IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

EFFICACY OF EXTRACORPOREAL SHOCKWAVE THERAPY IN COMMON ORTHOPEDIC CONDITIONS: A REVIEW

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Abstract: This study investigates the efficacy of Extracorporeal Shock Wave Therapy (ESWT) in treating common orthopedic conditions. ESWT found to be effective in treating various orthopedic conditions such as calcific shoulder tendinopathy, plantar fasciitis, tennis elbow, achilles tendinopathy. The study assessed the treatment parameters of ESWT and the data analysis revealed that significant improvement has been seen in outcomes of the patients with notable reductions in pain and improvements in functional ability.

IndexTerms -Calcific shoulder tendinopathy, tennis elbow, plantar fasciitis, achilles tendinopathy.

1. INTRODUCTION

ESWT has emerged as a promising treatment option for various musculoskeletal conditions. This non-invasive therapy delivers high-energy shock waves to the affected areas by promoting healing and tissue repair. RSWT is a variant that generates shock waves ballistically by transferring energy to tissues and promoting healing. RSWT can be used in combination with other therapies to enhance its effectiveness. Using lower pressure values along with low frequency could be quite safe for CP children who are usually demonstrating osteopenia issues and bone fragility. **Hussein, H. M. et.al (2025).** ESWT is categorized into two types: Focused Shock Wave Therapy (FSWT) which reaches maximum energy at deeper tissue levels and Radial Shock Wave Therapy (RSWT) which imparts maximum energy more superficially **Kirez, I.E. et.al (2025).** SW therapy may stimulate the healing process by increasing the flow of blood and promoting tissue repair. It can also increase the formation of new blood vessels which can improve tissue oxygenation and promote healing. SW therapy may reduce pain by suppressing the activity of nociceptors. SW therapy has been shown to have a stimulating effect on tendon tissue by increasing the synthesis of glycosaminoglycans and proteins and promoting the healing process. The therapy may also accelerate the initiation of the healing process in injured tendons by making it a promising treatment option for tendon pathologies **Notarnicola, A. et.al (2022).** Shock waves are generated through tissue with an increase in pressure and are produced by electrohydraulic, electromagnetic or piezoelectric processes. Studies have demonstrated that shock waves can cause membrane hyperpolarization which in turn triggers cellular activity and it has been shown in numerous studies to be useful in accelerating bone repair. Shock wave therapy's function in tissue regeneration and repair is further supported by evidence that it increases growth factor expression and encourages the development of new blood vessels. Shock wave therapy shows as a promising treatment for several musculoskeletal disorders. Its ability to stimulate cellular activity and enhance angiogenesis to promote osteogenesis makes it a valuable tool for promoting tissue repair and healing. **Zelle, B. A. et al. (2010).**

2. METHODOLOGY

Over the course of six months this study used a literature review research approach. A comprehensive search strategy was implemented by utilizing prominent databases such as Google Scholar, Science Direct and PubMed. "Extracorporeal Shock Wave Therapy" and other musculoskeletal disorders such as "Calcific Shoulder Tendinopathy", "Tennis Elbow", "Plantar Fasciitis" and "Achilles Tendinopathy" were among the specific keywords included in the search criteria. This approach enabled the identification of relevant studies and literature for providing a thorough understanding of the efficacy and applications of ESWT in treating these conditions.

Inclusion criteria- Articles were included if they met the following criteria: The articles that were published between 2000 and 2025 ensuring that the review captured recent and contemporary research. The articles addressed orthopedic conditions specifically allowing for a focused examination of ESWT's applications in this field and only Randomized Controlled Trials (RCTs) were included for providing a high level of evidence with minimizing bias.

Exclusion criteria- Studies were excluded if they met any of the following criteria: Studies published in languages other than English were excluded. Certain study designs were also excluded including cohort studies, case-control studies, surveys, case series and observational studies which may provide valuable insights. Additionally, studies published before 2000 were excluded ensuring that the review focused on more recent research and advancements in the field.

