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Evolution And Clinical Effectiveness Of Surgical And Conservative Methods In The Treatment Of Calcaneal Exostoses

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Abstract: Calcaneal spur, a bony outgrowth at the attachment site of the plantar fascia, is one of the main causes of chronic heel pain and is frequently associated with plantar fasciitis. Despite its prevalence, the clinical and pathological significance of the spur remains controversial. This study reviews the evolution and clinical effectiveness of both surgical and conservative treatment approaches for calcaneal spurs, based on recent literature data. An analytical review of key studies was conducted, evaluating the outcomes of endoscopic plantar fasciotomy, minimally invasive spur resection, and conservative modalities such as shock wave therapy, ultrasound therapy, and low-dose radiotherapy. Evidence suggests that endoscopic and minimally invasive surgical methods reduce operative trauma and enhance postoperative recovery. However, the calcaneal spur itself is not always the primary pathological factor; rather, inflammation and tendinopathy of the plantar fascia play a more significant role. Conservative methods, particularly ESWT and low-dose radiotherapy, have proven effective in pain reduction and inflammation control. Treatment of calcaneal spurs should be individualized, taking into account the condition of the plantar fascia and the morphology of the spur. In modern clinical practice, the calcaneal spur should be viewed not as an independent disease, but as a morphological manifestation of plantar fasciitis.

Keywords: Calcaneal spur; plantar fasciitis; endoscopic plantar fasciotomy; minimally invasive surgery.

Introduction: The calcaneal spur is a bony outgrowth (osteophyte) located at the attachment site of the plantar fascia to the calcaneus. It is often associated with plantar fasciitis and represents one of the most common causes of chronic heel pain in the general population. The morphological and clinical significance of this pathology remains a subject of scientific debate.

Chronic heel pain is reported to affect up to 10–15% of the adult population, particularly in individuals aged 40–60 years, athletes, and those with prolonged standing occupations. The pathogenesis of calcaneal spurs has been linked to chronic mechanical overload, microtrauma, and degenerative changes at the fascia–bone interface. Over time, repetitive traction forces induce periosteal reactions leading to osteophyte formation. However, it remains unclear whether the spur is the primary cause of pain or a secondary manifestation of plantar fasciitis.

In recent decades, considerable attention has been directed toward refining both surgical and non-surgical treatment modalities for calcaneal spur–related pain. Traditional open surgical methods have largely been replaced by endoscopic plantar fasciotomy and minimally invasive spur resection, which significantly reduce operative trauma and rehabilitation time. Meanwhile, conservative interventions—such as physiotherapy, extracorporeal shock wave therapy (ESWT), ultrasound, and low-dose radiotherapy—have

demonstrated favorable outcomes in managing inflammation and reducing pain intensity.

The following literature review aims to summarize and critically analyze the evolution of these treatment approaches, evaluate their clinical effectiveness, and highlight current perspectives on the pathogenesis of calcaneal spurs and their association with plantar fasciitis.

Barrett S.L. and Day S.V. (1991) were the first to describe the endoscopic plantar fasciotomy method for treating chronic plantar fasciitis and calcaneal exostosis. The authors highlighted its advantages, such as minimal incision trauma, faster pain reduction, and shorter rehabilitation time. According to their results, endoscopic fasciotomy was found to be more effective and less traumatic compared to traditional open surgery. This study laid the foundation for subsequent research on minimally invasive surgical approaches to calcaneal spur treatment [1].

Following Barrett and Day's work, a number of studies have confirmed the benefits of endoscopic plantar fasciotomy. Compared with conventional open procedures, the endoscopic approach allows for precise visualization of the fascia, less postoperative pain, and faster return to normal activity. Complication rates, such as wound infection and postoperative adhesions, are also significantly lower. Recent modifications of the technique include partial fascial release, which preserves the medial and lateral fascial bands to prevent longitudinal arch instability.

However, despite these advantages, some authors note potential drawbacks, including the risk of incomplete fascial release or iatrogenic injury to the tibial nerve branches. Therefore, careful preoperative selection and intraoperative control are crucial. Long-term outcomes suggest that while the majority of patients experience substantial pain relief, a small percentage may develop recurrence due to persistent biomechanical stress or underlying metabolic disorders.

