Medical Coverage Policy

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Extracorporeal Shock Wave Therapy (ESWT) for Musculoskeletal Conditions

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INSTRUCTIONS FOR USE

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Overview

This Coverage Policy addresses extracorporeal shock wave therapy (ESWT) for musculoskeletal conditions.

Coverage Policy

Coverage for extracorporeal shock wave therapy (ESWT), also referred to as extracorporeal shock wave lithotripsy (ESWL), for musculoskeletal and orthopedic conditions varies across plans. Please refer to the applicable benefit plan document to determine benefit availability and the terms, conditions and limitations of coverage.

Extracorporeal shock wave therapy (ESWT) is considered experimental, investigational or unproven for the treatment of ANY musculoskeletal condition.

Coding Information

Notes:

1. This list of codes may not be all-inclusive since the American Medical Association (AMA) and Centers for Medicare and Medicaid Services (CMS) code updates may occur more frequently than policy updates.
2. Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Experimental/Investigational/Unproven for the treatment of any musculoskeletal condition:

CPT®* Codes	**Description**
20999	Unlisted procedure, musculoskeletal system, general
28890	Extracorporeal shock wave, high energy, performed by a physician or other qualified health care professional, requiring anesthesia other than local, including ultrasound guidance, involving the plantar fascia
28899	Unlisted procedure, foot or toes
0102T	Extracorporeal shock wave performed by a physician, requiring anesthesia other than local, involving the lateral humeral epicondyle

***Current Procedural Terminology (CPT®) ©2024 American Medical Association: Chicago, IL.**

General Background

Extracorporeal Shock Wave Therapy (ESWT), previously referred to as extracorporeal shock wave lithotripsy (ESWL), has been in use for over 30 years. It was first developed to break kidney

stones into fragments that can then be passed naturally: a procedure known as renal lithotripsy. Its musculoskeletal applications began in the late 1980s, with dedicated devices developed in the early 1990s. The term ESWT was subsequently standardized to describe its use in treating chronic musculoskeletal disorders (Chen, et al., 2021a).

ESWT is a noninvasive treatment modality that delivers focused low- or high-intensity pulsed mechanical waves thought to stimulate tissue regeneration and healing. Low-intensity ESWT is typically administered in an office setting under ultrasound guidance to localize the pathological site, with treatments delivered in serial sessions spaced approximately one week apart. High-intensity ESWT is generally performed in a hospital or ambulatory surgery center under anesthesia. Currently, there is no standardized protocol regarding the optimal number of sessions or impulses, and treatment parameters may vary based on indication and device type (Chen, et al., 2021a).

There are two types of ESWT based on how the waves are delivered: focused and radial. Focused ESWT directs shock waves at a targeted area with high tissue penetration where it is proposed to stimulate healing and disrupt pain signals. The shock waves may be generated using electrohydraulic, electromagnetic or piezoelectric technology. The difference between the three methods of generation is the time at which the shockwave forms (Roerdink, et al., 2017).

Radial ESWT uses pneumatic (compressed air) devices to deliver radial shock waves to a wider area than focused ESWT at a relatively low energy level (Hayes 2016b). This generates stress waves in the applicator that transmit pressure waves (radial shock waves) non-invasively into tissue. Since the waves generated by radial ESWT are not true shock waves, the technology is also referred to as radial pressure wave therapy or extracorporeal pulse activation therapy (EPAT) (Császár, et al., 2015). However, published literature continues to refer to radially generated wave therapy as radial ESWT.

ESWT has been investigated as a treatment for various musculoskeletal conditions such as medial epicondylitis (i.e., golfer's elbow); calcific tendonitis of the rotator cuff; Achilles and patellar tendonitis; avascular necrosis of the femoral head; and nonunion of fractures. However, ESWT devices are FDA approved for only two musculoskeletal indications: plantar fasciitis (i.e., heel pain) and lateral epicondylitis (i.e., tennis elbow). The mechanism by which ESWT might relieve pain associated with musculoskeletal conditions is unknown. It is thought to disrupt fibrous tissue with subsequent promotion of revascularization and healing of tissue. It has also been hypothesized that the shock waves may reduce the transmission of pain signals from the sensory nerves and/or stimulate healing (Huang, et al., 2000). On that basis, ESWT has been proposed as an alternative to surgery.

Lateral Epicondylitis

Lateral epicondylitis is caused by repetitive motion that exerts stress on the grasping muscles of the forearm, which originate at the lateral epicondyle of the elbow. Conservative treatment involves rest, ice, stretching, strengthening, avoiding activity that hurts, and, as healing occurs, strengthening exercises. While the majority of cases of fasciitis, tendonitis and epicondylitis resolve spontaneously over time with rest and discontinuation of the provoking activity, surgical treatment may be indicated for patients who fail conservative treatment.

U.S. Food and Drug Administration (FDA)

Extracorporeal shock wave therapy devices (focal and radial) are considered Class III medical devices and regulated by the FDA through the Premarket Approval (PMA) process. They are indicated for non-surgical treatment of lateral epicondylitis in adults with symptoms lasting ≥6 months that have not responded to conservative therapy (FDA, 2025).

Device or Product	Identifier	Manufacturer	Decision Date
OssaTron®	P990086	HealthTronics, Inc.	03/14/2003
SONOCUR® Basic	P010039	Siemens Medical Solutions USA, Inc.	7/19/2002

*FDA product codes: NBN

Note: Device or product names are provided for example purposes only. Their inclusion does not indicate endorsement or preference for any specific brand or model. Coverage decisions are not based solely on FDA approval. This list is not intended to reflect all available products or technologies.

Literature Review

A number of RCTs (n=32–114) and systematic reviews with meta-analysis have evaluated the safety and effectiveness of ESWT versus sham for the treatment of lateral epicondylitis. These studies have been limited by short-term follow-up of 6–12 months and have yielded conflicting results. Some studies have demonstrated significant improvement of pain and/or function for patients in the treatment group (Yao et al., 2020). Other study results have indicated that ESWT for tennis elbow was no better than placebo, corticosteroid injections or surgery (Chen, et al. 2023; Karanasios, et al., 2021; Defoort, et al., 2021; Yoon, et al., 2020; Zheng, et al., 2020; Guler, et al., 2018).

Zhang et al. (2024a) completed a systematic review and meta-analysis of six randomized controlled trials (RCTs) involving 276 adults with lateral epicondylitis (LE) of at least three months' duration to evaluate the safety and effectiveness of extracorporeal shock wave therapy (ESWT) compared with local corticosteroid injection (LCI). To be included, studies must have directly compared ESWT with LCI. Exclusion criteria included individuals with shoulder, neck, or thoracic dysfunction; localized or widespread arthritis; neurological abnormalities; nerve entrapment; prior elbow fracture, dislocation, or surgery; and prior ESWT or LCI within six months. Primary outcomes evaluated were pain reduction evaluated by changes in visual analogue scale (VAS) scores and functional improvement assessed by changes in grip strength. Secondary outcomes were listed as changes in patient-rated tennis elbow evaluation (PRTEE) scores. Among the included studies follow up ranged from 1 to 6 months. At one month, LCI showed superior pain relief and grip strength ($p<0.001$). However, by three months, ESWT demonstrated significantly greater improvements in both VAS ($p<0.001$) and grip strength ($p=0.0005$), with sustained benefits in two studies at six months (VAS $p<0.001$; grip strength $p=0.005$). PRTEE scores favored LCI at one month ($p<0.001$) but shifted toward ESWT at three months ($p<0.001$), with no significant differences at six months. Both interventions had similar rates of self-limiting adverse events such as discomfort, swelling, bruising, and site irritation. Limitations of the review included small sample sizes, short follow-up durations, and heterogeneity in participant activity levels, LE severity, ESWT device specifications, LCI formulations, and rehabilitation protocols, which may affect generalizability.

Kaplan et al. (2023) conducted a randomized sham-controlled trial that evaluated and compared the effects of radial and focused types of extracorporeal shock wave therapy (ESWT) on lateral epicondylitis. Included patients have a new diagnosis of lateral epicondylitis, acute lateral epicondylitis (symptom duration < 3 months), aged ≥18 during the diagnosis, and have filled out the pre- and post-ESWT assessment process. If a case had both elbows affected, the elbow with a higher pain level was initially accepted for the analysis. Patients with acute lateral epicondylitis were randomized into focused (n=32), radial (n=32), and sham ESWT (n=33) groups. The ESWT was applied for three sessions at 2-4 days intervals. All the subjects were evaluated at baseline (week 0), week 5, and 13. Patient-rated tennis elbow evaluation (PRTEE) scores were used to measure forearm pain and disability. Nine patients were lost to follow-up with data from 87 patients reported in the statistical analyses (n=30, n=29, and n=28 from the treatment groups,

respectively). Both focused and radial ESWT groups were seen as remarkably better than the sham ESWT group in all PRTEE scores (pain, function, and total) ($p < 0.001$), for the change from first admission to interval examination times (weeks 5 and 13). Focused ESWT was superior to radial ESWT for the change of PRTEE total scores from baseline to weeks 5 (36.7±25.9 vs. 23.0±17.2; $p=0.021$) and 13 (34.7±24.3 *vs.* 22.4±18.5; $p=0.044$). Authors noted limitations to the study included that advanced radiologic tool for diagnosing the lateral epicondylitis was not used, there was a limitation with the operator-informed outcome measures and the subgroup analysis was not based on more detailed grouping according to weekly symptom duration. Also, the cost/benefit of the ESWT compared to other non-invasive methods of treating the lateral epicondylitis was not considered. An additional limitation of the study included that the population only included patients located in Turkey and the results may not be applicable to other races or ethnic groups. Further long-term studies with large patient populations are needed to validate the findings in this study.

