Original article

Functional outcome of manipulation under anaesthesia for the treatment of frozen shoulder

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ABSTRACT

Background: Frozen shoulder is defined as painful progressive loss of shoulder movements with unknown etiology. It is a self-limiting disease with the natural history of 18-30 months but with residual pain and restriction of shoulder movement. Its incidence is 2-5%. Various treatment modalities include benign neglect, physical therapy, non-steroidal anti-inflammatory medications, oral glucocorticoids, distention arthrography, intra articular steroid injections, closed manipulation under anaesthesia (MUA) and arthroscopic release of joint capsule. MUA regarding pain control and range of motion is safe, yields immediate results and is very cost effective. The purpose of this study was to ascertain the functional outcome of manipulation under anaesthesia and physiotherapy for the treatment of frozen shoulder in term of safety, cost effectiveness and immediate results.

Patients and methods: In the 6 months study period, 50 patients with adhesive capsulitis were included by non-probability purposive sampling. Manipulation of shoulders was done under general anaesthesia and after the MUA intra articular injection of a mixture of corticosteroid and local anaesthetic was injected. Postoperatively, all patients underwent physiotherapy. Functional outcome was measured using Shoulder Pain and Disability Index (SPADI) preoperatively and postoperatively at 1st, 2nd and 3rd week follow up.

Results: Out of 50 patients, 32 (64%) were females and 18 (36%) were males having female to male ratio of 1.8:1. Average age was 51 years and average duration of symptoms preceding to MUA was 4 months and 27 days. The average pain score decreased from 92.52% to 18.08% and the average disability score reduced from 95% to 17.10%, both at 3rd week postoperative follow up. There were no procedure-related complications.

Conclusion: Manipulation under anaesthesia along with physiotherapy diminishes pain and disability, improves range of motion and expedites early recovery of function in patients having frozen shoulder.

Keywords:

Frozen shoulder, Physiotherapy, Manipulation under anaesthesia

INTRODUCTION

Frozen shoulder, also called as Adhesive Capsulitis, is described as progressive painful loss of both active and passive range of shoulder movements with unknown etiology.[1,2] It was first reported as "scapulohumeral periarthritis" incorporating the periarticular soft tissues of the shoulder by Duplay in 1872.[3] Codman created the term "frozen shoulder" in 1934.[4] Pathologically, it's a multifactorial fibroproliferative disorder with retracted and thickened joint capsule and reduced volume of joint often < 5mL instead of around 20mL.[5,6]

Frozen shoulder without any etiology, abnormal findings on physical examination and on radiograph except restricted movement is classified as primary (idiopathic) frozen shoulder. Frozen shoulder with a systemic, intrinsic or extrinsic pathology is secondary frozen shoulder. Diabetes mellitus, hyperthyroidism, and hypoadrenalism are systemic reasons; cervical disc herniation and humerus fractures are extrinsic reasons; and tendinitis (rotator cuff, biceps, calcific) and acromioclavicular arthritis are intrinsic reasons.[7]

It's a self-limited disease with the natural history of 18-30 months but has three phases: Phase I—pain and reduced range of motion (freezing), Phase II—stiffness predominates (frozen), Phase III—thawing (symptoms resolves).[2,5,8] However remaining pain and limited range of movement can even persist long-term.[9]

The incidence of adhesive capsulitis in the general population is about 2-5%, but various conditions have an increased incidence, comprising female gender(4:1), age above 49 years, trauma, diabetes mellitus (5 times more), prolonged immobilization, stroke, myocardial

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infarction, hyperthyroidism, autoimmune diseases and cervical disc disease.[2,6,10,11] About 70% of patients are women. Adhesive capsulitis usually affects women in the sixth decade of life, mostly involves the non-dominant limb and occurs bilaterally in 34% of affected patients.

Treatment modalities include benign neglect, physical therapy, non-steroidal anti-inflammatory medications, oral glucocorticoids, intraarticular steroid injections, hydrodistension, closed manipulation under anaesthesia and arthroscopic release of joint capsule but there is currently no consensus about the optimal treatment.[9,12,13] It is crucial in developing countries to find out the most cost effective and safe procedure to decrease morbidity of disease and yield immediate results.

