Arthroscopic Equipment Used in the Treatment of Calcaneal Spurs
A case presentation

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Calcaneal spurs are a common cause of heel pain, discomfort and difficulty in walking and in athletic activities. Often they are associated with plantar fasciitis. The first line of treatment is non-surgical, but often this fails. Although many surgeons prefer the open or mini-open approaches, a growing number of orthopedic specialists are starting to use surgical tools initially designed for arthroscopy in order to treat this pathology. The initial technique was developed by a group of surgeons from the Orthopedic Service of Hospital Hermanos Ameijeiras in Havana, Cuba. This technique involves approaching the heel with an arthroscopic camera and a shaver, creating a chamber around the spur, releasing the plantar fascia and using a burr to eliminate the spur. The surgical tools are borrowed from arthroscopy, but the technique is in fact endoscopic. This only proves that the tools and methods developed in arthroscopic surgery can be extended and used in other areas of orthopedic surgery. We discussed the recent international literature, in order to evaluate the number of reported cases, the surgical technique variations and the outcomes. We looked at patient characteristics (age, sex, comorbidities), outcome measuring tools employed (for example the Budiman-Mak foot function index) and results after surgery, including healing time and complications. We aim to draw a conclusion, based on published results and taking into account as many reported cases as available, in regards to the use of arthroscopic tools in the endoscopic treatment of calcaneal spurs.

Keywords: calcaneal spurs, plantar fasciitis, arthroscopy

Calcaneal spurs are a common cause of heel pain, discomfort and difficulty in walking and in athletic activities. Often they are associated with plantar fasciitis. Some authors consider that repeated microtrauma to the heel and plantar area results in an inflamed plantar fascia, which in term determines a reaction at its insertion site to the calcaneus, with adjacent periostitits [1].

The most common presentation is that of a patient complaining of heel pain and a sensation of tightness in the morning, right after standing up from bed, or after being seated for a lengthy amount of time [2]. The patient may avoid putting pressure on the affected heel, and palpating the medial plantar area of the heel may elicit a varying degree of pain, just as passive dorsiflexion of the toes or ankle will elicit a degree of pain [3].

Imagistic studies may be carries out. Plain radiographs will aid in establishing the diagnosis of subcalcaneal spur (fig. 1), and also rule out other potential causes of hindfoot pain (i.e. a tumor of the calcaneus). The fascial lesions, such as thickening, may be visualized with the help of an ultrasound. MRI is another very efficient method of visualization, showing both the soft tissue as well as the bony modifications to the plantar and hindfoot area [4].

Fig. 1. Bilateral calcaneal bone spurs. This image is from the author's personal database

The first line of treatment is non-surgical, and some authors report as much as 90% success rate with conservative treatment [2, 5] It includes foot stretching, orthoses, tension night splints, taping, extracorporeal shock wave therapy (ESWT) [6], corticosteroid injections (4) and anti-inflammatory medicine. This line of treatment may be continued for up to 6 months before it is considered that it has failed [2]. When conservative treatment fails, several surgical options exist: open plantar fasciotomy and bone spur removal, mini-open plantar fasciotomy, percutaneous plantar fasciotomy [7] and endoscopic fasciotomy and calcaneas spur removal. In selected cases, endoscopic treatment of calcaneal spurs and plantar fasciitis may be a tissue-sparing and effective approach [1].

Although many surgeons prefer the open or mini-open approaches, a growing number of orthopedic specialists are starting to use surgical tools initially designed for arthroscopy in order to treat this pathology. The initial technique was developed by a group of surgeons from the Orthopedic Service of Hospital Hermanos Ameijeiras in Havana, Cuba, with excellent results: 85% improvement in pain levels at 1 year followup [1]. This technique adressed the heel spur and the associated plantar fasciitis [1] and it involves approaching the heel with an arthroscopic camera and a shaver throush two portals (medial and lateral), creating a chamber around the spur in the subcutaneous tissue, establishing a lateral and a medial portal in the plantar fascia at the anterior edge of the calcaneal tuberosity [8], releasing the plantar fascia and using a burr to eliminate the spur. Although the two-portal technique is most often used, some authors describe a single portal technique [9]. The surgical tools are borrowed from arthroscopy, but the technique is in fact endoscopic; powered by the continuous development of computation power [10], more and more often arthroscopic tools seem

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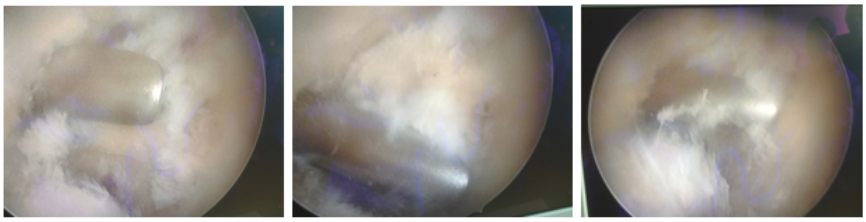

Fig. 2-4. Endoscopic images showing plantar fascia release and calcaneal bone spur reduction. These images are from the author's personal database

to be used in other fields, as engineering and medicine come more and more often in contact, creating new areas of research and development [11].

