Role of Volume in Intra-articular steroid injection for the Treatment of Subacromial Impingement Syndrome in Combined Military Hospital (CMH) Lahore.

Asad Ali Chaudhry, Sana Kamran Hussain, Tehreem Fayyaz, Shanzay Ali Pirzada, Sheharbano Waqar, Amjid Khan, Danyel Gurz, Maj Gen (R) Ch. Ahmed Khan, Brig (R) Dr. Shahid Majeed

ABSTRACT

Objective: To find out whether increasing the volume of intra articular steroid injection for the treatment of Subacromial Impingement Syndrome(SIS) causes more pain relief and mobility than conventional small dose injection**.**

Methods: We conducted this randomized study in Orthopedic Department of CMH Lahore Medical College from December 2018 to February 2019. All patients of subacromial impingement syndrome(SIS) with shoulder pain fulfilling the inclusion criteria were enrolled in this randomized controlled trial. After randomly dividing the patients into two groups, group A patients were administered about 10 ml of 1% Xylocane plus 40 miligram of methylprednisolone in subacromial region wile group B patients were injected 10ml of 1% xylocaine plus 40miligram of methylprednisolone plus 20 ml of normal saline. Pre injection pain in the affected shoulder was assessed in resting state and during activity with the help of Visual Analogue Scale(VAS).Pre injection shoulder motion was documented with the help of a goniometer. Post injection shoulder pain and motion was recorded immediately after the intervention in both groups and subsequently at one month and three months follow up visits.

Results: A total of 100 patients with mean age of 61 years+/- 10.32 SD were equally divided in group A and group B.Post injection pain on VAS decrease by 6 to 8 points in both groups at three months follow up. Range of motion after treatment in Group A was more markedly improved by the end of 3 months than group A, with some patients experiencing almost full range of motion. But no statistically significant difference between the outcome of the two groups was found(P value > 0.05).

Conclusion: The increased volume of intra articular steroid injection for the treatment of Subacromial Impingement Syndrome(SIS) has no significant effect in reducing shoulder pain and range of motion than conventional small volume injection.

Key words: Arthrographic distension, Corticosteroid injection, Subacromial impingement syndrome.

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INTRODUCTION

The shoulder joint is prone to injuries and inflammatory conditions. Among these conditions tendon disorders of the shoulder joint are a major concern. The most frequently occurring condition that results in shoulder pain and resultant limitation of movement is the Subacromial Impingement Syndrome. The tendons of the rotator cuff, bicps long head and the bursa of the subacromial region impinges between the head of humerus and arch of the coraco acromial ligaments giving rise to this pathology.[1-6] This disease is diagnosed by clinical examination.

Numerous treatment modalities have come into practice based on verifiable evidence. The preferred mode of treatment is yet to be established owing to the

Department of Orthopedic Surgery, CMH Medical College Lahore
Correspondence to: Dr. Asad Ali Chaudhry
Email: drasadch@gmail.com

fact that the aetiology of the disease is not entirely known Treatment options include use of NSAIDS, shoulder physio, avoidance of aggravating factors like heavy weight lifting and intra articular steroid injections, although the effects of steroid injections may not be well maintained.[7-13] As it is nowadays the preferred treatment modality, our research explores the efficacy of shoulder distension to improve symptoms by increasing the volumes this injection.

We based our research on the concept that if increased volume of intra-articular injection with a standard 40 mg dosage of steroid and 10cc of 1% xylocaine amounting to 30cc, may give more relief and better outcome than a 10cc intra articular injection. This is due to the breakage of adhesions because of the extra 30cc causing joint inflation. This increases mobility and general prognosis of SIS.

METHODS

The protocols for conducting this study were approved by the hospital Ethics Committee. A randomised controlled trial, using convenience sampling method, was conducted within the Orthopedic Department of CMH Lahore Medical College from December 2018 to February 2019. Total sample size was 100 with 50 participants in each of the 2 groups- A & B. All the patients were randomly divided into two groups through lottery method. All the patients in group A were given corticosteroid injection with 10cc 1% xylocaine and 40mg corticosteroid and Group B consisted of those who were given 30cc of 40mg corticosteroid injection, 20 normal saline and 10 cc 1% xylocaine. [13-15] The two groups were followed for three months. Our study included adult patients between the ages of 45-90 years, of either gender, with first presentation of unilateral or bilateral Subacromial impingement syndrome (SIS). Joint involvement was limited to that of the shoulder.

