DOI: https://doi.org/10.30795/scijfootankle.2019.v13.869

CASE REPORT

Scientific Journal of the Foot & Ankle

Vascular complication after anterior ankle arthroscopy: case report

Complicação vascular após artroscopia anterior do tornozelo: relato de caso

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ABSTRACT

Postoperative complications are a concern for surgeons, and their incidence reaches 9% in ankle arthroscopy. Of these, neurovascular complications are particularly concerning. This report aims to show a vascular complication not previously reported in the literature, in order to alert about its possibility and to provide information on the treatment recommendations in the current literature. It is a case of distal arterial occlusion in the foot after anterior ankle arthroscopy. The patient was operated upon, and the problem was resolved four months after surgery.
Level of Evidence V; Therapeutic Studies; Expert Opinion.

Keywords: Arthroscopy; Ankle/surgery; Postoperative complications.

RESUMO

As complicações pós-operatórias são uma preocupação para os cirurgiões e a incidência chega a 9% quando se refere à artroscopia do tornozelo, sendo que, dentre elas, as complicações neurovasculares são particularmente temidas. Este relato tem como objetivo mostrar uma complicação vascular sem relato pregresso na literatura, a fim de alertar sobre a sua possibilidade e trazer informações sobre as recomendações de tratamento da literatura atual. Trata-se de um caso de oclusão arterial distal no pé após artroscopia anterior do tornozelo. O paciente foi operado e apresentou resolução do problema após quatro meses da cirurgia.
Nível de Evidência: V; Estudos Terapêuticos; Opinião do Especialista.

Descritores: Artroscopia; Tornozelo/ cirurgia; Complicações pós-operatórias.

How to cite this article: Santos TF, Dinato MCM. Vascular complication after anterior ankle arthroscopy: case report. Sci J Foot Ankle. 2019;13(1):87-90.

INTRODUCTION

Arthroscopy is a widely used method in the diagnosis and treatment of intra-articular disorders of the ankle, such as chronic instability, anterior impingement, anterolateral impingement, osteochondral lesion, synovitis, and presence of foreign bodies. It is also useful in the diagnosis of pain complaints with no apparent cause[1]. Its main benefits are lower morbidity, shorter length of hospital stay and early return to activities[2,3]. In addition, it is a safe procedure, provided that the anatomical parameters for accessing the joint are respected[4].

Despite this, it is not risk-free. Because it is performed in a limited work area and in close proximity to neurovascular bundles and tendons (Figure 1), there is a risk of injury to these structures[1,5].

In this article, we report a case of vascular complication after anterior ankle arthroscopy.

Work performed at the Universidade Estadual de Campinas, Campinas, SP, Brazil.

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Conflicts of interest: none. **Source of funding:** none.
Date received: December 21, 2018. **Date accepted:** February 20, 2019. **Online:** March 31, 2019.

CASE REPORT

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 02183518.4.0000.5404.

The patient is a 27-year-old man with a history of a motorcycle accident 6 years prior. He complained of pain in the left ankle and limited range of motion. Clinically, he presented with mechanical block of dorsiflexion and anterolateral ankle pain. The imaging tests showed an intra-articular loose body (Figure 2). The patient had no systemic disease or previous vascular diseases and was not a smoker.

The patient underwent anterior arthroscopy, which was performed under spinal anesthesia with a pneumatic tourniquet placed on the left thigh and using a 4.5-mm arthroscope with a 30-degree angled lens. The anteromedial and anterolateral portals were used according to the technique adopted, and no traction was used during the procedure. Severe synovitis and a loose body measuring approximately 2 cm were observed. The loose body was removed, and arthroscopic debridement was performed using a 4.0 mm shaver blade. The procedure did not have any complications, and the patient presented good distal perfusion with palpable pulses at the end of the procedure.