Aldajah et al. (2022) conducted a randomized controlled trial (RCT) that assessed the effect of extracorporeal shock-wave therapy (ESWT) on pain, grip strength and upper-extremity function in lateral epicondylitis (LE). Forty patients with LE (21 males) were randomly allocated to either the ESWT experimental (n=20) or the conventional-physiotherapy control group (n=20). All patients received five sessions during the treatment program. The outcomes measured pain using the Visual Analog Scale (VAS), upper-extremity function using the Taiwan version of the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and maximal grip strength (MGS) using a dynamometer. Patients in both groups improved significantly after treatment in pain, upper extremity function and maximal grip strength; however, the scores were significant higher after ESWT ($p<0.000$). Author noted limitations included that the study was not double-blinded, small patient population and short-term follow-up. An additional limitation was that the study was conducted in Amman, Jordan and the results may not be applicable to other races or ethnic groups. The authors concluded that ESWT had a superior effect in reducing pain and improving upper-extremity function and grip strength in people with lateral epicondylitis. However, further long-term studies with large patient populations are needed to validate the findings in this study. No health disparities were identified by the investigators.

Additional RCTs and meta-analysis (n=5 RCTs/233 patients) have evaluated the comparative effectiveness of ESWT and therapeutic ultrasound (US) in the treatment of elbow tendinopathies, with outcomes demonstrating notable heterogeneity. While some studies report comparable improvements in pain and function between ESWT and US, others suggest ESWT may offer superior benefits, particularly in sustained pain relief and overall recovery. These studies have been limited by lack of control or placebo groups, small sample sizes, and short-term follow-up of 1–12 months (Yan, et al., 2019; Yalvaç, et al., 2018; Vulpiani, et al., 2015).

Król et. al (2024) conducted a randomized controlled trial (RCT) to compare the efficacy of focused extracorporeal shock wave therapy (FSWT) and ultrasound therapy (US) in treating lateral epicondylitis (LE). Sixty participants aged 18–65 years were randomly assigned to one of three groups: Group A (n=20) received FSWT, Group B (n=20) received US therapy, and Group C (n=20) received placebo US. Inclusion criteria included pain in the lateral epicondyle persisting for ≥ 3 months, positive Thompson's and Mill's tests, and pain during resisted middle finger extension. Exclusion criteria encompassed local infection, pregnancy, malignancy, bilateral LE, carpal tunnel syndrome, medial epicondylitis, elbow arthritis or instability, polyarthritis, ipsilateral shoulder dysfunction, neurological abnormalities, radial nerve entrapment, cardiac arrhythmia or a pacemaker, diabetes, and recent corticosteroid or physical therapy interventions. Outcomes were assessed using a numerical rating scale (NRS) for pain, the Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire for function, and objective muscle strength measurements via SH5001 dynamometer. Group A showed the greatest reduction in pain and PRTEE scores, with statistically significant improvements at 6 and 12 weeks post-treatment ($p \leq 0.05$). Wrist extensor and flexor

strength in Group A also increased significantly at 3, 6, and 12 weeks, with corresponding improvements in strength ratios compared to the unaffected limb ($p \leq 0.05$). Grip strength improved significantly in Groups A and B, though intergroup differences in strength gains were not statistically significant ($p > 0.05$). No adverse effects were reported in the US group, while the FSWT group included reports of pain at the site of application, subcutaneous hematomas, and swelling in the lateral epicondyle. Acknowledged limitations included the need for additional objective measures, absence of a placebo FSWT group, and lack of long-term follow-up. An additional noted limitation is the small participant population.

Aydın and Atiç (2018) performed a prospective randomized controlled trial comparing the efficacy of ESWT to wrist-extensor splint (WES) application in the treatment of lateral epicondylitis (LE). Patients were included if they had been treated based on a diagnosis of unilateral LE. Patients were excluded if they had bilateral LE, carpal tunnel syndrome, cubital tunnel syndrome, previous elbow surgery, previous conservative and surgical treatment for LE, neurological deficits in the upper extremity, systemic disease, other diseases in the neck and shoulder region, lateral epicondylar tendon ruptures, tumors in the forearm and elbow, osteoporosis, and hemophilia. The patients were randomized into two groups. Group one (n=32) received ESWT four times per week using the DolorClast device and group two (n=35) received a wrist extensor splint. The primary outcomes measured were the effectiveness of ESWT compared to WES in decreasing pain, improving grip strength, increasing quality of life, and alleviating arm pain during daily life activities in the treatment of LE. Evaluation data were collected before and after treatment at weeks four, 12, and 24. Four patients in the ESWT group and one in the WES group were lost to follow-up. In both groups there were significant improvements ($p < 0.001$) in decreasing pain, increasing grip strength and improving quality of life at four, 12, and 24 weeks compared to pretreatment values. However, there was no statistically significant difference between the two groups at the three time points ($p > 0.05$). The authors noted limitations of the study were the small patient population and use of the patient-reported questionnaires.

Plantar Fasciitis

Plantar fasciitis is an overuse injury resulting in inflammation of the plantar fascia, which connects the heel to the toes. It is a common cause of heel pain in adults. Symptoms usually start gradually with mild pain at the heel, pain after exercise and pain with standing first thing in the morning. On physical examination, firm pressure will elicit a tender spot over the medial tubercle of the calcaneus. Conservative treatment for plantar fasciitis includes rest, physical therapy, heel cushions, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, foot orthotics, shoe modifications, night splinting, and casting. Surgery is usually considered only for intractable pain which has not responded to 6–12 months of proper conservative treatment.

U.S. Food and Drug Administration (FDA)

Extracorporeal shock wave therapy devices (focal and radial) are considered Class III medical devices and regulated by the FDA through the Premarket Approval (PMA) process. They are indicated for non-surgical treatment of chronic proximal plantar fasciitis in adults with symptoms lasting ≥6 months that have not responded to conservative therapy (FDA, 2025).

Device or Product	Identifier	Manufacturer	Decision Date
OssaTron®	P990086	HealthTronics, Inc.	10/12/2000
Epos™ Ultra	P000048	Dornier Medical Systems, Inc.	1/15/2002
Orthospec™	P040026	Medispec, Ltd.	4/01/2005
Orbasone Pain Relief System	P040039	Orthometrix, Inc.	8/10/2005
EMS Swiss DolorClast®	P050004	Electro Medical Systems S.A.	5/08/2007
Storz Medical Duolith SD1 Shock Wave Therapy Device	P080028	Storz Medical AG	1/08/2016

*FDA product codes: NBN

Note: Device or product names are provided for example purposes only. Their inclusion does not indicate endorsement or preference for any specific brand or model. Coverage decisions are not based solely on FDA approval. This list is not intended to reflect all available products or technologies.

Literature Review

The safety and effectiveness of ESWT for the treatment of plantar fasciitis has been evaluated in technology assessments, systematic reviews with meta-analyses (n=6–11 studies/550–1287 participants), and randomized controlled trials (RCTs) (n=44–272). These studies have compared ESWT to placebo, conservative treatment such as exercise and/or orthotic support or steroid injections with conflicting results. In some studies, there is a greater reduction in heel pain and/or improvements in functional ability in individuals treated with ESWT (Xu, et al., 2020; Mishra, et al., 2019; Xiong, et al., 2019; Lai, et al., 2018; Li, et al., 2018b). However, similar improvement rates for both ESWT treatment and placebo or conservative treatment groups have been reported in other studies (Cinar, et al., 2020; Çağlar Okur and Aydın, 2019; Li, et al., 2018a). In general, these studies have limitations such as small sample sizes, lack of control groups, participant attrition, and short-term follow-up (3–12 months) that limit the generalizability of their results.

Tung et al. (2025) completed a systematic review and meta-analysis of randomized controlled trials (RCTs) (n=15 studies/1123 participants) to evaluate the effectiveness of extracorporeal shock wave therapy (ESWT) versus other conservative treatment options (e.g., corticosteroid injections (CSI), orthotics) or placebo for managing plantar fasciitis (PF). Eligible RCTs compared ESWT to any other treatment modality using at least one of the following primary outcomes: visual analog scale (VAS) pain scores, plantar fascia thickness (PFT) and total Foot Function Index (FFI). Studies with follow-up durations under 12 weeks or insufficient data for effect size calculation were excluded. Follow-up periods ranged from 3 to 24 months. Overall ESWT demonstrated a significantly greater improvement in VAS compared to placebo ($p<0.00001$) and improved FFI significantly more than corticosteroid injections ($p=0.03$). However, custom foot orthotics significantly outperformed ESWT in FFI outcomes ($p=0.001$). No significant differences were found in PFT between ESWT and other treatments. Limitations included heterogeneity across studies, small sample size, and a short-term follow-up.

Heide et al. (2024) conducted a four-arm, parallel-group, sham-controlled, observer-blinded, and partly patient-blinded randomized controlled trial (RCT) to assess the effectiveness of radial extracorporeal shock wave therapy (rESWT) in reducing heel pain in patients with plantar fascipathy. A total of 200 participants between aged 18–70 were randomized into four groups: rESWT (n=50), sham-rESWT (n=50), standardized exercise program (n=50), or advice plus custom foot orthoses (n=50). Inclusion criteria required heel pain lasting more than three months, localized to the medial calcaneal tuberosity, with tenderness on palpation. Exclusion criteria

included recent rESWT treatment, inflammatory or neurological conditions, prior foot/ankle surgery with retained hardware, and contraindications to rESWT (e.g., anticoagulant use, pregnancy, bleeding disorders, epilepsy, or pacemaker). The primary outcome was self-reported heel pain during activity over the past week, measured using a numeric rating scale (NRS). Secondary outcomes included function and quality of life and were assessed via the RAND-12 Health Status Inventory, Foot Function Index Revised Short Form (FFI-RS), and Patient Global Impression of Change (PGIC). Assessments were conducted at baseline and at 3, 6, and 12 months. At six months no statistically significant differences were found in heel pain reduction between rESWT, sham-rESWT, exercise, or advice plus orthoses. Secondary outcomes similarly showed no significant differences. Reported adverse events included treatment related pain and discomfort across all groups. Study limitations include single center design in specialized care setting, small population, short term follow-up, reliance on self-reported questionnaires, lack of objective testing, and potential conflict of interests.

