## INFORMATION BRIEF (RAPID REVIEW)

# RADIOFREQUENCY ABLATION THERAPY FOR PAIN MANAGEMENT: ANKLE, HIP JOINTS AND PLANTAR FASCIITIS

**Malaysian Health Technology Assessment Section (MaHTAS)**
**Medical Development Division**
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**TITLE: RADIOFREQUENCY ABLATION THERAPY FOR PAIN MANAGEMENT ON THE ANKLE AND HIP JOINTS AND FOR PLANTAR FASCIITIS**

## PURPOSE

To provide brief information on the effectiveness, safety and cost-effectiveness of radiofrequency ablation therapy for pain management on the ankle and hip joints, and plantar fasciitis based on request from the Director of Medical Practice Division, Ministry of Health Malaysia.

## BACKGROUND

Ankle joint pain refers to any discomfort, soreness, or aching sensation experienced in or around the ankle joint. It can range from mild to severe and may worsen with movement, especially walking or standing. The ankle joint is a complex structure formed by three bones (tibia, fibula, and talus) and held together by a network of ligaments and tendons that allow for various foot movements. Pain can arise from damage or inflammation to any of these structures. Treatment for ankle pain depends on the underlying cause and severity. It can range from self-care measures like RICE (Rest, Ice, Compression, Elevation) for minor injuries to physical therapy, medication (pain relievers, anti-inflammatories), steroid injections, bracing, or, in severe cases, surgery. [1] Painkillers, whether taken by mouth or applied to the skin, often don't work well. Physical therapy, acupuncture, and supportive insoles may help some, but many patients report little to no improvement. Nerve blocks can offer dramatic, temporary relief, but the pain usually creeps back within days. On top of that, concerns about side effects and drug interactions make some patients hesitant to try commonly prescribed medications for nerve-related pain. Trauma remains the leading cause of ankle pain, especially sural neuropathy, with case reports frequently linking it to falls or severe twisting injuries. [11,12]

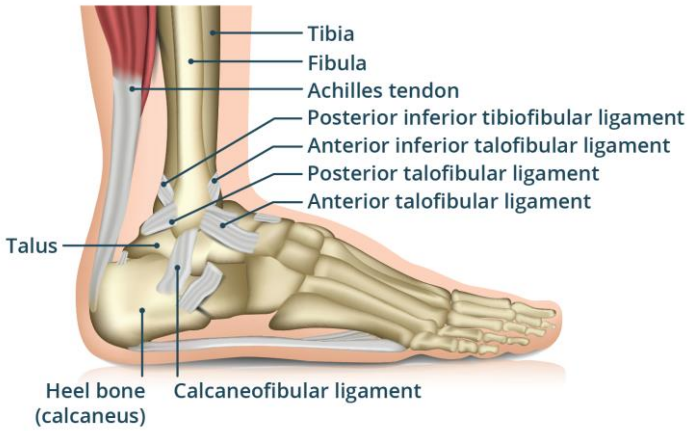


Figure 1: The tendons, ligaments and bones of the ankle joint. [27]

Chronic hip pain is a common condition with a wide variation of a etiologies: osteoarthritis (OA), rheumatoid arthritis, osteonecrosis, infection, avascular necrosis, labral pathologies, metastasis, peripheral neuropathy, and post-total hip arthroplasty (THA) pain. [1]The overall incidence of hip pain in the adult population (> 45 years of age) is about 7-10% (9.3% in women, 8.7% in men). It is often the primary cause of functional disability. Among adults who