3. RESULT

A total of 2109 records were identified through database searches and other sources. After removing articles based on exclusion and inclusion criteria only 21 articles were found to be relevant to the study. By following the PRISMA framework the study ensured comprehensive approach identification and synthesizing relevant research.

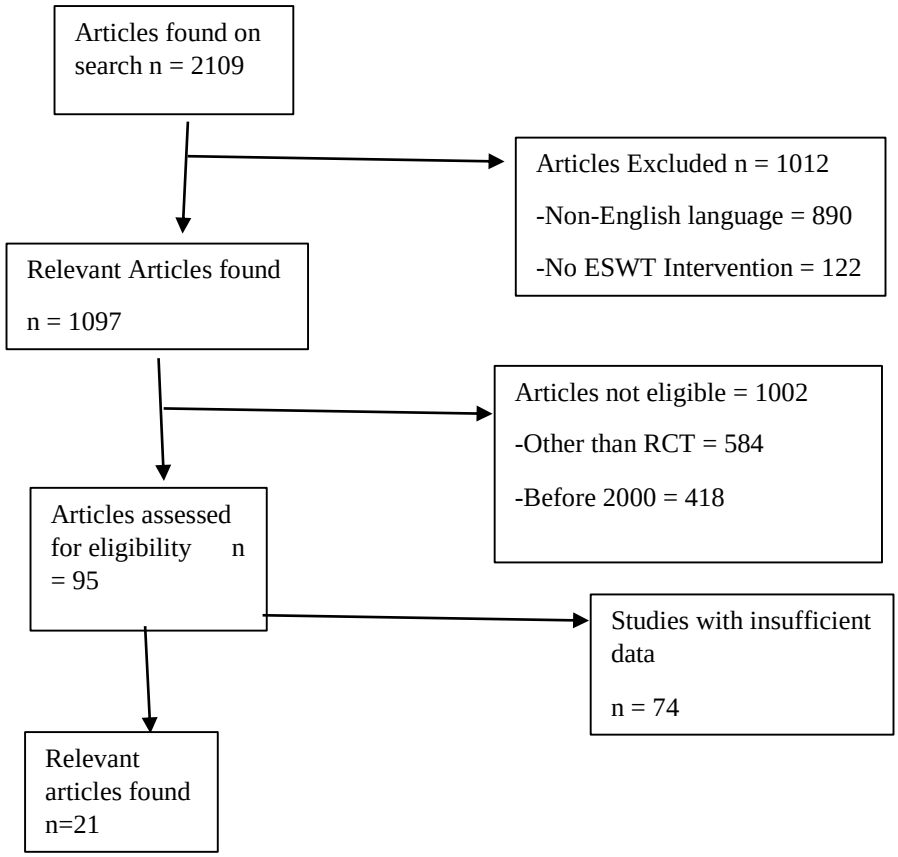

TABLE 1:

Effects of Extracorporeal Shock-Wave Therapy for Rehabilitation of Shoulder Calcific Tendinopathy:

Author/ Year	Objective of study	Sample size	Methodology	Outcomes measure	Result	Conclusion
Peters, J. et.al [2004]	To evaluate the efficacy of Extracorporeal Shock Wave Therapy (ESWT) in treating calcific tendinitis of the shoulder.	90 study subjects.	30 patients received [E1=lower energy level] and 31 patients received [E2= higher energy level]. The control group consisted of 29 patients who received an indistinguishable sham treatment (E3). An on-off switch introduced into the circuit allowed shock wave as well as sham treatment.	Ultrasound.	Those in group E1 had significantly less pain during treatment. Subjects in group E2 had no residual calcification or recurrence of pain.	ESWT in calcific tendinitis of the shoulder is very effective. It does not have significant side effects.
Karimiah-madabadi, A. et.al (2025)	To compare the efficacy of (ESWT) and deep friction massage in treating supraspinatus	Thirty-two non-professional athletes were included.	Non-professional athletes diagnosed with supraspinatus tendinitis were randomly assigned to either the ESWT group with therapeutic exercise or the	Pain intensity and the pressure pain threshold, shoulder abduction,	No significant differences were observed between the groups in shoulder external rotation.	This study concludes that shockwave therapy is significantly more effective than deep friction massage for

