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Review Article

The Role of Extracorporeal Shockwave Therapy (ESWT) in Treating Low Back Pain: Current Concept Review

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Abstract

The current study aims to evaluate the potential role of extracorporeal shock wave therapy (ESWT) in functional status, physical disability, and pain in patients suffering from low back pain (LBP). ESWT may provide superior therapeutic outcomes in reducing pain and ameliorating the patient's functional status regarding LBP.

Keywords: Extracorporeal Shockwave Therapy; Low Back Pain; Review

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Background

Low back pain (LBP) is described as a pain emerging in the back area, from the inferior costal border to the gluteal sulcus, affecting people of all ages (1). LBP represents the second leading etiology of adulthood disability in the United States of America (USA). It accounts for almost 149 million work days lost and is estimated to cost approximately 100 to 200 billion dollars annually (2). The LBP lifetime prevalence and mean LBP prevalence have been estimated to be 84% and 11.9%, respectively.

Conservative management methods, including physical exercises, manual techniques, pharmacotherapy, and physiotherapeutic procedures, remained the primary therapeutic approach of choice for patients suffering from LBP. Modern extracorporeal shock wave therapy (ESWT) has recently been employed more (3). Despite the growing ESWT administration in LBP management, debates surround its definitive effectiveness (4). This review discusses the therapeutic role of ESWT in patients suffering from LBP.

ESWT

ESWT provides a noninvasive physiotherapy technique that was demonstrated to be compelling enough in various pathologies, including nonunion of long bone fractures, plantar fasciitis, calcific tendinopathies of the shoulder, and lateral epicondylitis of the elbow (5). Radial shockwave therapy (R-SWT) and focused shockwave therapy (F-SWT) deliver two primary forms of ESWT. F-SWT initially creates wide-range pressure, which converges at a certain depth in the patient's body. Piezoelectric, electrohydraulic, and electromagnetic provide three primary F-SWT commercial tools for clinical benefit (6).

Conversely, R-SWT creates outward directed maximal pressure waves at the applicator which is alleviated as waves moved toward the deeper structures (6, 7). Pressure waves generated by R-SWT reach lower peak pressure and lower speeds and might not elicit a true shockwave by which a so-called alternative terminology of "radial pressure wave therapy" is suggested (8).

The physical impacts related to the ESWT seem to be associated with maximal positive pressure (bar) or energy per unit area [energy flux density (EFD), mJ/mm^2], which could be considered as the ESWT dosage (7). Contrary to F-SWT, which enables more effects from the application site, R-SWT generally poses a remarkable superficial impact (8). Although both provide appropriate choices, distinct mechanistic features may lead to different outcomes for an opted condition (9-11).

ESWT in Acute Back Pain

Acute LBP (ALBP), which has a lifetime prevalence of approximately 85% among 18 to 74-year-olds, represents one of the most frequent types of musculoskeletal system-associated pain (12-14). The "German National Care Guidelines" evaluates the evidence of non-medication therapy efficacy in the acute nonspecific LBP management (15). Due to the lack of robust scientific supporting data, R-SWT was not indicated in the abovementioned guideline (16). In a recently published randomized controlled trial (RCT) investigating the effectiveness of R-SWT in patients suffering from ALBP, the author concluded that both groups significantly demonstrated improvement in all patient-reported outcome measures at the last follow-up. Visual analogue scale (VAS) for LBP declined by 60.7% ($P < 0.001$) and 86.4% ($P < 0.001$) in the intervention and sham groups, respectively. The intervention group represented significantly less pain relief following 4 and 12 weeks. The EuroQol 5 Dimension (EQ-5D) submodality pain especially demonstrated superior results for the sham group ($P < 0.014$) compared to the intervention over 8 weeks. Conventional guideline therapy combined with additional R-SWT in ALBP poses no significant impact on

physical function, pain intensity, or quality of life (16).

ESWT in Chronic Back Pain

ALBP episodes are mostly resolved within 6 weeks. About 25% of patients suffering from ALBP experience a recurrence episode within the upcoming year, and chronic LBP (CLBP) may develop in almost 7% of all suffers (17). CLBP is referred to as an LBP longer than 12 weeks and frequently impairs behavioral, socioeconomic, and physical conditions (17).

A recent RCT by Walewicz et al. investigated the potential role of R-SWT in patients suffering from CLBP. Compared to a conventional physiotherapy program, the R-SWT significantly impacts pain relief and functional condition improvement. Compared with traditional physiotherapy, R-SWT and core stability exercises posed significant postural sway improvements in patients suffering from LBP (18).

According to a prospective randomized study performed by Rajfur et al. investigating the efficacy of focused extracorporeal shock wave therapy (FESWT) in CLBP during a 3-month follow-up, FESWT combined with an exercise program achieved an effective option in patients suffering from CLBP in short to long-term periods. Although FESWT led to pain relief, no significant improvement in the patient's functional state was noted. Hence, ESWT could not provide a critical enrichment approach for achieving a typical rehabilitation program (19).