Complications like fracture or dislocation of proximal humerus, damage to the cartilage, brachial plexus traction injury, rotator cuff tears, labral detachments and glenoid rim fractures can occur during manipulation.[2]

This study aimed to determine that manipulation under anaesthesia followed by physiotherapy is superior to other modalities in terms of safety, cost effectiveness, early pain control, early improvement in range of motion and back to work promptly.

PATIENTS AND METHODS

Institutional Review Board approval was obtained before commencing this study (IRB/356-A/SIMS on 01-08-2017). This was a descriptive case series study, accomplished in the Department of Orthopaedic Surgery, SIMS/Services Hospital, Lahore over a period of 6 months from 01–08–2017 to 31–01–2018. Sample size of 50 cases was determined with 95 % confidence level, 10 % margin of error and taking anticipated percentage of shoulder had no or slight pain i.e. 87 %.

Non-probability purposive sampling included patients diagnosed to have frozen shoulder with restriction of passive movement in the shoulder joint of more than 30 degrees for at least two of these movements; Abduction 160°-180°, Forward flexion 160°-180°, External rotation with arm at side 45°-90° and External rotation with arm in 90° abduction 90°; either sex with duration of symptoms 3–6 months; age 40-70 years; post immobilization because of previous injury to the extremity; idiopathic and diabetes Mellitus on history. Patients having frozen shoulder with any previous shoulder surgery, hemiplegia, spastic extremity, marked osteoporosis and with less than 30 degrees decreased range of motion for at least two of above three movements, were excluded. Fifty patients satisfying the selection criteria were admitted through the orthopaedic outpatient department. Demographic information like name, age and gender were recorded. History revealing the severity of pain and decrease in range of motion of shoulder, previous trauma, Diabetes Mellitus and duration of disease was taken. Both shoulders were examined comparatively. Levels of passive abduction, flexion, external rotation in abduction and with arm at side, internal rotation in abduction and with arm at side were calculated for every patient using a standard goniometer. Haemoglobin, ESR, blood urea, fasting blood glucose and ECG were done in all patients. An anteroposterior (A/P) radiograph of the shoulder joint and AP and Lateral views of the cervical spine were taken. Preoperatively every patient was assessed according to Shoulder Pain and Disability Index (SPADI). The SPADI is a self-explanatory questionnaire, with 13 questions responded on a ten-point scale divided in two categories: pain (5 items) and disability (8 items). Total SPADI score is measured by adding up all 13 items and dividing by 130 (the maximum score) times100. This gives rise to a score between 0 (best) and 100 (worst).[9,14] The patients were shifted to the operation theater after written informed consent and thorough preparation. Procedure was performed under general anesthesia with the patients in supine position. Manipulation of the shoulders was carried out having a short lever arm and a fixed scapula. The acronym FEAR was used as a secure sequence for shoulder manipulation; Flexion, Extension, Abduction, Adduction and Rotation (external and internal). Palpable and sometimes audible release of adhesions was noted that was a good prognostic sign.[15] After the procedure, an intra-articular injection of a 10ml mixture of steroid (Triamcinolone Acetonide 80mg) and long acting local anaesthetic (Bupivacain) was injected in the shoulders. After manipulation, the patients were kept admitted in hospital for one day for post manipulation pain control and the training of physical therapy. After MUA, patients had to visit a physiotherapist daily during first week. Every patient had individualized physiotherapy session. Patients were given a home exercise plan to maintain ROM. A follow up of three weeks was carried out in outpatient department postoperatively on 1st week, 2nd week and 3rd week to asses functional outcome in term of pain control and improvement in range of motion depending upon Shoulder Pain and Disability Index (SPADI) and compared pre-operative and post-operative SPADI scores. All this information was saved through a Performa. The collected data was transferred

and analyzed using SPSS version 23.0. The variables to be analyzed were included demographic information (like name, age, and gender), control of pain and improvement in range of motion of shoulder by Shoulder Pain and Disability Index (SPADI). The variables were evaluated using simple descriptive statistics using mean and standard deviations for quantitative data like age. Frequency and percentage of qualitative data like gender, control of pain, improvement in range of motion of shoulder were calculated. Data was stratified for type of frozen shoulder.