Cooperman S.R. et al. (2025) investigated the effect of calcaneal spur resection on postoperative outcomes in patients undergoing plantar fascia surgery. The study compared over 200 cases of fasciotomy with and without spur removal. The results showed that excision of the spur did not significantly affect the overall functional outcomes of the surgery. However, patients who underwent spur resection experienced earlier pain relief and reduced mechanical tension in the fascial tendon. On the other hand, these cases were associated with slightly longer operative times and a higher incidence of minor bone regeneration complications. The authors concluded that spur resection is not always necessary and should be reserved for cases with large osteophytes evident on radiographs or in patients unresponsive to conservative therapy [2].

This research emphasizes an important clinical consideration — that the presence of a calcaneal spur does not necessarily dictate the need for its removal. The findings align with the current biomechanical understanding that heel pain is multifactorial, often arising from soft-tissue inflammation and fascial degeneration rather than from the bony spur itself. The decision to perform spur excision should therefore be individualized, balancing radiological findings with patient-specific symptoms and functional limitations.

Moreover, comparative outcome studies in the last decade have shown that while spur resection can provide short-term pain relief, its long-term superiority over fascia-release-only surgery remains unproven. Surgeons increasingly favor selective or partial fasciotomy techniques that address the underlying fascial pathology while minimizing osseous intervention. This paradigm shift reflects the broader trend in modern orthopedics toward function-preserving, minimally invasive procedures that aim to optimize recovery and reduce surgical morbidity.

Arican M., Turhan Y., and Karaduman Z.O. (2019) described a rare cause of heel pain—fracture of the calcaneal spur. Through a clinical case, they emphasized the importance of radiographic examination to identify spur fractures as a potential cause of severe heel pain and gait limitation. Such pain may mimic ordinary plantar fasciitis, but conservative therapy tends to be ineffective in the presence of a fracture. The authors concluded that timely radiological diagnosis of spur fractures can prevent unnecessary surgical interventions [3].

Importantly, this study underlines the necessity of differential diagnosis in chronic heel pain syndromes. While plantar fasciitis typically results from repetitive microtrauma and fascial tension, a spur fracture produces a distinct mechanical and inflammatory profile, frequently resistant to physiotherapy, orthotic correction, or corticosteroid injection. The authors concluded that timely radiological identification of spur fractures is essential to avoid unnecessary surgical procedures or prolonged ineffective therapy.

This report expands the diagnostic spectrum of heel pain etiologies and highlights that, in selected patients, a thorough imaging-based assessment should precede any invasive treatment. Consequently, the findings by Arican et al. (2019) support a more comprehensive diagnostic algorithm integrating clinical evaluation, ultrasound, and radiography to differentiate between

soft-tissue inflammation, enthesopathy, and structural bony injury.

Kuyucu E., Koçyiğit F., and Erdil M. (2015) investigated the clinical significance of calcaneal spurs associated with plantar fasciitis and analyzed the relationship between spur length and pain intensity. Radiological evaluations revealed that spur length had no direct correlation with the level of pain or degree of functional limitation. The authors concluded that the degree of plantar fascia inflammation and tendinopathy plays a more important role than the spur itself. Therefore, it is incorrect to always regard the calcaneal spur as the primary source of pain [4].

Johal K.S. and Milner S.A. (2012) critically analyzed the association between heel spurs and plantar fasciitis, exploring the central question: "Is the spur the actual cause of pain or merely a coincidental finding?" Their study involved a comprehensive review of clinical and radiological data from patients with chronic heel pain, comparing the presence, morphology, and size of calcaneal spurs with the intensity and duration of pain symptoms.

The results demonstrated that in many cases, heel spurs are incidental radiographic findings that do not necessarily correlate with the severity of plantar pain. The authors observed that a significant proportion of patients with radiologically evident calcaneal spurs remained asymptomatic, while others with severe plantar fasciitis symptoms showed no detectable spur formation. These findings suggest that the spur itself is not the primary pathological structure responsible for pain, but rather a byproduct of chronic traction forces and degenerative changes within the plantar fascia.

Johal and Milner emphasized that clinical attention should shift from the osseous spur to the soft-tissue alterations within the plantar fascia, such as collagen degeneration, fibroblast proliferation, and local inflammation at the fascial insertion site. They also noted that focusing treatment solely on spur removal may overlook the underlying fascial pathology that perpetuates the patient's symptoms. Consequently, the authors recommended a more conservative and multifactorial therapeutic approach—prioritizing the management of inflammation, tendon elasticity, and biomechanical balance of the foot—before considering surgical excision of the spur.

