SDUAHER

DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, KOLAR, KARNATAKA

In partial fulfillment of the requirements for the degree of

MASTER OF SURGERY

IN

ORTHOPAEDICS

" A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."

By

DR. X ROGER KENNEDY MBBS.

Under the Guidance of

DR. ARUN H.S M.S.ORTHO

PROFESSOR & HEAD OF THE DEPARTMENT

DEPARTMENT OF ORTHOPAEDICS,

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA,

KOLAR-563101

MAY-2020

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION

AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."** is a bonafide and genuine research work carried out by me under the guidance of **Dr ARUN H.S**, Professor & HOD, Department of Orthopaedics, Sri Devaraj Urs Medical College, Kolar in partial fulfillment of University regulation for the award "**M.S. DEGREE IN ORTHOPAEDICS**", the examination to be held in May 2020 by SDUAHER. This has not been submitted by me previously for the award of any degree or diploma from the university or any other university.

Date:

Place: Kolar

DR. X. ROGER KENNEDY

Postgraduate in Orthopaedics

Sri Devaraj Urs Medical

College Tamaka, Kolar

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION

AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled **"A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."** is a bonafide research work done by **Dr.X ROGER KENNEDY,** under my direct guidance and supervision at Sri Devaraj Urs Medical College, Kolar in partial fulfillment of the requirement for the degree of "**M.S. IN ORTHOPAEDICS"**.

Date:

Place: Kolar

DR. ARUN H. S MS ORTHO

Professor and Head of the department

Department Of

Orthopaedics Sri

Devaraj Urs Medical

College Tamaka, Kolar

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

CERTIFICATE BY THE HEAD OF DEPARTMENT

This is to certify that the dissertation entitled "**A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."** is a bonafide research work done by **DR. X ROGER KENNEDY** under my direct guidance and supervision in Department of Orthopaedics at Sri Devaraj Urs Medical College, Kolar in partial fulfillment of the requirement for the degree of "**M.S. IN ORTHOPAEDICS"**.

Date:

Place: Kolar

Dr ARUN H S MS ORTHO

Professor & HOD

Department of Orthopaedics Sri Devaraj Urs Medical College Tamaka, Kolar

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

ENDORSEMENT BY THE HEAD OF THE DEPARTMENT AND PRINCIPAL

This is to certify that the dissertation entitled **"A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."** is a bonafide research work done by **DR.X ROGER KENNEDY,** under the direct guidance and supervision of **DR.ARUN H. S**, Professor and Head of Department of Orthopaedics, Sri Devaraj Urs Medical College, Kolar in partial fulfillment of University regulation for the award "**M.S. DEGREE IN ORTHOPAEDICS**"**.**

DR. ARUN H S MS ORTHO
Prof. and HOD
Department of Orthopaedics
Sri Devaraj Medical College
Tamaka, Kolar

Date:
Place. :

DR. SREERAMULU P N
PRINCIPAL
Sri Devaraj Medical College.
Tamaka, Kolar

Date :
Place :

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION

AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

ETHICAL COMMITTEE CERTIFICATE

This is to certify that the Ethical committee of Sri Devaraj Urs Medical College, Tamaka, and Kolar has unanimously approved

DR.X ROGER KENNEDY

Post-Graduate student in the subject of

ORTHOPAEDICS at Sri Devaraj Urs Medical College,

Kolar

to take up the Dissertation work entitled

"A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER."

to be submitted to the

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION

AND RESEARCH CENTER, TAMAKA, KOLAR,

KARNATAKA,

Member Secretary

Sri Devaraj Urs Medical College,

Kolar–563 101.

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION

AND RESEARCH, TAMAKA, KOLAR,

KARNATAKA

COPYRIGHT

I hereby declare that the Sri Devaraj Urs Academy of Higher Education and Research, Kolar, Karnataka shall have the rights to preserve, use and disseminate this dissertation/thesis in print or electronic format for academic/research purpose.

Date: **DR. X ROGER KENNEDY**

Place: Kolar

ABSTRACT:

Introduction: Frozen shoulder" is a chronic condition characterized by gradually progressive, painful restriction of all shoulder joint movement, with slow spontaneous recovery of either partial or complete movement over a period of time. Although many treatment options have been proposed for the frozen shoulder syndrome, each has limitations. Hydro dilation technique was developed in order to loosen the reported contraction and adhesion. we evaluated the Range of movement and pain relief of shoulder following "Hydraulic distension under local anaesthesia along with a steroid" pre and post distension.

Material and methods: A prospective observational study was conducted in the department of orthopaedics at RLJ hospital attached to Sri Devaraj Urs Medical College between June 2018 to November 2019 for a period of 1.5 year. All the Patients with Peri arthritis shoulder and age above 30 years were included in the study. After obtaining the informed consent from the patients, Demographic data, History, Clinical Examination and details of investigations were recorded in study proforma. The pain and functional scoring used as per "The society of American Shoulder and elbow surgeons" and follow-up was done at 3 weeks, 6 weeks and 12 weeks after procedure. IBM SPSS version 22 was used for statistical analysis.

Results: Total 50 patients were included in the study. The average age of the study population was 52.68 ± 9.79. There were no patients with complete disability. Marked pain (grade 1) was observed on presentation in 46(92%) of the subjects. Post distension only 9(18%) had pain. Flexion, abduction, internal rotation, external rotation movements of the shoulder have improved post distention and were statistically significant at 3^{rd}, 6^{th}, 12 th week. The mean ASES was 36.04 ± 5.84 at base line, it was 67.6 ± 7.64 at 6^{th} week and 91.04 ± 8.68 at 12^{th}

week. The differences in the ASES score at 6th week and 12th week follow up period with baseline value were statistically significant (P value <0.001).

Conclusion: Hydraulic distension is a safe, reliable, cost effective modality in treating the chronically distressing painful condition of frozen shoulder.

PLAGIARISM CERTIFICATE

SDUAHER

Sri Devaraj Urs Academy of Higher Education and Research

Certificate of Plagiarism Check for Thesis/Dissertation

Author Name	Dr.Roger Kennedy X
Course of Study	M.S ORTHOPAEDICS
Name of Supervisor	Dr. ARUN H.S
Department	ORTHOPAEDICS
Acceptable Maximum Limit	
Submitted By	librarian@sduu.ac.in
Paper Title	A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER
Similarity	8 %
Paper ID	191201114314
Submission Date	2019-12-01 11:43:14

* This report has been generated by DrillBit Anti-Plagiarism Software

X. Roger Kennedy	
Signature of Student	Signature of Supervisor
	Professor & H.O.D. Dept. of Orthopaedics Sri Devaraj Urs Medical College Tamaka, KOLAR-563 101
Head of the Department	
University Librarian Senior Librarian Library and Information Centre Sri Devaraj Urs Medical College Tamaka, KOLAR-563 101.	Director Of Post Graduate Studies Director P.G. STUDIES Sri Devaraj Urs Medical College Tamaka, KOLAR-563 101

ACKNOWLEDGEMENT

*First and foremost I thank my **"Almighty God"** for giving me his endless blessings and giving me the strength both mentally and physically during my post graduation and to make this dissertation book possible.*

*I express my profound gratitude to my beloved **PARENTS Smt. VIMALA VINNARASI** and **Sri. XAVIER ARUL KENNEDY** for giving me continuous encouragement, unfailing support and unconditional love throughout my life. Also, my gratitude goes to my loving **SIBLING X MARIYA TIFFANY** for always being there to help me in all ways possible for them . And in remembrance of my late **UNCLE ROY.***

I would like to acknowledge all those who have supported me, not only to complete my dissertation, but helped throughout my post graduation course.