	tendinitis in non-professional athletes.		Deep friction massage group with therapeutic exercise.	external rotation, supraspinatus strength, and quality of life.		managing supraspinatus tendinitis.
Al-Khair, M.A.A. et.al [2020]	To compare the clinical, functional, and ultrasonographic outcomes of focused, radial, and combined extracorporeal shock-wave therapy (ESWT) in the treatment of calcific shoulder tendinopathy.	45 Patients of calcific shoulder tendinopathy.	Enrolled 45 patients were classified into 3 groups, all received four sessions of ESWT 1 week apart. Group 1: - 15 patients received focused shock waves (F-SW) 1500 shocks. Group 2: - 15 patients received radial shock waves (R-SW) 2000 shocks. Group 3: - 15 patients received combined focused and radial shock waves.	Shoulder disability questionnaire.	At the end of the study, the best improvement that regards a decrease in calcification size was obtained in group 3when compared with group 1 and group 2.	The best therapy in calcific shoulder tendinopathy appears to be combined focused and radial ESWT.
Pan, P.J. et.al [2007]	To compare the functional outcomes of ESWT and (TENS) therapy in chronic calcific tendinitis.	Sixty patients with continuous shoulder pain for 6 months or more.	Patients were randomly allocated to receive Extracorporeal shock - wave therapy (30 shoulders) or TENS treatment (30 shoulders).	Mean Constant score, VAS, manual muscle test.	The size of calcium deposits decreased significantly during the 4- and 12-week follow-ups. Moreover, the arc-shaped calcific plaques of the rotator cuff were markedly meliorated with ESWT.	ESWT is more effective in the treatment of chronic calcific tendinitis of the shoulder than is TENS therapy.
Louwerens, J.K.G et.al (2020)	To compare clinical and radiographic outcomes after treatment with ESWT and ultrasound-guided needling in patients with symptomatic calcific tendinitis.	82 patients were included in the study.	The ESWT group received (2000 pulses, EFD 0.35 m J/mm^2) in 4 sessions with 1-week intervals. UGN was combined with a corticosteroid ultrasound-guided subacromial bursa injection.	Constant Murley Score (CMS), the Disabilities of the Arm, Shoulder, and Hand questionnaire, and visual analog scale for pain.	In total, 22% of the UGN and 41% of the ESWT patients received an additional treatment during follow-up because of persistent symptoms.	Both techniques are successful in improving function and pain, with high satisfaction rates after 1-year follow-up.

TABLE 2:

Effects of Extracorporeal Shock-Wave Therapy for Rehabilitation of Lateral Epicondylitis :

Author/ Year	Objective of study	Sample size	Methodology	Outcomes measure	Result	Conclusion
Speed, C.A. et.al (2002)	To perform a double-blind placebo-controlled trial of moderate dose ESWT in chronic lateral epicondylitis.	Seventy-five subjects participated.	Adults with lateral epicondylitis were randomised to receive either active treatment (1500 pulses ESWT at 0.12 m J/ mm2) or sham therapy, monthly for three months.	Visual analogue scores.	Both groups showed significant improvements from two months. No significant difference existed between the groups with respect to the degrees of change in pain scores.	There appears to be a significant placebo effect of moderate dose ESWT in subjects with lateral epicondylitis but there is no evidence of added benefit of treatment when compared to sham therapy.

