DOI: https://doi.org/10.30795/jfootankle.2023.v17.1700

Technical Tips

Percutaneous subtalar arthrodesis – configuration of portals using a guidewire

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Abstract

Subtalar arthrodesis is indicated to treat many hindfoot disorders, and different approaches are described, including percutaneous, which has grown recently. In this modified percutaneous technique, using a guidewire, two portals are ideally made for access to the subtalar joint, regardless of the deformity found in this joint. The technique intents to be faster and decrease morbidity and complication rates. Therefore, the objective of the study was to present a technical variation of the percutaneous technique.

Level of Evidence V; Therapeutic Studies; Expert Opinion.

Keywords: Arthrodesis; Foot deformities/complications; Minimally invasive surgery; Subtalar joint; Treatment outcome.

Introduction

The subtalar joint has an important biomechanical role during gait[1]. Post-traumatic osteoarthrosis is the primary pathology affecting the subtalar joint[2,3]. In cases without improvement with conservative approaches, surgical treatment is recommended. The primary procedure used for advanced stages of subtalar degenerative conditions is arthrodesis which can be performed by: open, percutaneous, or arthroscopic approach. Each one of these approaches has its indications, advantages, and disadvantages[4,5].

The open approach is the most traditional technique used for subtalar arthrodesis. The inconvenience is the complication rate related to soft tissue healing, which ranges from 20% to 38%[2,4]. When properly indicated, the subtalar joint arthrodesis performed percutaneously is another option that minimizes complications related to the soft tissue[2,3,5]. The main indication is subtalar arthritis with mild or moderate hindfoot malalignment, specifically in patients with soft tissue problems[2].

Percutaneous subtalar arthrodesis is traditionally performed through a sinus tarsus and classic posterolateral portals[6]. There are few studies evaluating the results of this technique and the best way to access the subtalar joint, especially in cases with degeneration and alteration in the height of the posterior facet[2,3,5]. In cases with post-traumatic arthrosis, the inclination of the posterior subtalar facet can be changed, making the percutaneous access for decortication through the classic posterolateral portal and the sinus tarsal portal more difficult[6]. In these cases, making the portals according to the height and inclination of the posterior subtalar facet can improve decortication and decrease soft tissue complications, potentially providing better surgical results.

The aim of this study is to describe a modification in portals.

Surgical technique

The patient was in a supine position on a radiolucent table. An ipsilateral pad was used on the hip to keep the limb in

Study performed at the COTE Brasilia Clinic, Brasília, DF, Brazil.

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How to cite this article: Dias PFS, Braga BM, Ferreira GF, Schmidt E, Carvalho KAM, Nunes GA. Percutaneous subtalar arthrodesis – configuration of portals using a guidewire. J Foot Ankle. 2023;17(2):126-30.

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60° internal rotation. The procedure was performed using a fluoroscopy (mini c-arm), allowing a lateral and axial view of the calcaneus.

The first step was the preparation of the portals. They were made according to the inclination and height of each patient's posterior subtalar joint facet. For this, a Kirschner wire was used as a guide. The wire was positioned over the skin parallel to the same slope as the posterior subtalar joint facet. According to the inclination of this wire, a 05 mm posterolateral and sinus tarsal portals were made (Figures 1A and 1B), providing an ideal angle to introduce the burr into the joint (Figure 2). The first portal was the sinus tarsus. After making the skin incision, the subcutaneous layer was split using a mosquito clamp.