*I wish to express my heart full indebtedness and owe a deep sense of gratitude to my mentor and guide**, Dr. ARUN H. S** Professor and HOD, Department of Orthopaedics, for being very helpful throughout the study and offered his invaluable guidance and support to fully understand and complete this study. Through his vast professional knowledge and expertise, he ensured that I understand everything before I apply the information in my study. I am sincerely thankful to **Dr. ARUN H S** for encouraging me to the highest peak, paying close and continuous attention towards me to finish all tasks and also providing his kind support, valuable suggestions, immense patience and great care. His precious advice on both the dissertation as well as the path of my career has been priceless. Without his constant supervision and advice, completion of this dissertation would have been impossible*

I wholeheartedly acknowledge ***Dr. B. SHAIKH NAZEER, Dr. D SATHYARUP, Dr. MANOHAR and Dr. NAGAKUMAR*** *professors in the department of Orthopaedics, for their valuable teachings of perseverance, professional ethics, moral support and commitment.*

It gives me immense pleasure to extend my sincere thanks to ***Dr PRABHU E and Dr HARIPRASAD,*** *Associate professors, Department of Orthopaedics for their guidance, motivation and moral support during my entire post-graduate course which enabled me to complete my work.*

I sincerely thank ***Dr MANOJ, Dr P A PATIL, Dr ASHIK BARY, Dr ESWARA REDDY*** *assistant professors &* ***Dr UTKARSH , Dr JISHNU*** *senior residents, Department of Orthopaedics, SDUMC, Kolar, for their constant guidance and encouragement.*

I express my sincere thanks to my colleagues and dearest friends ***Dr CECIL FIDO, Dr AJAY KURAHATI, Dr RAM, Dr SACHIN, Dr ABHIJIT, Dr SAKTHI, Dr SREEJITH, Dr ABHISHEK, Dr UMESH, Dr. HARSHA, Dr. YASAR & PULLINGOWS*** *for their co-operation and help in carrying out this study.*

Heartfelt thanks to my seniors and juniors. I thank all the staff nurses who are our pillars of support. Special thanks to all operation theatre staff, OPD staff for their help and support throughout my study.

I thank my beloved friends for their constant moral support and giving their time whenever I have needed the most.

*Last but not least, I extend my gratitude towards all the **PATIENTS** who agreed to participate in this study, without their precious support it would not be possible to conduct this research.*

DR X ROGER KENNEDY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
CHL	Coracohumeral Ligament
COX	Cyclooxygenase
IA	Intra-Articular
ICAM-1	Intercellular Adhesion Molecule-1
IHD	Intraarticular Hydraulic Distension
IL	Interleukin
IQR	Interquartile Range
IRR	Infra-Red Radiation
MMPs	Matrix Metalloproteinases
MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
MUA	Manipulation Under Anesthesia
NSAIDs	Nonsteroidal Anti-Inflammatory Drugs
PET	Problem Elicitation Technique
ROM	Range of Motion
SNP	Single-Peptide Polymorphisms
SPADI	Shoulder Pain and Disability Index
TENS	Transcutaneous Electrical Nerve Stimulation
TIMPs	Tissue Inhibitor of Metalloproteinases
TNF	Tumour Necrosis Factor
ASES	American Shoulder and Elbow Surgeons Shoulder
VAS	Visual Analogue Score

INTRODUCTION

INTRODUCTION:

"Frozen shoulder" is a chronic condition characterised by gradually progressive, painful restriction of all shoulder joint movement, with the slow spontaneous recovery of either partial or complete movement over a period of time.[1] The first recorded description of a frozen shoulder was reported by Duplay in 1872 in his description of a "periarthritis scapulohumeral" and the word 'frozen shoulder' was first coined by Codman in 1934.[2] He described the symptoms to be slow onset of pain felt near the insertion of the deltoid muscle, inability to sleep on the afflicted side, and limited active and passive elevation and external rotation, yet with a normal radiological appearance.

Frozen shoulder is an extremely disabling condition, characterised by remitting shoulder pain and stiffness. It is a chronic condition with unknown etiology. Clinically it is characterised by considerable pain and insidious shoulder stiffness, which results in restriction of passive and active forward flexion and external rotation. Codman, when he introduced the term 'frozen shoulder', claimed that this disorder is "difficult to define, difficult to treat, and difficult to explain from the point of view of pathology". Incidence of 3%-5% in the general population and among the diabetic population 20% incidence was observed.[3]

Lundberg divided Frozen shoulder into two groups: Primary frozen shoulder and Secondary frozen shoulder. Primary frozen shoulder is detected in the absence of a definite cause for the condition while trauma results in the secondary frozen shoulder to develop. Frozen shoulder involves three steps. These are the 'freezing phase' or the 'painful phase' lasting 3 to 8 months, the 'frozen phase' or the 'adhesive phase' lasting four to twelve months and the 'thawing phase' or 'resolution phase', which from twelve months to forty- two months and is characterised by a steady return of shoulder mobility and function.[4]

The best techniques of conservative management of adhesive capsulitis has included combinations of regimens that include physiotherapy utilising a number of techniques, hydraulic distension of the glenohumeral joint and intra-articular steroid injections. While in operative management point of view, a significant benefit for a faster recovery of pain was reported with Arthroscopic capsular release with the immediate recovery of function and earlier return to work.

Although a variety of treatment options have been reported for the frozen shoulder syndrome, each has its disadvantages. Improvement with Home exercises may not alter the rate of natural recovery. Benefits from intensive physical therapy are passive.[5] significant complications have been documented with Manipulation under anesthesia but significant, and publications report protracted recovery. Some patients were benefited from the injection of intraarticular steroids, but this hypothesis was established on a few quality randomised studies.[6] Poor outcomes by few patients were reported with Arthroscopic release done under general anesthesia as it is an invasive procedure.[7] An infrequently cited option is hydraulic joint capsule distension under local anesthesia (hydroplasty). It is also called as Distension arthrography (also known as hydrodilatation). The hydrodilatation procedure was first described by Andrèn, L et al.[8] This technique was developed in order to loosen the reported contraction and adhesion. It is based on the principle of injection into the glenohumeral joint under pressure. Fareed and Gallivan[9], initially reported in a case series of twenty patients that this is an office technique without arthrography, and the patients in this study noted immediate pain resolution, the return of normal function and normal sleep. Benefits retained for up to ten years.

This disorder is one of the most frequently reported musculoskeletal problems observed in orthopaedics. However, despite the ubiquity of this condition and the advances in shoulder surgery over the last fourteen decades there are still many unknowns in deciding what the best treatment options are for this disease condition. In this study, we evaluated the Range of movement and pain relief of shoulder following “Hydraulic distension under local anaesthesia” pre and post distension.

AIMS & OBJECTIVES

AIMS AND OBJECTIVES:

- To measure the early Range of movement of the shoulder following "Hydraulic distension under local anaesthesia" pre and post distension.
- To evaluate the pain relief in the frozen shoulder following the hydraulic distension Pre and post-procedure.
- To compare the functional outcome in frozen shoulder Pre and post Distension procedure.

REVIEW OF LITERATURE

REVIEW OF LITERATURE:

Peri arthritis shoulder/ frozen shoulder/ Adhesive capsulitis:

The shoulder is a unique anatomical structure which permits us to interact with our environment with an extraordinary range of motion (ROM). Significant morbidity has been reported with loss of mobility of this joint. Adhesive capsulitis/ Peri arthritis shoulder/frozen shoulder is a poorly understood musculoskeletal disorder that can be disabling.[10] The first recorded description of a frozen shoulder was reported by Duplayin 1872 in his description of a "periarthritis scapulohumeral", though the term frozen shoulder was first used in 1934 by Codman, who described the common symptoms of a gradual onset of pain felt near the insertion of the deltoid muscle, inability to sleep on the afflicted side, and limits both active and passive elevation and external rotation, yet with a normal radiological appearance. It is diagnosed by numerous physical characteristics including a thickening of the synovial capsule, adhesions within the subacromial or subdeltoid bursa, adhesions to the biceps tendon, and/or obliteration of the axillary fold secondary to adhesions.[11]

CLINICAL PHASES:

Adhesive capsulitis presentation is generally broken into three distinct stages. Freezing or painful stage. It is the 1st stage and patients may not show up throughout this phase because they think that gradually the pain will resolve if self-treated. As the symptoms worsen, pain progresses, and both active and passive Range of Movements becomes more restrained, ultimately resulting in the patient taking medical consultation. This phase typically lasts between three and nine months and is characterised by acute synovitis of the glenohumeral joint. Frozen or transitional stage it is the 2nd stage. During this phase, shoulder pain does not compulsarily worsen. Because of pain at end ROM, use of the arm may be restricted, causing muscular disuse. The frozen phase lasts anywhere four to twelve months.