Chung, B. et.al [2004]	To check the effectiveness of Extracorporeal Shock Wave Therapy in the Treatment of Previously Untreated Lateral Epicondylitis: A Randomized Controlled Trial	60 subjects who had previously untreated lateral epicondylitis for less than 1 year and more than 3 weeks were included in this study.	Subjects were randomly allocated to receive 1 session per week for 3 weeks of either sham or active extra-corporeal shock wave therapy. Active therapy group received 2000 pulses, and all subjects were provided with forearm stretch. After 8 weeks of therapy, subjects were classified as either treatment successes or treatment failures	Visual analog scale scores, EuroQoL questionnaire and grip strength	Mean change in quality of life over 8 weeks was an increase of 1.3 and 3.3 for sham and active therapy groups, respectively, and mean change in grip strength over 8 weeks was an increase of 7.4 kg and 6.8 kg for sham and active therapy groups, respectively	Despite improvement in pain scores and pain-free maximum grip strength within groups, there does not appear to be a meaningful difference between treating LE with ESWT combined with forearm-stretching program and treating with forearm-stretching program alone.
Aldajah , S. et.al [2022]	To investigate the effect of extracorporeal shock-wave therapy (ESWT) on pain, grip strength, and upper-extremity function in lateral epicondylitis.	Forty participants, 20 in the ESWT group and 20 in the conventional-physical-therapy The group completed the study.	Participants: 18-80 years old with lateral epicondylitis & elbow pain (6-12 months). Exclusions: cervical/elbow issues, diabetes, thyroid problems, malignancy, pregnancy, recent CSs injections. Randomized to ESWT (n=20) or physiotherapy (n=20).	VAS, the Taiwan version of the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, and a dynamometer.	Participants in both groups improved significantly after treatment.	Five sessions of ESWT intervention showed a significant reduction of pain and significant improvement in upper-extremity function and grip strength.
Yan, C. et.al [2019]	To compare the effectiveness of ESWT and US in relieving pain and restoring the functions of tennis elbow following tendinopathy.	Five RCTs comprising five patients were included in the present meta-analysis.	RCTs published in PubMed, Embase, Cochrane Library, and SpringerLink databases comparing ESWT and US in treating tennis elbow were identified by software and manual search.	Visual Analog Scale and Grip strength.	The subjective scores of elbow functions were found to be better in the ESWT group compared to the US group.	Although there was no significant difference in the elbow function evaluation scores between ESWT and US, the superiority of the ESWT group was in the VAS of pain.
Ahadi, T. (2019)	To compare the efficacy of prolotherapy with hypertonic dextrose and radial shock wave therapy in chronic lateral epicondilosis.	33 patients were included in the study.	Sixteen patients received three sessions of shock wave therapy, and 17 received one session prolotherapy.	(VAS), grip strength Pneumatic Dynamometer, pressure pain threshold (PPT) and Disabilities of Arm, Shoulder, and Hand quick questionnaire (Quick DASH) .	The two groups were similar regarding grip strength and PPT. No complication was observed in the two groups**.**	A regiment of three sessions (weekly) of RSWT is significantly more effective than one session of prolotherapy with 20% dextrose regarding pain and function in the management of chronic lateral epicondylosis in short-term follow-up.

Table 3:

Effects of Extracorporeal Shock-Wave Therapy for Rehabilitation of Plantar Fasciitis:

