

SHOCK WAVE THERAPY FOR PLANTAR FASCIITIS

A Randomized Controlled Trial Comparing Two Technologies

Drăgoi Răzvan Gabriel¹, Dușe Adina Octavia¹, Popa Daniel¹, Andriș Ramona¹, Nicolescu Laura Corina²

¹"Victor Babeș" University of Medicine and Pharmacy, Timișoara, Romania, University Clinic of Physical medicine, Balneology and Rheumatology, Transdisciplinary Research Center in Medical Rehabilitation, Balneology and Rheumatology (CTRMBR)

²"Vasile Goldiș" University of Arad, Department of Medicine

Disclosure statement

I have no actual or potential conflict of interest in relation to this program/presentation.

Plantar Fasciitis

Most common cause of heel pain.
Affects 10% of the population over a lifetime.

Degenerative process at the calcaneal enthesis rather than purely inflammatory.

Conventional Treatment

- Stretching,
 - orthotics,
 - NSAIDs,
 - corticosteroid injections.
- High recurrence rates.
Need for evidence-based alternatives with fewer side effects.

Shock Wave Therapy

- Non-invasive modality increasingly used.
- Multiple delivery technologies available.
- Limited head-to-head comparative evidence between modalities.

SHOCK WAVE: MECHANISMS OF ACTION

Neovascularization

Acoustic waves **stimulate angiogenesis and promote vascular ingrowth** into the enthesis, improving local oxygen and nutrient supply.

Neuronal Desensitization

Repeated mechanical **impulses reduce unmyelinated C-fiber density and modulate nociceptor activity**, leading to sustained pain reduction.

Cellular Regeneration

Activation of fibroblasts and tenocytes **promotes collagen synthesis** and remodeling of degenerated fascial tissue at the calcaneal insertion.

Inflammatory Modulation

Release of growth factors (TGF- β , VEGF, IGF-1) and inhibition of pro-inflammatory cytokines creates a favorable healing microenvironment.

Calcium Dissolution

Mechanical disruption of calcific deposits along the plantar fascia reduces local mechanical stress and associated pain.

Mechanotransduction

Physical pressure waves transduce extracellular signals into cellular responses, **triggering tissue repair pathways**.

OBJECTIVES

01

Compare the efficacy of Diamagnetic Shock Wave Therapy (DSWT) vs. Electrohydraulic Shock Wave Therapy (EHSWT) in chronic plantar fasciitis

02

Assess pain reduction over time using standardized VAS scoring at multiple follow-up points (baseline, 1, 2, and 3 weeks)

03

Evaluate functional improvement using the Foot and Ankle Outcome Score (FAOS) in both treatment groups

04

Measure patient satisfaction and contribute evidence-based recommendations for clinical application

STUDY DESIGN

**RANDOMIZED CONTROLLED
TRIAL**

PARALLEL-GROUP DESIGN

3-WEEK INTERVENTION

Eligible Patients
Age 18–65, VAS ≥ 5 , ≥ 3 months



Randomization

Group A: DSWT
Diamagnetic Shock Wave

Group B: EHSWT
Electrohydraulic Shock Wave

PATIENT SELECTION CRITERIA

✓ INCLUSION CRITERIA

- Age 18–65 years
- Chronic plantar fasciitis ≥ 3 months
- Initial VAS score ≥ 5
- Confirmed clinical diagnosis
- No prior shock wave treatment
- Willingness to participate in physiotherapy program

✗ EXCLUSION CRITERIA

- Malignancy or active infection
- Blood coagulation disorders
- Pregnancy
- Pacemaker or implanted devices
- Prior corticosteroid injection < 3 months
- Peripheral neuropathy
- Severe cardiovascular disease

DSWT · Group A

Diamagnetic Shock Wave Therapy

- Generates acoustic waves via diamagnetic resonance
- Precise energy delivery to target tissue
- Frequency: 2× per week × 4 weeks
- Duration: 10 minutes per session
- Intensity per manufacturer protocol
- Supervised by physiotherapist

EHSWT · Group B

Electrohydraulic Shock Wave Therapy

- Acoustic waves generated by electric spark discharge
- Broad unfocused energy delivery pattern
- Frequency: 2× per week × 4 weeks
- Duration: 10 minutes per session
- Intensity per manufacturer protocol
- Supervised by physiotherapist

ADDITIONAL PHYSIOTHERAPY

The integrated physiotherapist intervention significantly contributed to patient recovery in both groups

1

Standardized Protocol

Implemented a supervised, evidence-based exercise program consistent across both treatment arms to control for co-intervention bias.

2

Patient Education

Provided structured education on plantar fascia biomechanics, footwear, activity modification, and home exercise compliance.

3

Outcome Monitoring

Monitored and reinforced treatment adherence, particularly for home-based stretching components between sessions.