Exclusion criteria was for those who had a history of trauma of shoulder joint and was diagnosed either on history or radiograph. Those who had been previous patients of SIS, treated with injectable corticosteroid or those who had an absolute contraindication to the treatment were also excluded.

A consent form was provided to the patients before administration of the intra-articular injection for their newly diagnosed SIS. Patient's discomfort and pain before the injection was evaluated by using the visual analog scale .[16]A goniometer was used for measuring the range of motion of the shoulder joint.

All the collected data was analysed with SPSS(version 21).Frequencies and percentages were calculated for numerical data while mean and standard deviation was calculated for categorical data. T-test was applied using STATA to determine significant difference in the treatment modalities of Group A patients and Group B. P value was considered significant if < 0.05.Data was represented as graphs where necessary.

INJECTION TECHNIQUE

In group A 40 mg of corticosteroid and 10cc of Xylocaine was mixed in a 10ml syringe while in group B, 30cc injection of 10 cc 1%xylocaine, 40mg corticosteroid and 20cc of normal saline was used. The same syringe and needle were used to administer the solution into the shoulder within the articular space. The position of the patient was sitting in upright position in a chair. Distal posterolateral acromial edge was palpated and marked. Appropriate aseptic measures were undertaken by isopropyl alcohol. Sterile gloves were worn during the procedure. Needle was inserted into the inferior acromion edge on its posterio lateral side keeping its direction medial and anterior. There should have been no resistance to flow of liquid while slowly injecting. If resistance was faced, needle was repositioned.

The patient was allowed to rest while informed of the codman's pendular exercises .[17-19] The patient's pain and shoulder motion was evaluated through VAS and goniometer over a five minutes period. The patient was also told to adhere to his follow up schedule of one month and three months visit after injection. On follow up visits, pain and range of motion was assessed yet again and recorded to know whether range of motion of both groups had improved and comparable.

RESULTS

We included a total of 100 patients were from OPD at random and divided into two equal groups of 50 each. The mean age was 61 years +/- 10.32 S . Out of 100 individuals 64(64%) were diabetic out of which 34(53%)were men and 30(46.8%) women. Only20(20%) of the sample smoked of which 14(70%) were male and 6(30%) female. All of patients experienced improvement in circumduction by the end of the trial.

Shoulder pain as assessed through VAS was significantly decreased in both Groups soon after the injection administration of around 4 to 6 points. Pain levels at 1 month were excluded as we were concerned with the end result of the treatment. By the 3rd month of follow up it showed a minimum of 6 to 8 points decrease in pain. This trend was seen in both groups

receiving the injection.(figure I)

Motion of the shoulder joint group A was markedly improved at 3 months follow up with some patients experiencing almost full range of motion. All patients showed improved circumduction. Individually, forward flexion right after injection in Group A improved right after the injection upto 146.5 from a mean of 35.6 degrees. Group B also showed a similar improvement from 37 degrees before administration to 147 degrees. At the 3 month follow up mark, Group A and Group B's forward flexion improved upto a mean of 170.8 and 170.3 degrees. Movement in this plane is a maximum of 180 degrees.

In Abduction, patients experienced an improvement from 43.7 degree movement to 130 degrees right after injection administration in Group A and 44.4 to 132 degrees was observed in Group B. At the end of 3 months Group A patients showed a 167.8 degree abduction while group B was comparable at 167.1.Max range of motion is 180 degrees.

Internal Rotation was improved from a mean of 42.7 degrees (Group A) and 42.9 degrees (Group B) of motion range to 62.3 in both after injection. At follow up visit 3rd months post injection both groups showed similar improvement at 78.4 and 78.9 degrees respectively.

Extension was also improved from 10.6 degrees in Group A to 23.8 right after treatment and 29.5 degrees at the 3 month mark. Group B, showed similar results. Adduction and External Rotation for both groups showed improvements in range of motion. Group A and Group B ranges of motion values are found to be similar as shown in the trends in Figure II and Figure III.