Author/Year	Objective of study	Sample size	Methodology	Outcomes measure	Result	Conclusion
Akdere, E. et.al (2024)	To compare the effectiveness of ESWT and peloidotherapy on pain, quality of life and functional status in individuals diagnosed with (PF).	A total of 78 patients, aged between 18 and 65 years.	The peloidotherapy group received 15 sessions of peloidotherapy five days a week for three weeks, while the ESWT group received three sessions of radial-type ESWT once a week for three weeks.	Visual Analog Scale (VAS) and Heel Tenderness Index (HTI), functional status and quality of life were assessed using the Foot Ankle Outcome Score (FAOS).	A statistically significant difference in Favor of peloidotherapy was observed However, this difference did not persist at the one-month follow-up.	In the conservative treatment of PF, both peloidotherapy and ESWT can be recommended as effective and reliable options.
Konjen, N. et.al (2015)	To compare the effectiveness of (RSWT) and ultrasound therapy (US) in the treatment of chronic plantar fasciitis. Study Design: Randomized controlled trial.	Fifteen patients were required for each group to detect a difference effectively between the two groups.	The RSWT group was treated with 1 session per week for 6 weeks ,2000 impulses and frequency 10Hz, the ultrasound therapy group was treated with a Sonoplus 591 Enraf Nonius unit.	Visual analog scale, and for foot-mobility function by the mobility subscale of the plantar fasciitis pain and disability scale	None of the patients took pain relieving medications during the period of research treatment. The results showed that pain scores decreased by statistically significant levels in both groups.	In chronic plantar fasciitis treatment, both RSWT and US were found to be effective in reducing pain and increasing mobility.
Buchbinder, B.et.al [2002]	To determine whether ultrasound-guided ESWT reduces pain and improves function in patients with plantar fasciitis.	178 patients screened and enrolled 166.	Patients who fulfilled inclusion criteria and provided written informed consent were randomized and stratified by treatment center (3 treatment sites) in blocks of 4 to receive either active treatment or placebo regimens.	Ultrasound	At 6 and 12 weeks, there were significant improvements in overall pain in both the active group and placebo group.	No evidence found to support a beneficial effect on pain, function, and quality of life of ultrasound-guided ESWT over placebo.
Ulusoy, A. et.al [2017]	To compare the effectiveness of (LLLT), therapeutic ultrasound and (ESWT) using magnetic resonance imaging (MRI).	The present study included 60 patients with chronic recalcitrant plantar fasciitis.	Divided randomly into 3 treatment groups: group 1 underwent 15 sessions of LLLT, group 2 underwent 15 sessions of continuous US, Group 3 underwent 3 sessions of ESWT.	Visual analog scale (VAS), heel tenderness index (HTI), (AOFAS) ankle-hindfoot scale, Roles–Maudsley score.	2 withdrew from the study, 4 were unable to complete, 2 patients refused the second MRI examination.	LLLT, US therapy, and ESWT all significantly reduced the pain with no side effects.
On, H.J. et.al (2023)	To compare the effects of local vibration combined with extracorporeal shock wave therapy and extracorporeal shock wave therapy alone for plantar fasciitis.	A randomized controlled trial including 34 participants.	A group treated with extracorporeal shock wave therapy combined with local vibration or a group treated with extracorporeal shock wave therapy alone.	NPRS (Numerical pain rating scale), Foot Function Index, Ultrasonography.	Significant improvements were measured in both groups in the thickness of the plantar fascia, numerical rating scale, and Foot Function Index values.	Local vibration combined with extracorporeal shock wave therapy is an effective treatment for chronic plantar fasciitis.
Cinar, E. et.al [2020]	This study aimed at estimating the extent to which a combination therapy of (ESWT) with usual care improve	Two groups: ESWT (n = 23) and control (n = 21).	All participants received a home exercise program with orthotic support. In addition, ESWT group received 2000 shock	Function subscale of (AOFAS-F).	Groups performed differently in cadence where there was an increase in cadence in ESWT group whereas a	ESWT did not have an additive benefit over usual care to improve foot function and walking performance in

	functional ability in the patient with plantar fasciitis when compared to usual care alone.		waves with 0.02 m j /mm2 for three sessions.		decline in control in the third month.	patient with plantar fasciitis over three months post-treatment.

Table 4:

Effects of Extracorporeal Shock-Wave Therapy for Rehabilitation of Achilles tendinopathy: -