are active in sports, the incidence of chronic hip pain is 30 to 40%, while among the elderly over the age of 60, the incidence of pain averages about 12 to 15%. Unfortunately, it increases with age. Typical clinical signs include pain in flexion, abduction and internal hip rotation. Synovitis and labral injuries of the hip joint are common causes of pain in younger people, while trochanteric pain syndromes and various osteoarthritis are more common in older age groups. [2] The hip joint is a spherical synovial joint that transfers weight between the upper and lower body and allows movement in all planes. Hyaline cartilage inside the joint, as well as the fibrocartilaginous sheath (labrum) around the edge of the acetabulum, enables its functionality. The hip joint is supported anteriorly by the iliofemoral and pubofemoral ligaments, and posteriorly by the ischiofemoral ligament. It is surrounded by a large number of muscle groups that allow a wide range of motion. [3] Current treatments for chronic hip pain often have significant limitations compared to radiofrequency ablation (RFA). Pain medications and non-pharmacological methods typically provide incomplete relief, while intra-articular injections offer only short-term benefits. Although total hip arthroplasty (THA) is considered a definitive treatment, it carries risks for patients with comorbidities, and a significant number of patients continue to experience chronic pain after the surgery. In contrast, RFA is a minimally invasive alternative that can provide effective relief, particularly for patients who are not candidates for THA or whose previous treatments have failed. [14,15,16]

Plantar fasciitis is a common and debilitating musculoskeletal condition, affecting approximately 10% of the general population during their lifetime. Plantar fasciitis has many other names, including painful heel syndrome, heel spurs, runner's heels, sub-calcaneal discomfort, calcaneodynia, and calcaneal periostitis. It develops when the plantar fascia gets inflamed, causing heel discomfort and pain. It is a degenerative disorder of the plantar fascia that causes it to become overly thick and painful, particularly where it connects to the calcaneal bone. Because of the impacts of this disorder, 11 to 15% of those afflicted require medical care. This condition commonly affects runners and military personnel, although it may affect any population, especially middle-aged ladies between the ages of 40 and 60. [4]

It affects 11% to 15% of people with foot symptoms, with 20% to 30% experiencing it in both feet. While often improving with activity, pain can persist and disrupt daily life. The pain, initially diffuse, typically concentrates on the inside of the heel over time. This condition, which is a prevalent cause of heel pain, typically manifests as a sharp pain during the first steps in the morning or after prolonged periods of rest. As the day progresses and activity increases, the pain may subside, but it often returns after extended periods of standing or walking. Conservative treatments for plantar fasciitis such as NSAIDs, stretching, orthotics, physical therapy, ESWT, steroid injections, and PRP often provide only temporary, inconsistent, or limited relief, with risks like fascia rupture and heel pad atrophy from steroids, and variable outcomes with ESWT. Surgical options, including open plantar fascia release or arthroscopic debridement, are associated with longer operative and recovery times, larger wounds, higher complication rates, and incomplete pain relief. In recent years, radiofrequency ablation (RFA) has emerged as a minimally invasive technique for the treatment of recalcitrant plantar fasciitis. [5,21,22.]

## Radiofrequency ablation

Radiofrequency (RF) treatment is an effective therapy for various chronic pain conditions including radicular pain, sacroiliac joint pain, post-surgical pain, myofascial pain, and arthritic pain. [6] According to the previous information brief report (2023) entitled radiofrequency ablation for greater and lesser occipital nerve neuralgia, pulsed radiofrequency lesioning

could relieve chronic pain by delivering an electrical field and heat bursts (42°C, as opposed to conventional radiofrequency applications that deliver a constant temperature of 60°C to 80°C) to neural tissue without causing neural injury. The procedure is similar to a needle biopsy in that a needle-like probe is inserted into the body (see Figure 2). The probe emits radiofrequency waves into the surrounding tissue, causing nearby cells to die. As these cells die, the immune system removes them, causing an internal reaction and in general, causing the nodule to shrink. The health care provider uses ultrasound or another imaging technique to place the probe's tip in the correct location. Radiofrequency ablation can be performed in an office or as an outpatient procedure and does not require general anaesthesia. The patient may be given relaxation medication as well as a numbing agent for the area of the skin where the probe is inserted. Most people who have radiofrequency ablation can go home the same day and resume their normal activities within 24 hours. [5]