Miscellaneous Indications

ESWT has been proposed for other conditions, including but not limited to: delayed or nonunion fractures, osteonecrosis of the femoral head, greater trochanteric pain syndrome (GTPS), low back pain, neck pain, cervical spondylosis, muscle spasticity, patellar tendinopathy, Achilles tendinopathy, subacromial pain syndrome, trigger finger, Dupuytren disease, and rheumatoid arthritis. ESWT for these indications has been evaluated in randomized controlled trials, systematic reviews and uncontrolled studies with small patient populations and short term follow-up (Tan, et al., 2025; Li, et al., 2024; Yazdani, et al., 2024; Zhang, et al., 2024b; Charles, et al., 2023; Brunelli, et al., 2022; Elgendy, et al., 2022; Feeney, 2022; Chen, et al., 2021b; Gatz, et al., 2021; Pinitkwamdee, et al., 2020; Rahbar, et al., 2021; Eftekharsadat, et al., 2020).

Achilles Tendinopathy

Achilles tendinopathy is an overuse condition involving degeneration and inflammation of the Achilles tendon, which connects the calf muscles to the calcaneus (heel bone). It affects both active and sedentary individuals and is typically classified as insertional (at the tendon's attachment to the heel) or non-insertional (mid-portion of the tendon). Early symptoms often include sharp, intermittent pain during activity, particularly worse in the morning and aggravated by continued use. Conservative management is the first-line approach and includes: activity modifications and rest, nonsteroidal anti-inflammatory drugs (NSAIDs), ice therapy, physical therapy with eccentric strengthening, stretching, heel lifts, orthotics, immobilization, or night splints. Surgical intervention is reserved for cases unresponsive to at least three to six months of comprehensive non-operative treatment (Strasser, 2024).

Literature Review

Alsulaimani et al. (2024) performed a two-armed, parallel-group, explanatory, single-center, randomized controlled trial (RCT) to evaluate the effectiveness of radial extracorporeal shock wave therapy (ESWT) versus sham treatment in adults with insertional Achilles tendinopathy. Seventy-six participants (mean age 48–52 years) were randomized to receive either radial ESWT (n=38) or sham therapy (n=38), with both groups receiving identical exercise and education from a physiotherapist. Inclusion required symptoms persisting for over three months. Exclusion criteria included prior ESWT, Achilles tendon surgery or rupture, inflammatory arthropathy, neurological or genetic connective tissue disorders, serious mental illness, or fluoroquinolone use within the past two years. The primary outcome measure was the Victorian Institute of Sports Assessment–Achilles (VISA-A) score. Secondary outcomes included pain scale scores (VAS), physical activity levels (7-day Recall), kinesiophobia (Tampa Scale), pain catastrophizing scores (Pain Catastrophizing Scale), pain self-efficacy (Pain Self-Efficacy Questionnaire), and health-related quality of life scores (EQ-5D-5L). Exercise adherence and use of other treatments were also tracked. Assessments were conducted at baseline, 6 weeks, and 12 weeks via electronic questionnaires. No significant differences were found between groups in VISA-A scores at 6 weeks

(p=0.44) or 12 weeks (p=0.20), nor in any secondary outcomes (p>0.05). Participants in the sham group reported substantial pain during treatment (mean VAS 7.31). Adverse events, including post-treatment Achilles pain lasting up to two days and activity-related discomfort, were self-reported and generally mild. The authors noted limitations in blinding. Additional limitations include lack of objective physical measurements, small sample size, short-term follow-up, and participant attrition.

Abdelkader et al. (2021) conducted a double-blind randomized controlled trial (RCT) that compared the efficacy of conservative physical therapy treatments to ESWT with conservative physical therapy treatments for treating chronic noninsertional Achilles tendinopathy (NAT). Adult patients with unilateral NAT (n=50; n=22 men, n=28 women) who failed standard conservative treatment were randomized into two groups. Patients in the study group (n=25) received four sessions of ESWT at weekly intervals in addition to conservative physical therapy treatments. Patients in the control group (n=25) received the same conservative physical therapy treatment as well as sham ESWT. Function and pain were assessed at baseline, one month, and 16 months using the Victorian Institute of Sport Assessment–Achilles questionnaire (VISA-A) and visual analog scale (VAS), respectively. Both groups significantly improved one month posttreatment, however functional scores and pain reduction was significantly better in the study group than in the control group (both p=0.0001). At the 16-month follow-up, the functional and pain scores were significantly better than those at the baseline (p=0.0001 for both). At all-time points, both scores in the study group were significantly better than those in the control group (p=0.0001 for both). Author noted limitations included a lack of outcome data between posttreatment and the final follow-up. Additional limitations include the small patient population, short-term follow-up and that the study only included patients in Egypt and the results may not be applicable to other races or ethnic groups. The authors concluded that adding ESWT to conservative physical therapy treatment resulted in significantly greater improvements in both the short and long term. However, further long-term studies with large patient populations are needed to validate the findings in this study. No health disparities were identified by the investigators.

Mansur et al. (2021) conducted a single-center, double-blinded, randomized controlled trial that evaluated if the use of shockwave therapy in combination with eccentric exercises improves pain and function in patients with Achilles insertional tendinopathy (AIT). Patients were eligible for inclusion if they were aged 18 and 75 years, experiencing pain at the calcaneal tendon insertion for at least three months, and a diagnosis of AIT. Patients (n=109) were randomized into either the treatment group (n=58) or the control group (n=61). The treatment group (SWT group) received eccentric exercises with extracorporeal shockwave therapy and the control group received eccentric exercises with sham shockwave therapy. Patients were assessed at baseline and at two, four, six, 12, and 24 weeks after the first intervention. Three sessions of radial shockwaves (or sham treatment) were performed every two weeks and eccentric exercises were undertaken for three months. The primary outcome measured function at 24 weeks using the Victorian Institute of Sport Assessment-Achilles questionnaire (VISA-A). Secondary outcomes measured visual analogue scale (VAS) for pain, Foot and Ankle Outcome Score (FAOS), and 12-item Short Form Health Survey (SF-12). A total of 23 patients were lost to follow-up at the 24-week assessment. At the 24-week evaluation, the SWT group exhibited a mean VISA-A of 63.2 compared to 62.3 in the control group (p=0.876). Both groups showed significant improvement (all p>0.05) in all outcomes during the study but there were not significant differences between the groups in any of the outcomes. In the SWT group there was a higher rate of failure (38.3%) with a lower rate of recurrence (17.0%) compared to the control group (11.5% and 34.6%, respectively; p=0.002 and p=0.047). There were no complications reported for either group. Author noted limitations included: the recruitment took place at a single, tertiary center that limited generalizability, short term follow-up and the amount of patients lost to follow-up. Lastly, the authors noted that previous muscle quality and tendon degeneration was not evaluated. The study concluded that extracorporeal shockwave therapy does not potentiate the effects of

eccentric strengthening in the management of Achilles insertional tendinopathy. No health disparities were identified by the investigators.

Carpal Tunnel Syndrome

Carpal tunnel syndrome (CTS) is a clinical syndrome caused by compression of the median nerve at the wrist. It is the most common entrapment neuropathy in adults. The pathophysiology of CTS is not fully understood; it is thought that ischemic injury due to increased carpal tunnel pressure is the most crucial factor. Risk factors include repetitive wrist movements, obesity, rheumatoid arthritis, diabetes mellitus, and menopause. Clinical symptoms include nocturnal pain, numbness and a tingling sensation in the median nerve dermatome. The diagnosis of CTS is confirmed by these typical clinical symptoms, along with electrodiagnostic studies. Treatment options consist of wrist splints, physical modalities, local corticosteroid injections, and surgical treatments. The effects of a wrist splint, local corticosteroid injection, and surgical treatment have been demonstrated in multiple studies (Kim, et al., 2019).

Literature Review

Several randomized controlled trials (n=25–189) and one systematic review with meta-analysis (n=6 RCTs/281 participants) have evaluated the efficacy of extracorporeal shock wave therapy (ESWT) for carpal tunnel syndrome (CTS) compared to standard treatments including wrist splints, corticosteroid injections, and surgical intervention. These studies are limited by small sample sizes, short follow-up durations (1–6 months), absence of sham controls in some trials, gender imbalances, and heterogeneity in ESWT protocols and intensities, resulting in inconsistent findings. Some trials reported significant improvements in pain, function, and/or nerve conduction in ESWT groups (Haghighat et al., 2019; Kim et al., 2019; Atthakomol et al., 2018; Raissi et al., 2017). Conversely, other studies found no significant benefit of ESWT over placebo, corticosteroid injections, or surgery (Koçak Ulucaköy et al., 2020; Sweilam et al., 2019).