Yue et al. performed a systematic review and meta-analysis of RCTs investigating ESWT for managing CLBP. Accordingly, the ESWT led to lower pain intensity at month 1 [standardised mean difference (SMD) = -0.81, 95% confidence interval (CI) = -1.21 to -0.42], as well as a lower disability score at month 1 and month 3 (SMD = -1.45, 95% CI = -2.68 to -0.22; SMD = -0.69, 95% CI = -1.08 to -0.31, respectively) compared with control. No remarkable shockwave-associated adverse events were noted. ESWT administration in patients suffering from CLBP allowed significant short-term pain relief and reduced disability (17).

Similarly, in a recent meta-analysis performed by Li et al. investigating the efficacy and safety profile of ESWT on LBP, no significant effect was found for ESWT in the context of the pain intensity at month 3 of follow-up ($P > 0.05$). No remarkable therapeutic-associated adverse events were noted (20).

Clinical Administration in Tendinopathies, Soft Tissue Pathologies, and Fasciopathy

The ESWT administration is established on clinical focusing, referees as treatment over the region of maximal pain, which should be applied to optimize outcomes and guide application to primary zones of injury. For instance, the muscle-tendon-bone unit treatment could indicate soft tissue impairments compared to the ESWT administration at the primary zone of tendon pathology. As one more example, exploration of the soleus, gastrocnemius, myotendinous junction, and direct application through the tendon should be considered when mid-portion management of Achilles tendinopathy is applied to identify the additional zone of injury.

Although the treatment process using ESWT could be painful, despite raising concerns regarding botulinum toxin, corticosteroid, or application of other medication in managing musculoskeletal injury or spasticity treatment, no upper limits in total ESWT application are established. Hence, managing secondary damage zones during the treatment session could be rational. In the case of Achilles tendinopathy, treatment of secondary plantar fasciitis or coexisting posterior tibial tendinopathy could achieve the optimized function (21).

Conclusion

The LBP therapeutic program using ESWT offers a compelling choice, leading to considerable pain relief, lower disability, and a better functional status without associated adverse events and short to long-term follow-up.

Conflict of Interest

The authors declare no conflict of interest in this study.

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References

1. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, et al. Chapter 4. European guidelines for the management of chronic nonspecific low back pain. *Eur Spine J*. 2006;15 Suppl 2(Suppl 2):S192-S300. doi: 10.1007/s00586-006-1072-1. [PubMed: 16550448]. [PubMed Central: PMC3454542].
2. Prego-Jimenez S, Pereda-Pereda E, Perez-Tejada J, Aliri J, Goni-Balentziaga O, Labaka A. The impact of sexism and gender stereotypes on the legitimization of women's low back pain. *Pain Manag Nurs*. 2022;23(5):591-5. doi: 10.1016/j.pmn.2022.03.008. [PubMed: 35428592].
3. Walewicz K, Taradaj J, Rajfur K, Ptaszkowski K, Kuszewski MT, Sopel M, et al. The Effectiveness of radial extracorporeal shock wave therapy in patients with chronic low back pain: A prospective, randomized, single-blinded pilot study. *Clin Interv Aging*. 2019;14:1859-69. doi: 10.2147/CIA.S224001. [PubMed: 31806944]. [PubMed Central: PMC6857735].
4. Sun K, Zhou H, Jiang W. Extracorporeal shock wave therapy versus other therapeutic methods for chronic plantar fasciitis. *Foot Ankle Surg*. 2020;26(1):33-8. doi: 10.1016/j.fas.2018.11.002. [PubMed: 30502222].
5. Chou R. In the clinic. Low back pain. Ann Intern Med. 2014 Jun 3;160(11):ITC6-1. doi: 10.7326/0003-4819-160-11-201406030-01006. [PubMed: 25009837].
6. Wang CJ. Extracorporeal shockwave therapy in musculoskeletal disorders. *J Orthop Surg Res*. 2012;7:11. doi: 10.1186/1749-799X-7-11. [PubMed: 22433113]. [PubMed Central: PMC3342893].
7. Crevenna R, Mickel M, Schuhfried O, Gesslbauer C, Zdravkovic A, Keilani M. Focused extracorporeal shockwave therapy in physical medicine and rehabilitation. *Current Physical Medicine and Rehabilitation Reports*. 2021;9(1):1-10. doi: 10.1007/s40141-020-00306-z.
8. van der Worp H, van den Akker-Scheek I, van Schie H, Zwerver J. ESWT for tendinopathy: Technology and clinical implications. *Knee Surg Sports Traumatol Arthrosc*. 2013;21(6):1451-8. doi: 10.1007/s00167-012-2009-3. [PubMed: 22547246]. [PubMed Central: PMC3657080].
9. Wu YT, Chang CN, Chen YM, Hu GC. Comparison of the effect of focused and radial extracorporeal shock waves on spastic equinus in patients with stroke: A randomized controlled trial. *Eur J Phys Rehabil Med*. 2018;54(4):518-25. doi: 10.23736/S1973-9087.17.04801-8. [PubMed: 29072044].
10. Wang YC, Chen SJ, Huang PJ, Huang HT, Cheng YM, Shih CL. Efficacy of different energy levels used in focused and radial extracorporeal shockwave therapy in the treatment of plantar fasciitis: A meta-analysis of randomized placebo-controlled trials. *J Clin Med*. 2019;8(9). doi: 10.3390/jcm8091497. [PubMed: 31546912]. [PubMed Central: PMC6780733].
11. Lohrer H, Nauck T, Dorn-Lange NV, Scholl J, Vester JC. Comparison of radial versus focused extracorporeal shock waves in plantar fasciitis using functional measures. *Foot Ankle Int*. 2010;31(1):1-9. doi: 10.3113/FAI.2010.0001. [PubMed: 20067715].
12. Schmidt CO, Raspe H, Pfingsten M, Hasenbring M, Basler HD, Eich W, et al. Back pain in the German adult population: Prevalence, severity, and sociodemographic correlates in a multiregional survey. *Spine (Phila Pa 1976)*. 2007;32(18):2005-11. doi: 10.1097/BRS.0b013e318133fad8. [PubMed: 17700449].