OUTCOME MEASURES

VAS

Visual Analogue Scale

Primary outcome. Pain intensity 0–10. Assessed at baseline, week 1, week 2, and week 4.

FAOS

Foot & Ankle Outcome Score

Secondary outcome. Functional limitations in daily activities. Composite score expressed as percentage (0–100%).

LSQ

Likert Satisfaction Scale

Patient-reported satisfaction. Assessed at end of treatment to capture subjective treatment experience.

TIME

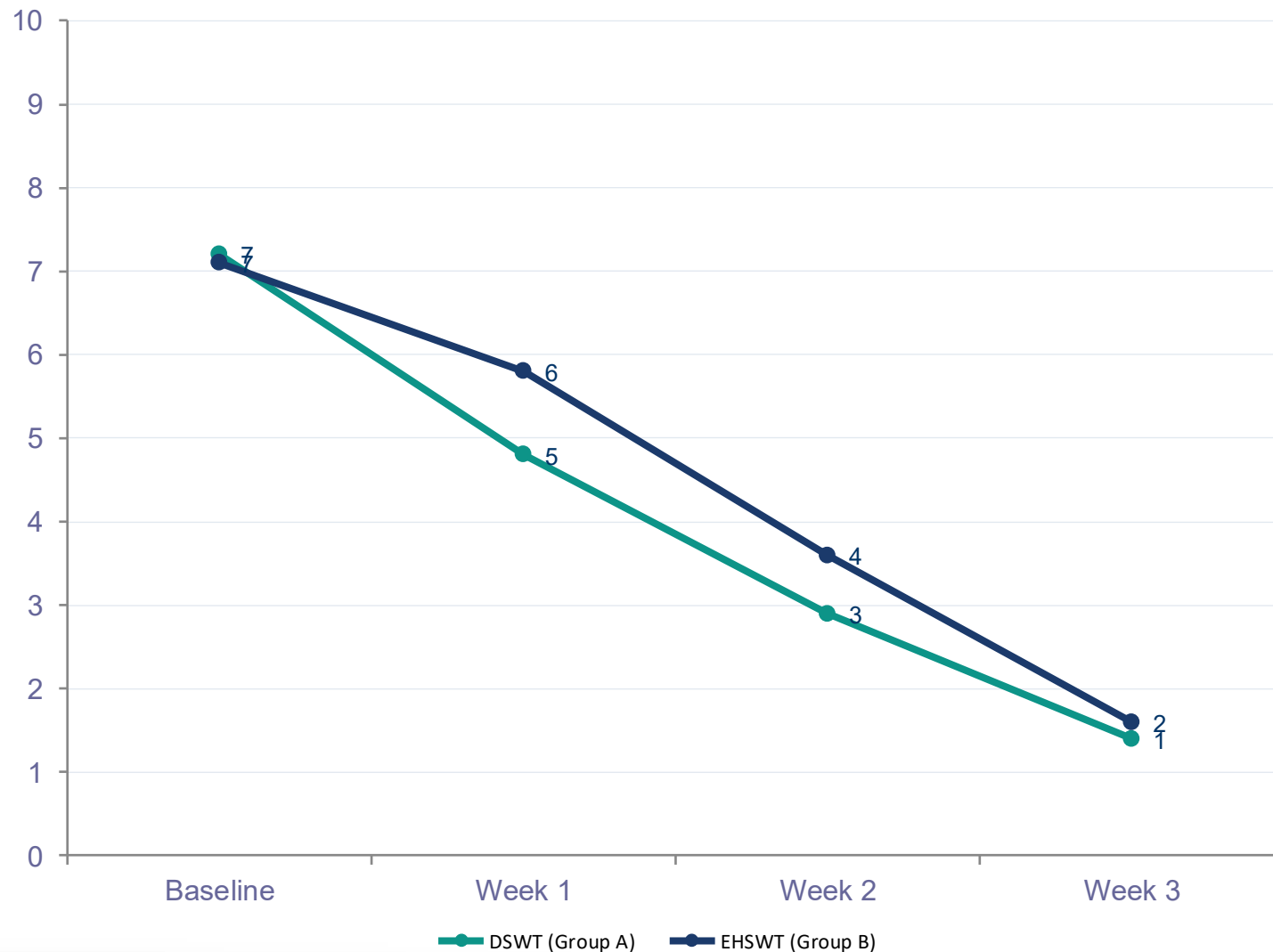
Assessment Timepoints

Baseline → Week 1 → Week 2 → Week 3.
Allows evaluation of both early response and sustained benefit.

