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A systematic review of the literature utilizing hydrodilatation for adhesive capsulitis: what is an optimal method?

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 21 December 2024 and was last updated on 21 December 2024.

INTRODUCTION

Review question / Objective Is hydrodilatation effective for adhesive capsulitis over other treatments?
What is an ideal method of performing hydrodilatation for adhesive capsulitis?
-What kind of imaging guidance should be used?
-What kind of injectate should be included?
-What is an ideal volume for hydrodilatation?
-Should physical therapy be considered following hydrodilatation?
-What are the factors that affect outcomes following hydrodilatation?
-Should nerve block be used for hydrodilatation?
-Should joint capsule be preserved or ruptured?

Rationale Adhesive capsulitis, commonly known as “frozen shoulder,” is a debilitating and painful condition affecting 2–5% of the general population. Currently, several conservative management options are available for patients with adhesive capsulitis, including oral nonsteroidal anti-inflammatory drugs (NSAIDs), physical therapy, and corticosteroid injections.
Hydrodilatation, also referred to as hydrodilation, hydrodistension, arthrographic distension, capsular distension, or joint distension, was first introduced by Andren and Lundberg in 1965. This technique aims to expand the joint space by exerting hydraulic pressure through the injectate. Since its introduction, numerous studies have explored the use of hydrodilatation for adhesive capsulitis, yielding conflicting evidence.
Several systematic reviews have assessed the efficacy of hydrodilatation. The most recent review, published in 2023, concluded that it may provide transiently greater improvements in shoulder disability and passive external rotation compared to intra-articular corticosteroid injections. However, these reviews have been limited by variability in hydrodilatation methods, including differences in injection volume, imaging guidance, types of injectates, injection approaches, capsular rupture versus preservation, number of injections, use of

nerve blocks, and post-procedural physical therapy recommendations.
Additionally, the included patient populations may have been heterogeneous due to varying inclusion and exclusion criteria across studies. Therefore, the objective of this systematic review is to describe the different hydrodilatation techniques reported in the literature, evaluate their efficacy, and ultimately propose an optimal method for managing adhesive capsulitis.

Condition being studied Adhesive capsulitis, commonly known as "frozen shoulder," is a debilitating and painful condition affecting 2–5% of the general population.

METHODS

Search strategy

PubMed
(adhesive capsulitis OR frozen shoulder OR frozen shoulders) AND (hydrodilatat* OR distension OR hydrodilat* OR hydrodistension)

Embase
('adhesive capsulitis' OR 'frozen shoulder' OR 'frozen shoulders') AND ('hydrodilatat*' OR 'distension' OR 'hydrodilat*' OR 'hydrodistension')

Web of Science
ALL=((adhesive capsulitis OR frozen shoulder OR frozen shoulders) AND (hydrodilatat* OR distension OR hydrodilat* OR hydrodistension)).

Participant or population Adult patients with clinical diagnosis of adhesive capsulitis.

Intervention Glenohumeral joint hydrodilatation (hydrodilation, hydrodistension, joint distension, arthrographic distension).

Comparator Glenohumeral joint hydrodilalation with different imaging guidance, injectate, volume, or any other techniques; glenohumeral joint corticosteroid injection, physical therapy, sham, other injections, or other interventions.

Study designs to be included Randomized controlled trials, prospective and retrospective comparative studies, and case series.

Eligibility criteria The systematic review will include randomized controlled trials, prospective and retrospective comparative studies, and case series. That is, studies classified as Level I–IV evidence, based on the Oxford Centre for Evidence-Based Medicine, are eligible for inclusion.

Exclusion criteria are reviews, case reports, studies conducted on animals, cadavers, or in vitro settings, letters to the editor, and technical descriptions. Additionally, articles lacking details on the hydrodilatation procedure, diagnosis, follow-up, clinical examination, or statistical analysis will be excluded.

Information sources PubMed, Embase, and Web of Science will be searched from their inception to December 21, 2024, for articles evaluating or utilizing hydrodilatation in patients with adhesive capsulitis. If required data are not available in the published manuscript, corresponding authors will be contacted for additional information.

Main outcome(s) All clinically relevant outcomes including patient-reported pain and functional outcome measures, range of motion (ROM), and complications.

Data management Two authors will independently review each study identified in the initial search and conduct data extraction. Extracted variables will include the country where the study was conducted, study design, inclusion and exclusion criteria, patient demographics, hydrodilatation techniques, rehabilitation protocols, follow-up durations, and any reported adverse events. Any statistical information such as mean and standard deviation will be also extracted for meta-analysis. If required data are not available in the published manuscript, corresponding authors will be contacted for additional information.

Quality assessment / Risk of bias analysis Two authors will evaluate the risk of bias using the revised Cochrane risk-of-bias tool for randomized controlled trials (ROB 2) and Risk Of Bias In Non-Randomized Studies - of Interventions (ROBINS-I) for non-RCTs. Any discrepancies between the two authors will be resolved through discussion with a third author.

Strategy of data synthesis We will conduct random-effects pairwise meta-analyses to account for clinical variability among studies, including differences in patient and injection characteristics, provided there are two or more studies with similar outcome measures and follow-up periods. Depending on the available outcome measures, either the standardized mean difference (SMD) or weighted mean difference (WMD) will be calculated. Statistical heterogeneity will be assessed using Q and I^2 statistics. If multiple hydrodilatation techniques are identified and deemed suitable for comparison, we will consider performing a network meta-analysis to evaluate

different techniques and derive both direct and indirect evidence. Publication bias will be assessed if more than 10 studies are included in the analysis. All analyses will be conducted using STATA Version 16 (StataCorp, LLC, College Station, TX).

Subgroup analysis Subgroup analyses will be performed based on injection techniques, such as types of imaging guidance, injection approaches, and types of injectates. Additionally, meta-regression will be considered, with injection volume included as a covariate, to explore whether additional volume offers further benefit. Recognizing the clinical significance of this question, we will also calculate the mean or median hydrodilatation volume reported across studies and categorize it into quartiles or fewer categories to facilitate subgroup analyses based on hydrodilatation volume.

Sensitivity analysis Randomized controlled trials will be analyzed separately for sensitivity analysis.

Language restriction We will limit the studies to those published in English language based on the previous studies suggesting no evidence of bias when studies in other languages were excluded.

Country(ies) involved United States.

Keywords hydrodilatation, hydrodistension, adhesive capsulitis, frozen shoulder.

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