



ISSN: 2395-1958  
IJOS 2019; 5(2): 1020-1022  
© 2019 IJOS  
www.orthopaper.com  
Received: 19-02-2019  
Accepted: 23-03-2019

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# International Journal of Orthopaedics Sciences

## Management of adhesive capsulitis by combination of hydrodilatation, intra-articular steroid injection and manipulation under anaesthesia

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**DOI:** <https://doi.org/10.22271/ortho.2019.v5.i2o.1471>

### Abstract

Adhesive capsulitis is characterized by gradually progressive pain and stiffness of the shoulder. Different treatment modalities are available for the management of primary adhesive capsulitis. The aim of this study was to assess the efficacy of using a combination of Hydrodilatation, Intra-articular steroid injection and Manipulation under anaesthesia. The study group comprised of 20 patients with primary adhesive capsulitis with a mean age of 56.15 years. There was significant improvement in pain, range of motion and function in six months follow-up period. No complications were reported in our study.

**Keywords:** Adhesive capsulitis, hydrodilatation, intra-articular steroid injection, MUA

### 1. Introduction

The condition was originally attributed to Duplay in 1872, coining the term periarthritus [1]. Codman was the first to introduce the phrase of frozen shoulder in 1934, describing pain down to the deltoid insertion with a gradual progressive loss of motion [2]. The term 'Adhesive Capsulitis' was introduced by Neviasser in 1945, in recognition of the inflammatory and fibrotic features as part of the pathogenesis [3]. Shoulder range of motion decreases over a period of few months, until it becomes functionally limiting [4].

Adhesive capsulitis occurs in 2–5% of the population [5] affecting females more than males, with as much as 70% preponderance toward the female sex [6, 7]. Patients typically develop adhesive capsulitis in the 40–60 year old age bracket [8, 9] with the non-dominant arm mostly involved [5].

Adhesive capsulitis is largely a self-limiting condition [8]. It is a disease that improves over a period of 18 to 36 months, [10] with symptoms persisting up to 52 months in up to a half of patients [11]. Dominant arm involvement has been shown to have a good prognosis; associated intrinsic pathology and insulin dependent diabetes are poor prognostic indicators [10, 9].

Further those with diabetes, prolonged shoulder immobility (trauma, overuse injuries or surgery) or systemic disease (hyperthyroidism, hypothyroidism, cardiovascular disease, autoimmune disease or Parkinson's disease) are at higher risk [12]. The incidence of adhesive capsulitis increases by 10 to 20% in patients with diabetes [13]. Further, bilateral involvement is more frequent in patients with diabetes than in non-diabetic patients (33–42% v/s 5–20%) [13, 14].

Primary Adhesive capsulitis is defined as an idiopathic condition of the shoulder, characterized by the spontaneous onset of shoulder pain accompanied by increasingly severe limitation of glenohumeral movement in all directions with restricted active and passive movement [15]. AC is largely a clinical diagnosis and there is lack of consensus around the defined functional loss of motion [15]. Generally, loss in range of motion of at least 25% in at least two directions and up to 50% reduction in external rotation are observed [16]. The pain, persisting for more than 4 weeks, is often severe and characteristically disturbs the sleep [8].

The pathological findings have been well documented by Neviasser (1945), who found a tight capsule, along with dense adhesions between the humeral head and the capsule. He further described an inflammatory reaction in the capsule and synovium that subsequently led to adhesions to the attachment of the capsule to the humeral head [17].

### 1.1 Stages of adhesive capsulitis/frozen shoulder

Adhesive capsulitis progresses through 4 stages described by Neviaser in 1987. These 4 stages are based on the correlation

of history, physical examination and arthroscopic examination (See Table 1).

**Table 1:** The four stages of adhesive capsulitis

Stages	Symptoms	Signs	Arthroscopic Appearance	Biopsy
Stage 1	Pain referred to deltoid insertion Pain at night	Capsular pain on deep palpation Empty end feel at extreme of motion Full motion under anesthesia	Fibrous synovial inflammatory reaction No adhesions or capsular contracture	Rare inflammatory cell infiltrate Hypervascular hypertrophic synovitis Normal capsular tissue
Stage 2	Severe night pain Stiffness	Motion restricted in forward flexion, abduction, internal and external rotation Some motion loss under anesthesia	Christmas tree synovitis Some loss of axillary fold	Hypertrophic hypervascular synovitis Perivascular, sub synovial capsular scar
Stage 3	Profound stiffness Pain only at the end of range of motion	Significant loss of motion Tethering at ends of motion No improvement under anesthesia	Complete loss of axillary fold Minimal synovitis	Hyper cellular, collagenous tissue with a thin synovial layer Similar features to other fibrosis conditions
Stage 4	Profound stiffness Pain minimal	Significant motion loss Gradual improvement in motion	Full mature adhesions Identification of intra-articular structures difficult	Not reported

Adapted from Neviaser and Neviaser [17].

The treatment modalities for Adhesive capsulitis include Physical therapy, Hydrodilatation, Intra-articular corticosteroid Injection, Manipulation under anaesthesia, Arthroscopic capsular release etc. In this study we aim to assess the efficacy of combining hydrodilatation, intra-articular steroid injection and manipulation under anaesthesia.