Gholipour et al. (2023) conducted a prospective randomized controlled trial that assessed the efficacy of using radial extracorporeal shock wave therapy (R-ESWT) with LCI (local corticosteroid injection) in treating carpal tunnel syndrome (CTS). Patients (n=40) with mild to moderate CTS were randomized into either the sham R-ESWT (n=20) group or the active R-ESWT group. Both groups had a LCI (local corticosteroid injection). The first group received four sessions of sham-ESWT weekly, which involved sound but no energy; the second group received R-ESWT at equal intervals. Patients were assessed at baseline, one month, three months and six months for pain using the visual analogue scale (VAS) and symptoms using the global symptom score (GSS) The GSS questionnaire measured pain, numbness, paresthesia, weakness/clumsiness, and nocturnal waking. At the end of the 6th month, patients with exacerbation of paresthesia, finger tingling, and decreased strength were referred for surgery after being confirmed by the EMG-NCV. Significant improvement was observed in both groups for pain ($p<0.05$) and symptoms ($p<0.05$) at three-months. The second group revealed more significant symptom improvement at ($p<0.05$) at six months. At the end of the study period, significantly more patients were referred for carpal tunnel release from the sham-ESWT group (n=15/75%) compared to (n=8/40%) to the ESWT group ($p=0.025$). Author noted limitations included the small patient population and short-term follow-up period. Another important limitation was the gender had a high count of females and cannot be generalizable to everyone. Accordingly, evaluation of the components that would indicate the possible mechanisms of ESWT and corticosteroids' simultaneous action in future studies are of primary concern.

In a randomized, double-blind, placebo-controlled trial, Menekseoglu et al. (2023) evaluated the efficacy of radial extracorporeal shock wave therapy (ESWT) on pain, function, and electrophysiological parameters in patients with mild-to-moderate carpal tunnel syndrome (CTS). Forty-five participants (66 wrists) were randomized to receive either radial ESWT (n=33) or sham ESWT (n=33), with all participants also receiving night splints and tendon/nerve gliding exercises.

Inclusion criteria were as follows: age 40–60 years, diagnosis of mild-to-moderate CTS, no CTS treatment in the prior six months, positive Phalen and Tinel tests, and agreement to abstain from other CTS therapies during the study. Exclusion criteria encompassed other neuropathies, prior wrist or cervical surgery, recent corticosteroid injection, bleeding disorders, and pregnancy. Primary outcomes were assessed using the Visual Analog Scale (VAS), Boston Carpal Tunnel Questionnaire (BCTQ), Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), and electrophysiological studies at baseline and one-month post-treatment. Of the 45 participants, 37 (55 wrists) completed the study (ESWT: n=27; sham: n=28). Both groups showed significant improvements in VAS ($p<0.001$), BCTQ ($p<0.001$), LANSS ($p<0.001$), median nerve sensory distal latency ($p=0.002$), and median nerve motor distal latency ($p=0.004$). Sensory conduction velocity improved significantly in both groups, with greater improvement observed in the ESWT group ($p=0.007$ vs. $p=0.026$). Limitations include participant attrition, single-center design, small sample size, and short-term follow-up.

Öztürk Durmaz et al. (2022) conducted a randomized controlled trial (RCT) that compared the effectiveness of radial extracorporeal shock wave therapy to local corticosteroid injection (LCI) on pain, function and nerve conduction studies in the treatment of idiopathic carpal tunnel syndrome (CTS). Adults (n=72) aged 18–65 years diagnosed with mild and moderate CTS through clinical parameters and nerve conduction studies (NCSs) were included in the study. Patients were randomized into three groups. Patients (n=33) in the rESWT/splint group received a splint and one session of rESWT per week, a total of three sessions (frequency of 5 Hz and 2000 shock pulses). Patients in the LCI/splint group (n=28) received a splint and an injection of methylprednisolone (Depo-Medrol). Patients (n=31) in the splint only group, received a splint and were instructed to use it for two months while sleeping at night and resting during the day. Primary outcomes measured symptom severity and functional status using the Boston Symptom Severity Subscale (Boston-SSS) and functional status using the Boston Functional Severity Subscale (Boston-FSS). Secondary outcomes measured pain and numbness using the Visual Analog Scale (VAS) along with hand grip strength. One week after treatment, pain, numbness and symptom severity showed significant improvement compared with pretreatment values in all three groups. In the intergroup comparison, there was a significant improvement in pain, numbness, symptom severity and functional severity in the LCI group compared to the ESWT and control groups. Twelve weeks after treatment the pain, numbness, symptom severity and functional severity showed significant improvement in all three groups. Pain and functional severity differed significantly between groups with the difference in pain was in favor of the LCI group and the difference in functional severity was in favor of the LCI and control groups. The numbness, symptom severity, and handgrip strength did not differ significantly between the groups in the 12^{th} week after the treatment. Author noted limitations included the unblinded study design, small patient population, short term follow-up and imaging (e.g., ultrasonography) was not used to determine the treatment site before both injections and rESWT. An additional limitation is that the study was conducted in Turkey and the results may not be applicable to other races or ethnic groups. The authors concluded that ESWT, splint, and local corticosteroid injection were effective for the treatment of CTS, but symptom relief was greater in the first week and 12th week with local corticosteroid injection. No health disparities were identified by the investigators.

Habibzadeh et al. (2022) conducted a randomized controlled trial (RCT) that evaluated the short-term effect of radial shockwave on the median nerve pathway as a new method in patients with mild-to-moderate carpal tunnel syndrome (CTS). Patients with CTS (n=60) were randomized into three groups: the point shockwave group (n=20), the sweep shockwave group (n=20) and the control group (n=20). The point shockwave group had ten sessions of conventional physiotherapy and four sessions of rESWT on the carpal tunnel. The sweep shockwave group had ten sessions of conventional physiotherapy and four sessions of rESWT on the carpal tunnel and median nerve pathway. The control group received ten sessions of conventional physiotherapy. Follow-up occurred at one and four weeks after the end of treatment. Pain and paresthesia intensity and

symptom severity significantly decreased in all three groups at one and four weeks, but significantly greater improvement was noted in shockwave groups. In terms of clinical and electrophysiological parameters, two groups of shockwaves showed similar results. There were no differences observed between utilizing radial shockwave on the carpal tunnel or median nerve pathways on the palmar surface of the hand, in terms of clinical and electrophysiological measurements. Author noted limitations included the lack of long-term follow-up and failure to re-evaluate the electrophysiological parameters of the median nerve four weeks after the end of the treatment. An additional limitation is that the study was conducted in Iran and the results may not be applicable to other races or ethnic groups. The authors concluded that radial shockwave combined with conventional physiotherapy is an effective noninvasive treatment for mild-to-moderate carpal tunnel syndrome that produces greater and longer-lasting results than conventional physiotherapy alone. Randomized controlled studies with large patient populations and long-term follow-up are needed to validate the outcomes of this study. No health disparities were identified by the investigators.

Turgut et al. (2021) conducted a double-blind, randomized controlled trial that evaluated the efficacy of extracorporeal shock wave therapy for pillar pain after open carpal tunnel release. Patients (n=60; 50 women and 10 men) were included that presented with a visual analogue scale (VAS) score of ≥ 5, pillar pain after CTRS and hyperemic and edematous scar tissue. Patients were allocated into two groups: the experimental ESWT group (n=30) and the control group (n=30). The ESWT group received three sessions of ESWT (Storz Medical AG, Tägerwilen, Switzerland), one session per week. The control group received three sessions of sham ESWT, one session per week. Pre- and post-treatment scores were assessed by an orthopedist blinded to the group assignment. Outcomes measured pain using the VAS and hand functions using the Michigan hand outcomes questionnaire (MHQ) before treatment, three weeks, three months, and six months after treatment. Six months after the treatment, the results indicated a significant difference in VAS scores and MHQ scores between the groups ($p<0.001$; $p<0.001$, respectively) in favor of the ESWT group. Limitations of the study included the small patient population and disproportionate amount of males and females enrolled. The authors noted that future studies should include larger samples to better understand the etiology of pillar pain and the effectiveness of ESWT in its management. No health disparities were identified by the investigators.

Greater Trochanteric Pain Syndrome

Greater trochanteric pain syndrome (GTPS) is a clinical condition characterized by lateral hip pain often worsened by weight-bearing activities. It is commonly associated with gluteal tendinopathy, particularly involving the gluteus medius and minimus tendons, and may also involve trochanteric bursitis. Although the pathophysiology of GTPS is not fully understood, mechanical overload and degenerative changes in the gluteal tendons are considered key contributors. Risk factors include female sex and middle to older age. Diagnosis is primarily clinical, supported by imaging modalities such as ultrasound or MRI, which help identify tendon degeneration and calcification. Clinical symptoms include localized tenderness over the greater trochanter, pain during resisted hip abduction, and functional limitations in walking and sleeping positions. Treatment options include nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, and physical therapy (Carlisi, et al., 2019).

Literature Review

Ramon et al. (2020) conducted a multicenter, randomized, controlled trial in Italy that assessed the effectiveness of electromagnetic-focused extracorporeal shockwave treatment (F-ESWT) in patients with greater trochanteric pain syndrome (GTPS). Patients (n=103) were included in the study if they were age ≥ 18 years, had unilateral pain in the greater trochanteric area for > 3 months, had pain while lying on the affected side and had local tenderness on palpation of the greater trochanteric area. Patients were randomized to the treatment group (n=53), that consisted of electromagnetic F-ESWT and a specific exercise protocol, or the control group (n=50),

that received sham F-ESWT and the same exercise protocol. Both groups were treated with three weekly sessions. Patients were assessed at baseline and one, two, three and six months after treatment. The primary outcome measured pain using a visual analogue scale (VAS) score at two months. Secondary outcomes measured hip disability, lower extremity function, quality of life (QoL) and patient satisfaction. The mean VAS score significantly decreased from 6.3 at baseline to 2.0 in the F-ESWT group versus 4.7 in the control group at two months ($p<0.001$). All secondary outcomes at all follow-up intervals were significantly better in the F-ESWT group, except for the lower extremity functional score at one month after treatment ($p=0.25$). No complications were observed. Author noted limitations included the lack of follow-up of > 6 months after the intervention and the control group received 3 F-ESWT sessions at the lowest setting and it could be considered a quasiplacebo group. Thirdly, patients' compliance with the home exercise protocol was not exact. Lastly, women were more likely to be in the treatment group and a sample size of 103 patients may be not large enough to detect important differences in between the sexes. An additional limitation was the population studies only included white race and the results may not be applicable to other races or ethnic groups. The authors concluded that F-ESWT in association with a specific exercise program is safe and effective for GTPS, with a success rate of 86.8% at two months after treatment. However, further research is necessary to confirm the long-lasting effectiveness of F-ESWT for GTPS.

