

Title of the study: The Pull Test To Determine Responders To Subacromial Injection In Patients With Shoulder Impingement

Trial registration: NCT02686671

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The study took place at Advanced Physical Therapy of Alaska facilities in Anchorage, Alaska.

Between March 2016 and October 2016, two investigators performed the following clinical tests to determine inter-examiner reliability using nine patients with lateral shoulder pain from a local physical therapy outpatient clinic: (1) shoulder flexion, external rotation, abduction and internal rotation passive ROM; (2) Spurling test; (3) Hawkins-Kennedy test; (4) Neer impingement test; (5) painful arc of abduction; and (6) Pull Test, which has been proposed as an shoulder impingement clinical test to differentiate SA bursitis from rotator cuff conditions. Following reliability testing, 29 participants were included from a consecutive convenience sample of 38 patients scheduled for fanwise SA CSI between the periods of January 2017 and February 2018. Past medical history was screened for inclusion and exclusion criteria.

For inclusion, the following criteria were: (1) age 18 to 80 years; (2) one or more positive shoulder clinical tests out of the following: Hawkins-Kennedy test, Neer impingement test, and painful arc of abduction; (3) lateral shoulder pain between 2/10 and 10/10 on Numeric Pain Rating Scale (NPRS) during resisted shoulder abduction; and (4) SPADI (total) score greater than or equal to 20.

For exclusion, the following criteria were: (1) large three-dimensional limitation with any passive range of motion (ROM) of the shoulder as compared to the contralateral side, to rule out adhesive capsulitis; (2) shoulder surgery within the last six months; (3) CSI to the involved shoulder within the past three months; (4) systemic inflammatory condition; (5) radiculopathy during cervical spine active ROM; (6) cervical spine pain as a primary complaint (7) lateral shoulder pain reproduction during Spurling test; (8) inability to undergo a follow-up phone call; (9) neurological disorders that would prevent clinical test performance and (10) pregnancy by self-report.

Study Design

A non-randomized, exploratory study, with repeated measures for pain and disability, was conducted to identify variables associated with successful fanwise subacromial (SA) corticosteroid injection (CSI) in participants with lateral shoulder pain.

Testing Sequence

Each participant read slide presentation print-outs explaining study procedures followed by informed consent and medical history questionnaire. A pre-CSI pain questionnaire for average and current shoulder pain (Numeric Pain Rating Scale, NPRS) and Shoulder Pain and Disability Index (SPADI) were then completed to identify changes over the follow-up period.

Prior to their scheduled fanwise SA CSI as part of their plan of care, each participant within a private treatment room underwent a series of cervical and shoulder clinical tests similar to those performed during the reliability portion of testing by Investigator 1. For

the first two tests, participants exhibiting three-dimensional limitations of passive range of motion (ROM) within any plane indicative of adhesive capsulitis and/or a positive Spurling test were excluded from the study. If passive ROM and Spurling test were negative, the following shoulder clinical tests were performed with at least one required to be positive to participate further: (1) Hawkins-Kennedy test; (2) Neer impingement test; and (3) painful arc of abduction. Next, the Pull Test, involving comparison of shoulder pain produced between resisted shoulder abduction alone at 0° shoulder abduction and resisted shoulder abduction simultaneous with manually-performed humeral long-axis traction by the investigator was performed. Force level for resisted shoulder abduction alone was measured using a dynamometer (Chatillon® DF II Series Digital Force Gauge). For resisted shoulder abduction with traction, traction force was applied at mid-humerus level by one of the investigator's hands. The traction amount was determined by the maximum sulcus distance obtained between the lateral acromion and humerus monitored by the investigators' thumb of the other hand, with no inferior movement of the shoulder girdle detected. The participant was instructed to push outward from their distal humerus into the chest of the investigator positioned adjacent for this portion of the Pull Test. Maximum resisted shoulder abduction, with force level recorded, was the final test performed.

Following clinical testing, each participant underwent fanwise SA CSI using a blind lateral approach performed by a pain medicine physician or physician assistant with over 30 years of experience. For the CSI, a standard solution consisting of 9cc of 0.25% bupivacaine with 1:200,000 epinephrine and 40 mg of triamcinolone (Kenalog®) was administered using a 9 cm 22- or 25-gauge needle. Manually-performed humeral long-axis traction was performed by a medical assistant when a patient was unable to relax, which can affect the entry point into the AHI.

Approximately 30-minutes post-CSI (to allow for anaesthetic to take effect and post-injection vital signs to be charted by a medical assistant), Investigator 2 performed the previous series of shoulder clinical tests in the same order except for shoulder passive ROM and Spurling test, which were not performed. The Pull Test was not performed, however, resisted shoulder abduction alone was included as a test to compare with the pre-CSI result. The second investigator was blind to the results of pre-CSI testing with exception of force applied during resisted shoulder abduction pre- CSI, with a similar force used for resisted shoulder abduction post-CSI to identify pain level change. Maximum resisted shoulder abduction was performed last with force and pain level recorded. One-week and six-week phone follow-ups were conducted post- CSI. Each participant was allowed to continue their current physical therapy regimen if applicable.