The development of the radiofrequency technique was applied in orthopedics to decrease laxity of connective tissues around joints, at first in the context of shoulder instability. The rationale behind it was to obtain temperatures between 70 °C and 80 °C, which would cause collagen to shrink and trigger a healing response. [9] For plantar fasciitis, RFA working by targeting nerve tissue to disrupt pain signals. There are two main types of RFA, Thermal RFA (TRFA) uses high temperatures to desensitize nerves, but carries a risk of damaging surrounding tissues. In contrast, Pulsed RFA (PRFA) (Figure 3) employs low-temperature pulsed electric fields, offering similar pain relief with minimal neurodestructive effects and a significantly lower risk of complications like neuritis or neuroma, as the pauses between pulses prevent excessive heating. [5] In Malaysia, radiofrequency ablation is not listed in the Private Healthcare Facilities and Services (Private Hospitals and Other Private Healthcare Facilities) (Amendement) Order 2013. [7,8]

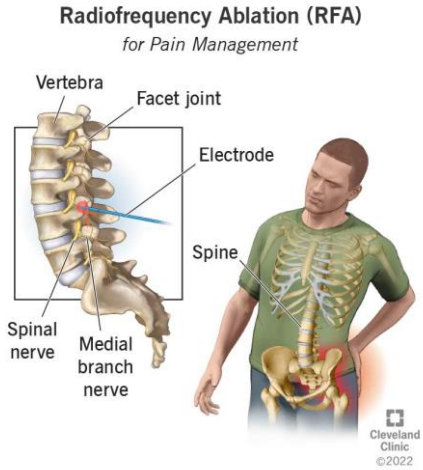


Figure 2: Radiofrequency ablation targets specific parts of a nerve so that it stops sending pain signals to the brain. [9]


Figure 3: Example of stages of pulsed radiofrequency ablation for Plantar Fasciitis. A: Placement of the grounding pad B: Application of hypodermic cannula with a stylet C: Removal of the stylet needle and insertion of the electrode D: Application of radiofrequency E: Administration of anesthetic substance after the procedure. [4]

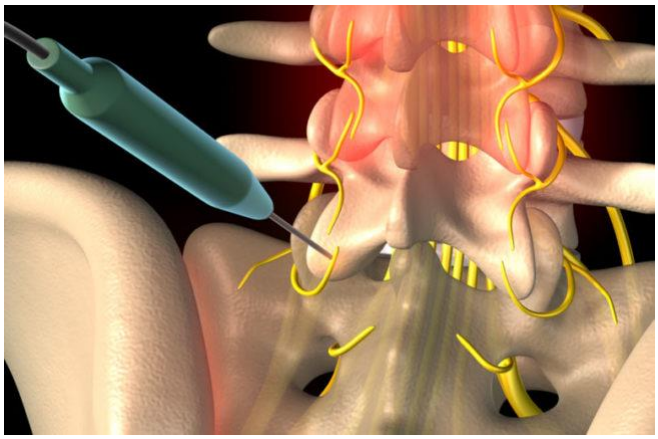

Figure 4: An example of tiny needle or probe first inserted into desired location to start RFA procedure. [10]

Several review on RFA have been conducted previously by MaHTAS including for osteoarthritis, prolapsed intervertebral disc and tennis elbow, occipital nerve neuralgia, Radiofrequency Neurotomy of Genicular Nerve of Both Knee and Radiofrequency microtenotomy (TOPAZ procedure) for plantar fasciitis.

## EVIDENCE SUMMARY

Fifty-five articles were retrieved from scientific databases of Ovid-Medline, PubMed, general search engine (Google Scholar) and reference list on radiofrequency ablation therapy for pain management on the ankle and hip joints, and plantar fasciitis using the following search terms "*Radiofrequency Ablation (RFA) Therapy, ankle, hip joints and plantar fasciitis pain".* The last search was done on 25th July 2025. Ten studies were included in this review which consisted of two randomised controlled trial, five observational studies and three case reports.

## EFFICACY/ EFFECTIVENESS

### Ankle

There were two low level of evidences retrieved on the management of radiofrequency ablation on management of ankle pain.

