

## CASE REPORT

## Pseudoaneurysm of Dorsalis Pedis Artery Following Lisfranc Surgery: A Rare Complication

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### ABSTRAK

*Aneurisma dan pseudoaneurisma pada dorsalis pedis arteri dikenali sebagai satu entiti vaskular yang jarang berlaku di mana insiden ini dilaporkan hanya sebanyak 0.5% daripada aneurisma arteri periferi dan hanya beberapa kes yang telah dilaporkan. Pembentukan pseudoaneurisma biasanya dikaitkan dengan kes patah tulang, luka atau kecederaan arteri iatrogenik. Kecederaan arteri yang bertepatan dengan pseudoaneurisma selalunya terlepas pandang kerana kekurangan penemuan klinikal. Penemuan klinikal yang cepat adalah penting untuk mengurangkan peratusan morbiditi serta kematian. Di sini, kami ingin membentangkan satu kes komplikasi yang jarang berlaku dalam satu prosedur ortopedik yang dilakukan pada seorang pesakit lelaki muda yang datang dengan keadaan bengkok yang menyakitkan di atas kaki kiri selepas terlibat dalam kecederaan industri. Pesakit tersebut telah menjalani pembedahan akibat kecederaan sendi Lisfranc dan telah pulih sepenuhnya. Selepas 2 bulan menjalani pembedahan tersebut, beliau kembali dengan bengkok yang mempunyai denyutan nadi di kaki kirinya. Beliau dirawat secara konservatif dengan menggunakan pembalut mampatan dan dapat menjalankan aktiviti seperti biasa selepas rawatan dijalankan.*

*Kata kunci: dorsalis pedis arteri, Lisfranc, pseudoaneurisma*

### ABSTRACT

Aneurysm and pseudoaneurysm of the dorsalis pedis artery remains to be rare

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vascular entities with a reported incidence of 0.5% of peripheral arterial aneurysms. Only, few cases were reported. The formation of pseudoaneurysm is commonly associated with fracture, laceration wound or iatrogenic arterial injury. An arterial injury that coincides with pseudoaneurysm can initially be missed due to lack of clinical findings. Prompt recognition remains paramount to reduce morbidity and mortality. Here, we present a rare complication of a commonly performed orthopaedic procedure in a young male who presented with painful swelling over left foot after he was involved in an industrial injury. He presented again with a pulsating mass over his left foot after 2 months post fixation surgery of a Lisfranc injury. He was treated conservatively with compression bandage and able to regain to his normal activity after the treatment initiated.

Keywords:   dorsalis pedis artery, Lisfranc, pseudoaneurysm

## INTRODUCTION

Lisfranc ligament is a strongest and largest ligament among the interosseous ligaments. Lisfranc injuries are relatively rare, approximately 0.2% of all fractures, with an incidence of 1/55,000 individuals, yearly. This injuries are frequently misdiagnosed or there is a delay in the diagnosis. Lisfranc injuries are usually complicated with post-traumatic arthritis which can cause a significant pain and disability (Desmond & Chou 2006). Dorsalis pedis artery (DPA) pseudoaneurysm and aneurysm are rare with a reported incidence of 0.5% of peripheral arterial aneurysms (Yamaguchi et al. 2002). Pseudoaneurysm of the DPA are commonly due to sharp penetrating trauma, fracture, blunt trauma or iatrogenic arterial injury (William et al. 2010). Prompt surgical treatment of a DPA pseudoaneurysm is recommended to avoid complications (Vlachovsky et al. 2017). In view of its rare incidence, we wish to highlight its

management through this case report.

## CASE REPORT

A 27-year-old healthy male suffered an industrial injury when a heavy barrel rolled over his left foot resulting in severe pain and swelling and he was unable to bear weight. His vital signs were within normal range during presentation to Emergency Department. His left foot was swollen but the compartment was soft.