Thawing stage. The 3rd stage begins when the Range of Movements improve. This phase lasts anywhere from twelve to forty-two months and is described by a slow return of shoulder mobility.[12, 13]

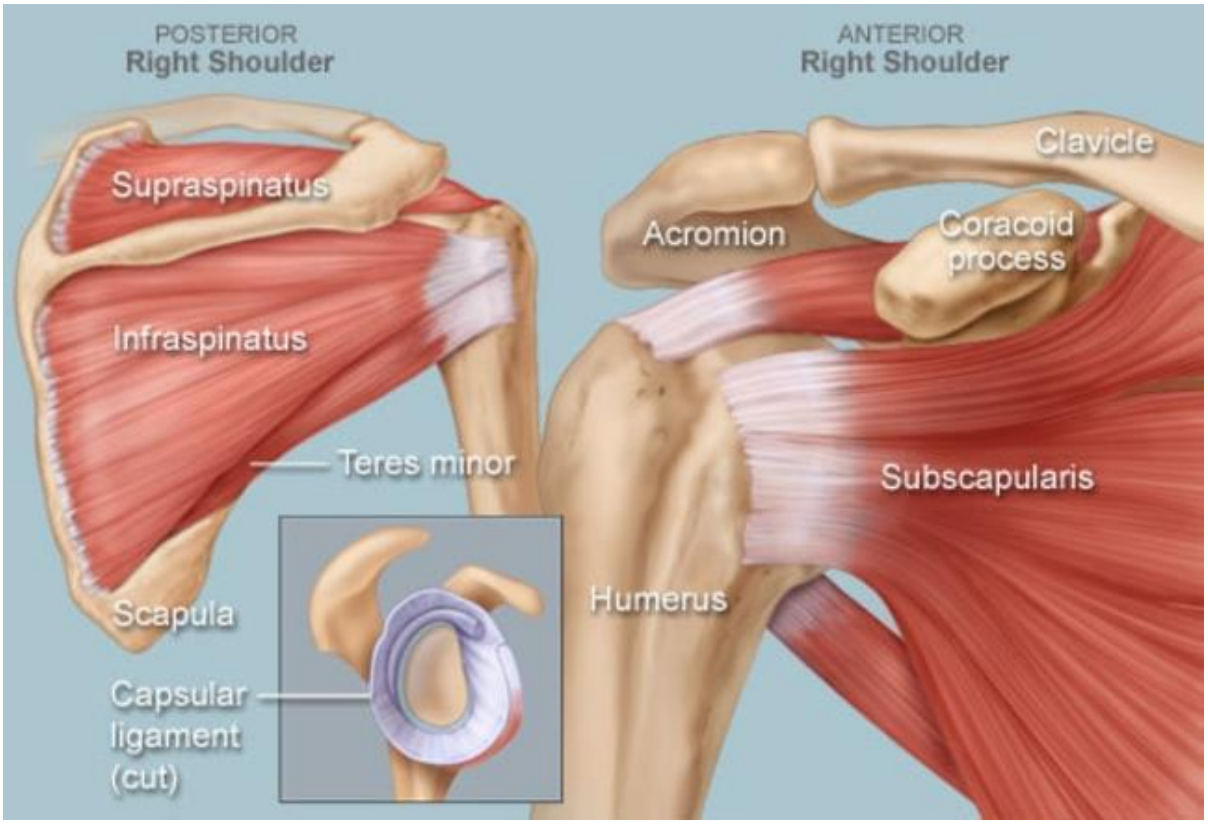
Incidence of 3%-5% in the general population and among the diabetic population, 20% incidence was observed. This disorder is one of the most frequently reported musculoskeletal problems observed in orthopaedics. Although some have defined frozen shoulder as a self-limiting disease that resolves in one to three years, other researchers suggest ranges of between twenty and fifty percent of patients with a frozen shoulder which suffer long-term Range Of Movements deficits that may last up to ten years.[14]

Adhesive capsulitis in typical patients is seen in female gender in her fifth to the seventh decade of life. In general, there is no preference for handedness, and frozen shoulder rarely occurs simultaneously bilaterally.[15] However, some researchers reported that it can occur sequentially bilaterally up to forty to fifty percent of patients.[16] frozen shoulder is generally associated with other systemic and nonsystemic diseases. By far incidence of 10–36% was reported with the most common co-morbid condition, diabetes mellitus.[17]

Adhesive capsulitis significantly results in limb disability and reduction of quality of life. In a study conducted by Bhageri, F et al[18], patients suffering from frozen shoulder demonstrated a high rate of pain and disability as well as low quality of life compared to the normal population. Pain, disability and mental component of quality of life in these patients are more correlated to psychological factors (anxiety and depression) than physical or personal parameter (age, sex,

education, or ROM). Pain and mental component of quality of life were more affected with depression.

Figure 1: Surgical anatomy of shoulder joint



The shoulder joint (or glenohumeral joint from Greek glene, eyeball, + -oid, 'form of', + Latin humerus, shoulder) is structurally classified as a synovial ball and socket joint and functionally as a diarthrosis and multiaxial joint. It involves articulation between the glenoid cavity of the scapula (shoulder blade) and the head of the humerus (upper arm bone).

Due to the very loose joint capsule that gives a limited interface of the humerus and scapula, it is the most mobile joint of the human body. The shoulder joint is a ball and socket joint between the scapula and the humerus. However, the socket of the glenoid cavity of the scapula is itself quite shallow and is made deeper by the addition of the glenoid labrum. The glenoid labrum is a ring of cartilaginous fibre attached to the circumference of the cavity. This ring is continuous with the tendon of the biceps brachii above.

Spaces:

Significant joint spaces are:

- 4–5 mm is the normal glenohumeral space.
- 9–10 mm is the normal subacromial space in shoulder radiographs; men have significantly greater space, with a mild reduction with age. In middle age, a subacromial space less than 6 mm is pathological, and may indicate a rupture of the tendon of the supraspinatus muscle.[19]
- The axillary space is an anatomic space between the associated muscles of the shoulder. The subscapular artery and axillary nerve transmit through this space.

The shoulder joint has a very loose joint capsule known as the articular capsule of the humerus, and this can sometimes allow the shoulder to dislocate. The long head of the biceps brachii muscle travels inside the capsule from its attachment to the supraglenoid tubercle of the scapula. Because the tendon of the long head of the biceps brachii is inside the capsule, it requires a tendon sheath to minimise friction.

Bursa:

Synovial bursae is mase of small fluid-filled sacs located around the capsule to aid mobility:

- Between the joint capsule and the deltoid muscle is the subacromial-subdeltoid bursa.
- Between the capsule and the acromion is the subacromial bursa.
- The subcoracoid bursa is between the capsule and the coracoid process of the scapula.
- The coracobrachial bursa is between the subscapularis muscle and the tendon of the coracobrachialis muscle.
- Middle of the capsule and the tendon of the subscapularis muscle is the subscapular bursa, this is also called as the subtendinous bursa of the scapularis.

The supra-acromial bursa does not normally communicate with the shoulder joint.

Nerve supply:

The nerves supplying the shoulder joint all arise in the brachial plexus. They are suprascapular nerve, axillary nerve, and lateral pectoral nerve.

Blood supply:

Branches of the anterior and posterior circumflex humeral arteries, the suprascapular artery, and the scapular circumflex artery supply the shoulder.