A randomized controlled trial (RCT) conducted by Carlisi et al. (2019) investigated if focused extracorporeal shock wave therapy (f-ESWT) is an effective treatment in patients with greater trochanteric pain syndrome (GTPS). Patients (n=50) were randomized into the f-ESWT study group (n=26) or the ultrasound therapy (UST) control group (n=24). Patients in the study group were treated with focused extracorporeal shock wave therapy once a week for three consecutive weeks. Patients in the control group were treated with ultrasound therapy daily for 10 consecutive days. Patients 18–80 years of age were enrolled if they met the following inclusion criteria: unilateral hip pain persisted for six weeks or longer; physical examination showed pain to palpation in the greater trochanteric area and pain with resisted hip abduction; patient had gluteal tendinopathy, in the absence of full thickness tears; no corticosteroid injections or other conservative therapies (except pharmacological pain treatments), since the onset of the current pain episode; shock wave therapy was not contraindicated; absence of clinical signs of lumbar radiculopathy at physical examination; no hip or knee osteoarthritis, no previous fractures or surgery in the affected limb and no rheumatologic diseases. The outcomes measured hip pain and lower limb function by means of a numeric rating scale (p-NRS) and the Lower Extremity Functional Scale (LEFS scale), respectively. The first follow-up evaluation was performed two months after the first treatment session, the second was carried out six months later. The statistical analysis on the intention to treat population, showed a significant pain reduction over time for the study group and the control group, the f-ESWT proving to be significantly more effective than UST at the two-month follow-up ($p=0.020$) and at the six month follow-up ($p=0.047$). A marked improvement of the LEFS total score was observed in both groups without statistical differences between groups. Author noted limitations included the small patient population, short term follow-up and unblinding of the patients. The authors concluded that f-ESWT is effective in reducing pain, both in the short-term and in the mid-term perspective, however it is not superior to UST.

Knee Osteoarthritis

Knee osteoarthritis (KOA) is a degenerative joint disease characterized by progressive cartilage degradation, subchondral bone remodeling, and synovial inflammation. It is one of the leading causes of disability in older adults. While the pathophysiology of KOA is not fully understood, structural changes in the synovial membrane, joint capsule, ligaments, and surrounding musculature are believed to play a central role. Risk factors include older age, obesity, prior joint injury, and inflammatory or metabolic conditions. Clinical symptoms typically include joint pain, stiffness, and reduced range of motion. Diagnosis is primarily clinical and radiographic, with the

Kellgren-Lawrence grading system widely used to classify disease severity from grade 0 (no OA) to grade IV (severe OA with joint space narrowing and osteophyte formation). Treatment options for KOA range from pharmacological agents (e.g., NSAIDs, corticosteroids, hyaluronic acid), to nonpharmacological interventions such as physical therapy, weight management, and assistive devices. (Chen, et al., 2025; Lan, et al., 2025).

Literature Review

Chen et al. (2025) conducted a network meta-analysis of 139 randomized controlled trials (RCTs) involving 9,644 participants to evaluate the efficacy of 12 non-pharmacologic therapeutic interventions for knee osteoarthritis (KOA). The interventions included low-level laser therapy (LLLT), high-intensity laser therapy (HILT), transcutaneous electrical nerve stimulation (TENS), interferential current (IFC), short wave diathermy, ultrasound, lateral wedged insoles, knee braces, exercise, hydrotherapy, kinesio taping (KT), and extracorporeal shock wave therapy (ESWT), with placebo as the comparator. Inclusion criteria required participants to be ≥18 years old with mild-to-moderate KOA (Kellgren-Lawrence grades I–III). Exclusion criteria encompassed prior knee surgery, systemic inflammatory or infectious diseases, and recent intra-articular injections. Outcomes were assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for pain, stiffness, function, and total score, as well as visual analog scale (VAS) scores at rest and during activity. Follow-up durations ranged from 2 days to 72 weeks. Statistically significant improvements ($p<0.05$) were observed for knee braces, exercise, hydrotherapy, and HILT. Knee braces demonstrated the greatest efficacy in improving WOMAC pain, function, and stiffness scores; hydrotherapy was most effective for total WOMAC and VAS-rest scores; and exercise significantly improved WOMAC total and VAS-activity scores. No statistically significant differences were found for ESWT, TENS, IFC, short wave diathermy, ultrasound, KT, or lateral wedged insoles compared to placebo ($p>0.05$). Limitations of the study include heterogeneity in intervention duration, variations in gender distribution, small sample sizes, and inconsistent data reporting.

Lan et al. (2025) completed a network meta-analysis of 32 randomized controlled trials (RCTs) to evaluate the effectiveness of physical modalities in reducing pain, stiffness, and functional impairment in patients with knee osteoarthritis (KOA). The analysis included 2,078 participants aged 55–72 years, with individual study sample sizes ranging from 18 to 240. Eligible studies included adults with clinically diagnosed KOA. Exclusion criteria included, incomplete or missing data, irrelevant outcomes, or lack of full-text access. The intervention group received either electrical stimulation therapy (EST), low-level light therapy (LLLT), ultrasonic therapy (UT), cryotherapy (CT), thermotherapy (TT), extracorporeal shock wave therapy (ESWT), or whole-body vibration therapy (WBVT) whereas the control group underwent routine rehabilitation exercises (RRE). Outcomes were assessed using the Visual Analog Scale (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the 6-minute walk test (6 MWT). Treatment durations ranged from 1 to 12 weeks, with no follow-up data reported. Only LLLT and ESWT demonstrated statistically significant improvements in VAS and WOMAC pain scores compared to RRE ($p<0.05$). All interventions significantly improved stiffness ($p<0.05$), while none showed significant improvements in function or 6 MWT outcomes. Limitations included heterogeneity in study design, small sample sizes, short treatment durations, lack of follow-up, and incomplete data reporting.

Zhong et al. (2019) conducted a randomized controlled trial that assessed the efficacy of low-dose extracorporeal shockwave therapy on osteoarthritis knee pain, lower limb function, and cartilage alteration for patients with knee osteoarthritis. Patients (n=63) with a six-month history of knee osteoarthritis symptoms were randomly assigned to two groups. Patients in the experimental group (n=32) received low-dose ESWT for four weeks while those in the placebo group (n=31) received sham shockwave therapy. Both groups maintained a usual level of home exercise. Measured outcomes assessed knee pain and physical function using a visual analog scale (VAS),

the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the Lequesne index at baseline, five weeks, and 12 weeks. Cartilage alteration was measured analyzing the transverse relaxation time (T2) mapping. Five patients were lost to follow-up. The VAS score, WOMAC, and Lequesne index of the ESWT group were significantly better than those of the placebo group at five and 12 weeks ($p<0.05$). Both groups showed improvement in pain and disability scores over the 12-week follow-up period ($p<0.05$). There was no significant difference in imaging results between groups during the trial, although T2 values of the ESWT group at 12 weeks significantly increased compared to those at baseline ($p=0.004$). The number and prevalence of adverse effects were similar between the two groups, and no serious side effects were found. The authors noted several limitations to the study. Patients had similar degrees of knee pain and radiographic knee OA before treatment. It is unknown whether patients with higher level of pain and more severe knee OA would benefit from ESWT. The optimal treatment protocol has not been established and high expectations and large placebo responses may influence the assessment of effect. The results may have been due to chance because of the small patient population studied. Lastly, the study was only three months, and the sustained effects for longer duration remain unknown. The authors concluded that a four-week treatment of low-dose ESWT was superior to placebo for pain easement and functional improvement in patients with mild to moderate knee osteoarthritis but had some negative effects on articular cartilage. Future studies should recruit more patients to observe the long-term effects of ESWT on knee OA and cartilage.

Low Back Pain

Chronic low back pain (CLBP) is a musculoskeletal condition defined as pain persisting for at least 12 weeks in the lower back region, often radiating to one or both lower limbs. It is a major global health issue, with prevalence rates ranging from 13.1% to 20.3%, affecting over 570 million people worldwide. The pathophysiology of CLBP involves altered muscle contraction patterns, muscle fatigue, inflammation, and degenerative changes, which contribute to pain and functional impairment. Risk factors include poor posture, muscle atrophy, and recurrent mechanical stress. Clinical symptoms of CLBP include persistent pain, limited mobility, and psychological distress. Treatment options are primarily conservative and include exercise, physical therapy, and pharmacological interventions (Liu, et al., 2023). Surgical interventions may be considered if there is no improvement after 3–12 months of optimal medical management.

