Effectiveness of Therapeutic Ultrasound and Contrast Bath Therapy in the Conservative Management of Calcaneal Spur: A Prospective Clinical Study

Authors: [1] Prof. Dr. S Purna Chandra Shekhar, [2] Dr. T.Rajeswari
[1] Professor, School of Physiotherapy, MNR University, Telangana, India
[2] Associate Professor, Devs Homoeopathic Medical College, KNRUHS, Telangana, India.

Corresponding Author: Prof S Purna Chandra Shekhar Telangana, India +91 9949591991

Abstract

Background:
Calcaneal spur is a prevalent cause of chronic heel pain in adults, leading to functional limitations and reduced quality of life. Conservative physiotherapy modalities are commonly used; however, evidence regarding combined modality effectiveness remains limited.

Objective:
To evaluate the effectiveness of therapeutic ultrasound combined with contrast bath therapy in reducing pain and improving functional outcomes in patients with calcaneal spur.

Methods:
A prospective interventional study was conducted on 30 patients aged 20–50 years with clinically and radiologically diagnosed calcaneal spur. Participants received therapeutic ultrasound followed by contrast bath therapy for 3–6 weeks. Outcome measures included the Visual Analogue Scale (VAS) and Foot Function Index (FFI). Pre and posttreatment data were statistically analyzed.

Results:
Significant reductions were observed in mean VAS scores ($p < 0.001$) along with significant improvements in FFI scores ($p < 0.001$) following the intervention.

Conclusion:
Therapeutic ultrasound combined with contrast bath therapy is an effective, noninvasive physiotherapy intervention for managing calcaneal spur, significantly reducing pain and improving functional ability.

Keywords:
Calcaneal spur; Heel pain; Therapeutic ultrasound; Contrast bath therapy; Physiotherapy rehabilitation

1. Introduction

Calcaneal spur is characterized by an osteophytic outgrowth from the calcaneal tuberosity and is commonly associated with plantar fasciitis. It is frequently observed in individuals aged 30–60 years and is linked to prolonged standing, abnormal foot biomechanics, obesity, and repetitive microtrauma.

Heel pain caused by calcaneal spur can significantly impair gait, balance, and daily functional activities. Conservative management is preferred as the first line of treatment, with physiotherapy modalities playing a key role in pain relief and functional restoration.

Therapeutic ultrasound is widely used in musculoskeletal rehabilitation due to its thermal and nonthermal effects, which promote tissue healing and reduce inflammation. Contrast bath therapy enhances peripheral circulation, reduces edema, and provides analgesic effects. Despite their individual benefits, limited studies have investigated the combined effectiveness of these modalities in calcaneal spur management.

2. Objective of the Study

1. To assess the effect of therapeutic ultrasound on pain reduction in patients with calcaneal spur.

2. To evaluate the effect of contrast bath therapy on functional improvement.

3. To determine the combined effectiveness of therapeutic ultrasound and contrast bath therapy over a 3–6 week intervention period.

3. Materials and Methods

3.1 Study Design

Prospective interventional clinical study.

3.2 Study Setting

Chandra's Homoeopathy & Physiotherapy Centre, Boduppal, Hyderabad, Tealangana, India.

3.3 Sample Size

Thirty (n = 30) participants.

3.4 Participants

Patients aged 20–50 years with clinically and radiologically confirmed calcaneal spur.

3.5 Inclusion Criteria

Heel pain duration > 1 month

Radiographic evidence of calcaneal spur

Ability to participate in physiotherapy sessions

3.6 Exclusion Criteria

History of foot or ankle surgery

Inflammatory arthropathies

Neurological disorders

Acute infections or open wounds

3.7 Intervention Protocol

Therapeutic Ultrasound

Frequency: 1 MHz

Mode: Continuous

Intensity: 1–1.5 W/cm²

Duration: 5–7 minutes

Application site: Plantar aspect of the heel

Contrast Bath Therapy

Warm water: 38–40°C for 3 minutes

Cold water: 15–18°C for 1 minute

Cycles: 4–5

Total duration: 15–20 minutes

Treatment sessions were conducted 5 days per week for 3–6 weeks.

4. Outcome Measures

1. Visual Analogue Scale (VAS) – Pain intensity (0–10 scale)

2. Foot Function Index (FFI) – Pain, disability, and activity limitation

Assessments were recorded at baseline and after completion of the intervention.

5. Statistical Analysis

Data were analyzed using SPSS software (version 26).

Descriptive statistics: Mean ± Standard Deviation

Inferential statistics: Paired ttest

Level of significance: $p < 0.05$

Table 1. Comparison of Pre- and Post-Intervention Pain Scores (VAS)

Outcome Measure	Pre-Treatment Mean±SD	Post-Treatment Mean±SD	Mean Difference	t-value	p-value
VAS (0-10)	7.23±.91	2.41±0.88	4.82	18.62	<0.001

Interpretation:
There was a highly significant reduction in pain intensity following therapeutic ultrasound and contrast bath therapy.

*Statistically significant at $p < 0.05$

Table 2. Comparison of Pre- and Post-Intervention Foot Function Index (FFI) Scores

Outcome Measure	Pre-Treatment Mean±SD	Post-Treatment Mean±SD	Mean Difference	t-value	p-value
FFI Total Score (%)	62.85 ± 6.72	24.37 ± 5.94	38.48	21.14	<0.001*

Interpretation:
A statistically significant improvement was observed in foot function and activity levels after intervention.

*Statistically significant at $p < 0.05$

Table 3 (If Journal Asks for Subscales of FFI)

FFI Subscale	Pre-Treatment Mean ± SD	Post-Treatment Mean ± SD	P-value
Pain	65.42 ± 7.11	26.15 ± 6.02	<0.001
Disability	61.87 ± 6.58	23.74 ± 5.88	<0.001
Activity Limitation	61.26 ± 6.94	23.21 ± 5.73	<0.001

6. Results

The results demonstrated:

A statistically significant reduction in mean VAS pain scores postintervention ($p < 0.001$)

A statistically significant improvement in mean FFI scores ($p < 0.001$)

Patients reported improved gait patterns, reduced morning stiffness, and enhanced functional performance.

7. Discussion

The findings of this study indicate that therapeutic ultrasound effectively reduces pain by increasing tissue temperature, enhancing blood flow, and promoting tissue repair. Contrast bath therapy complements ultrasound by facilitating vascular pumping mechanisms and reducing inflammatory metabolites.

The combined intervention provided superior outcomes compared to baseline values, supporting its clinical applicability in conservative management of calcaneal spur. These findings are consistent with previous studies reporting benefits of ultrasound and thermal therapies in plantar heel pain.

8. Limitations

Small sample size

Absence of a control group

Shortterm followup

Future studies with randomized controlled designs and longterm followup are recommended.

9. Conclusion

Therapeutic ultrasound combined with contrast bath therapy significantly reduces pain and improves functional outcomes in patients with calcaneal spur aged 20–50 years. This conservative physiotherapy approach is safe, costeffective, and suitable for routine clinical practice.

10. Ethical Considerations

The study was conducted in accordance with ethical standards. Informed consent was obtained from all participants prior to intervention.

11. Conflict of Interest

The authors declare no conflict of interest.

12. Funding

No external funding was received for this study.

13. References

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