

INPLASY PROTOCOL

To cite: An et al. The Effect of laser therapy in treating post-stroke shoulder pain: a systematic review and meta-analysis. Inplasy protocol 202310085. doi: 10.37766/inplasy2023.1.0085

Received: 30 January 2023

Published: 30 January 2023

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Support: No support.

Review Stage at time of this submission: Preliminary searches.

Conflicts of interest:
None declared.

The Effect of laser therapy in treating post-stroke shoulder pain: a systematic review and meta-analysis

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Review question / Objective: n patients with stroke, laser therapy, in comparison to other treatments, has a better effect in relieving shoulder pain?

Eligibility criteria: Relevant studies will be included if they: (1) were randomized, controlled trials (RCT), (2) included patients diagnosed with post-stroke shoulder pain, and (3) laser therapy was used for treating shoulder pain after stroke. Studies will be excluded if they; (1) used combined treatment without examining the effectiveness of laser therapy alone, (2) compared different types of laser therapy, or (3) reported insufficient information.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 30 January 2023 and was last updated on 30 January 2023 (registration number INPLASY202310085).

INTRODUCTION

Review question / Objective: In patients with stroke, laser therapy, in comparison to other treatments, has a better effect in relieving shoulder pain?

Rationale: Laser is an abbreviation for Light Amplification by Stimulated Emission of Radiation, emitting a light through a

process of amplification. Laser therapy including laser acupuncture is a treatment that amplifies a light on targeted treating area. Since it promotes cell activation and energy production in cells, having effects on reducing pain, recovering from damages, and regulating physiological activation, it is widely used for various diseases such as musculoskeletal diseases, respiratory diseases, headache,

and etc. There also exist studies including randomized controlled trials (RCTs), reporting effects of laser therapy for shoulder pain after stroke, and they recommend laser therapy for stroke patients suffering from shoulder pain. However, to the best of our knowledge, a meta-analysis regarding laser therapy for shoulder pain after stroke has never been done.

Condition being studied: Shoulder pain is a common problem following a stroke, and 75% of patients complain of pain in the first 12 months after a stroke. This interferes with activity, recovery, and rehabilitation. It requires a coordinated multidisciplinary pain management approach to minimize interference with rehabilitation and optimize outcomes(Lee SH, Lim SM. Acupuncture for Poststroke Shoulder Pain: A Systematic Review and Meta-Analysis. Evid Based Complement Alternat Med. 2016;2016:3549878. doi: 10.1155/2016/3549878. Epub 2016 Jul 31. PMID: 27547224; PMCID: PMC4983325).

Laser therapy, including laser acupuncture and low-level laser therapy (LLLT), has been used more and more recently in clinic because of its non-invasive, non-thermal, painless, and no bleeding or blood stasis characteristics, rather than traditional acupuncture to stimulate specific regions or acupoints. The advantages also include flexible adjustable exposed zones, accurate dosing of the exposure, nonspecific patterns of receptor structures, and the ability to combine the technique with any type of treatment(Chang YC, Chen CM, Lay IS, Lee YC, Tu CH. The Dosage Effect of Laser Acupuncture at PC6 (Neiguan) on Heart Rate Variability: A Pilot Study. Life (Basel). 2022 Nov 22;12(12):1951. doi: 10.3390/life12121951. PMID: 36556316; PMCID: PMC9786668.).

Since it promotes cell activation and energy production in cells, having effects on reducing pain, recovering from damages, and regulating physiological activation, it is widely used for various diseases such as musculoskeletal diseases, respiratory diseases, headache, and post-stroke shoulder pain.

METHODS

Search strategy: We will search Medline, EMBase, and the Cochrane Central Register of Controlled Trials from database inception. For Korean articles, we will search Research Information Service System (RISS), Korea Institute of Science and Technology Information (KISTI), and OASIS. For Chinese publications, we will search the China National Knowledge Infrastructure (CNKI) database and Wanfang database. The keywords used for the search will be “stroke OR cerebral infarction OR cerebral hemorrhage OR cerebrovascular disease” AND “laser therapy OR laser acupuncture” AND “shoulder pain” in each data base language.

