



Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Extracorporeal shockwave therapy for the treatment of musculoskeletal conditions
Topic exploration report number:	TER141

Introduction and aims

Health Technology Wales researchers searched for evidence on the clinical and cost effectiveness of extracorporeal shockwave therapy compared to alternative treatment options for musculoskeletal conditions. In Wales, extracorporeal shockwave therapy is currently used most commonly to treat tendinopathies, but can be used for a variety of other musculoskeletal conditions.

Summary of findings

There are a number of items of UK guidance, systematic reviews, meta-analyses, and primary evidence investigating the clinical effectiveness of extracorporeal shockwave therapy in musculoskeletal conditions. The majority of the evidence identified studied extracorporeal shockwave therapy for tendinopathies and plantar fasciitis.

Extracorporeal shockwave therapy has a good safety profile, and the findings of the systematic reviews suggest that there may be benefits to using extracorporeal shockwave therapy for musculoskeletal conditions. However, National Institute for Health and Care Excellence (NICE) Interventional Procedures Guidance (IPG) states that evidence on the efficacy of extracorporeal shockwave therapy for refractory tennis elbow, refractory plantar fasciitis, refractory Greater Trochanteric Pain Syndrome and Achilles tendinopathy is inconsistent and/or limited. NICE recommends that this procedure should only be used with special arrangements for clinical governance, consent and audit or research, and encourages further research into extracorporeal shockwave therapy.

We identified an economic study for extracorporeal shockwave therapy in orthopaedics, but it is published in German. Another article references the German article as stating that the cost

of extracorporeal shockwave therapy for rotator cuff tendonitis is less expensive than surgical treatment.

A summary of the extracorporeal shockwave therapy service in Abertawe Bro Morgannwg University Health Board, from 2014 to 2019, was provided by the topic proposer and gives clinical and cost information.

Evidence

UK guidelines and guidance

NICE has published four relevant IPGs on extracorporeal shockwave therapy, published between 2009 and 2016. These IPGs summarise the evidence on extracorporeal shockwave therapy for refractory tennis elbow, refractory plantar fasciitis, achilles tendinopathy, and refractory greater trochanteric pain syndrome. NICE considers extracorporeal shockwave therapy to be safe, but states that there are uncertainties with regards to its efficacy for these conditions. However, this guidance was published between 2009 and 2016, and there have been numerous systematic reviews conducted since then, suggesting that the evidence base may have developed further since their publication.

Local guidance

A summary of the extracorporeal shockwave therapy service in Abertawe Bro Morgannwg University Health Board, from 2014 to 2019, was provided by the topic proposer and gives clinical and cost information.

Systematic reviews

Several recent systematic reviews were identified comparing interventions for the treatment of musculoskeletal conditions, including extracorporeal shockwave therapy, corticosteroid injections, surgery and physical therapy. Of the systematic reviews identified since 2014: eight looked at upper limb tendinopathies, four looked at lower limb tendinopathies, 13 studied plantar fasciitis, one studied greater trochanteric pain syndrome, and seven looked at multiple musculoskeletal conditions (including tendinopathies and plantar fasciitis). All systematic reviews studying extracorporeal shockwave therapy included randomised controlled trials, and a majority of the systematic reviews also included a meta-analysis. One systematic review studied ultrasound-guided barbotage therapy for calcific tendonitis, which is one of the comparators identified by the topic proposer. However, this systematic review didn't include randomised-controlled trials.

Primary evidence

A number of randomised-controlled trials were identified comparing extracorporeal shockwave therapy to other treatment options for the treatment of tendinopathies and plantar fasciitis.

Economic evaluations

We identified an economic study for extracorporeal shockwave therapy in orthopaedics. Another article identified references the German article as stating that the cost of extracorporeal shockwave therapy for rotator cuff tendonitis is one-fifth to one-seventh the cost of surgical treatment, with longer recovery time and time off work in the surgical treatment group accounting for about two-thirds of the overall cost.

Areas of uncertainty

There is uncertainty regarding the scope of the topic, as shockwave therapy is currently used for numerous musculoskeletal conditions other than tendinopathies and plantar fasciitis. Further clarification on the population will be required should this topic be considered for appraisal. There are also uncertainties around the standard of care for musculoskeletal conditions, which may vary by condition. There is a lack of comparative data between extracorporeal shockwave therapy and ultrasound-guided barbotage therapy.

