

Pseudoaneurysm of the popliteal artery after hardware removal in a patient with Marfan syndrome

Rikesh A. Gandhi, Mark Hasenauer, Samir Mehta*

Department of Orthopaedic Surgery, University of Pennsylvania, 3737 Market Street, 6th Floor, Philadelphia, PA, 19104, United States

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ABSTRACT

The formation of pseudoaneurysms after orthopaedic procedures in the setting of connective tissue disorders such as Marfan syndrome (MFS) is not well documented in the literature. We report the case of a seventy-one year old male with MFS who underwent uncomplicated distal interlocking screw removal from a femoral cephalomedullary nail for symptomatic hardware. Five weeks later, he presented with a popliteal artery pseudoaneurysm. The patient underwent successful open ligation and excision of the pseudoaneurysm. This is the first reported case of a popliteal artery pseudoaneurysm following orthopaedic hardware removal in a patient with MFS. MFS may predispose patients to peripheral vascular complications even in the most routine cases. A thorough understanding of the patient and complications associated with MFS is required prior to proceeding with elective orthopaedic surgery. © 2018

1. Introduction

Hardware removal in orthopaedic surgery is frequently performed for painful or prominent implants. Although many orthopaedic surgeons may regard removal of hardware as a routine procedure, complications do occur in up to 20% of cases.¹ Arterial pseudoaneurysm is a lesser known and extremely rare complication. Only one instance of a posterior tibial artery pseudoaneurysm after tibial plate removal has been described in the literature.² Pseudoaneurysm of the genicular or popliteal artery is more commonly reported after total knee arthroplasty, knee arthroscopy, and anterior cruciate ligament reconstruction.^{3–7} These false aneurysms are formed by iatrogenic arterial wall injury due to direct intraoperative injury, or indirectly by intimal plaque disruption by the tourniquet or unintended manipulation.

Connective tissue disorders such as Marfan syndrome (MFS) would theoretically make a patient more prone to vascular complications. MFS is a relatively common autosomal dominant genetic disorder affecting the connective tissues of 0.02% of the population.⁸ The connective tissue changes classically involve large vessels such as the aorta. However, because the changes are diffuse, the risk of developing a pseudoaneurysm is thought to be increased in peripheral vascular territories as well.⁸ We report a case of a

ruptured popliteal artery pseudoaneurysm in a patient with MFS five weeks after a routine lower extremity removal of hardware.

2. Case report

A seventy-one-year-old man with MFS elected to undergo distal interlocking screw removal for hardware prominence and irritation around the screw site (Fig. 1). Five years prior, the patient had sustained a left subtrochanteric femur fracture treated with a locked cephalomedullary nail. His medical history included a diagnosis of MFS, diagnosed in the third decade of his life from a combination of family history and prior medical history including a diagnosis of an aortic aneurysm, bicuspid aortic valve, hypermobility of his joints, ocular manifestations, and arachnodactyly. His past surgical history included a 5-vessel coronary artery bypass grafting (CABG) for a myocardial ischemia event, an aortic valve replacement, and an ascending aortic aneurysm repair.

On the day of the surgery, the patient was brought to the operating room table uneventfully. A tourniquet was applied but not inflated. Screw removal was performed with an incision directly over the lateral side of the knee where the screw head was localized utilizing an image intensifier. The screw head was exposed utilizing an osteotome for removal of overlying bone and the screw was subsequently removed with a screwdriver (Fig. 2). At the time of removal, the screwdriver did not pass behind the femur and no aberrant vessels were encountered during the approach down to the screw head. Hemostasis was achieved and the wound was then irrigated with saline and closed in a layered fashion.

* Corresponding author.

E-mail addresses: rikesh.gandhi@uphs.upenn.edu (R.A. Gandhi), mark.hasenauer@uphs.upenn.edu (M. Hasenauer), samir.mehta@uphs.upenn.edu (S. Mehta).



Fig. 1. Preoperative radiographs of the distal femur illustrating the prominent distal interlocking screw.



Fig. 2. AP and lateral postoperative radiographs of the distal femur depicting successful removal of the distal interlocking screw without obvious radiographic complication.

The patient's immediate post-operative course was uneventful. He was discharged home the day of surgery and was symptom free at his two-week follow up visit. Five weeks after screw removal, the patient presented with a 1 week history of a pulsatile mass and bleeding from the surgical site. A self-applied tourniquet was present on his thigh for hemorrhage control.

On examination, a mass with a palpable pulse was present on the lateral aspect of his distal thigh deep to the incision. Intermittent pulsatile bleeding was noted. Differential diagnosis included an expanding hematoma, or an arterial aneurysm or pseudoaneurysm. Given the history of MFS and recent surgical intervention at the site, an arterial aneurysm or pseudoaneurysm was thought to be the most likely diagnosis. Ultrasonography use performed to confirm the diagnosis and demonstrated a pseudoaneurysm originating from the left popliteal artery measuring $11.6 \times 4.8 \times 4.4$ cm. Vascular surgery was urgently consulted. A computed tomography (CT) angiogram confirmed the popliteal pseudoaneurysm (Fig. 3). No vascular anomalies noted on CT angiogram. An open repair and excision of the pseudoaneurysm was recommended.