Movements:

- Flexion and extension (sagittal plane).
    - Flexion is carried out by the anterior fibres of the deltoid, pectoralis major, coracobrachialis.
    - Extension is carried out by the latissimus dorsi and posterior fibres of the deltoid.
- Abduction and adduction (frontal plane).
    - Abduction is carried out by the deltoid and the supraspinatus in the first 90 degrees. From ninety to one-eighty degrees, it is the trapezius and the serratus anterior.
    - Adduction is carried out by the pectoralis major, lattisimus dorsi, teres major, and the subscapularis.
- Horizontal abduction and horizontal adduction (transverse plane)
- Medial and lateral rotation (also called as internal and external rotation).
    - Medial rotation is carried out by the anterior fibres of the deltoid, teres major, subscapularis, pectoralis major, lattissimus dorsi.
    - Lateral rotation is carried out by the posterior fibres of the deltoid, infraspinatus and the teres minor.

- Circumduction of the shoulder (a combination of flexion/extension and abduction/adduction).[20]

Common risk factors for Peri arthritis shoulder/frozen shoulder:

Common risk components of adhesive capsulitis include female sex, age over 40 years, preceding trauma, HLA-B27 + vity, and continued immobilisation of the glenohumeral joint. It is estimated that 70% of subjects with adhesive shoulder capsulitis are women.[21] Demographic studies have shown that most of the subjects with adhesive capsulitis (84.4%) fall in between the age range of 40 years to 59 years.[22]

Adhesive capsulitis is associated with diabetes, thyroid disease, cerebrovascular disease, coronary artery disease, autoimmune disease, and Dupuytren's disease.[23] Interestingly, both type I and type II diabetic patients are at increased risk of developing adhesive capsulitis, with the prevalence of 10.3% and 22.4%, respectively. Diabetes mellites patients with frozen shoulder have worse functional outcomes compared to their nondiabetic counterparts.[24] A nationwide population-based study led by Huang, SW et al[25], showed that patients with hyperthyroidism have 1.22 times the risk of developing adhesive capsulitis when compared to the general population. Patients with cerebrovascular disease, especially those surgically treated for subarachnoid haemorrhage, are more susceptible to developing adhesive shoulder capsulitis. Smith, SP et al[26], showed that Dupuytren's disease was found in 52% of patients (30 of 58) with frozen shoulder.

Pathogenesis:

Frozen shoulder has long been regarded as a primarily fibrotic disorder similar to Dupuytren's disease because the histology of affected specimens primarily show fibroblasts mixed with type I and type III collagen.[27] These fibroblasts were observed to transform into smooth muscle phenotype (myofibroblasts), which is assumed to be responsible for capsular contracture. There are altered levels of matrix metalloproteinases (MMPs), which are involved in scar tissue remodeling. For example, MMP-14 is expressed in control patients but not at all in patients with frozen shoulder. MMP-14 is an activator of MMP-2, involved in collagen degradation, and this may result in excessive collagen production compared to breakdown. Expression of MMP-1 and MMP-2 is decreased in patients with frozen shoulder; at the same time, expression of tissue inhibitor of metalloproteinases (TIMPs) such as TIMP-1 and TIMP-2 is elevated. These reports support the idea that frozen shoulder is the result of an imbalance between extracellular matrix tissue degradation, remodeling and regeneration. Future therapy may directly inhibit fibrogenesis or promote remodeling of fibrotic tissue.[28]

In general, it is accepted that the development of a frozen shoulder involves an inflammatory as well as the fibrotic process. Corroborating this are studies demonstrating elevated inflammatory cytokines including interleukin (IL)-1α, IL-1β, tumour necrosis factor (TNF)-α, cyclooxygenase (COX)-1 and COX-2 in capsular and bursal tissues of subjects with adhesive capsulitis compared to controls.[29] frozen shoulder contain inflammatory cells, including T cells, B cells, macrophages and mast cells. Mast cells help to control fibroblast proliferation in vivo and may act as an intermediary between the inflammatory and subsequent fibrotic processes.[30]

Recent studies have sought to link molecular pathogenesis with known risk factors and genetic susceptibility for frozen shoulder. Cytogenetic analysis study has revealed elevated fibrogenic (MMP-3) and inflammatory cytokines (IL-6) in subjects with frozen shoulder. Ling, Y et al[31], found that specific single-peptide polymorphisms (SNP) of IL-6 (rs1800796 SNP) and MMP-3 (rs650108 SNP) are associated with severity and susceptibility of shoulder stiffness following rotator cuff repair, demonstrating a genetic predisposition for secondary adhesive capsulitis.

Kim, YS et al[32], reported that intercellular adhesion molecule-1 (ICAM-1), a transmembrane protein on endothelial cells and leukocytes that facilitate leukocyte endothelial transmigration, is increased in capsular tissue, synovial fluid, and serum of patients with adhesive capsulitis. Interestingly, the ICAM-1 level is also increased in hyperglycemic patients. This observation provides a potential molecular link between the two conditions. Raykha, CN et al[33], reported elevated expression of IGF-2 and β-catenin in Dupuytren's disease and adhesive capsulitis. One key growth factor involved in the frozen shoulder is TGF-β. This suggests concluded that both neoangiogenesis and neoinnervation occur in frozen shoulder, and the latter process may explain why adhesive capsulitis is unbearably painful.

Shaffer's criteria for diagnosing Frozen shoulder:

Shaffer, B et al[14], diagnosis of frozen shoulders, included

(1) At least a 1-month history of pain and stiffness of the shoulder.

(2) Limitation of both passive and active glenohumeral and scapulothoracic motion of equal to or less than 100 degrees of elevation, and less than 50% of external rotation, as compared to the contralateral side.

(3) The intra-operative characteristic feeling of tissue breakdown during manipulation. All patients were initially managed conservatively with medications, and stretching techniques, with manipulation, started after three months if pain and lost of motion were reported.

Role of different imaging methods:

There is no definitive gold standard test to diagnose adhesive capsulitis and diagnosis is based upon; (i) Clinical examination,

(ii) Exclusion of other pathologies and

(iii) Normal glenohumeral radiographs.[34]

Plain films of the shoulder may reveal osteopenia in patients with prolonged adhesive capsulitis secondary to disuse (i.e. disuse osteopenia). Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) may reveal thickening of capsular and pericapsular tissues as well as a contracted glenohumeral joint space.[35] Magnetic resonance imaging (MRI) can depict the thickening of the joint capsule, especially in the axillary region, and coracohumeral ligament.[36] MR arthrography may show shrinkage of the subcoracoid fat triangle, resulting from shortening or fibrosis of the rotator interval capsule. Alteration of the synovium is also shown by dynamic MRI enhanced with intravenous gadolinium administration.[37]

Mengiardi, B et al[38], reported that MRA findings of coracohumeral ligament (CHL) ligament thickness ≥ 4 mm (95% specificity, 59% sensitivity) or capsule thickness ≥ 7 mm (86% specificity, 64% sensitivity) may help in the diagnosis of adhesive capsulitis. Dynamic sonography may show thickening of the capsule joint and limited sliding movement of the supraspinatus tendon. These findings correlate with intraoperative direct visualization, documenting thickening of primarily the rotator interval and CHL.[39]

Interventions to treat Peri arthritis shoulder/frozen shoulder:

CONSERVATIVE METHODS:

Patient education:

Frozen shoulder is a very painful condition in which patient education is crucial for success as it has a very slow progression of resolution. It is mandatory to inform the patient about the phases, course, and duration of the condition, usually aids in pacifying frustration. Apprehension, feeling of urgency for functional return may be lowered.

Physiotherapy:

Conventionally, this encompasses the use of weighted pendulum stretching followed by passive stretching exercises, which targets to stretch the lining of the glenohumeral joint. Dierks, RL et al[40], conducted a prospective study of 77 patients that compared exercise within the limits of pain with intensive physiotherapy in subjects with idiopathic adhesive capsulitis. In this study, they found that exercise performed within the limits of pain (64% reached near normal, painless shoulder movements at 12 months and 89% at 24 months) yielded better results than that with intensive physiotherapy (63% achieved a similar result at 24 months).