Both NICE IPGs and a number of systematic reviews encourage further research into extracorporeal shockwave therapy. The systematic reviews specifically identify a gap in the long-term treatment of musculoskeletal conditions. There is currently an ongoing systematic review investigating the long-term efficacy of extracorporeal shock wave therapy in the treatment of external humeral epicondylitis, which was due to be published in July 2019.

Limited economic evidence for extracorporeal shockwave therapy was identified.

Conclusions

Evidence has shown that extracorporeal shockwave therapy is currently being used in NHS Wales and is a safe procedure, but evidence on its effectiveness compared to existing options draws mixed conclusions. The reliability of the evidence for its use also varies for different specific musculoskeletal conditions. A fuller appraisal would be required to explore the clinical and cost effectiveness of extracorporeal shockwave therapy in more detail.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland	We did not identify any relevant evidence from this source
Health Technology Assessment Group	We did not identify any relevant evidence from this source
Health Information and Quality Authority	We did not identify any relevant evidence from this source
UK guidelines and guidance	
SIGN	We did not identify any relevant evidence from this source
NICE	<p>NICE Interventional Procedures Guidance IPG571. Extracorporeal shockwave therapy for Achilles tendinopathy, December 2016, https://www.nice.org.uk/guidance/ipg571</p> <p>NICE Interventional Procedures Guidance IPG376. Extracorporeal shockwave therapy for refractory Greater Trochanteric Pain Syndrome. January 2011, https://www.nice.org.uk/guidance/ipg376</p> <p>NICE Interventional Procedures Guidance IPG313. Extracorporeal shockwave therapy for refractory tennis elbow. August 2009. https://www.nice.org.uk/guidance/ipg313</p> <p>NICE Interventional Procedures Guidance IPG311. Extracorporeal shockwave therapy for refractory plantar fasciitis. August 2009, https://www.nice.org.uk/guidance/ipg311</p>
Secondary literature and economic evaluations	
ECRI	We did not identify any relevant evidence from this source
EUnetHTA	We did not identify any relevant evidence from this source
Cochrane library	We did not identify any additional evidence from this source
Medline	<p>Upper limb tendinopathies</p> <p>Arirachakaran A; Boonard M; Yamaphai S; Prommahachai A; Kesprayura S; Kongtharvonskul J. 2017. Extracorporeal shock wave therapy, ultrasound-guided percutaneous lavage, corticosteroid injection and combined treatment for the treatment of rotator cuff calcific tendinopathy: a network meta-analysis of RCTs. European journal of orthopaedic surgery & traumatologie. 27(3):381-390</p> <p>Bannuru RR; Flavin NE; Vaysbrot E; Harvey W; McAlindon T. 2014. High-energy extracorporeal shock-wave therapy for treating chronic calcific tendinitis of the shoulder: a systematic review. Annals of Internal Medicine. 160(8):542-9</p> <p>Gatt DL; Charalambous CP. Ultrasound-guided barbotage for calcific tendonitis of the shoulder: a systematic review including 908 patients. 2014. Arthroscopy. 30(9):1166-72</p> <p>Huisstede BM; Hoogvliet P; Franke TP; Randsdorp MS; Koes BW. 2018. Carpal Tunnel Syndrome: Effectiveness of Physical Therapy and Electrophysical Modalities. An Updated Systematic Review of Randomized Controlled Trials. Archives of Physical Medicine & Rehabilitation. 99(8):1623-1634.e23</p>

Kim JC, Jung SH, Lee SU, Lee SY. 2019. Effect of extracorporeal shockwave therapy on carpal tunnel syndrome: A systematic review and meta-analysis of randomized controlled trials. *Medicine* 98(33):e16870. DOI: 10.1097/MD.00000000000016870

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Sayegh ET; Strauch RJ. 2015. Does nonsurgical treatment improve longitudinal outcomes of lateral epicondylitis over no treatment? A meta-analysis. *Clinical Orthopaedics & Related Research*. 473(3):1093-107

Louwerens JK; Sierevelt IN; van Noort A; van den Bekerom MP. 2014. Evidence for minimally invasive therapies in the management of chronic calcific tendinopathy of the rotator cuff: a systematic review and meta-analysis. *Journal of Shoulder & Elbow Surgery*. 23(8):1240-9,