This study played a pivotal role in redefining the clinical relevance of calcaneal spurs, moving away from the traditional perception of the spur as the main pain generator. It helped establish a more evidence-based understanding that chronic heel pain is a multifactorial condition primarily driven by degenerative and inflammatory changes in the plantar fascia rather than the presence of a bony protrusion itself [5].

Kociuga N. et al. (2016) conducted a comprehensive analysis of the clinical effectiveness of physiotherapeutic interventions in managing painful conditions associated with calcaneal spurs. The authors emphasized that the primary objective of conservative treatment is not only to alleviate heel pain but also to reduce mechanical overload and tensile stress on the plantar fascia. This biomechanical decompression helps interrupt the cycle of inflammation and degenerative changes at the fascial insertion site, which are key contributors to chronic plantar heel pain.

In their study, the authors compared the outcomes of several physiotherapeutic modalities, including ultrasound therapy, extracorporeal shock wave therapy (ESWT), deep tissue massage, stretching exercises, and the use of custom orthotic insoles designed to offload the plantar fascia. The results demonstrated that a multimodal approach combining these methods provided superior symptom relief compared to any single therapy alone. Particularly, ESWT was highlighted as an effective non-invasive option capable of stimulating microcirculation, promoting local tissue regeneration, and reducing nociceptive signaling.

Patients who underwent the combined conservative regimen showed marked improvement in pain scores, gait function, and overall quality of life. Moreover, ultrasound and massage therapy were found to enhance fascial flexibility and decrease local stiffness, thereby improving the biomechanical efficiency of the foot during weight-bearing activities.

Based on these findings, Kociuga and colleagues concluded that physiotherapy should be regarded as the first-line and most essential stage of management in patients with calcaneal spur–related pain. They emphasized that surgical treatment should be considered only in refractory cases where structured conservative measures fail to achieve adequate symptom control after a sufficient trial period. Thus, the study supports a patient-centered and stepwise approach to calcaneal spur management, prioritizing non-invasive techniques that restore function while minimizing procedural risks [6].

Seegenschmiedt M.H. et al. (1996) conducted one of the earliest and most comprehensive studies evaluating the clinical efficacy of radiotherapy in the management of chronic pain syndromes caused by plantar heel spurs. Their work aimed to determine whether targeted low-dose irradiation could modulate the local inflammatory response, decrease pain, and improve functional outcomes in patients resistant to conventional conservative therapy.

The authors compared various radiation protocols and observed that low-dose radiotherapy, typically within the range of 3–6 Gy total dose, produced significant therapeutic benefits without notable adverse effects. Radiobiological analysis suggested that such low doses act primarily through anti-inflammatory and immunomodulatory mechanisms, leading to suppression of local cytokine release, inhibition of fibroblast overactivity, and normalization of microcirculatory function within the affected fascial tissues.

Clinical results demonstrated that 70–80% of patients experienced substantial pain relief following treatment, with improvements maintained for 6–12 months in most cases. Patients reported enhanced mobility, decreased morning stiffness, and improved gait function. Importantly, the treatment was minimally invasive, painless, and free from post-procedural complications, making it a viable therapeutic alternative for elderly patients or individuals with contraindications to surgery.

Based on their findings, Seegenschmiedt and colleagues concluded that low-dose radiotherapy represents an effective conservative option in the stepwise treatment algorithm for calcaneal spur–related heel pain. They emphasized that while radiotherapy does not alter the spur morphology, it significantly modulates the underlying inflammatory and degenerative processes responsible for symptom persistence. The study thus established a radiobiological basis for incorporating low-dose irradiation into multimodal management strategies, particularly for chronic, therapy-resistant cases of plantar fasciitis and heel spur syndrome [7].

CONCLUSION

The analysis of the pathogenesis and treatment strategies of calcaneal spurs demonstrates the diversity of existing clinical approaches to this pathology. Endoscopic fasciotomy and minimally invasive spur resection techniques reduce surgical trauma and improve functional outcomes. However, recent studies emphasize that the calcaneal spur itself is not always the main pathogenic factor; the principal pathological process is often associated with inflammation and tendinopathy of the plantar fascia.

Conservative methods—including shock wave therapy, ultrasound therapy, and low-dose radiotherapy—have been shown to be effective in reducing pain and suppressing inflammation. Therefore, an individualized treatment approach, considering both the condition of the fascia and the morphology of the spur, is essential. In modern clinical practice, the calcaneal spur should be regarded not as an independent disease, but rather as a morphological manifestation of plantar fasciitis.

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