Literature Review

Nedelka et al. (2025) conducted a prospective, randomized, sham-controlled trial to evaluate the efficacy and safety of extracorporeal shock wave therapy (ESWT) for managing lumbar facet joint pain. A total of 128 participants (mean age 39–44 years) with lumbar facet syndrome confirmed by medial branch block were randomized to receive either focused ESWT (Group A, n=64) or sham therapy (Group B, n=64). Inclusion criteria required participants to have persistent or intermittent localized lumbar pain lasting ≥3 months, without radiation below the knee, mechanical provocation (e.g., pain on extension and rotation), and ≥50% reduction in pain intensity on the visual analog scale (VAS) within 60 minutes after ultrasound-guided medial branch nerve block. Exclusion criteria included clinical signs of radiculopathy; abnormal electromyography (EMG); radiographic evidence of lumbar disc herniation, nerve root compression, spinal stenosis, vertebral instability, spondylolisthesis, fractures, or tumors on MRI; and metabolic comorbidities such as diabetes mellitus or thyroid dysfunction. Primary outcomes included pain intensity (VAS), disability (Modified Oswestry Disability Index, ODI), and neuropathic pain features (PainDETECT questionnaire, PD-Q). Follow-up assessments were conducted at 2, 6, and 12 months. Additionally, all participants underwent lumbar MRI at baseline and at ≥6 months post-treatment. At 2 months, both groups showed statistically significant reductions in VAS scores (Group A: $p=0.03$; Group B: $p=0.01$). However, only Group A demonstrated sustained VAS improvements at 6 and 12 months ($p<0.01$). ODI scores improved significantly in both groups at 2 months ($p<0.05$). Over 12 months, only the ESWT group showed significant reductions in PD-Q scores ($p<0.01$), with no change in the control group. MRI follow-up

revealed resolution of bone marrow edema in 58.8% of ESWT-treated patients, compared to none in the sham group. Study limitations include single-center design, lack of electrophysiological follow-up, small sample size, and short-term follow-up.

Wu, Zhou, and Ai (2023) conducted a systematic review and meta-analysis of 22 randomized controlled trials (RCTs) involving 1,749 participants with a (mean age range: 22–62 years) to evaluate the safety and efficacy of extracorporeal shock wave therapy (ESWT) for low back pain. Inclusion criteria required studies to involve ESWT alone or in combination with other interventions, with control groups receiving conventional treatments (e.g., physiotherapy, oral medication) or sham ESWT. Studies had to report primary outcomes using measures such as the Visual Analog Scale (VAS), Pressure Pain Threshold (PPT), Oswestry Disability Index (ODI), Japanese Orthopaedic Association (JOA) scores, Finger-Floor Distance (FFD), Range of Motion (ROM), Beck Depression Inventory (BDI), and Hamilton Depression Scale. Studies without full-text availability were excluded. Among the included studies follow up ranged from 1–3 months. Post-treatment, ESWT groups showed significantly lower VAS ($p<0.00001$), ODI ($p<0.00001$), and BDI ($p=0.005$) scores; shorter FFD ($p<0.00001$); and higher JOA scores ($p=0.0001$). At 3-month follow-up VAS ($p=0.02$) and ODI ($p=0.005$) remained significantly improved. ESWT was also associated with fewer adverse reactions ($p=0.001$), primarily mild pain and local swelling on the day of treatment. Limitations included small sample sizes, lack of objective outcome measures, and short-term follow-up periods.

Rajfur et al. (2022) conducted a randomized controlled trial that assessed the effectiveness of focused ESWT in reducing pain intensity and improving functional efficiency in patients with chronic low back pain (LBP). Patients (n=40) with L5–S1 discopathy with chronic LBP pain were randomized into two groups: experimental group A (n=20) and control group B (n=20). Group A received fESWT at the lumbar and sacral spine. Group B received sham fESWT. Outcomes measured pain using a visual analog scale (VAS) and Laitinen Pain Scale (LPS), and functional status using the Oswestry Disability Index (ODI) before and after treatments, as well as follow-up observations at one and three months following ESWT. There was a significant analgesic effect (VAS and LPS) in both groups; however, it was significantly greater in the experimental group compared to the sham group ($p<0.05$). A more significant decrease in the perceived pain (VAS and LPS) was observed immediately after the active fESWT therapy. After one and three months, there were no significant between-group differences ($p>0.05$). Also, there was a significant effect in terms of functional state (ODI) for both groups ($p<0.05$); however, between-group comparisons revealed no statistically significant differences ($p>0.05$). Author noted limitations included the small patient population and short-term follow-up. Additionally, future research should use objective measurement methods (e.g., stabilometric platform, surface electromyography). An additional limitation of the study was that the study only included patients in Poland and the results may not be applicable to other races or ethnic groups. The authors concluded that ESWT reduces pain, although it does not seem to significantly improve a patient's functional state. Further clinical trials should be done, especially regarding patient functional evaluation after applying focused ESWT. No health disparities were identified by the investigators.

Walewicz et al. (2019) conducted a prospective, single-blinded randomized controlled trial that assessed the influence of radial extracorporeal shock wave therapy (rESWT) in patients with low back pain (LBP). Adult patients (n=40) with MRI confirmed discopathy of the L5-S1 spine segment, chronic pain lasting more than three months, pseudo-radicular pain syndrome not previously treated with spine surgery were included in the study. Patients were randomized into two groups, group A received rESWT (n=20) and group B received sham treatment (n=20). Patients from group A had rESWT performed twice a week for five weeks (10 sessions) and group B was treated with sham rESWT. Both groups received stabilization training. Measured outcomes assessed pain and functional efficiency using the following: Visual Analog Scale (VAS), Laitinen Pain Scale (LPS), and Oswestry Disability Index (ODI). Outcomes were measured before the start

and after the end of the full cycle of ESWT treatment. Measurements were repeated as a follow-up at one and three months after the end of the study. After the end of the study, group A had a statistically significant reduction in pain over the rESWT group (p=0.039). However, at the one- and three-month follow-up, group A experienced significantly more pain relief (p>0.05, p<0.0001; respectively) and change in functional state pain sensations (p=0.033, p=0.004; respectively) than group B. An author noted limitation included the small patient population. The study concluded that the results are promising but require further verification.

Muscle Spasticity

Muscle spasticity is a motor disorder characterized by excessive muscle stiffness (hypertonus), typically resulting from damage to central nervous system (CNS) structures. It commonly occurs in individuals with neurological conditions such as traumatic brain injury (TBI), stroke, cerebral palsy (CP), spinal cord injury, progressive neuromuscular diseases, or prolonged immobility. Clinically, spasticity presents as increased resistance to passive movement, muscle stiffness, abnormal postures, and impaired voluntary control. The stiffness is believed to stem from both neurological and musculoskeletal factors. Treatment is multifaceted, involving pharmacologic interventions (e.g., antispasmodics, intramuscular botulinum toxin), and physical modalities such as passive stretching, strengthening, orthotics, whole body vibration therapy, acupuncture, and electrical stimulation. However, evidence supporting the long-term effectiveness of these strategies remains limited (Paul, et al., 2025).

Literature Review

de Roo et al. (2025) conducted a systematic review of 12 randomized controlled trials involving 421 children (ages 12 months to 15 years, n=12–82) with spastic cerebral palsy (CP) to evaluate the safety and efficacy of extracorporeal shock wave therapy (ESWT). ESWT was applied either alone or in combination with conservative therapies (e.g., exercise, orthotics), while comparators included placebo treatments or standard physiotherapy. Inclusion criteria consisted of children with CP aged 0-18 years receiving ESWT for spasticity, with outcomes assessed across International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY) domains of function, activity, and participation. Studies were excluded if they evaluated combined ESWT & invasive treatments (e.g., Botox injections), phenol, baclofen treatment, or other chemical nerve blocks. Primary outcome measures included resistance to passive movement (Modified Ashworth Scale), passive range of motion (pROM), reflex activity (H/M ratio), baropodometry, selective motor control, gross motor function measure (GMFM), balance, gait, and hand function. Among the included studies follow-up ranged from 1 week to 3 months. Statistically significant improvements were observed in the ESWT group for MAS (p<0.01), gait stride length (p<0.01), pROM (p<0.01), GMFM (p<0.01), and H/M ration (p<0.005). However, no significant differences were found in gait cadence, single limb support, velocity, knee flexion angle, ankle plantar flexion angle, Biodex peak eccentric torque, or pediatric balance scale. Limitations of the review included small sample sizes, short follow-up durations, and heterogeneity in ESWT protocols and outcome measures.

Yuan et al. (2023) conducted a single-center randomized controlled trial (RCT) to evaluate the efficacy of ultrasound-guided stellate ganglion block (SGB) and extracorporeal shock wave therapy (ESWT) in treating upper limb spasticity in patients following ischemic stroke. Sixty participants (mean age 59.53 years) with post-stroke spasticity were enrolled. Inclusion criteria consisted of diagnosis of acute ischemic stroke confirmed by (MRI), upper limb elbow flexion-extension spasticity graded as 2 on the Ashworth Scale, and symptoms duration of 3–6 months. Exclusion criteria were severe systemic illness, mental disorders, recurrent stroke, or upper limb fracture or deformity. Participants were randomly divided into four groups: SGB (n = 15), ESWT (n = 15), combined SGB + ESWT (n = 15), and a control group receiving routine rehabilitation(n=15). Primary outcomes were measured using the Modified Barthel Index (MBI) for activities of daily living and the Fugl-Meyer Assessment for upper limb function. After one month, all intervention

groups showed statistically significant improvements in MBI and Fugl-Meyer scores compared to the control ($p < 0.05$). The combined SGB + ESWT group demonstrated superior motor function improvement over SGB or ESWT alone ($p < 0.05$), though MBI scores were not significantly different among the three intervention groups ($p > 0.05$). Limitations include small sample size and absence of long-term follow-up.