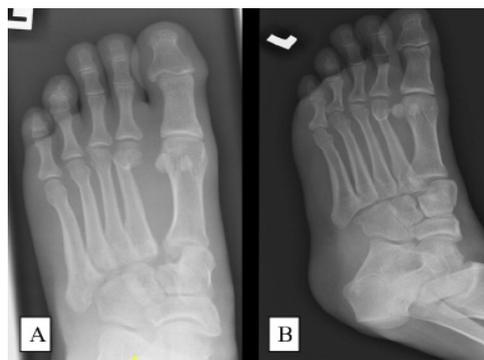


Figure 1: (A) Anteroposterior view and (B) oblique view of left foot plain radiograph showing Lisfranc injury of the left foot

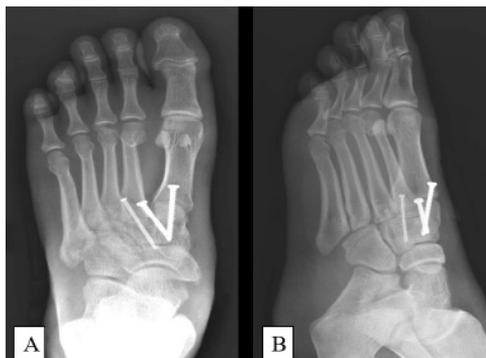


Figure 2: Post-operative (A) anteroposterior view and (B) oblique view of left foot radiograph that demonstrate internal fixation of the injury

Posterior tibia artery and DPA pulses were not palpable due to the swelling but detected on Doppler Ultrasound. Plain radiograph showed left foot Lisfranc injury (lateral homogenous) with associated neck of second metatarsal bone fractures (Figure 1). Open reduction and screws fixation of left foot was done within one week after trauma (Figure 2). He was discharged well and at two weeks after the operation, the wound healed well without infections.

After two months, the screws of the left foot were removed. However, he

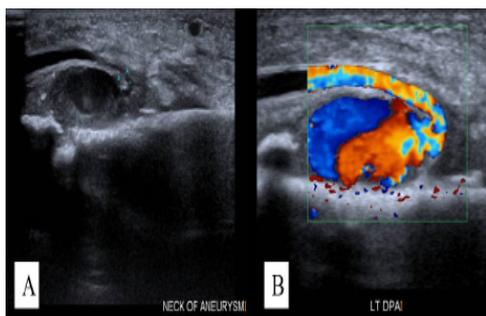


Figure 3: Ultrasound showing pseudoaneurysm in the dorsalis pedis artery (DPA). (A) neck of the aneurysm, (B) colour doppler grayscale showing turbulent flow of the left DPA

developed a slow oozing of blood from the wound postoperatively but was stopped with compression bandage and he was discharged home. During his follow-up at postoperative two weeks, he developed a pulsating mass over the surgical scar of the left foot. However, there was no bruit or thrill. Ultrasound Doppler of left foot showed a saccular structures measuring 1.2cm x 2.5cm x 3.9cm with mixed echogenicity over the dorsum of left foot with turbulent flow on colour Doppler with arterial wave pattern (Figure 3). It had communication with left DPA with the neck measures 1.2mm in diameter with surrounding hematoma. The part of the sac was thrombosed. This features were suggestive of left DPA pseudoaneurysm. The diagnosis was then confirmed with Computed tomography angiography (CTA).

A direct pressure and compression bandage of left foot was applied since the swelling was relatively small and the swelling subsided. No repeated ultrasound was done. He remained asymptomatic at 14 months post-operative follow-up and examination, and returned to his common activities and work.

## DISCUSSION

The tarsometatarsal joint is named after Jacques Lisfranc de Saint-Martin (1790-1847). Lisfranc ligament is a strongest and largest ligament among the interosseous ligaments that connects the base of second metatarsal to the base of medial cuneiform. It acts as a primary stabilizer for the midfoot. Lisfranc injuries are

relatively rare, approximately 0.2% of all fractures, with an incidence of 1/55,000 individuals, yearly. These injuries are frequently misdiagnosed or there is a delay in the diagnosis. Treatment emphasizes on anatomic reduction and rigid internal fixation with screws medially and Kirschner wires laterally to allow stable healing. Soft tissue management is important in treating this condition to achieve a good outcome, by single or two-stage surgery (Abdul Razak & Bajuri 2017). Most common complications for Lisfranc injuries are post-traumatic arthritis which can lead to significant pain and disability. It is due to articular damage during trauma and inadequate reduction intraoperatively (Desmond & Chou 2006). One of the studies mentioned that a non-uniform loading applied in different cortex may affect the microstructure features, leading to various patterns of crack (Mansor et al. 2015).