Verstraelen FU; In den Kleef NJ; Jansen L; Morrenhof JW. 2014. High-energy versus low-energy extracorporeal shock wave therapy for calcifying tendinitis of the shoulder: which is superior? A meta-analysis. *Clinical Orthopaedics & Related Research*. 472(9):2816-25

Wu YC; Tsai WC; Tu YK; Yu TY. Comparative Effectiveness of Nonoperative Treatments for Chronic Calcific Tendinitis of the Shoulder: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials. 2017. *Archives of Physical Medicine & Rehabilitation*. 98(8):1678-1692.e6

Lower limb tendinopathies

Everhart JS; Cole D; Sojka JH; Higgins JD; Magnussen RA; Schmitt LC; Flanigan DC. 2017. Treatment Options for Patellar Tendinopathy: A Systematic Review. *Arthroscopy*. 33(4):861-872

Liao CD, Tsauo JY, Chen HC, Liou TH. 2018. Efficacy of Extracorporeal Shock Wave Therapy for Lower-Limb Tendinopathy: A Meta-analysis of Randomized Controlled Trials. *American Journal of Physical Medicine & Rehabilitation*. 97(9):605-619

Mani-Babu S; Morrissey D; Waugh C; Screen H; Barton C. 2015. The effectiveness of extracorporeal shock wave therapy in lower limb tendinopathy: a systematic review. *American Journal of Sports Medicine*. 43(3):752-61

Startzman AN; Fowler O; Carreira D. 2017. Proximal Hamstring Tendinosis and Partial Ruptures. *Orthopedics*. 40(4):e574-e582,

Plantar fasciitis

Al-Boloushi Z; Lopez-Royo MP; Arian M; Gomez-Trullen EM; Herrero P. 2019. Minimally invasive non-surgical management of plantar fasciitis: A systematic review. *Journal of Bodywork & Movement Therapies*. 23(1):122-137