Objective

The objective of this article is to present the case of a patient treated with endoscopic calcaneal heel removal and plantar fascia release in our clinic and to discuss the relevant literature.

Experimental part

Case presentation

We present the case of a 47 year-old female patient presenting to our clinic with chronic posterior plantar pain in both of her feet. The described pain was said to be related to activity at first, but in recent years had slowly become persistent, being present even before getting out of bed.

She had initially been treated with NSAIDs, both topically and orally and shoe inserts in another Orthopedic service, before presenting to our Clinic. The treatment had only been partially helpful, and the pain level was still high enough to cause disturbance of her daily lifestyle.

Upon examination, we found sharp pain upon palpating the central and medial plantar area of the heel, present in both feet but more intense in the left one. The pain was also elicited by performing dorsal flexion of the ankles and of the forefoot, but the intensity was less than that produced by direct palpation. The patient's walk was affected, as she tended to put more pressure on her forefoot and on the lateral part of her hind foot, in an effort to protect the painful area. The thigh-calcaneus axis was normal in both feet. The Numeric Pain Intensity Scale was reported as 8 on the left side and 6 on the right side.

We performed a series of radiographs of her feet, A-P, L-L and anterior arch view, stored in the hospital's database, as per protocol [12], showing no significant collapse of the arches, but showing instead subcalcaneal spurs bilaterally, of moderate size.

We started treatment by prescribing etoricoxib 90 mg daily for 7 days, then as needed, with gastric protection, and 30 days of physiotherapy, kinetotherapy and medical massage, as well as 10 sessions of laser therapy in our service. The pain diminished considerably in her right heel, but only slightly in her left one at the end of this period. The Numeric Pain Intensity Scale was reported as 7 on the left side and 3 on the right side. The treatment was continued for another 4 months, except for the etoricoxib, which was recommended to be taken only when acutely needed, with gastric protection. At the end of this period the Numeric Pain Intensity Scale was reported as 6 on the left side and 1 on the right side. At this point extracorporeal shock wave therapy was proposed, but the patient turned it down, opting for a more aggressive approach towards the pathology.

Taking into consideration the lack of response to conservative treatment of the left hindfoot, the decision was made to address the problem surgically. Both mini-open as well as endoscopic plantar fasciotomy and subcalcaneal bone spur removal were discussed with the patient as options, explaining the advantages, the disadvantages as well as the risks and complications of each procedure, and the decision was made to perform the endoscopic procedure. Written consent was obtained.

The procedure was performed under spinal anaesthesia, with the foot and thigh exanguinated using an Esmarch bandage and a tourniquet and the patient in a prone position. Two approaches were made, medial and lateral, 5-7 mm each, through which an arthroscopic camera and initially a shaver, then a burr were inserted. A working chamber was created with the shaver, the subcalcaneal spur was identified and removed with the burr, and the insertion of the plantar fascia to the calcaneus was identifies and released with the shaver (fig. 2-4).

At the end, a single radiological image was taken intraoperatively to verify that enough of the spur was removed (fig. 5). A drain was put in place and the incisions were closed single layer.

Fig. 5. Heel spur removed endoscopically- intraop xray control image. This image is from the author's personal database

Results and discussions

Following surgery, the drain was removed the next day, and the patient was kept on antibiotics for another 3 days. The dressing was changed every two days, a compressive bandage was used and the sutures were removed after 14 days. The patient was discouraged from putting pressure on the wound initially, using a crutch and putting pressure only on the forefoot until the incisions were healed. After this time, the patient started slowly adding pressure on the hindfoot as pain allowed, progressing to full weight bearing at 3 weeks. At this time the Numeric Pain Intensity Scale was reported as 2 on the left side.

At the 3 months follow-up, the patient reported minimal pain, and the Numeric Pain Intensity Scale was reported as 1 on both sides, but only after long periods of walking and/or standing upright. Walking was not affected. The decision was made to continue with physiotherapy, kinetotherapy and medical massage on both heels, as needed.

The favorable outcome for the presented case is supported by the literature, as further shown.