Pelloso LRCA et al (2012) published a case report on Refractory chronic ankle pain controlled with pulsed radiofrequency. This study reported the successful application of pulsed radiofrequency (PRF) therapy in managing chronic ankle pain in a 60-year-old woman who had endured discomfort in her right ankle for five years. Her symptoms had resisted numerous treatments, including opioids, NSAIDs, antidepressants, anticonvulsants, physical therapy, local injections, acupuncture, and custom insoles. A diagnostic block of her right sural nerve using bupivacaine provided complete pain relief in the submalleolar area, prompting further intervention. The patient subsequently received two PRF sessions targeting the sural nerve, with the needle positioned between the Achilles tendon and the lateral malleolus. To pinpoint the nerve, sensory stimulation was conducted at 0.5 volts and 50 Hz, followed by pulsed current delivery at 45 volts for 140 seconds, maintaining a temperature of up to 42°C. Post-treatment, the patient reported about an 80% reduction in pain and was able to walk and stand with significantly less difficulty. The report suggested that PRF of the sural nerve may be a promising method for alleviating persistent ankle pain. [11]

Another case report by Todorov L et al (2011) found that the successful use of pulsed radiofrequency (PRF) for managing refractory chronic ankle pain in a 39-year-old female with confirmed sural neuropathy following trauma. Conventional treatments including oral and topical analgesics and lidocaine patches were ineffective. After transient pain relief from a diagnostic sural nerve block, a single PRF application (240 seconds at 45 volts, <42°C) yielded complete and sustained pain resolution at rest and during activity for five months without complications. This was the first documented successful PRF intervention targeting the sural nerve, suggesting its potential for long-term relief in neuropathic pain, despite unclear underlying mechanisms. [12]

### Hip

Based on retrieval evidences, four studies included are low level evidences consisted of cohort, case reports and retrospective review studies.

A retrospective cohort study conducted by Diwan S et al (2024) aimed to assess the efficacy of percutaneous pulsed radiofrequency ablation (PRF-HAN) for chronic hip pain (CHP). The comparator for treatment effectiveness was each patient's baseline pain and functional status while receiving conventional systemic analgesics. The study included 31 adult patients (mean age 66.6±5.7 years, 13 males, 18 females) who suffered from excruciating chronic hip pain, primarily due to severe osteoarthritis unresponsive to conventional treatment, and possessed severe comorbid conditions that made them ineligible for Total Hip Arthroplasty (THA). At baseline, these patients presented with significant pain and disability (mean NRS 7.4±1.6, HHS 29.6±9.2, WOMAC 62±9.9). The study involved an initial fluoroscopic-guided diagnostic denervation block of the femoral and obturator nerve articular branches. Only patients demonstrating a ≥50% reduction in their Numerical Rating Scale (NRS) scores from this diagnostic block proceeded to the PRF-HAN procedure. During PRF-HAN, the sensory

branches of the femoral and obturator nerves were ablated twice at 90°C for 90 seconds using a 22-gauge electrode. Accurate needle placement was confirmed by fluoroscopy and electrical stimulation (sensory stimulation at 50 Hz to elicit pain, motor stimulation at 2 Hz to avoid muscle contractions). Patient outcomes, including NRS, Harris Hip Score (HHS), and Western Ontario and McMaster Universities Arthritis Index (WOMAC) scores, were evaluated at baseline, post-diagnostic block, and then post-RFA at day one, first week, 6 weeks, and 6 months. The study found that PRF-HAN is a highly effective and safe treatment for CHP, particularly in patients unfit for total hip arthroplasty (THA) or intolerant to conventional analgesics. The procedure led to a substantial 75% reduction in pain, with Numerical Rating Scale (NRS) scores decreasing from a baseline of $7.4 \pm 1.6$ to $2.0 \pm 0.7$ on day 1 post-procedure, and remaining low at $3.1 \pm 2.1$ at 6 months. Functional outcomes improved significantly, with Harris Hip Score (HHS) increasing from $29.6 \pm 9.2$ at baseline to $86.6 \pm 5.7$ on day 1, while Western Ontario and McMaster Universities Arthritis Index (WOMAC) scores decreased from $62.0 \pm 9.9$ to $41.9 \pm 8.8$. Although HHS and WOMAC scores showed a gradual decline between 6 weeks and 6 months, they remained considerably better than baseline. No adverse events such as hematoma, motor weakness, or dysesthesia were reported during the 6-month follow-up. [14]