Author/ Year	Objective of study	Sample size	Methodology	Outcomes measure	Result	Conclusion
Rasmussen, S. et.al [2009]	Comparing the effect of supplementing conservative treatment of chronic Achilles tendinopathy with ESWT or placebo.	48 patients (28 men) with a mean age of 47 (19–80) years.	Patients assigned to nonoperative treatment of chronic Achilles tendinopathy were randomized to receive either active ESWT or sham ESWT over 4 weeks. (AOFAS) score and pain were assessed before treatment.	American Orthopaedic Foot and Ankle Society (AOFAS)	Better results were seen in the intervention group at 8 and 12 weeks of follow-up.	ESWT appears to be a supplement for the treatment of chronic Achilles tendinopathy.
Demir Benli, M. et.al (2022)	To compare the efficacy of the eccentric exercise and (ESWT) on chronic midportion Achilles tendinopathy.	A total of 63 patients with chronic midportion Achilles tendinopathy were enrolled.	The first group was treated with eccentric exercises every day for three months and the second group received four sessions of ESWT at weekly intervals.	VAS), Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaires, and ultrasonography measurements.	Tendon thickness and stiffness increased in the eccentric group while the difference was insignificant in the ESWT group.	Eccentric exercise and ESWT are efficient in the short term, whereas EE is efficient on tendon pain in the long term. While EE increases tendon thickness and stiffness, ESWT has no effect on these measures.
Gatz, M. et.al [2021]	To determine the effect of Line- and Point-Focused ESWT for Achilles Tendinopathy.	The study was conducted in 3 cohorts, namely ESWT point (n = 21), ESWT line (n = 24) and ESWT placebo (n = 21).	All cohorts performed daily physiotherapy for 24 weeks and received 4 sessions of point-focused, line-focused, or placebo ESWT in the first 6 weeks.	(VISA-A)Victorian Institute of Sports Assessment–Achilles.	There was a significant VISA-A improvement over time for all groups (P < 0.001). ESWT point had the strongest VISA-A score improvement.	There is a significant VISA-A score improvement for all study groups without a statistically significant benefit for ESWT point or ESWT line compared with ESWT placebo.
Rompe, J.D. et.al (2008)	To evaluate the effectiveness of a eccentric loading training of repetitive low-energy SW treatment in patients suffering from chronic midportion Achilles tendinopathy.	Sixty-eight patients with a chronic recalcitrant.	All patients had received unsuccessful management for >3 months, including at least (1) peritendinous local injections, (2) nonsteroidal anti-inflammatory drugs, and (3) physiotherapy.	(VISA-A)Victorian Institute of Sports Assessment–Achilles	groups 1 and 2 differed significantly in favor of the combined approach at the 4-month follow-up.	At 4-month follow-up, eccentric loading alone was less effective when compared with a combination of eccentric loading and repetitive low-energy shock-wave treatment.
Paantjens, M.A. et.al [2022]	To investigate the ESWT for Mid-portion and Insertional Achilles Tendinopathy.	This included three RCTs on mid-AT and four RCTs on ins-AT.	Two reviewers independently performed the study selection, quality assessment, data extraction, and grading of the evidence levels.	VISA-A)Victorian Institute of Sports Assessment–Achilles	For ins-AT very low quality of evidence were founded compared to standard care alone.	There is moderate evidence supporting the effectiveness of ESWT additional to a tendon loading program in mid-AT and for ins-AT is lacking.

4. DISCUSSION

Although the mechanism of action of this intervention is not fully understood and its beneficial effects are likely to be related to micro-displacements. **Majidi, L., et al. (2024**). Some studies compared different types of shockwaves without considering the intensity while others used a measure called EFD (energy flux density) to describe the intensity. **Liao, C. D., et al. (2018).** It seems that evaluation of the ESWT outcomes 12 months after trial would be helpful for the evaluation of ESWT and its dose **Vahdatpour, B., et al. (2018).** One theory is that shockwaves stimulate nerve impulses which can block pain signals. Another theory is that shockwaves can change the chemical environment of cells leading to the production of pain-inhibiting chemicals. **Li, C. et al. (2021).** The combination of ESWT with needling therapy is more effective in reducing pain in patients with tendinopathy than using ESWT or needling therapy alone. This may be because ESWT helps alleviate the minor inflammatory reactions caused by needling therapy. **Li, Z. et al. (2025).**

5. CONCLUSION

ESWT is particularly effective for shoulder calcification and for other conditions like plantar fasciitis and Achilles tendon problems. Some conditions like tennis elbow the benefits of ESWT are less clear. It is essential that clinicians and researchers continue to work together to advance the understanding of this treatment modality which can be achieved through high-quality research studies including RCT'S as well as through the development of evidence-based treatment protocols and guidelines.

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