On the first postoperative day, the patient began feeling significant pain in the foot of the operated side associated with altered perfusion of the hallux and second toe. The patient was evaluated by the vascular surgery team. He exhibited cyanosis of the hallux and second toe associated with decreased temperature, preserved sensitivity and preserved flow in the anterior tibial artery, as detected by Doppler; the absence of more distal flow was suggestive of spasm or thrombosis. Full anticoagulation, heating of the limb and observation were indicated. He progressed with hypoesthesia in the hallux and maintenance of cyanosis. He was discharged and received instructions regarding care and medication. Two weeks after the procedure, he showed progressive improvement of the sensitivity and definition of the distal skin necrosis area in the hallux and the second toe. He continued follow-up with the orthopedic and vascular surgery team and, at 4 months postoperative, presented with complete resolution of the condition, including return of sensitivity, restoration of the dorsalis pedis artery pulse and restoration of perfusion of the affected toes, without compromise of the toes. Unfortunately,

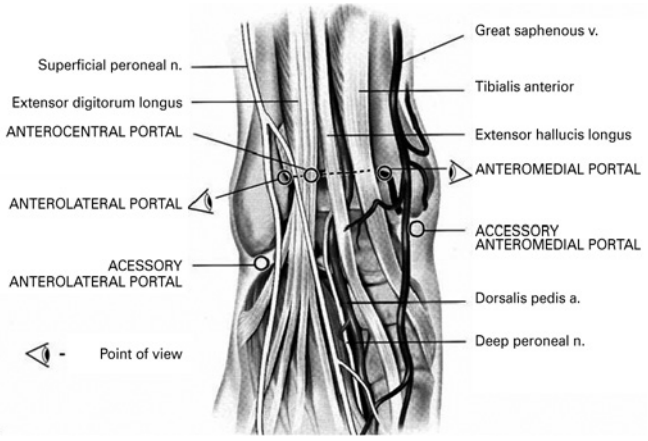

Figure 1. Schematic representation of the anterior anatomy of the ankle and its intimate relationship with the arthroscopy portals.
Source: Kelikian and Sarrafian, 2011[5]

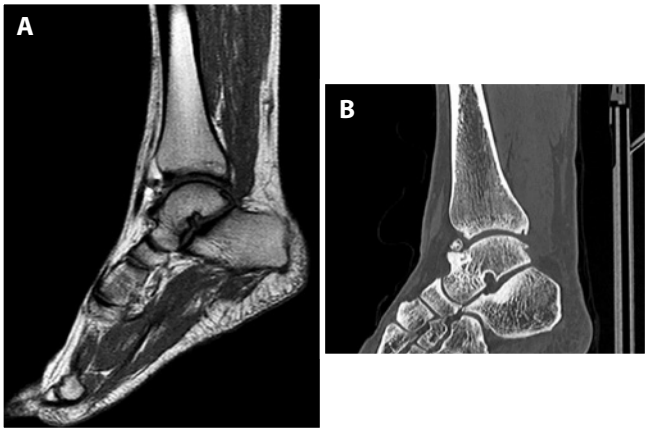

Figure 2. Preoperative diagnostic images showing an intra-articular loose body and presence of hypersignal suggesting inflammation. (A) Sagittal T2-weighted magnetic resonance image. (B) A sagittal CT section in a bone window.
Source: Authors' personal archive.

Figure 3. Evolution of the arterial occlusion. (A) and (B) Twelve days postoperative. (C) Appearance of necrosis, mainly of the hallux, at 19 days postoperative. (D) Appearance of necrosis of the hallux after 2 months. Second toe fully healed. (E) Fourth postoperative month. Hallux fully healed.
Source: Authors' personal archive.

there was no vascular study during follow-up. Figure 3 shows the evolution of this case.