Nonsteroidal anti-inflammatory drugs (NSAIDs):

As the pathology behind this condition is inflammatory, it would make sense to reduce the symptoms by administering anti-inflammatory drugs. To relieve symptoms, NSAIDs may be used during any stage as an attempt. This, together with physiotherapy, is the mainstay of treatment for frozen shoulder.[41]

Corticosteroids:

Studies have shown that adding steroids to the usual NSAID and physiotherapy regime results in a betterment of pain relief; however, generally, the relief does not extend beyond six weeks. Corticosteroids can be administered via injection or orally. Widiastuti-Samekto, M et al[42], in their study, reported that intra-articular corticosteroid injection provides faster improvement compared to the oral route.

Electrical stimulation:

Electroacupuncture or interferential electrotherapy, in combination with shoulder exercises, is useful in treating patients with frozen shoulder.

SURGICAL METHODS:

Shoulder manipulation:

In general, if severe stiffness persists, gentle manipulation of the shoulder while administering a general anaesthetic may improve shoulder function and motion. This allows the return of Range of Movements in the operating room. Manipulation under anesthesia has the limitation on waking up from anaesthesia the tissues that are stretched while the patient is under anaesthesia may cause pain. Furthermore, Loew, M et al[43], have observed iatrogenic intra-articular lesions following this procedure, which included bleeding, capsule rupture, tendon and ligament tears, and osteochondral defects.

Hydrodilation:

Hydrodilation, otherwise known as distention arthrography or brisement, describes a process in which capsular distention is achieved by injection of air or fluid under fluoroscopy and local anesthetic to stretch the contracted capsule and thereby increasing the intracapsular volume.[44] The hydrodilation procedure, as proposed by fareed, DO et al[9], is as follows. The patient is made to sit in a supine position, and the anterior shoulder is prepped. The affected humerus is externally rotated as tolerated. Joint space is entered by palpating the glenohumeral crease to identify a subcoracoid window. 1% lidocaine is used to anesthetize the skin. The 18-gauge 1.5-inch needle is used to enter the joint space angling slightly medially and superiorly, pointing toward the presumptive center of the glenoid fossa. Approximately 5 ml of 1% lidocaine is injected once the joint space is entered. Joint space entry is ensured by minimal plunger resistance during this injection. More plunger resistance may be encountered, with a severely contracted joint capsule. Injection of 1ml of triamcinolone (40 mg) is given. Using 10-ml increment syringes, up to 40 ml of sterile, chilled saline are forcibly injected into the joint space. When syringes are changed, Clear fluid efflux from the needle is usually seen. Capsular distension or rupture is indicated when the sensation of reduced resistance to injection during saline injection is noticed.

In a level II RCT by Quraishi, NA et al[45], an improved Constant score and visual analogue scale (VAS) pain score was observed in the distention group compared to the manipulation under anesthesia (MUA) plus intra-articular triamcinolone group.

A systematic review conducted by Buchbinder, R et al[46], included five clinical trials, it was concluded that capsular distention with steroid and saline may improve pain at 3 weeks and disability at up to 12 weeks and that short-term benefits with regard to pain, range of movement and function can be achieved with arthrographic distension using saline and steroids.

Arthroscopic selective capsular release:

Adhesive capsulitis can be treated with an excellent additional tool called Arthroscopy. The contracted structures in the shoulder are released to allow Range of Movements to return with manipulation if necessary. Arthroscopy allows a full assessment of the shoulder anatomy as well. Any abnormalities that have not been detected and that may have added to the development of the disease can be diagnosed. This may make postoperative Range Of Movements less painful and decreased recovery time.[47] Ogilvie-Harris, DJ et al[48], conducted a study on seventeen diabetic patients with adhesive capsulitis who failed to respond to conservative management, for which arthroscopic release was performed. At the 1–5-year follow-up, the patients showed relatively significant improvement in external rotation, abduction, pain and function. Pearsall, AW et al[49], reviewed and treated forty-three patients with a diagnosis of primary or secondary frozen shoulder who had symptoms for an average of 1 year and who failed conservative treatment of at least 12 weeks of physical therapy. Following the arthroscopic capsular release, all the patients showed a significantly decreased shoulder pain and improvement in shoulder range of motion.

Frozen shoulder, treatment of choice is almost in line with other conditions, which is conservative initially, but may eventually require more invasive methods depending on the expectations, functional demands, and comorbidities of the patient. The indication for surgical treatment should be a genuine failure of conservative treatment and not noncompliance.

Review of literature:

Jacob, LG et al[3], conducted a prospective randomised study comparing the results, of 2 groups of subjects treated either by manipulation under anaesthetic or by intra-articular shoulder injections using steroid with distension. 53 patients suffering from Idiopathic "Primary" Frozen Shoulder were prospectively randomized into two treatment groups and monitored for 2 years from the start of treatment. Patients were assessed using the Constant score, a Visual Analogue Score, and the SF36 questionnaire. They found no statistical differences between the 2 groups of patients with regards to the outcome measures. They concluded that treatment using steroid injections with distension is suggested for the treatment of Idiopathic "Primary" adhesive capsulitis. This has the same clinical result as manipulation under anaesthetic with less attendant risks.

Wu, WT et al[50], conducted a study on treatment of frozen shoulder exploring the effectiveness of glenohumeral joint distension. They searched electronic data sources, including PubMed, Scopus, and Embase from the earliest records available to February 2017. 11 randomized controlled trials, including at least one pair of comparisons between hydrodilation and a reference treatment, were included, comprising 747 participants. Patients' characteristics, details of reference treatments, aspects of capsular distension therapy, and outcome measurement were evaluated at three points in time: baseline, early following intervention, and at the trial's end. The superiority of capsular distension to reference treatments was not identified. External rotation limitation showed a probable early positive response to capsular distension when compared to intra-articular corticosteroid injection. Aspects of approaches, imaging guiding techniques and doses of distension were not found to modify treatment effectiveness. A single dose of a corticosteroid-contained regimen introduced through the

ultrasound-guided posterior approach is a preferable practice of hydrodilation for the management of frozen shoulder.

Buchbinder, R et al[46], conducted a placebo-controlled RCT on participants with a painful, stiff shoulder. Hydodilation with a mixture of saline and steroid was compared with a placebo (arthrogram). Outcome measures, assessed at 3, 6, and 12 weeks, included a shoulder-specific disability measure (SPADI), a patient preference measure (Problem Elicitation Technique (PET)), pain, and ROM. 48 participants were recruited. At three weeks, significantly increased improvement in SPADI ($p = 0.005$), PET, overall pain, active total shoulder abduction, and hand behind the back was found in participants in the hydrodilation and steroid group than in the placebo group. At six weeks, the results of the intention to treat analysis favoured joint distension, although the between-group differences were only significant for improvement in PET (difference in mean change in PET between groups = 45.9 (95% CI 3.2 to 88.7). At 12 weeks, both the intention to treat analysis demonstrated a significantly greater improvement in PET score for the distension group. Short term efficacy of Arthrographic distension with normal saline and corticosteroid over placebo was demonstrated in subjects with a stiff, painful shoulder.

Tvieta, EK et al[51], conducted a randomised trial, comparing hydrodilatation procedure, including corticosteroids, with the injection of corticosteroids without dilatation. 76 patients were included, and groups were compared six weeks after treatment. The study was designed as an open trial. In this Patients were given three injections with two-week intervals, and all injections were given under fluoroscopic guidance. Outcome measures were the Shoulder Pain and Disability Index (SPADI) and measures of active and passive range of motion. The groups showed a rather similar degree of improvement from baseline. According to multiple regression

analysis, the effect of dilatation was a mean improvement of 3 points (confidence interval: -5 to 11) on the SPADI 0–100 scale. This study did not identify any important treatment effects resulting from three hydrodilatations that included steroid compared with three steroid injections alone.