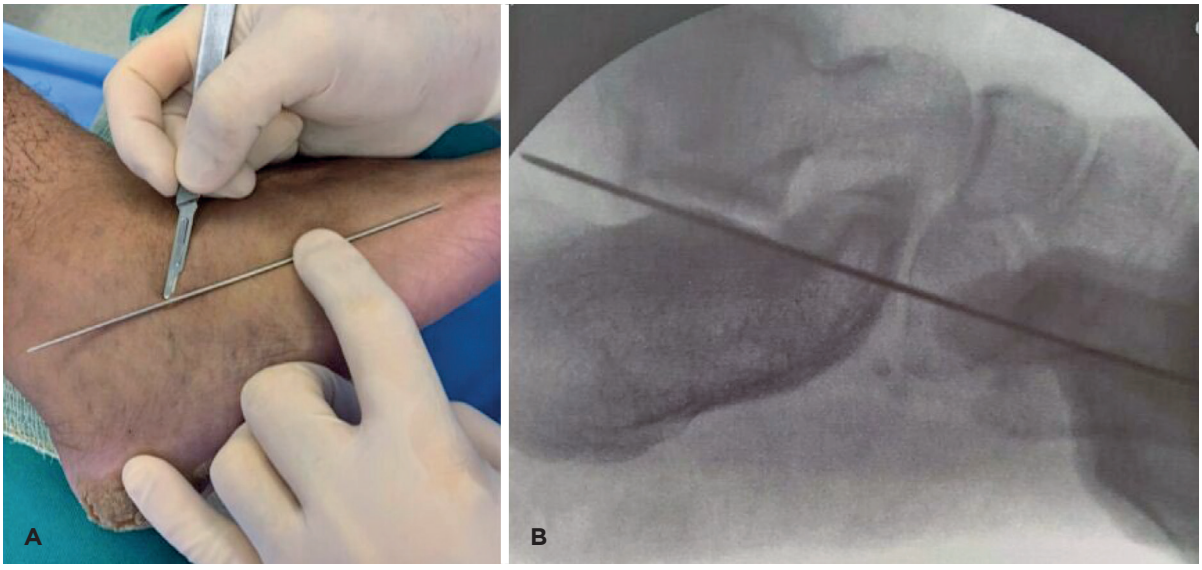

Figure 1. (A) Guidewire over the skin to guide the configuration of portals (B) Fluoroscopy with the guidewire parallel to the slope of the posterior subtalar tilt.

Figure 2. Burr introduction according to the posterior subtalar facet inclination.

Caution is essential because the dorsal intermediate cutaneous branch of the superficial peroneal nerve is superior, and the peroneal tendons are inferior. Then, the posterolateral portal was made at the level of the Kirschner wire, according to the subtalar inclination, just lateral to the Achilles tendon. The posterolateral portal varies in height according to the inclination of the posterior facet and is not limited to the classic posterolateral portal level, as described by Van Dijk[6]. Caution with the sural nerve is important in performing this portal; therefore, a blunt dissection was made with a hemostatic clamp, and the decortication is initiated just when the burr is inside the articular space (Figures 3 and 4).

After the portals were configured, a periosteal elevator was used to create a suitable working area in the joint. Decortication was started with a 2x10 mm Shanon burr (NOVASTEP®, Rennes, France) through the tarsal sinus portal. Then the same burr was introduced through the posterolateral portal (Figure 5). The decortication was finished with more robust roughing cutters such as the 3.1 mm wedge burr (NOVASTEP®, Rennes, France). During the procedure, constant irrigation separately of the burr was performed to avoid complications with the soft tissues. The last step was the fixation performed with two partial thread-cannulated 4.5 mm compression screws (Figure 6).

Postoperatively, the patient wears a plaster splint for two weeks and two more weeks with an immobilizing boot, both with non-weight bearing. Finally, weight-bearing was allowed with an orthopedic boot by the fourth week. Physical therapy started with the boot in the sixth week and was progressively removed until the eighth week (Figure 7).

Discussion

The percutaneous subtalar arthrodesis method has several advantages, including lower morbidity, soft tissue