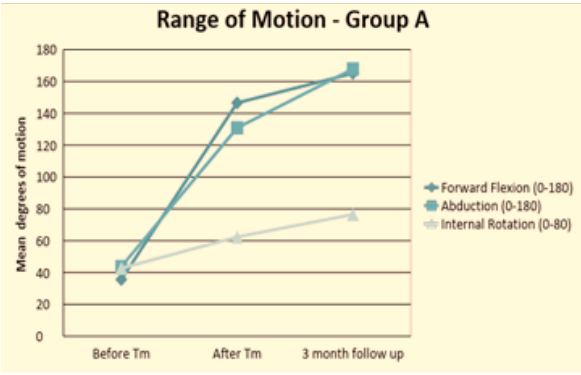

Figure I: Line graph showing the trend in decrease in pain of both group A and group B

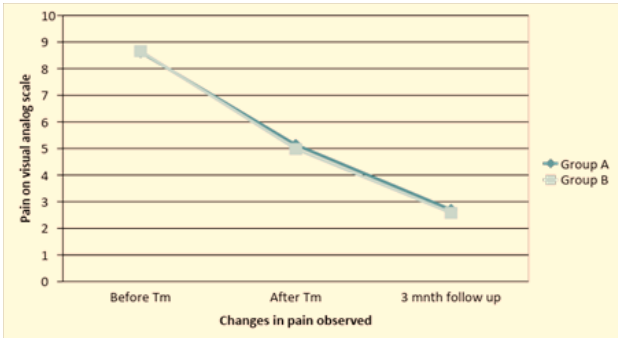

Figure II: Mean changes in degree of major range of motion at 3 months in Group A

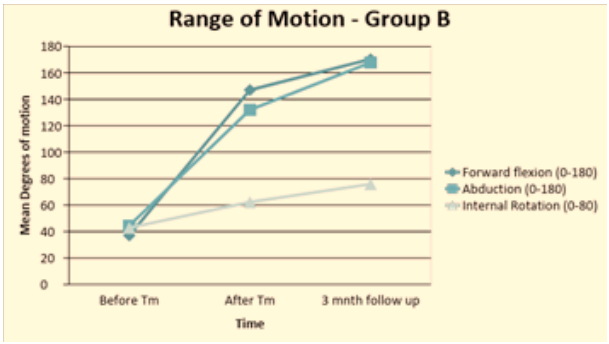

Figure III: Mean changes in degree of major ranges of motion in 3 months in Group B.

T-test was applied using STATA to determine significant difference in the treatment modalities of Group A patients and Group B patients and no statistically significant difference between the Pain improvement of both Groups could be found. (P value greater than 0.05) Motion of the shoulder in all direction showed increased freedom of movement in both groups but these results were insignificant as well. None of the patients complained of any adverse effects or complications due to the procedure or after it.

DISCUSSION

The most effective treatment for SIS is a dual approach of combining physiotherapy with intra articular injection of steroid aiming to decrease intra articular inflammation and distend joint capsule[19]. There is a strong association between Diabetes mellitus and SIS. Females are more commonly affected than males. However, Diabetes mellitus does not seem to affect patients' perceived severity of SIS according to some studies. [20-22]

Steroid injection into the shoulder joint for SIS is found to be safe and more effective as it reduces intensity of pain and improves mobility. These beneficial

effects may last upto 16 weeks post therapy in majority of patients but effects lating upto 26 weeks have been reported by some studies. [23-24] Oral analgesics have not been found to decrease pain or improve function when compared with placebo but are advised in early disease stage to control inflammation hence Naproxen sodium 550mg was prescribed to our patients.[25]

This is the first research to assess the role of volume in arthrographic distension of shoulder joint in SIS. It is a condition that improves over time with adherence to exercise schedules, proper physiotherapy and steroid injections. Our patients did not have a previous history of trauma or nerve damage. Nor had they undergone similar treatment in shoulder treated before. We also chose candidates that were newly diagnosed cases of SIS. It is possible that the observed improvements are due to the corticosteroid effect rather than capsular distension further highlighting that volume has less of a role in treatment.

