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Case report

Transarterial endovascular coil embolization in managing intractable bleeding from fibular artery: A case report

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ABSTRACT

Introduction: Pseudoaneurysms of the fibular artery are rare. Recently, endovascular techniques have been preferred over open surgery.
Case presentation: A 50-year-old male patient complained of recurrent bleeding from surgical wounds that had been present for one month. The patient sustained an open cruris fracture. No source of active bleeding was found at the time of exploration. The patient has then performed angiography with coiling and showed a pseudoaneurysm originating from the left fibular artery branch. Surgical debridement and external fixation were performed one day after the angiography and embolization procedure. The patient was discharged on the third day, and there has been no recurrent bleeding ever since.
Case discussion: A pseudoaneurysm can be thought of as one of the intractable bleeding causes. Recently, the endovascular technique has been commonly used as an alternative treatment if we did not find the source of bleeding in exploration. Many kinds of the literature showed the success of using non-surgical management, especially the coil embolization as the patient received.
Conclusion: In the management of pseudoaneurysm following trauma which cannot be found in open surgery, an endovascular technique like coil embolization can be the alternative method.

1. Introduction

Pseudoaneurysms are false aneurysms caused by a disruption in arterial wall continuity [1]. One of the classical signs of pseudoaneurysms is arterial bleeding. Pseudoaneurysms of the crural arteries are rare, especially the fibular artery. In literature, causes of pseudoaneurysms are mainly orthopedic interventions, such as fracture, dislocation, or surgery [2]. Owing to the benefits of endovascular techniques, including reduced blood loss, decreased morbidity, and shorter hospital stay, the endovascular approach has been preferred over open surgery if its feasibility and safety are assured [3].

This article reports a rare case of intractable bleeding from the fibular artery, which is successfully managed by transarterial endovascular coil embolization, the minimally invasive procedure compared to surgical management. This case report has been reported in line with the SCARE 2020 Criteria [4].

2. Case illustration

A 50-year-old male patient complained of recurrent bleeding from surgical wounds that had been present for one month. The patient sustained an open cruris fracture in a traffic accident, which required open reduction and internal fixation. After the 7th day of treatment, the patient developed severe bleeding from the surgical wound, hemoglobin dropped to 5 g%, and the patient was eventually decided to undergo surgical wound exploration and debridement. No source of active bleeding was found at the time of exploration. The bleeding occurred up to five times, and each time the patient's hemoglobin level dropped to 5 g%. The patients underwent three more surgical wound explorations. Still, no source of bleeding was discovered. Antibiotics given by the orthopedic surgeon controlled the infection (Fig. 1).

The patient was finally referred to a vascular surgeon after receiving four packs of PRC. The vital sign of the patient was good. The condition of the acral and the pulsation was good. Neurologic and movement examination showed normal. From the ultrasonography Doppler, the

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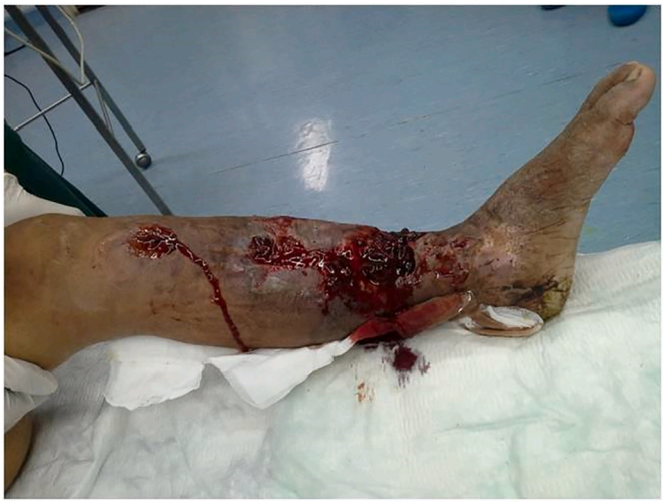

Fig. 1. The clinical picture of the patient.

tibialis anterior artery pulse wave was triphasic, and the posterior tibialis artery was triphasic as well. The saturation of all fingers was 99%.

We decided to perform angiography with coiling as a preventive measure to halt bleeding, followed by surgical debridement and external fixation. Angiography was done using a Judkins Right catheter guiding and Microcatheter Pro great inserted via left inguinal. We found a pseudoaneurysm originating from the left fibular artery branch. The size of the pseudoaneurysm was 20 × 10 × 10 mm. When the pseudoaneurysm ruptures, it will be deflated and undetectable during surgery.

At first, we would like to use a detachable coil that is more precise to close the neck of the pseudoaneurysm. However, the coil was not available. Therefore, we use a pushable coil that is less accurate and has a risk of dropping into the pseudoaneurysm. A pushable coil (Nester, Cook Medical) was inserted, but the coil fell into the pseudoaneurysm. A second coil was installed and lodged at the neck of the pseudoaneurysm. We performed another angiography following the coil insertion. The pseudoaneurysm was not visualized, and the coil was located in the neck of the pseudoaneurysm.