Demographics of the study groups

		Group A	Group B
Age	30 - 40	6 (30 %)	8 (40%)
	40 - 50	9 (45 %)	8 (40%)
	50 - 60	5 (25 %)	4 (20%)
IMC	< 18,5	1 (5%)	1 (5%)
	18,5 - 24,9	3 (15%)	5 (25%)
	25 - 29,9	8 (40%)	6 (30%)
	> 30,0	8 (40%)	8 (40%)
Sex	Male	5 (20%)	7 (33%)
	Female	15 (80%)	13 (66%)
Enviroment	Rural	14 (70%)	13 (65%)
	Urban	6 (30%)	7 (35%)

RESULTS: PAIN REDUCTION (VAS)



Key Findings

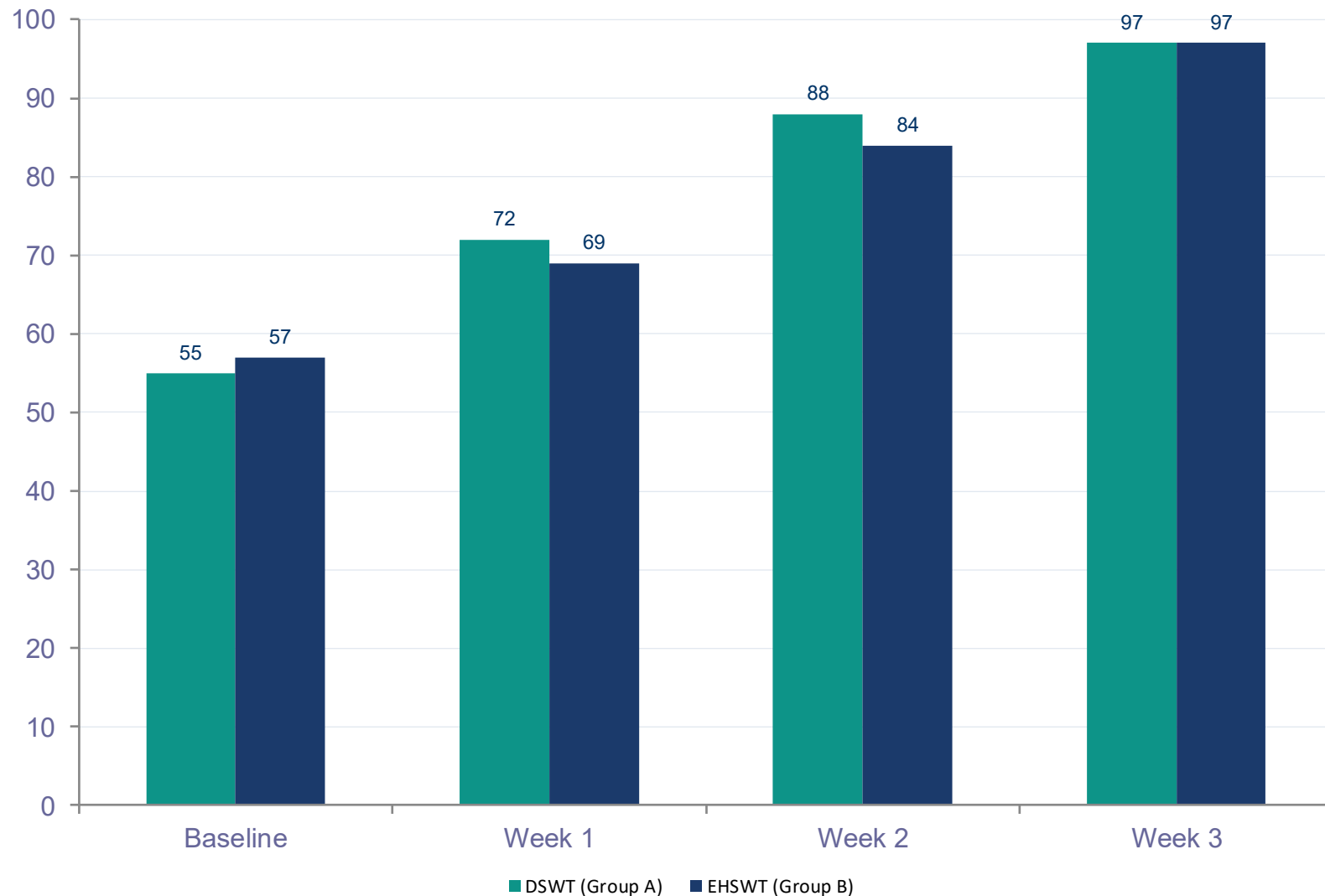
DSWT showed significantly faster pain relief at weeks 1 & 2 ($p < 0.05$)

By week 3, between-group difference no longer statistically significant

Both groups reached near-complete pain resolution at week 3

Mean VAS decreased from ~7.1 to ~1.5 in both groups

RESULTS: FUNCTIONAL IMPROVEMENT (FAOS)



97%

Final FAOS score (both groups)