We have shown that increasing the volume of corticosteroid and normal saline injection to 30cc has no significant effect on treatment outcome of patients of SIS when compared to that of the standard volume of 10cc. Subacromial shoulder irrigation is known to improve symptoms in rotator cuff tendonitis. It does play a role in shoulder distention which helped us hypothesise that increased volume should help break adhesions formed in SIS and therefore lead to a better prognosis or earlier recovery.[26-27] Furthermore, our study clearly highlights the similarities in results in improvement of VAS for pain and shoulder motion immediately post injection and three months follow up period. Although globally the treatment of SIS consists of 10cc of normal saline with 1% xylocaine and 40mg of corticosteroid but increasing the volume shows no effect on standard treatment outcome in our study. It is possible that 30cc of injection would not over distend the joint and should be sufficient to break joint adhesions more effectively. As our results did not show a significant difference between the range of motion and pain scale improvement, we therefore can conclude that volume has no role in the treatment outcome of SIS.

The definition of SIS is widely varied for many physicians and hence inclusion of inflammatory shoulder conditions may also vary under SIS. We recommend further large scale studies with stratification of the groups samples to minimize possible confounders.

CONCLUSION

The most common cause of shoulder pain in general population is the subacromial imingment syndrome(SIS). The increased volume of intra articular steroid injection for the treatment of Subacromial Impingement Syndrome(SIS) has no significant effect in reducing shoulder pain and range of motion than conventional small volume injection. As there is no comparable difference, we recommend that the usual 10cc of Intra-articular steroid injection with 1% xylocaine and 40mg of corticosteroid be continued in treatment of SIS in the future to achieve excellent results.

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REFERENCES

1. Koester MC, George MS, Kuhn JE. Shoulder impingement syndrome. The American Journal of Medicine 2005;118(5): 452-455.DOI: https://doi.org/10.1016/j.amjmed.2005.01.040.
2. Umer M, Qadir I, Azam M. Subacromial impingement syndrome. Orthopedic Reviews 2012; *4*(2):79-82.
3. Petri M,Neiman R,Whiting-Okeefe Q, Seaman WE.Randomized, double-blind, placebo-controlled study of the treatment of painful shoulder.Arthritis Reheum 1987;30(9):1040-1045.
4. Michener LA, McClure PW, Karduna AR. Anatomical and biomechanical mechanisms of subacromial impingement syndrome.Clinical biomechanics 2003; 18(5): 369-379.
5. Buchbinder R, Green S, Youd JM. Corticosteroid injections for shoulder pain. Cochrane Database Syst Rev.2003;(1):CD004016.
6. Blair B, Rokito AS, Cuomo F, Jarolem K, Zuckerman JD. Efficacy of injections of corticosteroids for subacromial impingement syndrome.J Bone Joint Surg Am.1996 ;78(11):1685-9.
7. Arroll B, Goodyear-Smith F. Corticosteroid injections for painful shoulder: A meta-analysis.Br J Gen Pract 2005; 55: 224-228.
8. Park SW, Lee HS, Kim JH. The effectiveness of intensive mobilization techniques combined with capsular distension for adhesive capsulitis of the shoulder.J phys Ther Sci 2014; 26(1):1767-1770.
9. Diercks R, Bron C, Dorrestijn O, Meskers C, Naber R, Tjerk de Ruiter et al. Guideline for diagnosis and treatment of subacromial pain syndrome:A multidisciplinary review by the Dutch Orthopaedic Association. Acta Orthop. 2014; 85(3): 314–322. doi: 10.3109/17453674.2014.920991.
10. Yoon SH, Lee HY, Lee HJ, Kwack KS. Optimal Dose of Intra-articular Corticosteroids for Adhesive Capsulitis: A Randomized, Triple-Blind, Placebo-Controlled Trial.The American Journal of Sports Medicine 2013;41(5): 1133-1139.
11. Sun Y, Zhang P, Liu S, Li H, Jiang J,Chen S et al.Intra-articular Steroid Injection for Frozen Shoulder: A Systematic

Review and Meta-analysis of Randomized Controlled Trials With Trial Sequential Analysis.The American Journal of Sports Medicine 2017;45(9):2171-2179.DOI: https://doi.org/10.1177/0363546516669944.