Senarath et al. (2023) conducted a prospective, randomized, single-blind comparative study to evaluate the effectiveness of radial extracorporeal shock wave therapy (rESWT) versus transcutaneous electrical nerve stimulation (TENS) in managing chronic post-stroke spasticity of the upper limb. A total of 106 participants (mean age: 63.87 years) were evenly assigned to rESWT (n=53) and TENS (n=53) groups. Inclusion criteria were first-time diagnosis of ischemic or hemorrhagic stroke, age 40–70 years, and hemiplegia lasting over six months. Exclusion criteria included: stroke due to thrombosis, severe shoulder pathology, limb contractures or fixed deformities, recent Botox or acupuncture, complete sensory loss, unstable medical conditions, and visual impairment. Primary outcome measures were assessed using the Modified Ashworth Scale (MAS), Voluntary control grading (VCG), Fugl-Meyer Assessment of Upper Limb (FMA-UL), and Action Research Arm Test (ARAT) with a 4-week follow-up. Significant improvements were noted in both groups ($p<0.05$) across all measures with rESWT demonstrating greater gains in MAS, VCG, and FMA-UL. Limitations include: single-center design, inconsistent blinding, small sample size, and lack of long-term follow-up.

Myofascial Pain Syndrome

Myofascial pain syndrome (MPS) is a prevalent musculoskeletal condition characterized by localized pain and the presence of myofascial trigger points (i.e., hyperirritable nodules within skeletal muscle fibers). It affects a significant portion of the population, with lifetime prevalence estimates ranging from 30% to 93% among individuals experiencing musculoskeletal pain. MPS is more common in adults over 60 and is often associated with poor posture, prolonged static positions, and repetitive strain, particularly in the neck and upper back. The exact pathophysiology remains unclear, though mechanical stress, limited mobility, and neurochemical changes are believed to play a role. Clinical symptoms include localized tenderness, palpable taut bands, referred pain, muscle spasms, and sleep disturbances. Diagnosis typically involves physical examination and pressure pain threshold testing. There is currently no consensus on the most effective treatment. Management options include conservative therapies such as physical therapy, acupuncture, massage, and ultrasound therapy (Ogbeivor, et al., 2025).

Literature Review

Ogbeivor et al. (2025) conducted a two-arm, randomized, double-blind, placebo-controlled trial to evaluate the efficacy of radial extracorporeal shock wave therapy (rESWT) compared with placebo in individuals with myofascial pain syndrome (MPS). A total of 70 adults with neck and/or upper back pain localized to the lateral or posterior regions, with palpable tenderness and single or multiple trigger points in those areas were included. Exclusion criteria were as follows: participants with a history of malignancy; hemophilia; anticoagulant therapy; visible tissue damage (i.e., skin petechiae and microvasculature disruption); metal implants; implanted cardiac stents and heart valves; infection; rheumatic, respiratory, and cardiovascular diseases; psychopathy; disorders of the vestibular and visual systems; neck or shoulder surgery within the prior year; a recent history of steroid injections for myofascial trigger points; pregnancy; a diagnosis of fibromyalgia; and cervical radiculopathy or myelopathy. The experimental group (n=34) received six weekly sessions of rESWT combined with standard physical therapy and therapeutic home exercises. The control group (n=36) received an identical treatment regimen except that they received a no-energy shock. Primary outcomes included the Numeric Pain Scale (NPS) and Neck Disability Index (NDI), while secondary outcomes included Pressure Pain Threshold (PPT) and SF-12 physical and mental health scores. Assessments were conducted at baseline, 4, 8, and 12 weeks. There were no statistically significant differences in any outcome

between groups at any time point (p>0.5). Limitations include small sample size, short term follow up, and participant attrition (n=21).

Vasvit et al. (2025) performed a double-blind randomized controlled trial (RCT) to compare focused extracorporeal shockwave therapy (fESWT) with sham-fESWT in office workers with myofascial pain syndrome (MPS) of the upper trapezius. Sixty-four participants (n=32 per arm) aged 23–55 years were enrolled. The intervention group received four weekly sessions of fESWT while the control group received sham treatment. Inclusion criteria were adults with active MPS diagnosed by an experienced physical therapist. Exclusion criteria included regular use of analgesics or muscle relaxants, a history of myocarditis, heart-related chest pain radiating to the arm, pregnancy, osteoporosis, open wounds in the treatment area, neurological disorders, and tendon or tissue rupture. Primary outcomes assessed muscle pain via the visual analogue scale (VAS). Secondary outcomes included tissue stiffness (shear modulus) and neck disability index (NDI). Assessments occurred at baseline, immediately after treatment, at two weeks, and at four weeks. The results demonstrated a significant decrease in shear modulus at the trigger point (p=0.009) and reduction in muscle stiffness of the lower aponeurosis (p=0.004) following 4 weeks. Additionally, VAS scores decreased at all time points following fESWT (p< 0.05), while the sham-fESWT group also demonstrated reductions during the final two weeks. NDI showed a significant decrease in both groups after four sessions (p<0.001). Limitations include study design, small sample size, short treatment duration with short term follow up.

Liu et al. (2024) conducted a network meta-analysis of 40 randomized controlled trials (RCTs) involving 2,227 participants (67.85% females) to compare the effectiveness of noninvasive therapeutic interventions for myofascial pain syndrome (MPS). Most studies were two-arm trials; comparators included placebo, sham, or control interventions. Interventions assessed included manual therapy, laser therapy, extracorporeal shockwave therapy (ESWT), ultrasound, exercise, electrical stimulation, heat, Kinesio taping, medication, and combination therapies. Eligible studies assessed adults diagnosed with MPS; studies combining invasive and noninvasive treatments were excluded. Primary outcome was pain intensity (e.g., VAS), with secondary outcomes of pressure pain threshold (PPT) and pain-related disability (e.g., Neck Disability Index). Among the included studies follow up ranged from 2 days to 34 weeks. Compared with control, manual therapy, laser therapy, ESWT, ultrasound, and combination therapy all significantly reduced pain intensity (p<0.05). Regarding PPT, manual therapy, laser therapy, ESWT, and ultrasound provided significant improvement (p<0.05). Pain-related disability improved significantly with manual therapy, laser therapy, and ESWT (p<0.05). Limitations include heterogeneity in interventions, small sample sizes, short treatment and follow up durations, and gender imbalance.

GezgİnaslanandGÜmÜŞ (2019) conducted a single blind randomized-controlled trial that investigated the effects of extracorporeal shock wave therapy (ESWT) on pain, sleep, fatigue, disability, depression, and quality of life (QoL) in patients with myofascial pain syndrome (MPS). Patients with a diagnosis of MPS were included in the study if they had persistent myofascial pain at trapezius levator scapulae, supraspinatus, or infraspinatus for at least for six months and having at least three myofascial trigger points (MTrPs). The patients (n=94; 16 males and 78 females) were randomized into two groups. The treatment group (n=49) received a total of seven sessions of high-energy flux density ESWT (H-ESWT) every three days. The control group (n=45) received the following treatment: hot pack, transcutaneous electrical nerve stimulation, and ultrasound for five days for two weeks. At baseline and one month after treatment; pain, quality of life (QoL), sleep, depression, fatigue, and disability in patients with MPS were assessed and compared between the groups. After treatment, both groups reported statistically significant decreases in pain, improved QoL, sleep, depression, fatigue, and disability (all p<0.001). However, when the groups were compared, the ESWT group reported statistically significant decreases in pain, improved QoL, sleep, depression, fatigue, and disability (all p<0.001). Author reported limitation included the presence of a non-treatment group and a larger sample size would

increase the power of results. Additional limitations include small patient population, disproportionate amount of males and females enrolled and short-term follow-up. The authors concluded that the study results suggest that H-ESWT is more effective than traditional physical therapy methods on pain, QoL, sleep, fatigue, depression, and disability in patients with MPS. However, they recommend further largescale, long-term studies to confirm these findings and to establish a definite conclusion. No health disparities were identified by the investigators.

Shoulder Conditions

Shoulder conditions including but not limited to: calcific and non-calcific tendinopathies, adhesive capsulitis, and subacromial shoulder pain (impingement) commonly present with pain, restricted range of motion (ROM), and functional limitations. These disorders share multifactorial etiologies involving overuse, repetitive microtrauma, microvascular changes, inflammatory processes, and structural or degenerative changes, which may include calcification of the tendons. Adhesive capsulitis is typically idiopathic but may be associated with systemic conditions (e.g., diabetes mellitus, thyroid disease, autoimmune disease, etc.). Clinical features include pain worsened with activity or at night, stiffness, weakness, and catching. Management includes non-operative treatments such as activity modifications, physical therapy, nonsteroidal anti-inflammatory drugs (NSAIDs), and oral or injected corticosteroids. Adjunctive measures such as transcutaneous electrical nerve stimulation, ultrasound, and shock-wave therapies have also been proposed. If symptoms persist despite conservative care, surgical evaluation is generally indicated (Finnoff and Johnson, 2021).

Literature Review

Sharahili and Alzahrani (2025) conducted a single-blind randomized controlled trial (RCT) to evaluate the efficacy of radial extracorporeal shockwave therapy (rESWT) combined with evidence-based physical therapy (EBPT) versus sham rESWT plus EBPT in patients with adhesive capsulitis. Thirty participants (mean age 54.17 years) were randomized to rESWT (n=15) or sham rESWT (n=15) for six weeks, with both groups receiving EBPT. Inclusion criteria were adults with diabetes mellitus and unilateral adhesive capsulitis in the frozen stage for ≥2 months, moderate pain (VAS ≥3/10), and restricted shoulder ROM. Exclusion criteria included bilateral involvement, radiculopathy, rotator cuff tear, osteoarthritis, rheumatoid arthritis, major cardiovascular conditions, and contraindications to ESWT (e.g., pregnancy, severe osteoporosis, bleeding disorders, prior shoulder surgery, pacemakers, anticoagulant use, epilepsy, or malignancy). Primary outcomes were pain intensity assessed using the visual analog scale (VAS) and shoulder disability evaluated using the disabilities of the arm, shoulder, and hand quick version (QuickDASH) questionnaire. Secondary outcomes were passive and active ROM, psychological distress evaluated utilizing the depression, anxiety, and stress scale-12 (DASS-12), and health-related quality of life form (HRQoL). Assessments occurred at baseline, post-intervention week 7, and 12 weeks. The rESWT group showed significantly greater pain reduction post-intervention ($p=0.008$) and at 12 weeks ($p<0.001$), and greater disability improvement at 12 weeks ($p<0.001$). Significant gains in active ROM (flexion, abduction, internal and external rotation) and passive ROM, as well as HRQoL were also observed at 12 weeks ($p<0.05$). There were no significant impacts to psychological distress measures between groups. Limitations include single-center design, lack of blinding, diabetes-specific population, small sample size, and short follow up duration.