Participant or population: Diagnosed stroke patients, who have troubles in shoulder pain.

Intervention: Laser therapy or laser acupuncture.

Comparator: standard treatment such as medication or rehabilitation therapy.

Study designs to be included: randomized controlled trials (RCTs).

Eligibility criteria: Relevant studies will be included if they: (1) were randomized, controlled trials (RCT), (2) included patients diagnosed with post-stroke shoulder pain, and (3) laser therapy was used for treating shoulder pain after stroke. Studies will be excluded if they; (1) used combined treatment without examining the effectiveness of laser therapy alone, (2) compared different types of laser therapy, or (3) reported insufficient information.

Information sources: Information may be obtained from 8 electronic databases (EMbase, Cochrane, Pubmed, CNKI, Wanfang, RISS, KISTI, OASIS).

Main outcome(s): The main outcomes will be the Visual Analogue Scale (VAS), the Fugl-Meyer Assessment (FMA) and total effective rate. VAS is a unidimensional

measure of pain intensity by “no pain” (score of 0) and “pain as bad as it could be” or “worst imaginable pain” (score of 10 [10 cm scale]). FMA-UE assesses motor recovery after stroke and has a range of 0–2, with a total score ranging from 0 to 66. The effective rate can be calculated based on the proportion of effectively treated patients (complete or partial improvement) to the proportion of patients in whom treatment was ineffective (no improvement).

Additional outcome(s): Additional outcomes for shoulder pain may include as followings; PSS : Penn shoulders scale, SPADI : Shoulder Pain and Disability Index, MBI : Modified Barthel Index, ROM : range of motion, BRS : Brunnstrom recovering staging, MAS : modified Ashworth scale, FIM : functional independence measure.

Data management: We will extract the first author, publication year, study design, number of participants, age and sex, details of intervention, main outcome measures, and adverse effects. And we will assess the study quality, using the Cochrane classification for assessing the risk of bias, which reviews the randomization and allocation of the patients, blindness of interventions for participants and outcome assessors, and completeness of studies reporting.

Quality assessment / Risk of bias analysis: We will assess the study quality, using the Cochrane classification for assessing the risk of bias, which reviews the randomization and allocation of the patients, blindness of interventions for participants and outcome assessors, and completeness of studies reporting.

Strategy of data synthesis: We will extract the first author, publication year, study design, number of participants, age and sex, details of intervention, main outcome measures, and adverse effects. We will compare the time, period, methods of treatment versus control group. Cochrane Collaboration software [Review Manager (RevMan) Version 5.4 for Windows, Copenhagen: The Nordic Cochrane Centre]

will be used for summarizing the results of selected studies, . Higgins I² statistic can be used for comparing heterogeneity of the selected studies.

Subgroup analysis: We will compare the time, period, methods of treatment versus control group. We will assess the effectiveness of laser therapy, using meta-analysis. The statistical analysis will be performed using a random effect model when I² value was $\geq 50\%$, and a fixed model when I² value was $< 50\%$.

Sensitivity analysis: Higgins I² statistic will be used for comparing heterogeneity of the selected studies.

Language restriction: No, there will be no language restriction imposed on this search.

Country(ies) involved: Republic of Korea (Sangji University, 80, Sangjidae-gil, Wonju-si, Korea).

Keywords: Laser therapy; post-stroke shoulder pain; systematic review; meta-analysis; laser acupuncture.

Dissemination plans: This review help giving Korean Medicine doctors evidence for using laser therapy including laser acupuncture in treating post-stroke shoulder pain patients in clinics. Furthermore, it will help future researchers to find a way to explore study design, such as well-designed RCTs for laser therapy in treating post-stroke shoulder pain patients.

Contributions of each author:

Author 1 - Dayoung An will write riginal draft preparation.

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