Surgical debridement and external fixation were performed one day after the angiography and embolization procedure done by the orthopedic surgeon. The patient was discharged on the third day, and there has been no recurrent bleeding ever since.

There was no more bleeding from the wound after observation for three days in the ward and seven days as an outpatient. Distal pulse was good, as was the neurological and movement examination. Ultrasonography showed a triphasic posterior tibial and anterior tibial pulse wave (Fig. 2).

3. Discussion

Pseudoaneurysms result from non-iatrogenic or iatrogenic causes. Non-iatrogenic causes include trauma and infection. Iatrogenic causes include surgical procedures, arterial access for endovascular procedures, and anastomotic failure. Pseudoaneurysms in orthopedics may be caused by a fracture, dislocation, surgery, or a wound. Pseudoaneurysms of the fibular artery are rare and mainly associated with trauma [1,5].

The classical signs of arterial pseudoaneurysm are pulse deficit, bruit, and arterial bleeding [3]. When the pseudoaneurysm ruptures, it may lead to massive bleeding and may cause hemorrhagic shock [5]. Bleeding of the fibular artery, branches of the anterior tibial artery, or branches of the posterior tibial artery caused by fractures of the tibia or fibula is usually untreated and not consulted to vascular surgeons as long as it does not interfere with the viability of the distal tissue. Bleeding to the distal is usually compensated by the other two arterial branches.

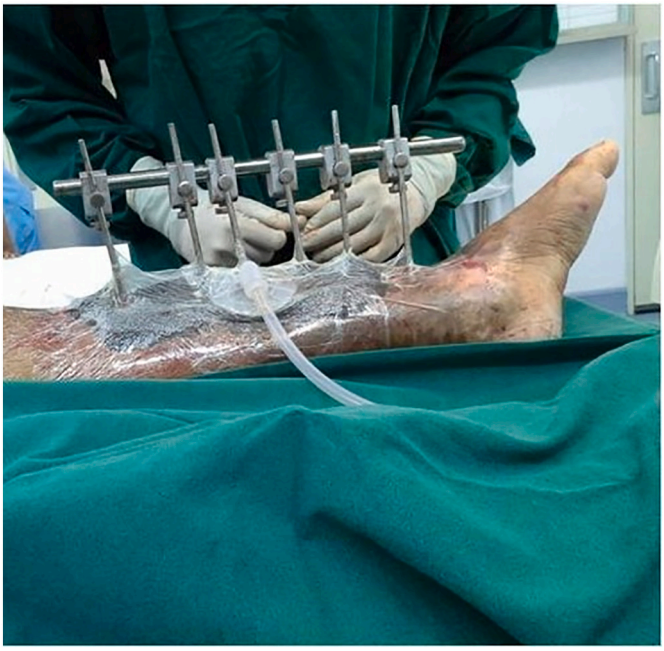

Fig. 2. Surgical debridement and external fixation.

Therefore, the distal viability of the tissue is maintained.

In the case of an open fracture, diagnostic measures to determine the condition of the blood vessels are rarely performed. Examination of blood vessels is performed by inspecting the viability of the distal tissue and examining the arterial pulses. If there is no disturbance in tissue viability and arterial pulse, a vascular surgeon is not consulted. The main applications of vascular diagnostic measures in trauma patients are the pelvis, kidneys, liver, and spleen [6]. In pelvic fractures, the indication for angiography is suspicion of a pelvic artery injury with active bleeding [7].

Treatment depends on the aneurysm's size, location, and the presence or absence of infection. In this case, the location of the pseudoaneurysm is deep; thus, it is hard to find in open surgery. Therefore, it is considered to perform angiography to determine the condition of the blood vessels. Small asymptomatic lesions may only need observation for 4–6 weeks with the expectation of spontaneous recovery. While larger (>3 cm) symptomatic lesions may need open surgical repair, ultrasound-guided compression, ultrasound-guided thrombin injection, or coil embolization [5,8]. In this case, the aneurysm size was 20 × 10 × 10 mm, but massive bleeding had occurred; thus, immediate treatment, either open surgical repair, ultrasound-guided compression, ultrasound-guided thrombin injection, or coil embolization, was indicated for the patient (Fig. 3).

Treatment of the pseudoaneurysm could be surgical and non-surgical. Non-surgical treatment includes endovascular techniques (percutaneous endovascular coil embolization and percutaneous endovascular stenting) and non-invasive techniques, such as ultrasound-guided compression and ultrasound-guided injection of thrombin [1,2,9].

Mohan et al. reported the successful management of 13 patients with pseudoaneurysm in the limbs using endovascular techniques such as coil embolization and covered stent. Seven adults and one child underwent embolization with polyvinyl alcohol particle/soft metal coil, whereas the remaining five adults underwent revascularization with a covered stent. The treatment was successful, and no procedure-related mortality in the group. All patients were followed up until 12–36 months, and no rebleed or necrosis of the limb was reported [3].