RESULTS

Mean duration of symptoms preceding to MUA was 4 months and 27 days (range 3-6 months). The mean age of 50 patients was 51 years (Mean±SD=51±7.70) with the youngest patient being 40 years of age and oldest 70 years. Out of 50 patients, females were 32 (64%) and males were 18 (36%) with female to Male ratio 1.8:1. Thirty-eight (76%) were diabetic, 9 (18%) idiopathic and 3 (6%) post traumatic. The left shoulder was involved in 31 (62%) patients and the right shoulder in 19 (38%) patient. The dominant shoulder was affected in 16 (32%) patients and the non-dominant in 34 (68%). There was no bilateral shoulder involvement in any patient. There were no intra-operative complications like humerus fracture, glenohumeral dislocations, glenoid rim fracture, injury to intra-articular cartilage and brachial plexus traction injury encountered during the MUA. Patients were assessed at each follow up visit for their subjective complaints like shoulder pain and disability due to decreased range of motion according to Shoulder Pain and Disability Index (SPADI) to get clinical evaluation of improvement after manipulation under anaesthesia. It showed that as time passed disability and pain were decreased and the range of motion of shoulder improved (Table–1 & Figure-1). Pre-operatively, the mean pain score was 92.52% (Mean±SD=92.52±3.99). Out of which 40 (80%) patient were between 91% – 100% (Mean±SD=94±2.61) and 10 (20%) patient between 81% - 90% (Mean±SD=86.6±2.97). After manipulation under anaesthesia and physiotherapy at first follow up after one week, pain in shoulder decreased and the mean pain score percentage was 66.20% (Mean±SD=66.20±4.24). Out of which 41 (82%) patient were between 61–70% and 9 (18%) patient between 71% - 80%. At 2nd follow up after two weeks, pain further decreased and the mean pain score was reduced to 44.80% (Mean±SD=44.80±3.92). At 3rd follow up after three weeks, all the patients had no pain or mild pain in their shoulders with mean pain score 18.08% (Mean±SD=18.08±4.175) out of which 42 (84%) patient between 11-20% ((Mean±SD=16.62±2.64) and 8 (16%) patient between 21-30% ((Mean±SD=25.75±1.56). There was a significant improvement in pain score 3 weeks after MUA (Mean±SD=18.08±4.175) compared to the pain score prior to MUA (Mean±SD=92.52±3.99), t (49) = 75.05, p < .00001. Gradual decrease in pain causes good compliance of patients regarding physiotherapy that ultimately lead to gradual improvement in shoulder mobility and patients had better quality of life (Table–1 and Figure-2). Pre-operatively, the mean disability score was 95% (Mean±SD=95±3.865). Out of which 44 (88%) patient were between 91.25–100% (Mean±SD=96.02±2.642) and 6 (12%) patient between 81.25-90% (Mean±SD=87.5±3.062). After manipulation under anaesthesia and physiotherapy at first follow up after one week, mobility of shoulder improved and the mean disability score was 63.75% (Mean±SD=63.75±3.62). Out of which 45 (90%) patient were between 61.25% – 70% and 5 (10%) patient between 71.25% - 80%. At 2nd follow up after two weeks, pain and disability further decreased and the mean disability score was reduced to 44.05% (Mean±SD=44.05±4.14). At 3rd follow up after three weeks, all the patients had almost normal mobility at their shoulders with mean disability score 17.10% (Mean±SD=17.10±3.54) out of which 43 (86%) patient between 11.25% - 20% (Mean±SD=16.25±3.04) and 7 (14%) patient between 21.25% - 30% (Mean±SD=22.32±1.04). There was a significant improvement in disability score 3 weeks after MUA (Mean±SD=17.10±3.54) compared to the disability score prior to MUA (Mean±SD=95±3.865), t (49) = 87.287, p < .00001.