Petroni GM et al conducted a retrospective study between September 2022 to September 2023 included 44 elderly patients with chronic hip pain. The patients were divided into two equal groups (n=22). Group A received combined anterior and posterior ultrasound-guided radiofrequency (RF) denervation, while Group B received anterior denervation only, targeting the femoral, obturator, and accessory obturator nerves. Group A also targeted the nerve to quadratus femoris. Procedures involved sensory and motor stimulation followed by thermal RF at 90°C for 1 minute after lidocaine. Average procedure times were 35 minutes (Group A) and 50 minutes (Group B). Pain was assessed using the Numeric Rating Scale (NRS) at baseline, one, three, and six months. The study found that a combined anterior and posterior ultrasound-guided radiofrequency denervation approach (Group A) had a greater impact on reducing chronic hip pain compared to an anterior neurolysis alone approach (Group B). Both groups started with comparable average Numeric Rating Scale (NRS) scores of 7.136 (SD 0.99 for Group A, SD 0.64 for Group B) at baseline (T0), with no statistically significant difference ($p = 1.000$). While both approaches effectively reduced pain in the first three months without significant differences, the combined approach in Group A maintained superior results at six months (T3) with an average NRS of 1.455 (SD 0.96), demonstrating excellent pain control. In contrast, Group B, with the anterior approach alone, showed an upward trend in pain, with an average NRS of 3.818 (SD 0.73) at six months. The difference in NRS values between the two groups at six months was statistically significant ($p < 0.001$). Repeated measures ANOVA analysis further indicated a significant effect of time ($F = 1001$; $p < 0.001$), a significant effect of the type of treatment ($F = 22.8$; $p < 0.001$), and a significant interaction between the group and time ($F = 35.9$; $p < 0.001$). The combined approach in Group A approximately reduced the NRS by 6 points six months after the intervention for patients with chronic hip pain. [15]

Kapural L et al (2018) conducted a retrospective review of 52 radiofrequency (RF) ablations in 23 patients who underwent radiofrequency (RF) ablation for chronic hip pain using a novel anterior approach to cooled RF denervation of the hip, guided by combined ultrasound and fluoroscopy. All patients had ≥50% pain relief from two diagnostic blocks targeting obturator and femoral articular branches prior to RF. Mean pain scores significantly decreased from $7.61 \pm 1.2$ to $2.25 \pm 1.4$ post-RF ($P < 0.01$). Duration of pain relief was significantly longer with RF (30 to 320 days for first ablation, 42 to 300 days for second; $P < 0.01$). The lateral femoral

branch approach was consistently safe, with trocar-to-femoral nerve distances >1 cm (median 2.5 cm, range 1 to 3.5 cm). The approach to the incisura acetabuli was more challenging, with distances below than 1 cm in 21 cases (median 0.8 cm, range 0.5 to 1.9 cm), and proximity to the femoral vein measured at 0.55 cm. Motor stimulation at below than 1 V was positive in 26 cases, requiring electrode repositioning. Opioid use remained unchanged. The study concluded that this anterior approach combining ultrasound and fluoroscopy for RF denervation of the lateral articular branches of the femoral and obturator nerves is a safe procedure. [17]

A case report by Khan JS et al (2018) reported the successful application of combined ultrasound and fluoroscopic-guided percutaneous radiofrequency (RF) lesioning to treat refractory chronic right hip pain in an 11-year-old girl. Prior to the procedure at this institution, the patient had experienced severe pain, with average scores of 8/10 on an 11-point numeric rating scale, which was unresponsive to extensive conservative and surgical treatments, including a previous, unsuccessful RF ablation attempt performed elsewhere solely under fluoroscopy. The procedure involved RF ablation at a target temperature of 80°C for 90 seconds at both the obturator and femoral articular branches, with the ablation performed three times at each site. At a 4-week follow-up, the patient reported 80% pain relief, and this improvement was maintained at an 18-week follow-up, where she continued to report pain reduction, regained full weight-bearing capacity and ambulation with a cane, and achieved a 20% reduction in daily oxycodone use (from 25 mg to 20 mg). The procedure was not associated with any adverse events. [18]