DISCUSSION

Ankle arthroscopy has become an important resource for the diagnosis and treatment of pathologies of this joint, but as with any procedure, it is subject to complications. Arthroscopy complications vary in incidence from 0.66 to 17% depending on the study[2,6,7]. Blázquez et al. reported a complication rate of 12.06% (77% of them associated with anterior arthroscopy)[3]. The reported complications included infection, synovial fistula, complex regional pain, fibular fracture and neurovascular injury[7]. The incidence of complications related to nerves, vessels and tendons ranges from 3.4 to 9%. Among neurological injuries, neuropraxias and lesions of the sensory branches of the superficial fibular nerve near the anterolateral portal are relatively common and tend to resolve spontaneously. Vascular injuries are less frequent, and because of their location close to the anterior joint capsule and its anatomical variations, the anterior tibial artery is the most commonly affected vascular structure[1]. The most frequent vascular complication is the formation of pseudoaneurysm, with an incidence of 0.008%[2,4].

In the literature, 14 cases of vascular injury were found after anterior ankle arthroscopy with the formation of an arterial pseudoaneurysm; in 12 patients, the injured artery was the anterior tibial artery, and in 2 patients, it was the dorsalis pedis artery (segment of the anterior tibial artery distal to the ankle joint). Reports of arterial occlusion with vascular involvement of the toes after arthroscopy were not found in the literature; this is the first case reported.

Anterior ankle arthroscopy is considered very safe compared to the posterior approach, which is more commonly associated with neurovascular injury[3,4,8]. Proper positioning of the portals, foot and ankle at the time of access to the joint and its manipulation decreases this risk[1,4]. Karia et al. analyzed 12 cadaveric ankles and observed a 1.46 mm increase in the space between the joint and the vascular bundle, with a 10-degree dorsiflexion, evidencing the importance of working with the dorsiflexed ankle to protect both the talar cartilage and the bundle[1]. In an anatomical study, Vazquez et al. describe a variation in the positioning of the vessels that reaches a 4.3% incidence[9]. Huber describes a more lateral variation of the dorsalis pedis artery in 5.5% of people and a more medial variation in 3.5%[5,8]. The presence of these variations is an important factor that favors vascular injury during the procedure, as complications can occur even with proper portal placement and careful manipulation of the ankle joint in dorsiflexion. In addition, the use of ankle traction during the procedure may be associated with an increased rate of complications. According

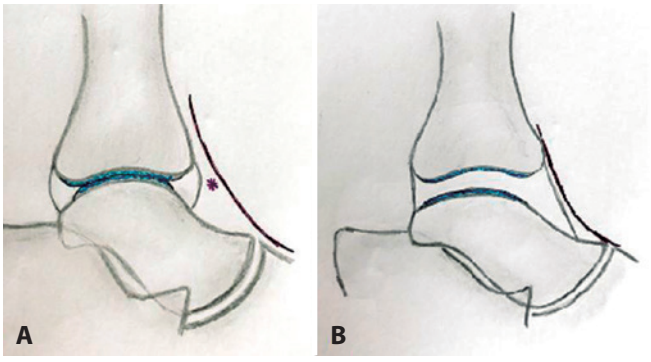

Figure 4. Schematic representation, lateral view of the ankle. (A) Ankle without traction and in 90-degree dorsiflexion. Asterisk indicates the position of the bundle relative to the capsule and larger work area. (B) With traction, there is greater joint space, but the capsule is under tension; there is a smaller work area, with the bundle closer to the joint and a greater risk of injury.
Source: Authors' personal archive.

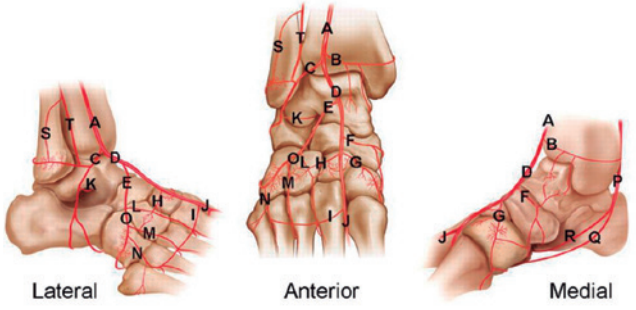

Figure 5. Lateral, anterior and medial view of the arterial supply at the ankle level.
Source: Kelikian and Sarrafian, 2011[5].