Table1. Differences in SPADI before and after MUA

SPADI	Pre-op	Post-op			t	df	P value
		1st week	2nd week	3rd week			Sig(2-tailed)
Pain Scale	92.52%	66.20%	44.80%	18.08%	75.050	49	.00001
Disability Scale	95%	63.75%	44.05%	17.10%	87.287	49	.00001

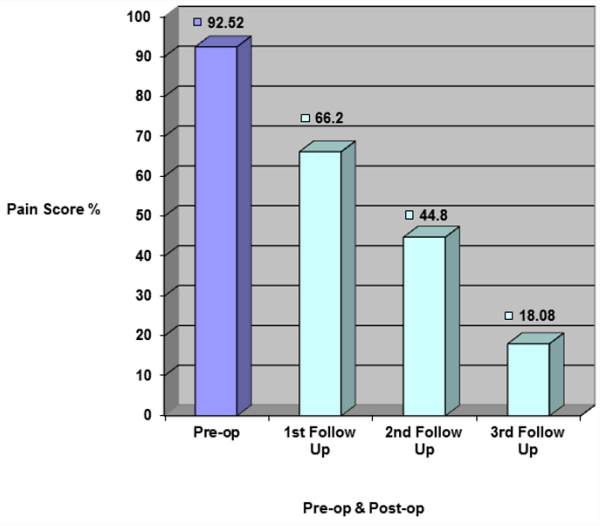

Figure 1. Pre-op and post-op SPADI (pain Scale)

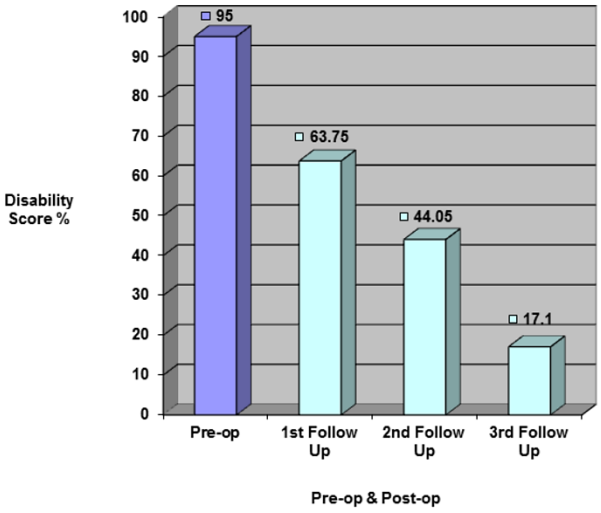

Figure 2. Pre-op & post-op SPADI (disability scale)

DISCUSSION

Frozen shoulder may be an algoneurodystrophic process. The etiology is unidentified and mostly no precipitating factor is found. However, there are a number of predisposing causes such as diabetes mellitus, rheumatoid arthritis, cervical spine disorders, cardiac surgery, ischaemic heart disease, Dupuytren disease and trauma. It occurs in non-dominant shoulder frequently. It usually occurs in one shoulder but can occur bilaterally, especially in Diabetics.[16] Recurrence is unusual.[17] In this study, non-dominant shoulder involvement was 68%. The left shoulder was involved in 31 (62%) patients and the right shoulder in 19 (38%) patient. A previous study described similar findings with non-dominant extremity involvement was 48.3% with right sided 36.67% and left sided 63.33% involvement.[18] In this study there was increased incidence of the disease in diabetics (76%) while other authors reported 25.8% to 42.5% diabetics.[18,19] Literature shows a significant association between idiopathic adhesive capsulitis and diabetes mellitus; the prevalence of adhesive capsulitis is around 20–38.6% in diabetics.[7,20] Previous reports mention that type 1 diabetics are at increased risk of having frozen shoulder than type 2 diabetes mellitus.[3,21] Patients with higher HbA1C levels or when diabetes mellitus has been present for a long period (>13 years), are at increased risk for developing adhesive capsulitis.[22,23] Ando and coauthors, in a comparative study, showed excellent clinical results of MUA both in the idiopathic and diabetic frozen shoulders, however poor outcome recorded in diabetic group in comparison with idiopathic group.[24] Jenkins and coworkers found a same improvement in range of motion (ROM) and Oxford Shoulder Score after MUA in both diabetic and non-diabetic groups, but an increased need of a repeated MUA in diabetics (IDDM 39%, NIDDM 31%) than in non-diabetics (15%) was found, while Woods and colleagues also reported a repeated MUA that was more in type 1 diabetics (38%) than in other patients (17.8%). Even then, they got a good outcome and a less complication rate (0.2%).[25,26] In present study, female to male ratio is 1.8:1 with female predominance and mean age is 51 years. These findings correlate with other reports.[3,18] It shows that frozen shoulder affects females more than males and frequently involves the patients of 4th to 6th decades.[1] Codman reported frozen shoulder difficult to define, difficult to treat and difficult to explain in term of pathology.[4] Adhesive capsulitis is commonly a self-resolving condition. However, in literature positive outcomes of the natural course of adhesive capsulitis have been questioned. Hand and group delineated in their study with 223 patients, that the recovery rate for adhesive capsulitis was 59%, while the remaining patients were still having complaints and 6-16% of patients had functional loss.[27] Whereas other study reported 94% spontaneous full recovery with an average of nine-year follow-up.[28] However, no other studies have shown such a successful outcome. In other studies, the rates of spontaneous absolute recovery has been reported to be as less as 39% and 50%.[11,24] In this study population, a quick increase in shoulder mobility after the procedure was noticed. Such significant improvement would not be possible without any intervention. One previous study reported 85% satisfaction rate with good results after MUA.[29] In a review of 16 studies, about 85% of patients were fully