Vastamaki, H et al[52], conducted a retrospective study to determine the length of symptoms, whether spontaneous frozen shoulder recovered without any treatment or whether restored ROM, pain relief, and function persisted over the long term. They reviewed 83 patients treated for frozen shoulder for 2 to 27 years (mean, 9 years) after the initial consultation. 51 of the 83 patients (52 shoulders) were treated with observation (untreated group), and 32 had received some kind of nonoperative treatment. 20 patients (22 shoulders; 13 women) underwent manipulation under anesthesia during the same time. The minimum follow-up was 2 years (mean, 14 years; range, 2–24 years). The duration of the disease averaged 15 months (range, 4–36 months) in the untreated group and 20 months (range, 6–60 months) in the nonoperative group. At last follow-up, the ROM had improved to the contralateral level in 94% in the untreated group, in 91% in the nonoperative group, and in 91% in the manipulation group. Fifty-one percent of patients in the untreated group, 44% in the nonoperative group, and 30% in the manipulation group were totally pain-free at rest, during the night, and with exertion. Pain at rest was less than 3 on the VAS in 94% of patients in the untreated group, 91% in the nonoperative group, and 90% of the manipulation group. The Constant-Murley scores averaged 83 (86%) in the untreated group, 81 (77%) in the nonoperative group, and 82 (71%) in the manipulation group, reaching the normal age- and gender-related Constant-Murley score. They concluded that 94% of patients with spontaneous frozen shoulder recovered to normal levels of function and motion without treatment.

Kim, K et al[53], compared the short-term effects of intraarticular hydraulic distension (IHD) when the capsule was preserved versus when it was ruptured. 54 patients with a painful, stiff shoulder underwent IHDs intended to preserve or rupture the capsule and then classified into capsule-ruptured (n ¼ 26) and capsule-preserved (n ¼ 20) groups, based on the obtained PV profiles. Clinical outcomes were evaluated at 3-day and 1-month follow-ups, in terms of pain and range of motion (ROM). Although both groups showed a significant increase in ROM and a decrease in pain after IHD, the improvements were greater in the capsule-preserved group than in the ruptured group at both follow-up times. In conclusion, the therapeutic effects of IHD in short-term follow-ups were enhanced by preserving the capsule.

Bhageri, F et al[18], assessed pain, disability, the quality of life, and factors associated with them in patients suffering from frozen shoulder. 120 patients (37 men and 83 women) with phase-II idiopathic frozen shoulder were enrolled in our cross-sectional study. Demographic data were collected, and the shoulder range of motion was measured in four different directions (elevation, abduction, external and internal rotation) in both upper limbs. Patients were asked to fill out the Visual Analog Scale for pain (VAS) and Short-Form Health Survey questionnaire (SF-36) as well as Disabilities of the Arm, Shoulder and Hand (DASH) questionnaires. We asked the patients to fill out the Hamilton anxiety and depression questionnaires. The mean of VAS pain, DASH, PCS, and MCS scores were 69(18), 53(17), 35(8.0), and 42(10), respectively. All the domains of SF36 questionnaires were below the normal population except physical function. VAS pain score was correlated to Hamilton depression scores in both bivariate and multivariable analysis. DASH score was correlated to sex, age, ROM, and both Hamilton anxiety and depression scores. They concluded that Patients with frozen shoulder are more suffering from pain and disability secondary to psychiatric parameters such as depression and anxiety than demographic features or even restriction of range of motion.

Quraishi, NA et al[45], prospectively evaluated the outcome of manipulation under anaesthesia and hydrodilatation as treatments for adhesive capsulitis. A total of 36 patients (38 shoulders) were randomised to receive either method. The mean age of the patients was 55.2 years (44 to 70), and the mean duration of symptoms was 33.7 weeks (12 to 76). Eighteen shoulders (17 patients) underwent manipulation under anaesthesia, and 20 (19 patients) had hydrodilatation. The mean visual analogue score in the manipulation under anaesthesia group was 5.7 (3 to 8.5; n = 18) before treatment, 4.7 (0 to 8.5; n = 16) at two months (paired t-test p = 0.02), and 2.7 (0 to 9; n = 16) at six months (paired t-test, p = 0.0006). The mean score in the hydrodilatation group was 6.1 (4 to 10; n = 20) before treatment, 2.4 (0 to 8; n = 18) at two months (paired t-test, p = 0.001), and 1.7 (0 to 7; n = 18) at six months (paired t-test, p = 0.0006). The visual analogue scores in the hydrodilatation group were significantly better than in the manipulation under anaesthesia group over the six-month follow-up period ($p < 0.0001$). The range of movement improved in all patients over the six months but was not significantly different between the groups. At the final follow-up, 94% of patients (17 of 18) were satisfied or very satisfied after hydrodilatation compared with 81% (13 of 16) of those receiving a manipulation. They concluded that patients undergoing hydrodilatation did better than those who were manipulated.

Bell, S et al[54], aimed to research the benefit of hydraulic arthrographic capsular distension (hydrodilatation) in the management of adhesive capsulitis of the shoulder. 109 patients with primary adhesive capsulitis were treated with hydrodilatation. In the 109 shoulders, the measured range of passive glenohumeral movement improved by approximately 30° in all directions. The procedure was of similar benefit if carried out early or late in the disease process. The absolute improvement in movement range was similar in severe and mild cases. The severe cases in the long term, although improved, still had more restriction in movement and tended

to have more pain than the other cases. There was a considerable improvement in all the non-diabetic patients. The patients with diabetes responded less well in the long term to hydrodilatation and had an increased requirement for arthroscopic surgery. They concluded that effective treatment of adhesive capsulitis can be achieved in the majority of cases with an immediate hydrodilatation of the shoulder.

Callinan, N et al[55], retrospectively reviewed to evaluate the effectiveness of a hydraulic distention technique (hydroplasty) combined with a therapy program for the treatment of the idiopathic frozen shoulder. Over a two-year period, 60 patients with idiopathic frozen shoulder were identified as having undergone the hydroplasty procedure and therapy protocol. Distention of the glenohumeral joint was achieved by an injection of a 10-mL combination of bupivacaine (Marcaine), lidocaine (Xylocaine), and corticosteroid followed by injection of 30 mL of chilled sterile normal saline. Therapy was initiated immediately after the surgeon had completed the hydroplasty. The mean active range of motion improvement was as follows: flexion 28 degrees, abduction 42 degrees, internal rotation 22 degrees, and external rotation 26 degrees. There was no significant difference in outcomes between diabetics and nondiabetics or subjects with symptoms less than six months' duration compared with subjects with symptom duration greater than six months. They concluded that the hydroplasty procedure combined with a therapy program is a successful treatment for idiopathic frozen shoulder.

Mulcahy, KA et al[56], assessed 51 patients, with “frozen shoulder”, and were referred for arthrographic examination, both before and after distension arthrography, using air and a low-osmolar contrast media combined with a steroid and local anaesthetic injection. 38 attended for further assessment at up to 6 months later. 16 patients were found to have a rotator cuff tear. There was no significant change in the mean range of active movement in the patients with

rotator cuff tears, but symptomatic improvement ensued in 44% of cases. In those found to have no rotator cuff tear, and external rotation of less than 35°, a significant improvement in range of movement was seen. They concluded that shoulder distension arthrography, with steroid and local anaesthetic injection, maybe of symptomatic benefit in patients with frozen shoulder and without a rotator cuff tear, while only those with external rotation of less than 35° are likely to improve their range of motion.

Rizk, TE et al[57], investigated the mechanism of action and the long-term clinical result of distention arthrography for the treatment of patients with frozen shoulder. 16 patients with adhesive capsulitis of the shoulder were treated with therapeutic capsular distention by using an intra-articular injection of a 30-mL mixture of lidocaine, corticosteroid, and contrast media immediately following diagnostic arthrography. Capsular disruption was demonstrated in all cases. Thirteen patients (80%) experienced immediate pain relief and increased shoulder mobility. This improvement was maintained over a follow-up interval of 6 months or more. Disruption occurred at the subscapular bursa in eight patients, the subacromial bursa in six, and the distal bicipital tendon sheath in two. These latter two patients had no pain relief. Arthrographic distention of the constricted capsule appears to be an excellent therapeutic intervention for achieving rapid symptomatic relief from adhesive capsulitis.