13. Casser HR, Seddigh S, Rauschmann M. Acute Lumbar Back Pain. *Dtsch Arztebl Int.* 2016;113(13):223-34. doi: 10.3238/arztebl.2016.0223. [PubMed: 27120496]. [PubMed Central: PMC4857557].
14. Babatunde OO, Jordan JL, Van der Windt DA, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. *PLoS One.* 2017;12(6):e0178621. doi: 10.1371/journal.pone.0178621. [PubMed: 28640822]. [PubMed Central: PMC5480856].
15. Bundesärztekammer (BÄK) Kassenärztliche Bundesvereinigung (KBV) Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften Nationale VersorgungsLeitlinie Nicht-spezifischer Kreuzschmerz–Langfassung. [accessed: 23 November 2021]. Available from: URL: https://www.awmf.org/uploads/tx_szleitlinien/nvl-007l_S3_Kreuzschmerz_2017-03.pdf
16. Lange T, Deventer N, Gosheger G, Lampe LP, Bockholt S, Schulze BA, et al. Effectiveness of radial extracorporeal shockwave therapy in patients with acute low back pain-randomized controlled trial. *J Clin Med.* 2021;10(23). doi: 10.3390/jcm10235569. [PubMed: 34884271]. [PubMed Central: PMC8658438].
17. Yue L, Sun MS, Chen H, Mu GZ, Sun HL. Extracorporeal shockwave therapy for treating chronic low back pain: A systematic review and meta-analysis of randomized controlled trials. *Biomed Res Int.* 2021;2021:5937250. doi: 10.1155/2021/5937250. [PubMed: 34840977]. [PubMed Central: PMC8617566].
18. Walewicz K, Taradaj J, Dobrzynski M, Sopel M, Kowal M, Ptaszkowski K, et al. Effect of radial extracorporeal shock wave therapy on pain intensity, functional efficiency, and postural control parameters in patients with chronic low back pain: A randomized clinical trial. *J Clin Med.* 2020;9(2). doi: 10.3390/jcm9020568. [PubMed: 32092987]. [PubMed Central: PMC7074373].
19. Rajfur K, Rajfur J, Matusz T, Walewicz K, Dymarek R, Ptaszkowski K, et al. Efficacy of Focused Extracorporeal Shock Wave Therapy in Chronic Low Back Pain: A Prospective Randomized 3-Month Follow-Up Study. Med Sci Monit. 2022;28:e936614. doi: 10.12659/MSM.936614. [PMID: 35689370]. [PMCID: PMC9199449].
20. Li C, Xiao Z, Chen L, Pan S. Efficacy and safety of extracorporeal shock wave on low back pain: A systematic review and meta-analysis. *Medicine (Baltimore).* 2022;101(52):e32053. doi: 10.1097/MD.0000000000032053. [PubMed: 36595991]. [PubMed Central: PMC9803516].
21. Tenforde AS, Borgstrom HE, DeLuca S, McCormack M, Singh M, Hoo JS, et al. Best practices for extracorporeal shockwave therapy in musculoskeletal medicine: Clinical application and training consideration. *PM R.* 2022;14(5):611-9. doi: 10.1002/pmrj.12790. [PubMed: 35187851]. [PubMed Central: PMC9321712].