- Babatunde OO; Legha A; Littlewood C; Chesterton LS; Thomas MJ; Menz HB; van der Windt D; Roddy E. 2019. Comparative effectiveness of treatment options for plantar heel pain: a systematic review with network meta-analysis. *British Journal of Sports Medicine*. 53(3):182-194
- Chen CM, Lee M, Lin CH, Chang CH, Lin CH. 2018. Comparative efficacy of corticosteroid injection and non-invasive treatments for plantar fasciitis: a systematic review and meta-analysis. *Scientific reports* 8(1): 4033.
- Hsiao MY; Hung CY; Chang KV; Chien KL; Tu YK; Wang TG. 2015. Comparative effectiveness of autologous blood-derived products, shock-wave therapy and corticosteroids for treatment of plantar fasciitis: a network meta-analysis. *Rheumatology*. 54(9):1735-43
- Li S; Wang K; Sun H; Luo X; Wang P; Fang S; Chen H; Sun X. 2018. Clinical effects of extracorporeal shock-wave therapy and ultrasound-guided local corticosteroid injections for plantar fasciitis in adults: A meta-analysis of randomized controlled trials. *Medicine*. 97(50):e13687
- Li H; Lv H; Lin T. 2018. Comparison of efficacy of eight treatments for plantar fasciitis: A network meta-analysis. *Journal of Cellular Physiology*. 234(1):860-870
- Li X; Zhang L; Gu S; Sun J; Qin Z; Yue J; Zhong Y; Ding N; Gao R. 2018. Comparative effectiveness of extracorporeal shock wave, ultrasound, low-level laser therapy, noninvasive interactive neurostimulation, and pulsed radiofrequency treatment for treating plantar fasciitis: A systematic review and network meta-analysis. *Medicine*. 97(43):e12819
- Lou J; Wang S; Liu S; Xing G. 2017. Effectiveness of Extracorporeal Shock Wave Therapy Without Local Anesthesia in Patients With Recalcitrant Plantar Fasciitis: A Meta-Analysis of Randomized Controlled Trials. *American Journal of Physical Medicine & Rehabilitation*. 96(8):529-534
- Roerdink RL; Dietvorst M; van der Zwaard B; van der Worp H; Zwerver J. 2017. Complications of extracorporeal shockwave therapy in plantar fasciitis: Systematic review. *International Journal Of Surgery*. 46:133-145
- Salvioli S; Guidi M; Marcotulli G. 2017. The effectiveness of conservative, non-pharmacological treatment, of plantar heel pain: A systematic review with meta-analysis. *Foot*. 33:57-67.
- Sun J; Gao F; Wang Y; Sun W; Jiang B; Li Z. 2017. Extracorporeal shock wave therapy is effective in treating chronic plantar fasciitis: A meta-analysis of RCTs. *Medicine*. 96(15):e6621
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	<p>Yin MC; Ye J; Yao M; Cui XJ; Xia Y; Shen QX; Tong ZY; Wu XQ; Ma JM; Mo W. Is extracorporeal shock wave therapy clinical efficacy for relief of chronic, recalcitrant plantar fasciitis? 2014. A systematic review and meta-analysis of randomized placebo or active-treatment controlled trials. Archives of Physical Medicine & Rehabilitation. 95(8):1585-93</p> <p><u>Greater Trochanteric Pain Syndrome</u> Barratt PA; Brookes N; Newson A. 2017. Conservative treatments for greater trochanteric pain syndrome: a systematic review. British Journal of Sports Medicine. 51(2):97-104 RSWT</p> <p><u>Multiple musculoskeletal conditions</u> Hawk C; Minkalis AL; Khorsan R; Daniels CJ; Homack D; Gliedt JA; Hartman JA; Bhalerao S. 2017. Systematic Review of Nondrug, Nonsurgical Treatment of Shoulder Conditions. Journal of Manipulative & Physiological Therapeutics. 40(5):293-319</p> <p>Korakakis V; Whiteley R; Tzavara A; Malliaropoulos N. 2018. The effectiveness of extracorporeal shockwave therapy in common lower limb conditions: a systematic review including quantification of patient-rated pain reduction. British Journal of Sports Medicine. 52(6):387-407</p> <p>Liao CD; Xie GM; Tsauo JY; Chen HC; Liou TH. 2018. Efficacy of extracorporeal shock wave therapy for knee tendinopathies and other soft tissue disorders: a meta-analysis of randomized controlled trials. BMC Musculoskeletal Disorders. 19(1):278</p> <p>Schmitz C; Csaszar NB; Milz S; Schieker M; Maffulli N; Rompe JD; Furia JP. 2015. Efficacy and safety of extracorporeal shock wave therapy for orthopedic conditions: a systematic review on studies listed in the PEDro database. British Medical Bulletin. 116:115-38</p> <p>Speed C. 2014. A systematic review of shockwave therapies in soft tissue conditions: focusing on the evidence. British Journal of Sports Medicine. 48(21):1538-42</p> <p>Steuri R; Sattelmayer M; Elsig S; Kolly C; Tal A; Taeymans J; Hilfiker R. 2017. Effectiveness of conservative interventions including exercise, manual therapy and medical management in adults with shoulder impingement: a systematic review and meta-analysis of RCTs. British Journal of Sports Medicine. 51(18):1340-1347</p> <p>Yu H; Randhawa K; Cote P; Optima Collaboration. 2016. The Effectiveness of Physical Agents for Lower-Limb Soft Tissue Injuries: A Systematic Review. Journal of Orthopaedic & Sports Physical Therapy. 46(7):523-54</p>
Primary studies	
Medline	<p>Lai TW; Ma HL; Lee MS; Chen PM; Ku MC. 2018. Ultrasonography and clinical outcome comparison of extracorporeal shock wave therapy and corticosteroid injections for chronic plantar fasciitis: A randomized controlled trial. Journal of Musculoskeletal Neuronal Interactions. 18(1):47-54</p>

