured area and become enclosed by a pseudocapsule^{5,8}. This pseudocapsule is an abnormal thin vessel wall that is prone to rupture. Several mechanisms are reported to be a cause of the development of pseudoaneurysms after THA. Direct injury caused by instruments



Figure 4 Postoperative Computer Tomography Angiography of the lower limbs showed a 0.5 x 0.7 cm pseudoaneurysm at the branch of the left profunda femoral artery. No evidence of active contrast extravasation.

such as retractors, scalpels, or orthopedic hardware, including protruding screws, extruded cement, or component migration, can result in a small puncture to the arterial wall, leading to pseudoaneurysm formation. Indirect injury often occurs due to stretching injuries of the atherosclerotic artery vessels, causing intimal tears in the artery. This can happen during forceful traction in THA operations^{6,9}.

Injury to vessels during THA has been reported, with the most commonly affected vessels being the common femoral artery, external iliac artery, and profunda femoris artery⁶. Intrapelvic migration of the acetabular component and protruding screws has been documented as a potential cause of pseudoaneurysm in the external iliac artery. Meanwhile, pseudoaneurysms in the common femoral artery and profunda femoris artery frequently occur during femoral preparation, implant migration around the femur, and forceful manipulation of the leg during surgery. Harper et al. reported a patient with Profunda femoris pseudoaneurysm following revision total hip arthroplasty. Patient in his report presents with thigh pain, swelling, and symptomatic anemia which has been evaluate with CT scan and conventional angiography.

The patient successfully treated with coil embolization and hematoma evacuation. The authors believe that the injury to the profunda femoris artery may have occurred during the anterior approach at the time of the patient's index THA. Retractor placement, hyperextension during preparation of the femur, and unfamiliarity with the approach have been proposed as potential causes of the injury¹⁰. Baker et al. also reported a case of a profunda femoris pseudoaneurysm caused by medial migration of broken cerclage wires, 8 years after revision hip surgery. The patient presented with thigh pain, swelling, and anemia. Coil embolization failed in this case, and multiple covered stents were required instead⁸. Nabhani et al. report a case with a deep femoral artery perforating branch pseudoaneurysm after revision hip arthroplasty due to recurrent dislocation. The vessel is located far from the operation site; thus, the authors believe that the cause of the injury was from the repeated manipulation of the patient's leg during the operation¹¹. Pollock et al. reported a case of profunda femoral artery pseudoaneurysm following two-stage revision hip surgery for periprosthetic infection, believed to have been caused by a sharp bone fragment encountered during the procedure¹². (table 1)

Table 1 Literature reviews of profunda femoris artery pseudoaneurysm after total hip arthroplasty or revision total hip arthroplasty

Authors	Year	Sex/ Age	Indication for surgery	Cause	Symptoms	Imaging	Treatment	Time interval
Nozawa et al. ¹³	2000	F/70	Post-traumatic OA	Osteotome	Active bleeding, swelling thigh	Angiography	Coil embolization	6 weeks
Harper et al. ¹⁰	2015	M/61	Aseptic loosening femoral stem	Retractor placement, anterior approach	Pain, anemia, swelling thigh	Angiography	Coil embolization	7 weeks
Huynh et al. ¹⁴	2015	M/71	Secondary OA	Retractor placement	Pain, swelling thigh	CT angiogram	Open repair	4 days
Baker et al. ⁸	2020	M/84	Periprosthetic femoral fracture	Broken cerclage wire	Pain, anemia, swelling thigh	CT angiogram	Multiple covered stents	8 years
Nabhani et al. ¹¹	2022	F/50	Recurrent THA dislocations	Recurrent THA dislocations	Pain	CT angiogram	Coil embolization	2 weeks
Pollock et al. ¹²	2022	M/69	Second stage revision THA	Sharp bone fragment	Pain, anemia, swelling thigh	CT scan	Open repair	2 weeks

The exact etiology of the pseudoaneurysm in our patient was unclear. Her index total hip arthroplasty proceeded uneventfully, with no signs or symptoms of pseudoaneurysm following the surgery. One purpose is that the pseudoaneurysm may have occurred when the THA was dislocated, and there were multiple forceful attempts to reduce the hip. This could have caused an indirect injury to the blood vessels.

Early detection of pseudoaneurysm formation after hip arthroplasty can often be difficult due to its non-specific symptoms, such as pain, swelling, and refractory anemia¹⁵⁻¹⁶. For our patient, who presented with a dislocated THA, this could have obscured the symptoms of the pseudoaneurysm. The time to detection is currently reported to range from 4 months to 15 years after the index surgery^{10,17}. Performing revision surgery in the presence of a pseudoaneurysm at the surgical site could result in rupturing the pseudoaneurysm sac, which can cause fatal bleeding, as in the case we presented above.

To our knowledge, there are currently no effective screening guideline available to detect pseudoaneurysm or other potential vascular complications prior to performing revision surgery. Diesel et al. have defined high-risk patients for vascular injury during revision THA as those with components or cement migrated more than 5 mm beyond the ilioischial line in pelvic AP or Judet radiographic view. They recommend further evaluation of these groups of patients by CT angiography and vascular surgeon evaluation¹⁸. However, vascular injuries in THA do not always result from migrated components or protruding implants but can also occur due to indirect mechanisms. Some authors have recommended performing vascular evaluation in every case undergoing revision THA surgery, regardless of the presence of migration⁶, but the cost-effectiveness of this approach is questionable.

CONCLUSION

Pseudoaneurysm is a rare vascular complication of THA, and revision surgery poses a higher risk than primary THA. Detecting pseudoaneurysms early on may be difficult because of their nonspecific symptoms, which can resemble those of other causes of painful THA. Atypical symptoms, such as unusual thigh swelling and unexplained anemia in dislocated THA patients, should raise a high degree of suspicion for pseudoaneurysms. In such cases, we recommend performing pre-operative CT angiography and consulting with a vascular surgeon before attempting revision THA.

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