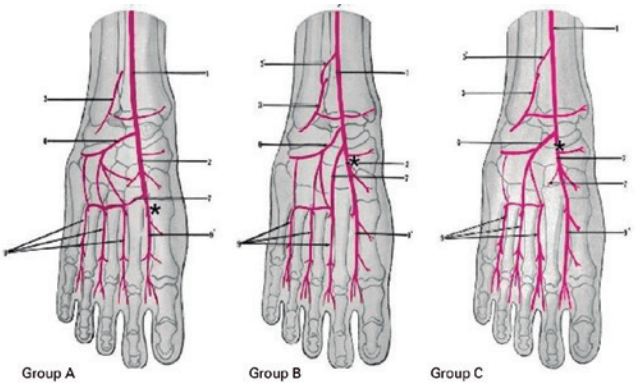

Figure 6. Main variations of foot blood supply.
Source: Kelikian and Sarrafian, 2011[5].

to Zengerink and van Dijk[2], the dorsiflexed ankle keeps the vessels and nerves relaxed, allowing them to move during the introduction of the equipment, thereby reducing the risk of injury; in turn, when using traction, they are tense and cannot move, leaving them more vulnerable to iatrogenic injury (Figure 4A and B).

The vascularization of the foot and, more specifically, of the hallux and second toe also undergoes anatomical variations. Figures 5 and 6 show the arterial supply in the ankle and toes, which helps explain why this involvement of the hallux and second toe was possible[5].

Figure 4 shows the intimate relationship of the anterior tibial and dorsalis pedis arteries with the joint. Figure 6 shows the main foot blood supply variations (the three types together comprise 89% of the total), and the asterisk shows the most likely point of interruption of blood supply to the hallux and second toe in our case, considering that there was no involvement of the other toes.

In approximately 73.5% of people, the dorsal artery of the foot (dorsalis pedis) penetrates the first intermetatarsal space at the base of the first metatarsal bone and provides branches that are responsible for irrigation of the first and second toes (first dorsal metatarsal artery), in addition to the more proximal branches (midfoot) responsible for the blood supply of the rest of the forefoot. It is from the first dorsal metatarsal artery that the dorsal and plantar branches responsible for the vascularization of the first and second toes arise, and in approximately 5% of people, this artery is absent or has smaller diameter[5]. This explains the fact that our patient presented with symptoms only in the hallux and second toe, and the compromise of this flow was probably due to emboli formed by manipulation very close to the artery wall at the level of the ankle associated with the possible anatomical variation of the dorsal metatarsal artery (smaller diameter), thus favoring the compromise of the distal blood flow of these toes.

Loss of distal blood supply was evidenced by the presence of cyanosis and pallor and a decrease in temperature of the extremity and was rapidly diagnosed. Rapid and specialized evaluation was performed in order to intervene quickly and effectively to restore flow and preserve the affected part of the limb. Arterial occlusion can be treated with the use of thrombolytics, embolectomy for larger vessels or use of oral anticoagulants and antiplatelet agents[10].

It is important to mention that there is another possible cause for the decrease in peripheral blood flow: compartment syndrome. In the presence of edema and local infiltration associated with pain, paresthesia and/or decreased perfusion, this possibility should be considered.

CONCLUSION

Based on the reported case and review of the literature, we conclude that the risk of arterial injury, although small, exists and must be taken into account, considering that possible anatomical variations of both the dorsalis pedis artery and of other arteries also exist and may be responsible for the complication observed. It is also always important to remember that we must handle cutting instruments carefully at the moment of access to the joint, especially when the dorsalis pedis artery is involved, as it is closely located to the joint capsule and can be damaged if the shaver blade is facing it at the time of use, especially when the capsule is under tension (foot in plantarflexion).

Authors' contributions: Each author contributed individually and significantly to the development of this article: TFS *(https://orcid.org/0000-0002-4824-1626) interpreted the results of the study, wrote the article, participated in the review process, approved the final version; MCMD *(https://orcid.org/0000-0001-6572-1771) conceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process, approved the final version. *ORCID (Open Researcher and Contributor ID).

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