The Canadian Agency for Drugs and Technologies in Health (CADTH) Health Technology Review (2023) reported the evidence regarding Radiofrequency Ablation (RFA) for chronic hip pain is insufficient to definitively determine its clinical effectiveness, primarily due to a small quantity and low quality of studies. One systematic review found no relevant evidence for RFA for hip pain, while another summarised clinical outcome from eight low-quality uncontrolled studies involving a total of only 43 patients. Although these studies reported some within-group improvement in pain (Visual Analogue Scale - VAS) and isolated instances of functional improvement, the significant methodological heterogeneity and small sample sizes mean the findings are not robust enough to establish comparative effectiveness. Adverse events, while infrequent, included persistent lateral surface hip numbness and transient hematoma. Despite this lack of strong evidence, one guideline from the American Society of Pain and Neuroscience (ASPN) conditionally recommends RFA for hip joint pain following diagnostic blocks, specifically targeting the obturator and femoral nerve branches. However, this review notes a significant discordance between its own assessment of the evidence quality and the ASPN guideline's rationale, cautioning that the guideline's recommendation should be interpreted and applied with care. [19]

## Plantar Fasciitis

There were four studies retrieved on the management of radiofrequency ablation on management of plantar fasciitis including two randomised controlled trials and two observational studies.

A randomised controlled trial study (Armağan C et al. 2024), conducted at the Orthopedics and Traumatology Clinic of Düzce University, Turkey included 30 patients over 18 years old with chronic plantar fasciitis unresponsive to 12 months of conservative treatment. Patients were randomly assigned to either the pulsed radiofrequency ablation (PRFA) group (n = 17)

or the open plantar fascia release surgery group (n = 13). Detailed clinical evaluations were performed pre-treatment and at 3, 6, and 12 months post-treatment using the Foot Function Index (FFI), AOFAS score, Visual Analog Scale (VAS), and Roles-Maudsley Score (RMS). Radiographic and laboratory investigations were used to confirm diagnosis and exclude other causes of heel pain. This study demonstrated that both PRFA and open plantar fascia release surgery significantly reduced pain and improved function in the long term. At the 3-month follow-up, PRFA showed statistically superior results compared to surgery across several clinical measures, including Foot Function Index (FFI) disability ($p = 0.018$), FFI activity limitation ($p = 0.001$), American Orthopaedic Foot & Ankle Society (AOFAS) scores ($p = 0.002$), Visual Analog Scale (VAS) exercise pain scores ($p = 0.007$), and Roles Maudsley scores ($p = 0.001$). Furthermore, PRFA had a significantly shorter operative time and quicker return to activities ($p < 0.001$). While no major complications occurred in either group, minor complications were significantly higher in the surgical group ($p < 0.01$). By the 6-month and 1-year follow-ups, no significant differences were observed between the two groups in clinical outcomes ($p > 0.05$), indicating comparable long-term benefits. Radiological measurements of foot structure, such as L-Kalkaneal Pitch, L-Meary, L-Hibbs, AP talus-first metatarsal angle, and AP-Talokalkaneal angle, showed no significant differences between the groups both preoperatively and postoperatively ($p > 0.05$). Demographic characteristics were largely similar, except for a significantly lower prevalence of asthma in the PRFA group ($p = 0.014$). The authors concluded that PRFA is an effective and reliable minimally invasive alternative to surgery, offering quicker recovery and lower complication rates with comparable long-term efficacy for chronic plantar fasciitis. [5]