### 2. Materials and Methods

A clinical study of 20 cases of primary adhesive capsulitis from July 2013 to Jan 2017 was undertaken to evaluate the effectiveness of the procedure. Inclusion criteria consisted of patients with primary adhesive capsulitis, between 40 – 70 years of age. Exclusion criteria consisted of patients who have undergone shoulder surgery, patients with post traumatic shoulder stiffness and those with severe neurological deficit of the upper extremity. A detailed clinical examination of bilateral shoulders, including a thorough neurovascular examination was done and an AP radiograph of the affected shoulder was also taken. The symptoms and findings were graded according to the Constant score. All cases were managed under general anaesthesia and the procedure was carried out under strict aseptic condition. All patients underwent fluoroscopically guided distension of the glenohumeral joint. With the patient in supine position, a 22-gauge, 3.5-inch spinal needle was inserted anteriorly into the glenohumeral joint under fluoroscopic guidance, followed by an injection of 80 mg of triamcinolone (in 2 mL), 8 mL of 0.5% lignocaine, and 10 mL of normal saline (20 mL in total). The manipulation manoeuvre is done with an initial gradual forward elevation in the sagittal plane to the maximum possible extent while the scapula was kept fixed. Passive external rotation was then performed in 0° of abduction, followed by external rotation in 90° of abduction. Finally, internal rotation in 90° of abduction and cross-body adduction were performed. A typical rasping noise occurred during the manipulation in all cases, confirming adhesiolysis. A full range of motion was always achieved. While performing the manipulation, special attention was paid not to fracture the humerus.

All patients received continuous passive exercise in the ward after the procedure. After discharge, exercise training with a physiotherapist in our outpatient clinic was continued until a satisfactory range of motion was obtained. Each case was

reviewed at three weeks, three months and six months interval.

The Constant Shoulder Score was used to assess the functional range at presentation and at six months follow-up. Further, scores of individual components of pain, activity and range of motion were compared at presentation and at six months follow-up post procedure. Student's t-test was used for comparison and all analysis was performed using SPSS for Windows software.

### 3. Result

The study group composed of 9 males and 11 females (M/F ratio of 1:1.2) with a mean age of 56.15 years. The average duration from the onset of the disease to the procedure was 6.2 months, ranging from 4 to 9 months. Follow-up was done at 3 weeks, 3 months and 6 months. Constant Shoulder scoring was done at presentation and at 6 months. The results obtained are summarised in Table 2. The mean Constant Score pre procedure was  $42.10 \pm 5.12$  and post procedure was  $75.20 \pm 6.13$  ( $p < 0.001$ ). The mean Pain score pre procedure was  $2.0 \pm 2.51$  and post procedure pain score was  $11.0 \pm 2.05$  ( $p < 0.001$ ). The mean ROM score pre procedure was  $23.90 \pm 1.99$  and post procedure mean ROM score was  $35.10 \pm 1.02$  ( $p < 0.001$ ). The mean Activity score pre procedure was  $1.80 \pm 1.70$  and post procedure was  $9.60 \pm 0.82$  ( $p < 0.001$ ).

**Table 2:** The results obtained are summarised

Measurement	Pre Procedure (Mean $\pm$ SD)	Post Procedure (Mean $\pm$ SD)	Statistical Significance (p value)
Pain Score	$2.0 \pm 2.51$	$11.0 \pm 2.05$	$< 0.001$
ROM Score	$23.90 \pm 1.99$	$35.10 \pm 1.02$	$< 0.001$
Activity Score	$1.80 \pm 1.70$	$9.60 \pm 0.82$	$< 0.001$
Constant Score	$42.10 \pm 5.12$	$75.20 \pm 6.13$	$< 0.001$

ROM – Range of Motion

### 4. Discussion

Although, a benign self-limiting condition which resolves over a period of time, most of the patients with adhesive capsulitis are severely affected by pain and loss of function. A single modality of treatment often provides temporary or partial relief of symptoms which may later on necessitate a secondary procedure. Hydrodilatation aims to disrupt capsular

fibrosis by using a large volume of sterile saline under fluoroscopic guidance. Intra-articular steroid injection helps to reduce the inflammation within the joint. Blanchard *et al.* [18] found greater improvement in pain, ROM and shoulder disability in favour of corticosteroid injections in the short-term (6 weeks) and, to a lesser extent, in the longer-term (up to 1 year). There is a risk of infection as with any intra-articular injection but no case of infection was reported in our study.

Manipulation under anaesthesia is usually done for refractory cases of severe adhesive capsulitis. MUA ruptures the contracted capsule and to minimise the secondary inflammatory response, it is combined with intra-articular steroid injection. The largest risk in this procedure is that of iatrogenic damage to the upper limb including, humeral fracture, glenohumeral dislocation, rotator cuff tears, glenoid fractures, brachial plexus injuries, labral tears and haematomas [19]. No iatrogenic injury was reported in our series. There was no incidence of any complication following the procedure. Significant improvement was noticed in all patients with a high level of patient satisfaction at 6 months follow-up.

The aim of this study was to assess the efficacy of combining Hydrodilataion, Intra-articular steroid injection and MUA. In our assessment, this combination technique offered early relief of symptoms and good range of movements. The dosage of analgesics needed was reduced and the number of hospital sessions and visits by the patients were also minimised. The patients were able to tolerate and respond to physiotherapy well. There was no recurrence or worsening of symptoms in any of the patients over the 6 months follow up period.

## 5. Conclusion

Although none of these individual procedures is new in the treatment of adhesive capsulitis, combining hydrodilataion, intra-articular steroid injection and manipulation under anaesthesia proved highly effective in providing early symptomatic relief, better patient cooperation and sustained & statistically significant relief of symptoms over the course of follow up. There were neither complications nor recurrence of symptoms in our study. The results of our study demonstrated the benefits of combining three commonly performed individual procedures into one which was performed in a single sitting.

Adhesive capsulitis is a common cause of pain and stiffness in the shoulder. When conventional management strategies fail to yield desired results, the technique of combining hydrodilataion, Intra-articular steroid injection and manipulation under anaesthesia with guided exercise is recommended.

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