We aim to discuss the recent international literature, performing a PubMed search for all articles relating to the following associations: endoscopic + plantar fasciitis, *endoscopic + heel spur endoscopic + plantar +*

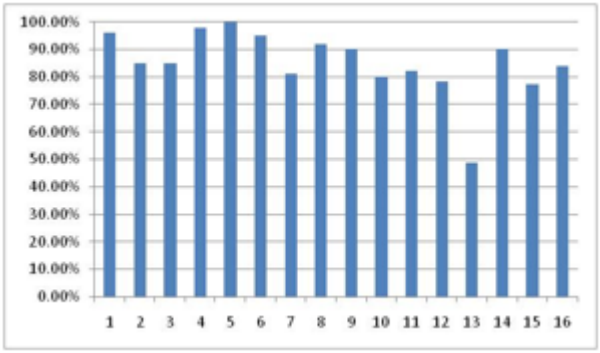

Fig. 6. The degree of patient satisfaction in 16 studies

fasciotomy and *calcaneal spur.* Reviews and studies that included case presentations or very short case series were excluded from this search. Articles describing the endoscopic release performed for decompression of the first branch lateral plantar nerve were excluded.

Where the data was available, the following criteria were noted: number of patients included; M:F ratio, age, the duration of the study, whether it was a multicentric or single center study, whether the interventions were performed by a single surgeon or by multiple surgeons, for how long were the patients treated non-operatively before surgery, how long was the follow-up, what was the rehabilitation time, whether the results were evaluated through a scale, what was the degree of satisfaction for the patients, what was the evolution of the patients' paint post-op, what were the complications, what were the advantages of the endoscopic procedure, and whether the study's authors recommend the use of the endoscopic procedure.

Our PubMed search resulted in 31 studies in the last 15 years, each study ranging from 10 to 652 cases, with a total of 1659 cases. The age group for each study varies significantly, but the majority was in their 4th and 5th decade. The duration of the studies ranged from 12 months to 5 years, and most studies showed a predominance of female patients. Of the studies, 2 were multicentric, while the rest (29) were conducted analyzing cases from a single centre. The cases were treated conservatorily for a varying period before surgery, ranging from 3-6 months in some studies to 21 or 34 months in other studies. The time to rehabilitation varied from 6 to 24 weeks, in most studies being 8-10 weeks. In 20 studies, results were measured through scales, the American Orthopedic Foot and Ankle Society (AOFAS) and Visual Analogue Scale (VAS) being the most commonly used: 10, respectively 6 times. The degree of patient satisfaction was reported in 16 of the 31 studies, and ranged from 48.8 to 100%, with most studies reporting patient satisfaction from 80% to 100%. In regard to complications, 19 studies reported no complications, and the rest of the studies reported a total of 27 complications, some of which were related to obesity [13] and some to the surgical procedure itself: transient paresthesia at the lateral border of the foot [14-16], hyperkeratosis at the portal site [15], stress fracture of the metatarsals[17, 18], superficial wound infections [14, 18], deep venous thrombosis [19], transient lateral hindfoot pain [18, 20], superficial phlebitis [19], persistent drainage from the wound [21]and bony stress reaction of the calcaneus [20]. One study found that the prognosis of sedentary patients was inferior to that of patients engaged in athletic activity [16], while another two studies found that the result were inferior for patients that underwent through the procedure bilaterally [22] or had prior ankle trauma or surgery [23].

The good results of the use of arthroscopic tools in unusual locations in the body are partly due to recent development of faster and more precise computation power [24] to further perfect the existing arthroscopic tools, allowing for an ever more flexible instrumentation set.

All studies recommend the use of endoscopic techniques in the surgical treatment of plantar fasciitis and heel spurs. Bader et all claim that with the correct technique, the results are reproducible and the procedure has a low complication rate and little risk of iatrogenic nerve injury. [18] In their 2013 article, Nery et al. claim that the endoscopic plantar approach is safe and very effective. [17] In their 2003 article, Boyle and Slater consider that endoscopic partial release of the plantar fascia is a successful, safe and reliable procedure [25]. In his 2018 article, Al-Ashhab found that the endoscopic release of the plantar fascia is a procedure accompanied by less pain, activities limitations and gait abnormality; it inflicts less surgical trauma and provides for a rapid recovery [26]. Wang et al. compared endoscopic and open radiofrequency microtenotomy for recalcitrant plantar fasciitis, and found both treatments having equivalent results at one year, but the endoscopic procedure was associated with an earlier improvement in functional outcome for the patients [27].

Conclusions

The endoscopic treatment of calcaneal spurs and of plantar fasciitis represents a safe and effective surgical technique, with a high success rate and a high patient satisfaction rate. The use of this technique offers a fast recovery, with few described complications, and is widely recommended in the studied literature. This suggests that the tools and methods developed in arthroscopic surgery can be extended and used in other areas of orthopedic surgery.

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