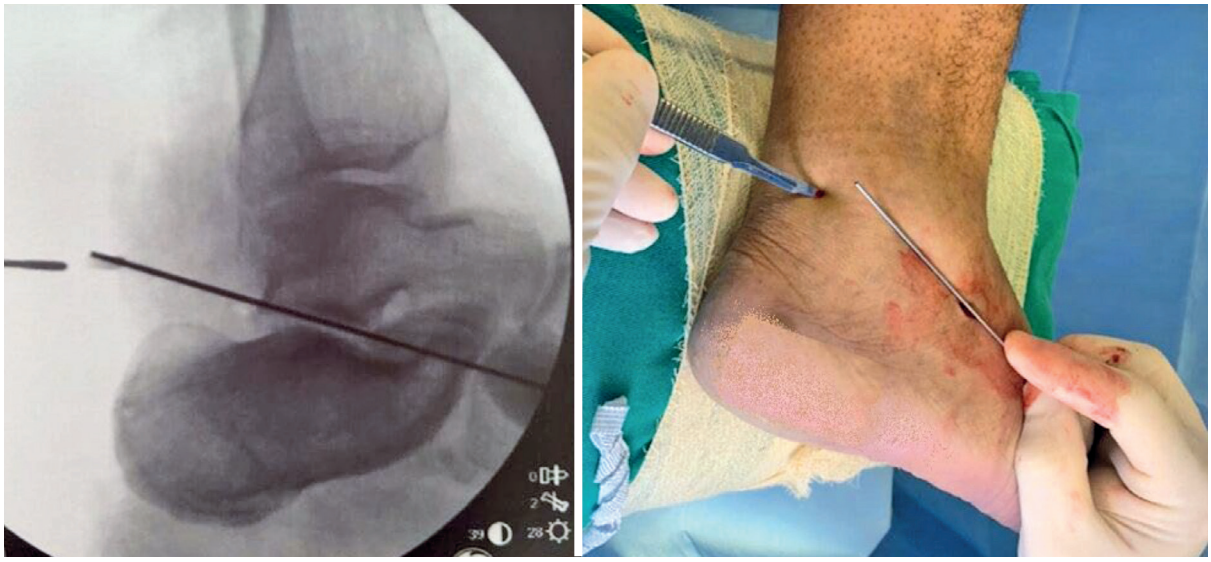

Figure 3. Making the posterolateral portal according to the posterior subtalar facet inclination. Caution with the sural nerve is important to perform this portal.

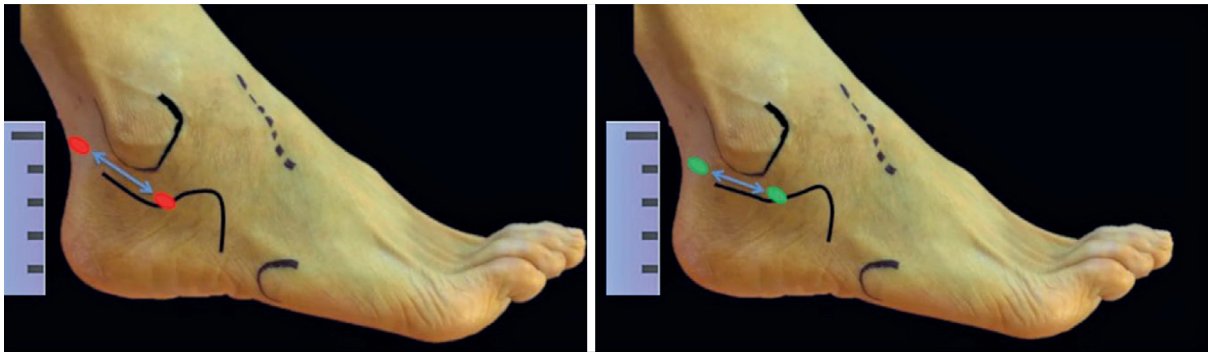

Figure 4. Height difference of the portals according to the slope of the subtalar joint.