Xue et al. (2024) conducted a systematic review and meta-analysis of 17 randomized controlled trials (RCTs) including 1,131 participants to assess the efficacy of extracorporeal shock wave therapy (ESWT) for rotator cuff tendinopathy. Sample sizes ranged from 9–80 and compared ESWT with placebo or other conservative treatments (e.g., routine rehabilitation, acupuncture). Inclusion criteria were adults with clinically or radiographically confirmed calcific or non-calcific rotator cuff tendinopathy. Studies were excluded if participants had a history of trauma, partial or full rotator cuff tears, osteoarthritis, adhesive capsulitis, systemic inflammation, or associated

neurological conditions. The primary outcome measure was pain reduction per the Visual Analogue Scale (VAS). Secondary outcomes included the Constant-Murley score (CMS), University of California Los Angeles score (UCLA), American Shoulder and Elbow Surgeons form (ASES), Range of motion (ROM), and Total effective rate (TER). Treatment duration ranged from 3–8 weeks with no follow-up data reported. Results showed significant improvements in pain (VAS), shoulder function (CMS, UCLA, ASES) ($p < 0.00001$), and TER ($p=0.0001$) in the ESWT group compared to controls. No significant difference was found in shoulder abduction (ROM) ($p=0.13$). Limitations included heterogeneity in ESWT protocols, study design, small sample sizes, and lack of follow-up.

Yang et al. (2024) conducted a systematic review and network meta-analysis of 14 randomized controlled trials (RCTs) involving 862 participants (mean age 30.5–71.3 years) to compare conventional physiotherapy (CPT) alone versus CPT combined with analgesic strategies for chronic shoulder pain. The analgesic strategies assessed included extracorporeal shock wave therapy (ESWT), suprascapular nerve block (SSNB), corticosteroid injection (CSI), hyaluronic acid injection (HAI), and Kinesio taping (KT). Sample sizes ranged from 30 to 97. Eligible studies included adults with shoulder pain lasting at least 3 months, including conditions such as rotator cuff tendinopathy, shoulder impingement syndrome, frozen shoulder, adhesive capsulitis, non-specific shoulder pain, and shoulder myofascial pain. Studies were excluded if they specifically focused on patients with post-mastectomy shoulder pain. Outcomes assessed were pain using visual analog scale (VAS) or Shoulder Pain and Disability Index (SPADI pain), physical function (SPADI disability and total), and shoulder mobility (ROM), with follow-up periods of 4–12 weeks. The results showed that ESWT+CPT significantly improved pain (VAS) and function (SPADI) ($p<0.05$) compared to CPT alone. SSNB+CPT significantly improved pain and ROM ($p<0.05$). CSI+CPT improved SPADI ($p<0.05$), while HAI+CPT and KT+CPT showed no significant benefit over CPT. Limitations include heterogeneity in intervention protocols, reliance on self-reported measures, small sample sizes, short follow-up durations.

Shao et al. (2023) conducted a randomized controlled trial that investigated the effect of ESWT on short-term functional and structural outcomes after rotator cuff (RC) repair. Included patients were aged 40 and 70 years, underwent unilateral shoulder surgery, the tear size < 5cm, the presence of pain or limited passive range of motion (ROM) after RC repair and tendon edema at three months post repair by MRI. Thirty-eight individuals were randomly assigned to the ESWT group (n=19) or control group (n=19) three months after RC repair. All participants followed a 3-month standard post-operative rehabilitation program for RC repair. A radial shock wave device (SwissDolor-Clast, EMS) was used at the end of each session by the same physiotherapist who performed the rehabilitation. A total of 32 participants completed all assessments. Pain and function improved in both groups. At six months post-repair, pain intensity was lower and ASES scores higher in the ESWT when compared to the control group (all p-values<0.01). The MRI reported that the signal/noise quotient (SNQ) near the suture anchor site decreased significantly from baseline to follow-up in the ESWT group ($p=0.008$) and was significantly lower than that in the control group ($p=0.036$). Muscle atrophy and the fatty infiltration index did not differ between groups. Author noted limitations included the small sample size and short-term follow-up. Also, included patients had medium to large rotator cuff tears and the conclusions cannot be generalized to people with massive or irreparable tears. Furthermore, the study did not include a control group with no treatment to ensure a balance between groups. An additional limitation of the study included that the population only included patients located in Turkey and the results may not be applicable to other races or ethnic groups. The study concluded that ESWT and exercise more effectively reduced early shoulder pain than rehabilitation alone and accelerated proximal supraspinatus tendon healing at the suture anchor site after RC repair. However, ESWT may not be more effective than advanced rehabilitation in terms of functional outcomes at the short-term follow-up.

Surace et al. (2020) conducted a Cochrane review to determine the benefits and harms of shock wave therapy for rotator cuff disease, with or without calcification, and to establish its usefulness in the context of other available treatment options. The review consisted of 32 trials (n=2281/patients) which included randomized controlled trials (RCTs) and controlled clinical trials (CCTs) that used quasi-randomized methods to allocate patients, investigating patients with rotator cuff disease with or without calcific deposits. Trials comparing extracorporeal or radial shock wave therapy to any other intervention were included in the study. The outcomes measured included pain relief greater than 30%, mean pain score, function, patient-reported global assessment of treatment success, quality of life, number of participants experiencing adverse events and number of withdrawals due to adverse events. The authors found that there were very few clinically important benefits of shock wave therapy, and uncertainty regarding its safety. Due to the wide clinical diversity and varying treatment protocols it is unknown whether or not some trials tested subtherapeutic doses, possibly underestimating any potential benefits. The authors concluded that further trials of extracorporeal shock wave therapy for rotator cuff disease should be based on a strong rationale and consideration of whether or not they would alter the conclusions of this review. Additionally, a standard dose and treatment protocol should be decided before conducting further research. A core set of outcomes for trials of rotator cuff disease and other shoulder disorders would also facilitate our ability to analyze the evidence.

There is insufficient evidence to draw conclusions regarding the use of ESWT for the treatment of the outlined conditions.

Professional Societies/Organizations

American College of Foot and Ankle Surgeons (ACFAS): According to a consensus statement on the diagnosis and treatment of adult acquired infracalcaneal heel pain, extracorporeal shockwave therapy (ESWT) is safe and effective in the treatment of plantar fasciitis. The ACFAS stated that "since ESWT has few negative consequences and the recovery time is short, with patients typically walking and returning to full activities within a few days, the panel thought that ESWT is a valuable option for providers treating heel pain." This recommendation was made using systematic reviews with meta-analysis of randomized controlled trials. Additional randomized controlled trials with larger patient populations and long-term follow-up are needed to support the outcomes of the mentioned studies (Schneider, et al., 2018).

In 2017 the **Washington State Health Care Authority (WSHCA)** conducted a technology assessment that evaluated the comparative efficacy, effectiveness, and safety of ESWT in adults for the treatment of various musculoskeletal and orthopedic conditions, including but not limited to plantar fasciitis, tendinopathies, adhesive capsulitis of the shoulder, and subacromial shoulder pain. As part of the technology assessment a total of 72 randomized controlled trials were included and reviewed. Limitations of the studies noted by the Committee generally included potential for risk bias, short-term follow-up, inconsistency of measured outcomes, and lack of high-quality evidence and small sample sizes. The authors concluded extracorporeal shock wave therapy was unproven for efficacy and cost-effectiveness.

Health Equity Considerations

Health equity is the highest level of health for all people; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which people are born, grow, live, work, and age.

Social determinants of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include safe housing, transportation, and neighborhoods; racism, discrimination and violence; education, job

opportunities and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

It has been documented that musculoskeletal (MSK) pain disproportionately affects people from different ethnic backgrounds through higher burden and less access to care (Scheer et al., 2022). Physical therapy is a common conservative treatment for MSK conditions; however, Black adults with arthritis are less likely than White adults to receive referrals, and overall utilization of physical therapy is lower among non-White populations (Cavanaugh & Rauh, 2021). Additionally, a systematic review by Tawakkol et al. (2025) identified barriers to MSK healthcare among Indigenous populations, including geographic isolation, economic constraints, and limited cultural understanding between providers and patients.

Medicare Coverage Determinations

	Contractor	Determination Name/Number	Revision Effective Date
NCD	National	No National Coverage Determination found	
LCD	Palmetto GBA	Extracorporeal Shock Wave Therapy (ESWT) L38775	02/14/2021

Note: Please review the current Medicare Policy for the most up-to-date information.
(NCD = National Coverage Determination; LCD = Local Coverage Determination)

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Revision Details

Type of Revision	Summary of Changes	Date
Annual Review	• Revised policy statement for ESWT to remove any "indication". • Updated to new formatting standards.	11/15/2025
Annual Review	• Removed policy statements related to wound healing.	12/15/2024
Annual Review	• No policy statement changes.	11/15/2023