satisfied with the outcome of MUA.[15] Meyer and coauthors reported that 90% of their patients with primary frozen shoulder were unable to work, but six months after MUA 80% were able to return to their work.[30] It is however indispensable to initiate physiotherapy immediately after MUA to sustain the mobility acquired during manipulation in first few weeks otherwise significant stiffness quickly returns.[11,31]

Kraal and coworkers found that Intra-articular corticosteroid infiltration with physiotherapy lead to superior Shoulder Pain and Disability Index scores and good range of motion early stage frozen shoulder during first three months.[9] One previous study reported that addition of physiotherapy after a shoulder joint injection leads to statistically significant outcome.[7] Physiotherapy after MUA was an essential part of treatment protocol in this study. Patients' determination and participation in the exercise regime were pivotal to our good result. Our regime was flexible and individualized. Whelton and colleagues also stressed on the importance of physiotherapy and recommended that it should be used in conjunction with other treatment modalities.[32] In this study there were no procedure-related complications. This is similar to previous studies which reported 0 to 0.5%.[15,29,33]

MUA may be executed in isolation or as supplement to arthroscopic arthrolysis. In combination treatment, MUA has superior short-term outcome within one year.[7] Comparing MUA alone with MUA and arthroscopic arthrolysis, no difference was found in outcomes one year after the procedures.[34] Grant and coworkers compared MUA with arthroscopic arthrolysis and reported no apparent difference in ROM or patient-quoted outcomes.[33] MUA is comparatively easy to perform and time saving. Arthroscopic arthrolysis is visually managed, but technically more challenging, less time-saving and has particulars risks (chondrolysis due to thermal effects of coagulation, axillary nerve damage).[35] It has been proven in the literature that MUA accelerate recovery in frozen shoulder. There is still no consensus about the appropriate time for MUA to get better outcome. One study described that early MUA had a outstandingly better outcome at final follow-up when done <9 months after the onset of symptoms, than in the late group.[36] Another study found no association between duration of frozen shoulder and outcomes of MUA.[37] Vastamaki and colleagues endorsed that between 6 and 9 months after the onset of symptoms might be the best time for MUA.[20]

Overall, the results of this study recommend MUA as an efficacious and secure treatment of the frozen shoulder. Previous studies reported MUA to be the most commonly used non-conservative treatment modality for the refractory cases where conservative treatment fails.[15,38] MUA for adhesive capsulitis has been described to enhance mobility and to lessen shoulder pain. Various retrospective studies propose that duration of symptoms may be decreased by manipulation and better outcome is sustained for several decades.[37,38] A review article reported a remarkable increase in glenohumeral joint range of motion after MUA in the short term (< six weeks) and a maintained effect in the long term (> 12 months) was constantly present with 85% satisfaction rate.[15]

This study examined the effectiveness of MUA and focused on the speedy results. Whelton and coauthors reported MUA to offer good long-term enhancement in outcome scores in the treatment of idiopathic frozen shoulder regardless of duration of symptoms that also endorses our study results.[32]

CONCLUSION

Manipulation under anaesthesia integrated with physiotherapy relieves pain and disability; improves range of motion and expedites early comeback of function in patients with frozen shoulder syndrome.

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