Robinson, CM et al[58], wrote a review on the frozen shoulder that is commonly encountered in general orthopaedic practice. It may arise spontaneously without an obvious predisposing cause, or be associated with a variety of local or systemic disorders. Diagnosis is based upon the recognition of the characteristic features of the pain, and selective limitation of passive external rotation. The macroscopic and histological features of the capsular contracture are well-defined, but the underlying pathological processes remain poorly understood. It may cause

protracted disability and imposes a considerable burden on health service resources. Most patients are still managed by physiotherapy in primary care, and only the more refractory cases are referred for specialist intervention. Targeted therapy is not possible, and treatment remains predominantly symptomatic. However, over the last ten years, more active interventions that may shorten the clinical course, such as capsular distension arthrography and arthroscopic capsular release, have become more popular.

Smith, CD et al[59], conducted a prospective study to assess the immediate and long-term effectiveness of arthroscopic capsular release in a large cohort of patients with stage II idiopathic frozen shoulder. 136 patients with a stage II arthroscopically confirmed idiopathic frozen shoulder were included in the study. At each postoperative attendance, a record was made of pain, function, and range of motion. At 12 months, the Oxford shoulder score was calculated, and pain and range of motion were assessed. 51% achieved good pain relief within a week and 80 % within six weeks of arthroscopic capsular release. The mean preoperative visual analogue scale pain score was 6.6, and the mean postoperative score was 1.0. The mean time to achieving good pain relief was 16 days following surgery. No patient could sleep through the night prior to surgery, while 90% reported having a complete night's sleep at a mean of 12 days after surgery. The mean postoperative Oxford shoulder score was 38/48, and the mean improvement was 19.2. They concluded that arthroscopic capsular release is a safe procedure, with rapid improvement in pain and a marked improvement in range of motion.
[The Oxford Shoulder Score (OSS) is a 12-item patient-reported PRO specifically designed and developed for assessing outcomes of shoulder surgery e.g. for assessing the impact on patients' quality of life of degenerative conditions such as arthritis and rotator cuff problems.]

Gam, AN et al[60], compared the treatments of idiopathic 'Frozen Shoulder' (adhesive capsulitis), distension combined with steroid is compared with steroid alone. The evaluation was based on pain scales, analgesic usage, and range of motion outcome scales. 26 patients fulfilled the criteria for inclusion in the study and were randomized by the envelope method. Eight were treated with steroid alone and 12 with distension combined with a steroid. Patients received one treatment per week for a six weeks period with a follow-up at 12 weeks. They were evaluated by pain VAS on function, and at rest within the study period, the different ranges of motion (ROM) were measured at inclusion time and subsequent afterwards at 3, 6, and 12 weeks. The VAS outcomes showed no difference between the treatments (VAS-function p=0,1; VAS-rest p=0.1), while in the distension group ROM showed significant improvement in all directions except extension (external p=0.0007, flexion p=0.03, extension p=0,01). A blinded clinical assessment of ROM also showed significant improvement (p=0.002). They concluded that distension with steroid can seem to help in the management of 'Frozen Shoulder'.

Indian studies:

Vad, VD et al[61], conducted a prospective study to explore the efficacy of capsular distension in the treatment of adhesive capsulitis of the shoulder joint. 21 patients (18 women, 4 men; mean age, 41.3y; range, 29–54y) with adhesive capsulitis of shoulder joint. Nineteen patients had Hannafin stage II, and 3 patients had Hannafin stage III adhesive capsulitis. All patients had continuous pain and a significant range of motion (ROM). L'Insalata Shoulder Rating Questionnaire (LSRQ) score and Hannafin ROM assessment protocol were administered. In the 19 patients with stage II adhesive capsulitis, the mean LSRQ score and range of abduction improved from predistention values of 49.8° and 87.2° to postdistension mean values of 88.1° and 117.6° at a minimum of 1-year postdistention, respectively (P<.05). However, in the 3 patients with stage III adhesive capsulitis, the mean LSRQ score and range of abduction

changed from predistention values of 41.2°, and 84.1° to postdistension mean values of 57.8° and 90.4° at a minimum of 1-year postdistention, respectively (P>.05). They conclude that the treatment modality should be individualised on the basis of the stage of the adhesive capsulitis, and the distension procedure should be reserved for patients in stage II who do not progress despite participating in a PT program.

Khan, AA et al[62], conducted an open randomised controlled trial to compare the painful limitation of movement of shoulder to receive physical therapies alone versus shoulder arthrography with intra-articular steroid. The outcome at 8 weeks was compared in the treatment of 'Frozen shoulder'. Clinical cases within a sequential randomisation process. Physical Therapies provided to all patients were therapeutic exercises, transcutaneous electrical nerve stimulation (TENS) and infra-red radiation (IRR). Outcome measures were the improvement of pain on a Visual Analogue Scale (VAS) score and range of motion measured by Goniometer at 8 weeks. They found the baseline range of motion in the two groups was comparable. At 8 weeks, a statistically significant difference in outcome were observed in the two groups. The chi-square means the difference of improvement in range of motion for the abduction was p <0.00 and for external rotation was p <0. 00. The pain reduction on VAS score was not significant in the two groups (p <0. 40). They concluded that the distension arthrography with intra-articular (IA) steroid plus physical therapy was superior over physical therapy alone in the functional improvement of the frozen shoulder.

Singh, GP et al[63], conducted a prospective, observational study to compare the result of treatment of frozen shoulder by Hydraulic Distention under local anesthesia with steroid and intra articular steroid alone. 60 patients were taken in this study and were divided into two groups. Group I was treated by hydraulic distention of glenohumeral joint with 50ml normal

saline with steroid, oral medicines (analgesics and muscle relaxants) and exercises. Patients in group II were treated by intra-articular steroid followed by oral medicines (analgesics and muscle relaxants) and exercises. All patients in group 1 noted immediate pain relief with an excellent return of range of motion (ROM) and resumption of normal sleep. At the end of 45 days of follow up, all patients had returned to their normal daily activities. All patients in group II noted immediate pain relief and resumption of almost normal sleep. At the end of 45 days of follow up, most of the patient presented with good relief of pain but could not return to most of their normal activities because of less improvement in ROM. They concluded that Hydraulic distension technique is quick, safe and gives early results, so it should be considered first for the treatment of the frozen shoulder.

Mishra, AN et al[64], aim to evaluate clinical evaluation of the outcome of treatment of frozen shoulder by hydraulic distension under local anesthesia with steroid. A rapid, immediate result and cost-effectiveness of hydraulic distension technique was also evaluated is this study. There were 22 shoulders with good results after distension and 26 good results at follow up. In total there were 19 shoulders with excellent results at follow up, as compared to 2 shoulders with excellent results after distension. Patients who had detiorated revealed that they had failed to do regular prescribed home exercises. In contrast, patients who had gained excellent results had their regular home exercises as prescribed to them. They concluded that hydraulic distension is a safe, reliable, cost-effective modality in treating the chronically distressing painful condition of frozen shoulder.

Shah, MA et al[65], conducted a Prospective, Randomized trial to evaluate and compare the outcome of Manipulation under anesthesia (MUA) and Hydraulic distension for frozen shoulder and to see which treatment option is superior in terms of early pain relief and improved range of motion (ROM). A total of 36 patients were randomised to receive either method. Group A included 16 patients who underwent manipulation under anesthesia. Group B consisted of 20 patients who had hydraulic distension. The patients received supervised physiotherapy after both procedures. Both the groups were then compared regarding early pain relief and range of motion. Regarding pain relief in Group A, 9 out of 16 patients reported no pain within 1 week, whereas in Group B, 17 out of 20 patients were pain-free within the first week of procedure. Regarding active ROM, during the first week in Group A, 10 patients had "excellent" while 6 patients showed "good" results. In Group B, 18 patients had "excellent" and 2 patients "good" results. They concluded that Hydraulic distension gave better results in terms of early pain relief and improved ROM.