Kinoshita et al. reported treating an 80-year-old man with pseudoaneurysm following a femoral trochanteric fracture. One day after

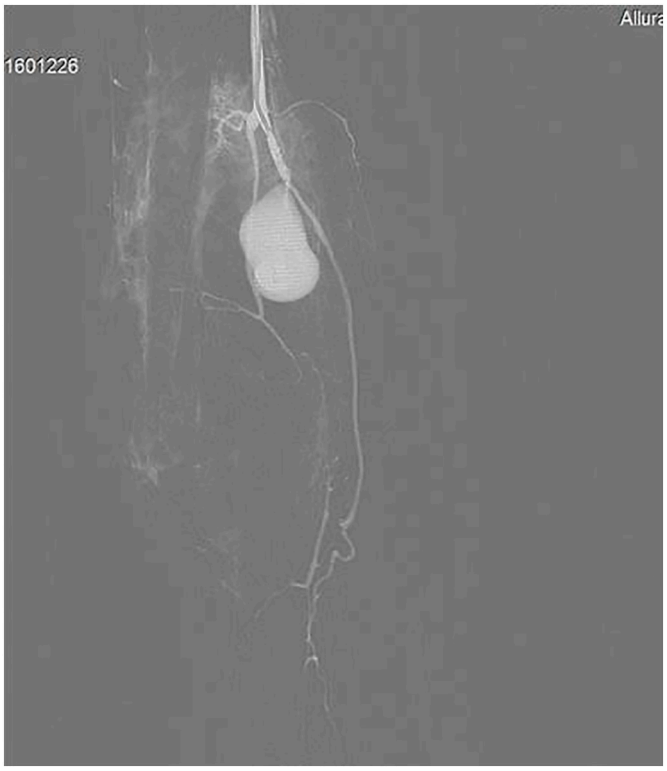

Fig. 3. Angiograph showing pseudoaneurysm of left fibular artery branch.

internal fixation, his hemoglobin (Hb) value dropped from 12.0 to 6.0 g/dl without any noticeable signs of bleeding. On CT angiography, a pseudoaneurysm was detected. It was immediately treated by transcatheter embolization. After embolization, the patient showed significant clinical improvement, and the Hb and C-reactive protein (CRP) values improved to normal after several weeks [5].

Kaczynski et al. reported the management of a 78-year-old man with pseudoaneurysm in the peroneal artery after embolectomy. Ten weeks after the surgery, the patient had a routine check-up and was examined by duplex ultrasound scan (DUS). The examination showed a pseudoaneurysm confirmed on CTA. The patient was then treated by coil embolization. The peroneal artery was selected using a 0.027-inch microcatheter (Pro great, Terumo) and was successfully embolised by deploying multiple 3, 4, and 5 mm diameter 0.01800 fibred platinum coils (VortX Diamond-18, Boston Scientific) proximal and distal to the pseudoaneurysm. After the embolization, there were no complications related to the procedure [8].

Naouli et al. reported a 28-year-old man with bleeding from sutured wound 20 days after trauma. The patient also has tachycardia with a fall in the hemoglobin levels from 12 to 8 g/dl. The angiography of the profundal femoris artery via the contralateral approach showed a 3 cm pseudoaneurysm which was then embolized by Cook® coils. The embolization was successful, and the bleeding was arrested. There were no complications after the embolization, and the patient was discharged on the 10th day [10].

The classical procedure used to treat pseudoaneurysm is surgical. However, open surgical have the risk of active bleeding and infection due to soft tissue damage during the surgery. In the last few decades, the paradigm has shifted to minimally invasive techniques, such as coil embolization, covered stent, ultrasound-guided compression, and ultrasound-guided injection of thrombin. Recently, the endovascular technique has been commonly used for pseudoaneurysm treatment since it can reduce patients' hospital stay, is cost-effective, and does not increase the chance of infection. Many kinds of the literature showed the success of using non-surgical management, especially the coil embolization as the patient received [3].

This article tries to provide insight that aneurysm rupture should be considered in conditions of intractable bleeding following an action that has the risk of causing rupture, even though an aneurysm is rarely found in that location. The absence of an aneurysm at open surgery does not exclude the possibility of an aneurysm, so angiography is still necessary, especially when bleeding cannot be controlled. Furthermore, angiography is a minimally invasive procedure that can be performed quickly and offer a better prognosis for the patients.

4. Conclusion

An endovascular technique like coil embolization can be the alternative method in managing pseudoaneurysm following trauma, which cannot be found in open surgery.

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Consent

The patient obtained informed consent for the operation, therapeutic procedures, and publication of this case report and any accompanying images before treatment.

Ethical approval

The institutional review board accepted this case report for publication.

CRediT authorship contribution statement

Patrianef Darwis conceived the study concept and design. Redita Noviana Putri was responsible for writing the original draft. The manuscript was reviewed and edited by Zatira Elfizri.

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Guarantor

Patrianef Darwis.

Provenance and peer review

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Declaration of competing interest

None.

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