Another randomised controlled trial study conducted by Landsman AS et al (2013) aimed to determine the efficacy of Radio-frequency Nerve Ablation (RFNA) for the treatment of heel pain. This study involved 17 patients with plantar fasciosis unresponsive to at least three conservative treatments over 3 months. Patients were randomly assigned to receive either active radiofrequency nerve ablation (RFNA, n = 8) or a sham procedure (n = 9), with both participants and physicians blinded. Pain was assessed weekly for 16 weeks using a 10-point visual analog scale. Sham group patients without significant improvement after 4 weeks could cross over to receive active treatment. This study found that Radio-frequency Nerve Ablation (RFNA) significantly improved pain symptoms, while sham treatment did not. At the 4-week follow-up, comparing the change in pain from baseline between the active treatment and sham groups, statistically significant differences were observed for average pain ($p = 0.047$) and peak pain ($p = 0.048$), demonstrating superior pain reduction with active RFNA. However, the change in first-step pain was not significantly different between groups at this early stage ($p = 0.300$). All nine patients initially assigned to the sham group who showed no improvement subsequently received active RFNA, and then also demonstrated statistically significant improvement in their symptoms. At the 16-week follow-up (for those who received active treatment, including crossovers), statistically significant reductions in pain were maintained across all categories when compared to their baseline levels: first-step pain ($p = 0.041$), average pain ($p = 0.001$), and peak pain ($p = 0.002$). The study concluded that RFNA is an efficacious treatment for plantar fasciosis, demonstrating significant pain reduction compared to sham and consistent long-term benefits up to 16 weeks. [20]

A retrospective observational study by Kurtoglu A et al (2022) involving 261 patients (378 feet) with chronic persistent plantar fasciitis treated with Radiofrequency Nerve Ablation (RFNA) found that the procedure was both safe and effective. A statistically significant reduction in pain and improvement in function was observed following RFNA. Specifically, there was a statistically significant difference between pre-procedure and post-procedure

Visual Analogue Scale (VAS) scores ($p < 0.001$) and between pre-procedure and post-procedure American Orthopaedic Foot and Ankle Society (AOFAS) scores ($p < 0.001$). The median VAS score decreased from 8 (range 8 to 9) pre-procedure to 0 (range 0 to 7) in the first month post-procedure and remained 0 (range 0 to 7) during the final follow-up (8 to 24 months). Similarly, the median AOFAS score improved from 41 (range 35 to 54) pre-procedure to 98 (range 60 to 100) in the first month post-procedure, maintaining at 98 (range 55 to 100) at final follow-up. No statistically significant difference was found in VAS or AOFAS scores between the first month post-procedure and the final follow-up, indicating sustained improvement. Notably, no adverse events were recorded in any patient, and the study achieved a 93% success rate with a single RFNA treatment. While 16 patients (24 feet) did not achieve complete improvement, their functional outcomes were still better than pre-operative levels. The non-obese patient group demonstrated better VAS and AOFAS scores and better functional recovery post-procedure than the obese group ($p < 0.001$). The presence of heel spurs did not statistically affect clinical outcomes ($p > 0.05$ for VAS and AOFAS scores). RFNA's advantages included quick return to work and weight-bearing activities. [21]

Another retrospective observational study by Yuan Y et al (2020) compared outcomes of open plantar fascia release and percutaneous radiofrequency ablation (PRFA) in 31 patients (39 feet) (eight patients in the study had both feet treated for plantar fasciitis (31 patients + 8 extra feet = 39 feet)) with intractable plantar fasciitis. The study found that both surgical procedures significantly improved symptoms of pain and limb function. Specifically, for the open plantar fascia release group, the mean VAS score decreased from 8.81 ± 1.11 pre-operatively to 0.50 ± 1.41 post-operatively ($p < 0.001$), and the mean AOFAS score increased from 39.63 ± 8.52 to 99.38 ± 2.50 ($p < 0.001$). Similarly, for the PRFA group, the mean VAS score decreased from 7.87 ± 1.73 to 0.73 ± 1.28 ($p < 0.001$), and the mean AOFAS score increased from 42.73 ± 10.75 to 98.40 ± 4.24 ($p < 0.001$). Critically, there were no statistically significant differences in postoperative VAS scores ($p = 0.634$) or AOFAS-AH scores ($p = 0.438$) between the two groups, indicating similar long-term curative effects. However, PRFA demonstrated significant advantages in procedural efficiency and recovery: the average operative time for PRFA was shorter (19.73 min vs 36.78 min for open release; $P = 0.012$), and the average recovery time to normal activity was also shorter (13.27 days for PRFA vs 25.94 days for open release; $p = 0.008$). No major complications like infection, hematoma, or complex regional pain syndrome occurred in any patient. Overall, 29 out of 31 patients (93.55%) reported satisfaction with the operation. The study concluded that while both techniques are effective, percutaneous radiofrequency ablation is a better technique due to its shorter operative time and postoperative recovery time. [22]