Aneurysm and pseudoaneurysm of the DPA are rare vascular entities with a reported incidence of 0.5% of peripheral arterial aneurysms (Yamaguchi et al. 2002). A total of 161 cases of traumatic arterial pseudoaneurysm were analysed (Raherintanainana et al. 2016), young adults are the majority affected population with male predominant (63%), painful swelling as the commonest presenting symptom (34%), arteriography is the commonest investigation (52%) with axillary-brachial artery as the commonest critical artery injury (22%).

Normal arterial wall is made up of three layers namely adventitia, media

and intima. Compared with a true aneurysm, in which all three layers of the wall degenerate, an out-pouching which causes extravasation of blood due to a full-thickness arterial wall defect occurs in a PA. It lacks the normal arterial wall layers and forms a fibrous-walled cavity. In PA, communication with the originating artery is usually present and it gradually enlarges as the size of wall defect increases over time (Yamaguchi et al. 2002). Another case with DPA pseudoaneurysm was reported after a blunt trauma in which a reversed interposition graft from the great saphenous vein was successfully placed post-excision of the aneurysm (Vlachovsky et al. 2017). A histological report confirmed it to be a pseudoaneurysm as fibrous inflammatory granulation tissue with no arterial structure was discovered from the sac (Yamaguchi et al. 2002).

Pseudoaneurysm of the DPA are commonly due to sharp penetrating trauma, fracture, blunt trauma or iatrogenic arterial injury (Yu et al. 2013). In another case, a pseudoaneurysm that developed after an ankle sprain following basketball was noted (Lloyd 1979). There were previous reports that iatrogenic injury post Lisfranc Surgery, arthrodesis, amputation, and ankle arthroscopy, causes DPA pseudoaneurysm (Lieberman et al. 1991).

Majority of the cases were typically reported to have the following characteristics including soft, pulsatile tissue mass, and localised in the dorsal foot (Lui 2016). Secondary physical signs including neurological deficit can occur when the pressure exerted

on the surrounding structures caused by the fibrous capsule that increase in size (Nishi et al. 2004). Several means including duplex ultrasonography, magnetic resonance angiography (MRA), formal arteriography, and CTA may be used to diagnose. MRA and CTA allows surgical planning with topographic localization while Duplex ultrasonography on the other hand, confirms the arterial origin of the mass (Vlachovsky et al. 2017). Most of the cases reported had CTA.

Prompt surgery for DPA pseudoaneurysm is best as patients are at risk of complications such as rupture of aneurysm, nerve compression, or distal thromboembolism (Vlachovsky et al. 2017). Surgeons advocate a simple excision or resection without reconstruction of dorsalis pedis artery and bypass, reconstruction by end to end anastomosis or with a patent arcuate artery, and arterial ligation (Vlachovsky et al. 2017). Before any surgery is done, assessment of the integrity and the patency of the arcuate artery and posterior tibial artery and should be done (Nishi et al. 2004). The reconstruction and preservation of function of this DPA were advocated as it may be important in patients who later in life may developed arteriosclerosis or diabetic occlusion (Bogokowsky et al. 1985). The mobilization of the artery is minimized intraoperatively, protected adequately, and must be visualized during all steps of screw insertion which are strongly recommended and failure to do so may inadvertently result in arterial wall injury (William et al. 2010). It was previously concluded that endovascular coiling is preferred

treatment of pseudoaneurysm arising from small branches artery and open surgical repair is a standard if the pseudoaneurysm arising from critical axial vessels (Raherinantenaina et al. 2016). Apart from surgical intervention, one case of posterior tibial artery pseudoaneurysm which recovered spontaneously while another case of successful conservative management in asymptomatic paediatric pseudoaneurysm, even in patients with coagulopathies were reported (Dhal et al. 2001; Barkho et al. 2018). He also reviewed nine other studies where conservative management with regular follow-up and observation was an option of successful treatment.

## CONCLUSION

Pseudoaneurysms of the dorsalis pedis artery are rare vascular entities. It can be due to sharp penetrating trauma, fracture, blunt trauma or iatrogenic arterial injury. Even if the patient has no symptoms, pseudoaneurysm of the dorsalis pedis artery should initiate prompt surgical intervention because of the superficial nature of the artery and the high risk of rupture or thrombosis due to minor trauma. Prompt recognition remains paramount to reduce morbidity and mortality.

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