The patient underwent successful open ligation of the tributary vessel feeding the pseudoaneurysm with vascular surgery. He tolerated the procedure well. The rest of the postoperative hospital course was uneventful. One week postoperatively, the patient was discharged to a rehabilitation facility. Unfortunately, on a month after the surgery, the patient suffered a fatal cerebrovascular accident.

3. Discussion

We report a case of a popliteal artery pseudoaneurysm after hardware removal in a patient with MFS. Although pseudoaneurysms have been reported after routine orthopaedic procedures, their presence in the setting of connective tissue disorders such as MFS is less known. Early identification of pseudoaneurysms are important to guide treatment. If left untreated, peripheral pseudoaneurysms can lead to hemorrhage, limb compromise, and permanent disability. This case highlights the risk of possible iatrogenic arterial complications following a routine hardware removal, and the unique issues surrounding MFS patients.

Clinical findings of swelling, pulsatile mass with bleeding, and auscultating a bruit should alert the surgeon to a possibility of a pseudoaneurysm. The diagnosis can be confirmed by means of doppler ultrasound, CT angiography, magnetic resonance (MR)

angiography, or arteriography. A high degree of suspicion needs to be maintained as the diagnosis is often delayed up to 11 days after the initial procedure. While we cannot be sure the pseudoaneurysm was not present prior to the surgical intervention, the timing of symptoms leads us to believe an indirect soft tissue injury at the time of screw removal to be the most likely inciting event. The patient's underlying connective tissue disorder is thought to have played a role in pseudoaneurysm formation.

Although MFS typically affects the aorta, small- to medium-sized arteries may also be weakened as the connective tissue changes are diffuse.⁹ The overall incidence of peripheral arterial disease in MFS is unknown since screening beyond the aorta is not typically performed. While regular screening for heart or thoracic aorta involvement with echocardiography is recommended, there are currently no recommendations regarding the necessity or value of performing peripheral vascular examinations as part of routine monitoring or for preoperative evaluation. Yetman et al. has shown that one-third of the adults in their cohort of Marfan syndrome patients had peripheral vascular aneurysms, detected incidentally during CT angiography or MR angiography of the thoraco-abdominal aorta.¹⁰ Patients with peripheral aneurysms were found to be older and were more likely to have undergone prior aortic root replacement. Host factors such as smoking, hypertension, and hyperlipidemia correlated with a greater likelihood of peripheral disease. Thus, such factors should be incorporated in the decision-making in a patient who is a candidate for elective surgery and a preoperative ultrasound may be considered in high risk MFS patients.

There are several important lessons to be learned from this case. First, it must be stressed that even the most routine procedures should be approached systematically. The decision on whether to remove hardware should be made with great care and a thorough understanding of the complications associated with the procedure weighed against the potential benefits. Second, careful soft tissue handling and meticulous hemostasis should be maintained in patients with MFS. Indirect soft tissue injury can damage already weakened vessel walls subjecting the vessel to pseudoaneurysm formation. Third, clear visualization of the entire hardware being removed should be obtained prior to beginning instrumentation for removal. Percutaneous technique without complete visualization of the hardware may lead to inadvertent soft tissue injury.

This case highlights the unique risks in MFS patients. Although there are currently no guidelines for routine peripheral surveillance, consideration to preoperative evaluation should be given to high risk patients. Vascular vigilance in the peri- and post-operative period is critical in MFS patients.

Author contributions

Rikesh A. Gandhi: Development of learning points, primary drafting of manuscript.

Mark Hasenauer: Secondary drafting of manuscript and revision.

Samir Mehta: Development of learning points, final manuscript editing.

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Informed consent

Informed consent was obtained from all individual participants included in the study.

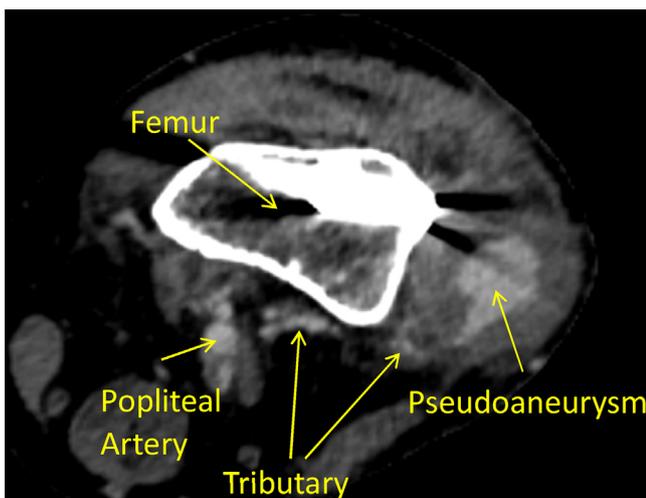


Fig. 3. Computed Tomography Angiogram (CTA) of the lower extremity depicting the pseudoaneurysm arising from the popliteal artery.

Conflict of interest

The authors declare that they have no conflict of interest.

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