## SAFETY

Based on the retrieval evidences, three studies reported on complications or adverse events associated with the use of radiofrequency ablation (RFA).

Landsman AS et al (2013) reported that no major complications occurred, and the only adverse events observed were minor and associated with injections, such as ecchymosis, dizziness, vasovagal responses, and pain during nerve localisation, deemed comparable to standard heel injections.

Kapural L et al (2018) documented no adverse events were reported except one case of neuritis (severe burning in the groin area) that resolved within one week following hip RFA transient case of neuritis.

The CADTH Health Technology Review (2023) identified adverse effects associated with radiofrequency ablation (RFA) for treating hip pain. Of the 25 patients who received RFA, four reported side effects, specifically, lingering numbness on the lateral surface of the hip and a temporary hematoma due to vessel puncture. In comparison, among 15 patients who underwent pulsed RFA, only one experienced a subcutaneous hematoma.

According to the Medical Device Authority Malaysia, there were several types and brands of radiofrequency ablation devices manufactured by various manufacturer registered such as [redacted] (Registration number: GC5340122-100591) and [redacted] (Registration number: GC1957724-168198). [3] The devices had also received 510(k) from the USFDA. [23,24]

## COST-EFFECTIVENESS

There was no evidence retrieved on cost-effectiveness of radiofrequency ablation therapy for pain management on the ankle and hip joints, and plantar fasciitis.

As per reported in previous radiofrequency ablation for pain management: shoulder (tendonitis, adhesive capsulitis), elbow epicondylitis and carpal tunnel syndrome information brief, the cost of radiofrequency ablation greatly depended on the chosen professional and the geographical location. In several countries, the patients had to pay cash or arrange a payment plan with the provider or a third-party source.[25]

For pain management cases, such as tendonitis, adhesive capsulitis in the shoulder, elbow epicondylitis, and carpal tunnel syndrome, the total expense often hinges on the practitioner's fees and local healthcare standards. In Malaysia, the cost typically ranges from $1,000 (RM 4,211.65) to $3,500 (RM 14,712.25) per session, placing it in the mid-range globally. India offers the lowest prices ($500 to $1,500), while Turkey stands out for affordability ($1,000 to $4,000), with fees approximately 60–70% lower than those in the US and Western Europe, where prices can reach up to $7,000 in places like Florida. Additional costs such as consultations, diagnostic imaging, medications, and follow-up visits may also apply. [26]

## CONCLUSION

Based on the above review, there were limited evidence on radiofrequency ablation (RFA), particularly pulsed RFA, as a minimally invasive option for managing chronic pain in the ankle, hip joints, and plantar fasciitis. For plantar fasciitis, there were randomised controlled trials with small sample size and observational studies, demonstrating comparable long-term outcomes to surgery with faster recovery and fewer complications. The current evidence for RFA in hip and ankle pain remains insufficient and requires further high-quality research to establish its effectiveness, and long-term outcomes.

In terms of safety, the radiofrequency ablation was reported to cause non-serious adverse events and device-related consequences. Several brands of radiofrequency ablation devices had been registered with the Medical Device Authority Malaysia and cleared by the USFDA.

There was no study retrieved on cost-effectiveness of the radiofrequency ablation for pain management on the ankle and hip joints, and plantar fasciitis.

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