	<p>Carlisi E; Cecini M; Di Natali G; Manzoni F; Tinelli C; Lisi C. 2019. Focused extracorporeal shock wave therapy for greater trochanteric pain syndrome with gluteal tendinopathy: a randomized controlled trial. <i>Clinical Rehabilitation</i>. 33(4):670-680</p> <p>Cheng L; Chang S; Qian L; Wang Y; Yang M. 2019. Extracorporeal shock wave therapy for isokinetic muscle strength around the knee joint in athletes with patellar tendinopathy. <i>Journal of Sports Medicine & Physical Fitness</i>. 59(5):822-827</p> <p>Morral A; Urrutia G; Gich I; Ruiz R; Bonfill X. 2019. Radial extracorporeal shock wave device appearance does not influence clinical outcomes: A randomized controlled trial. <i>Journal of Rehabilitation Medicine</i>. 51(3):201-208,</p> <p>Takla MKN; Rezk SSR. 2019. Clinical effectiveness of multi-wavelength photobiomodulation therapy as an adjunct to extracorporeal shock wave therapy in the management of plantar fasciitis: a randomized controlled trial. <i>Lasers in Medical Science</i>. 34(3):583-593</p> <p>Ugurlar M; Sonmez MM; Ugurlar OY; Adiyeye L; Yildirim H; Eren OT. 2018. Effectiveness of Four Different Treatment Modalities in the Treatment of Chronic Plantar Fasciitis During a 36-Month Follow-Up Period: A Randomized Controlled Trial. <i>Journal of Foot & Ankle Surgery</i>. 57(5):913-918</p> <p>Yalvac B; Mesci N; Geler Kulcu D; Volkan Yurdakul O. 2018. Comparison of ultrasound and extracorporeal shock wave therapy in lateral epicondylitis. <i>Acta Orthopaedica et Traumatologica Turcica</i>. 52(5):357-362</p>
<p>Ongoing primary or secondary research PROSPERO database</p>	<p>A meta-analysis of medium- and long-term efficacy of extracorporeal shock wave therapy in the treatment of external humeral epicondylitis [CRD42019138667]</p> <p>A systematic review to assess the efficacy of shock wave therapy compared to conventional treatment as a best method of intervention for plantar fasciitis [CRD42019145252]</p> <p>Changes in imaging of musculoskeletal conditions following extracorporeal shockwave therapy: a systematic review [CRD42018091140]</p> <p>Comparison between steroid injections and shockwave therapies in the management of plantar fasciitis: a systematic review and pair-wise meta-analysis [CRD42017084224]</p> <p>Effect of the extracorporeal shock wave therapy for knee osteoarthritis: a systematic review and meta-analysis of RCTs [CRD42018084749]</p> <p>Extracorporeal shock wave therapy for the treatment of osteoarthritis: a systematic review and meta-analysis [CRD42019120534]</p>

Other sources

Evidence provided by the topic proposer	<p>Summary of the Extracorporeal shockwave therapy Service, 2014 to 2019, Abertawe Bro Morgannwg University Health Board.</p> <p>Buchbinder R, Ptasznik R, Gordon J, Buchanan J, Prabakaran V, Forbes A. Ultrasound-guided extracorporeal shock wave therapy for plantar fasciitis: a randomized controlled trial. <i>JAMA: the journal of the American Medical Association</i>. 2002; 288(11):1364-72.</p> <p>Gerdesmeyer L, Wagenpfeil S, Haake M, Maier M, Loew M, Wortler K, et al. Extracorporeal shock wave therapy for the treatment of chronic calcifying tendonitis of the rotator cuff: a randomized controlled trial. <i>JAMA: the journal of the American Medical Association</i>. 2003; 290(19):2573-80.</p> <p>Rompe JD, Nafe B, Furia JP, Maffulli N. Eccentric loading, shock-wave treatment, or a wait-and-see policy for tendinopathy of the main body of tendo Achillis: a randomized controlled trial. <i>Am J Sports Med</i>. 2007; 35(3):374-83.</p> <p>Rompe JD, Furia J, Maffulli N. Eccentric loading compared with shock wave treatment for chronic insertional achilles tendinopathy. A randomized, controlled trial. <i>The Journal of bone and joint surgery American volume</i>. 2008; 90(1):52-61.</p> <p>Theodore GH, Buch M, Amendola A, Bachmann C, Fleming LL, Zingas C. Extracorporeal shock wave therapy for the treatment of plantar fasciitis. <i>Foot & ankle international / American Orthopaedic Foot and Ankle Society [and] Swiss Foot and Ankle Society</i>. 2004; 25(5):290-7.</p>
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Date of search:	November 2019
Concepts used:	Shockwave, shock wave, tendinopathy/tendinopathies, musculoskeletal, barbotage