12. McClure PW, Michener LA, Karduna AR. Shoulder function and 3-dimensional scapular kinematics in people with and without shoulder impingement syndrome. Phys Ther. 2006 ;86(8):1075-90.
13. Dong W, Goost H, Lin X, Burger C, Paul C, Wang Z, et al. Treatments for Shoulder Impingement Syndrome: A PRISMA Systematic Review and Network Meta-Analysis. Medicine (Baltimore). 2015 Mar; 94(10): 510-16 DOI: 10.1097/MD.0000000000000510
14. Haahr J, Ostergaard S, Dalsgaard J, Norup K, Frost P, Lausen S et al. Exercises versus arthroscopic decompression in patients with subacromial impingement: A randomised, controlled study in 90 cases with a one year follow up. Ann Rheum Dis. 2005 ; 64(5): 760-764. DOI: 10.1136/ard.2004.021188.
15. Lewis JS, Wright C, Green A. Subacromial Impingement Syndrome: The Effect of Changing Posture on Shoulder Range of Movement. J Orthop Sports Phys Ther 2005;35(2):72-87.
16. Sauers EL.Effectiveness of rehabilitation for patients with subacromial impingement syndrome. J Athl Train. 2005 ;40(3):221-3.
17. Gundtoft PH, Kristensen AK, Gulaksen BA, Brandslund I, Vobbe JW, Sorensen L. Prevalence of diabetes mellitus in patients with shoulder symptoms is low. Dan Med J. 2013 ;60(10):47-52.
18. Alhashimi RA. Analytical Observational Study of Frozen Shoulder among Patients with Diabetes Mellitus. Joints 2018; 06(03): 141-144.DOI: 10.1055/s-0038-1676105.
19. Amichener LA, Kwalsworth MK, Burnet EN. Effectiveness of rehabilitation for patients with Subacromial impingement syndrome: A systematic review. J Hand Ther 2004;17(2):152-164.DOI:https://doi.org/10.1197/j.jht.2004.02.004.
20. Desmeules F, Cote CH, Fremont P. Therapeutic Exercise and Orthopedic Manual Therapy for Impingement Syndrome: A Systematic Review. Clin J Sport Med 2003;13(3):176-182.
21. Esenyel CZ, Esenyel M, Yeşiltepe R, Ayanoglu S, Bulbul M, Sirvanci M et al.The correlation between the accuracy of steroid injections and subsequent shoulder pain and function in subacromial impingement syndrome. Acta Orthop Traumatol Turc. 2003;37(1):41-5.
22. Min KS, St Pierre P, Ryan PM, Marchant BG, Wilson CJ, Arrington ED. A double-blind randomized controlled trial comparing the effects of subacromial injection with corticosteroid versus NSAID in patients with shoulder impingement syndrome. J Shoulder Elbow Surg. 2013;22(5):595-601.DOI: 10.1016/j.jse.
23. Rizk TE, MD, Gavant ML, Pinals RS. Treatment of Adhesive Capsulitis (Frozen Shoulder) With Arthrographic Capsular Distension and Rupture. Arch Phys Med Rehabil 1994; 75:803-807.
24. Older MW, McIntyre JL, Lloyd GJ. Distension arthrography of the shoulder joint. Canadian Journal of Surgery 1976;19(3):203-210.
25. Paolo C, Haddo O, Levy O,Sforza G. Subacromial impingement syndrome: Management challenges.Orthopedic Research and Reviews 2018;10:83-91. DOI: 10.2147/ORR.S157864.
26. Rangan A, Hanchard N, McDaid C. What is the most effective treatment for frozen shoulder? Bmj 2016; 141-62.DOI:https://doi.org/10.1136/bmj.i4162.
27. Gomoll AH, Katz JN, Warner JJ, Millett PJ. Rotator cuff disorders: recognition and management among patients with shoulder pain. Arthritis Rheum. 2004;50(12):3751-61.

Authorship and Contribution Declaration

Asad Ali Chaudhry, conception and design of the study

Sana Kamran Hussain, acquisition of data

Tehreem Fayyaz, interpreted the data

Shanzay Ali Pirzada, drafted the manuscript

Sheharbano Waqar, acquisition of data

Amjid Khan interpreted the data

Danyel Gurz, acquisition of data

Maj Gen (R) Ch. Ahmed Khan, revised the manuscript critically for important intellectual content

Brig (R) Dr. Shahid Majeed, final approval of the version for publication