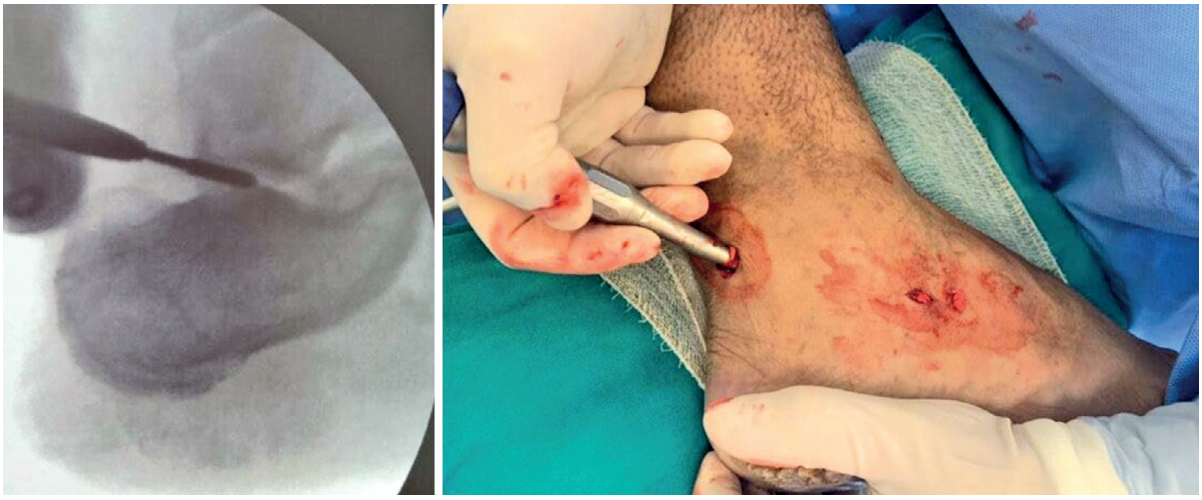

Figure 5. Burr introduction according to the posterior subtalar facet inclination.

Figure 6. Immediate postoperative clinical appearance.

complications, risk of neurovascular injury, and similar consolidation rates compared to open surgery[2,4]. Arthrodesis performed arthroscopically is also minimally invasive and includes the benefits related to soft tissue healing. However, it is a technically more complex procedure with a longer surgical time and a more challenging learning curve[2,3].

In arthrodesis, some parameters are essential to evaluate the performance of the surgery, such as consolidation, complication, pseudarthrosis (nonunion) rates, and time of consolidation. The literature shows a 6.5% pseudarthrosis rate in arthrodesis performed percutaneously without soft tissue complications[3]. In contrast, open surgery has a pseudarthrosis rate of up to 16%, with 20%–38% of soft tissue complications[2,4]. As described in arthroscopic arthrodesis, a shorter time for consolidation is expected in the percutaneous procedure compared to the open[7].

The percutaneous subtalar arthrodesis can be performed either through a posterolateral portal or associated with an anterolateral sinus tarsal portal[2,3]. The greater decortication with two portals provides a 92.2% consolidation rate and corrects mild and moderate deformities[3,8]. Since it is a percutaneous procedure, a well-directed portal is critical to achieve good subtalar decortication. The typical angulation of the posterior subtalar joint facet is 28.6° (ranging from 20° to 40°). It is possible to decorticate 65% of the posterior facet through the classic posterolateral portal[1,4]. However, several deformities are found in the arthritic subtalar joint, with pathological inclinations of the posterior facet, hindering access to adequate decortication through the classic portals. Due to this, we proposed a configuration of portals according to the inclination of the posterior subtalar facet. Using a Kirschner wire, it is possible to guide the portals providing an ideal angle to introduce the burr into the joint. The authors believe that the correct orientation of the burr predisposes to a more effective procedure, thereby improving the subtalar joint decortication and reducing surgical time and complication rate.

Percutaneous arthrodesis has limitations and contraindications such as severe hindfoot malalignment, significant bone loss, need for grafting, and a challenging learning curve[2,3,5]. Besides, the technique has some drawbacks, like higher radiation during the procedure and the use of more expensive equipment (burrs). In addition, very sclerotic areas can make

Figure 7. Clinical and radiographic results at six weeks postoperatively.

the homogeneous decortication procedure and the proper positioning of the hindfoot difficult[2]. Severe hindfoot malalignment is a contraindication because to correct the deformity, a huge graft is needed; thus, we do not recommend it.

The discomfort caused by screws was reported as the main complication in 15.5% of the percutaneous cases, similar to other techniques in 17%[3].

Conclusion

The authors presented a perioperative method to guide the configuration of sinus tarsal and posterolateral portals. It provides an ideal angle to introduce the burr into the joint and probably increase its decortication rate. Despite that, further research is needed to compare and understand its applicability in surgical practice.

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