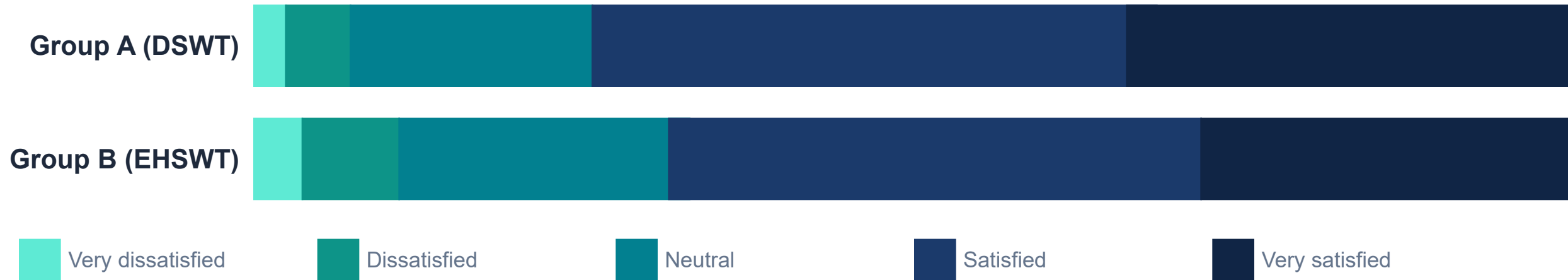
~75%

Relative improvement from baseline

*No statistically significant difference
between groups in functional
improvement ($p > 0.05$)*

PATIENT SATISFACTION

Likert Satisfaction Distribution — End of Treatment



High patient satisfaction was reported in both treatment groups. **Over 75% of patients in both arms reported being 'Satisfied' or 'Very Satisfied'** with their treatment outcome at end of the 4-week protocol. Both technologies were well-tolerated with minimal adverse effects. The supervised physiotherapy component was identified as an important contributor to overall patient satisfaction and recovery outcomes.

COMPARATIVE ANALYSIS: DSWT vs. EHSWT

Parameter	DSWT (Group A)	EHSWT (Group B)
Pain reduction — Week 1	✓✓ Superior ($p < 0.05$)	✓ Significant
Pain reduction — Week 2	✓✓ Superior ($p < 0.05$)	✓ Significant
Pain reduction — Week 3	Comparable	Comparable
FAOS improvement	~75% (baseline → 97%)	~75% (baseline → 97%)
Between-group FAOS diff.	Not significant	Not significant
Patient satisfaction	High (>75% satisfied)	High (>75% satisfied)
Mechanism	Diamagnetic resonance	Electric spark discharge
Energy delivery	Focused / precise	Broader / unfocused

CLINICAL IMPLICATIONS

DSWT as First-Line Intervention: The superior early pain response suggests that Diamagnetic SWT may be preferentially considered for patients requiring rapid pain relief, particularly in high-demand occupational or athletic populations.

Both technologies are effective:	Long-term outcomes (3 weeks) are comparable — EHSWT remains a valid and accessible treatment option when DSWT is unavailable.
Multimodal approach recommended:	Combining shock wave therapy with supervised physiotherapy significantly enhances outcomes beyond technology selection alone.
Biophysical properties matter:	Clinicians should consider the specific energy delivery characteristics of each modality when formulating individual treatment plans.
Duration of symptoms:	Chronic plantar fasciitis (≥ 3 months) responds well to both modalities — SWT should be integrated into standard rehabilitation pathways.

STUDY LIMITATIONS

01

Short Follow-up Period — The study assessed outcomes over 3 weeks. Longer-term follow-up (6–12 months) is needed to evaluate durability of treatment effects and recurrence rates.

02

Single-Center Design — Conducted at one institution, which may limit generalizability. Multi-center validation would strengthen the external validity of these findings.

03

Sample Size — The sample size, while sufficient for primary endpoint detection, may have been underpowered for subgroup analyses and secondary outcome comparisons.

04

Imaging Outcomes Absent — Structural changes (e.g., fascial thickness via ultrasound) were not measured. Imaging correlation would provide objective biological correlates of clinical improvement.

CONCLUSIONS

Diamagnetic SWT provides superior early pain reduction; both technologies achieve equivalent long-term outcomes

1

Both DSWT and EHSWT significantly reduce pain and improve function in chronic plantar fasciitis across a 4-week treatment protocol.

2

DSWT achieves statistically superior and more rapid pain reduction at weeks 1 and 2, suggesting it as a preferred first-line option for early symptom control.

3

Long-term pain reduction and functional improvement (FAOS ~97%) are comparable between groups, confirming both modalities as valid therapeutic choices.

4

High patient satisfaction was reported in both groups, supporting the acceptability and tolerability of shock wave therapy.

5

The biophysical properties of each shockwave technology should guide clinical decision-making when formulating individualized treatment plans.