LACUNAE OF LITERATURE:

Despite its first description by Andren and Lundbergmore than 3 decades ago, the literature on the use of hydrodilation to treat ftrozen shoulder is sparse and lacks consensus. A combination of pharmacological, rehabilitative, and/or surgical treatment is commonly helpful for the patient afflicted with frozen shoulder. So the present study was conducted to identify the early Range of movement and pain relief of shoulder following “Hydraulic distension under local anaesthesia” pre and post distension.

MATERIALS & METHODS

MATERIALS & METHODS:

Study site: This study was conducted in the department of orthopaedics at RLJ hospital attached to Sri Devaraj Urs Medical College.

Study population: 50 patients of age above 30 years presenting to RLJ hospital attached to Sri Devaraj Urs Medical College with complaints of the frozen shoulder were considered as the study population.

Study design: The current study was a prospective observational study

Sample size:

Sample size was calculated assuming the proportion of excellent outcome as 38% as per the study by Manoj, KR **e**t al.[66] The other parameters considered for sample size calculation were 15% absolute precision and 95% confidence level. An infinite population correction was applied. The following formula was used for sample size calculation.[67]

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where *n* = Sample size

Z= Z statistic for a level of confidence,

P = Expected prevalence of proportion

(If the expected prevalence is 38%, then *P*= 0.38), and

d = Precision (If the precision is 15%, then *d*=0.15).

The required number of subjects as per the above-mentioned calculation was 41. To account for a non-participation rate of about 25% (8 subjects), it was decided to sample about 49 (50) subjects in to the study.

Sampling method: All the eligible subjects were recruited into the study consecutively by convenient sampling till the sample size is reached.

Study duration: The data collection for the study was done between June 2018 to November 2019 for a period of 1.5 years.

Inclusion Criteria:

- All the Patients with Peri arthritis shoulder. (Shaffer's criteria)
- Patients age above 30 years.

Exclusion criteria:

- Massive Rotator cuff tears
- Shoulder instability
- Neurological disorders affecting the shoulder.
- Previous history of any treatment.
- Local skin lesions.

Ethical considerations: Study was approved by institutional human ethics committee. Informed written consent was obtained from all the study participants and only those participants willing to sign the informed consent were included in the study. The risks and benefits involved in the study and the voluntary nature of participation were explained to the participants before obtaining consent. Confidentiality of the study participants was maintained.

Data collection tools: All the relevant parameters were documented in a structured study proforma.

Methodology: After obtaining informed consent from the patients who agree to be part of the study. Demographic data, History, Clinical Examination and details of investigations were recorded in study proforma and then were taken for the procedure. Patients were followed up at 3 weeks, 6 weeks and 12 weeks after procedure. The pain and functional scoring used as per "The society of American Shoulder and elbow surgeons".

Basic investigations

- Hb %, Total WBC count, Differential count, ESR, BT, CT.
- HbA1c, FBS, PPBS, RBS.
- HIV, HBsAg status.

- The study requires 1% lignocaine, Inj. Kennecott, infiltrating Normal fluid saline.
- Ultrasound was done if necessary in doubtful cases of extravasation of fluid into the pericapsular area.
- This procedure was practised in many other centres, hence this study was conducted on the population in and around Kolar.

Procedure:

All the patients were got intraarticular Hydraulic distension with Normal saline. The surgeon had injected a single dose of 30-40 ml of the Normal saline or upto the ease of resistance felt during infiltration, along with steroid into the intraarticular area of the shoulder in an aseptic technique. Posterior Approach was used. 2 cm below the angle of the acromion and 2 cm medial to it (Mike walton). The needle is directed anteriorly and medially towards the coracoid process. 2 to 3 cm depth was reached with a 20-gauge needle. Mean joint depth would be 43.5 mm at posterior and 27.1 mm at the anterior side. X rays, Ultrasound was done if necessary in doubtful cases of extravasation of fluid into the pericapsular area.

Pendulum and range of movement exercise at home are advised for all the patients. Findings were recorded, and outcomes were measured before the injection and during each follow-up.

Statistical Methods:

Pain, range of motion, ASES score were considered as primary outcome variables. Flexion, Abduction, internal rotation and external rotation were considered as Primary explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Non normally distributed quantitative variables were summarized by median and interquartile range (IQR). Data was also represented using appropriate diagrams like bar diagram, pie diagram.

All Quantitative variables were checked for normal distribution within each category of explanatory variable by using visual inspection of histograms and normality Q-Q plots. Shapiro- wilk test was also conducted to assess normal distribution. Shapiro wilk test p value of >0.05 was considered as a normal distribution.

The change in the quantitative parameters, before and after the intervention was assessed one-way repeated measures ANOVA (In case of comparison across more than 2 time periods).

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.[68]

OBSERVATIONS AND RESULTS

RESULT:

A total of 50 subjects were included in the final analysis.

Table 1: Descriptive analysis of age in study population (N=50)

Parameter	Mean ± SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Age	52.68 ± 9.79	50.50	30.00	80.00	49.90	55.46

The mean age was 52.68 ± 9.79 in the study population, ranged between 30 years to 80 years (95% CI 49.90 to 55.46). (Table 1)

Table 2: Descriptive analysis of age group in the study population (N=50)

Age Group	Frequency	Percentages
30 to 39	3	6.00%
40 to 49	18	36.00%
50 to 59	15	30.00%
60 to 69	12	24.00%
≥70	2	4.00%

Among the study population, 3(6%) participants were aged between 30 to 39 years, 18 (36%) were aged between 40 to 49 years, 15 (30%) were aged between 50 to 59 years, 12 (24%) were aged between 60 to 69 years and 2 (4%) participants were aged ≥70 years. (Table 2 & Figure 2)

Figure 2: Bar chart of the age group in the study population (N=50)

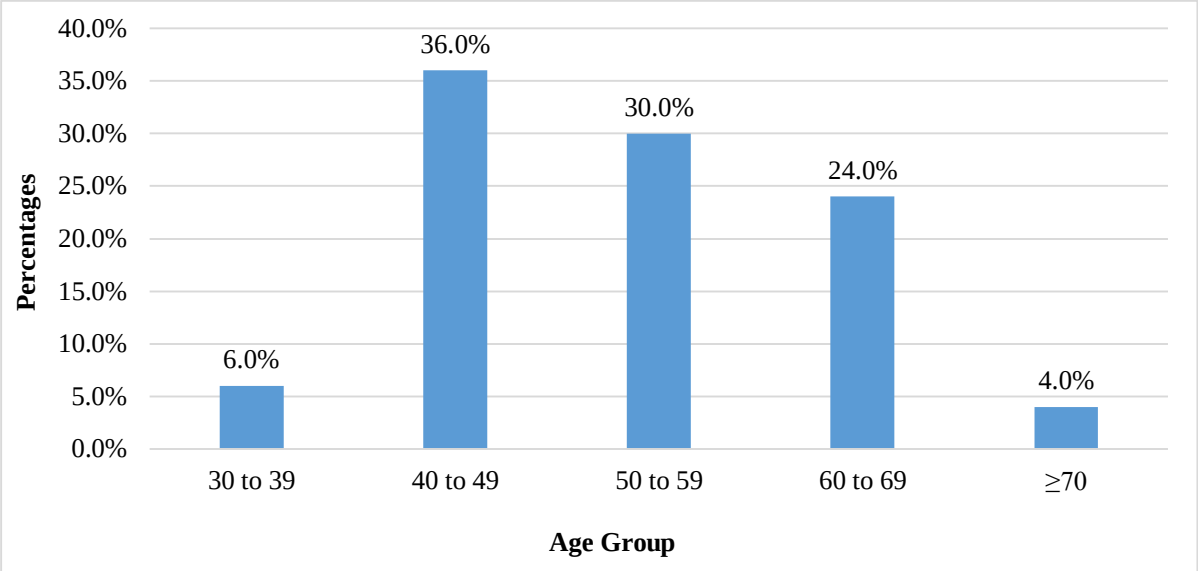


Table 3: Descriptive analysis of gender in the study population (N=50)

Gender	Frequency	Percentages
Male	36	72.0%
Female	14	28.0%

Among the study population, 36 (72%) were participants male and remaining 14 (28%) participants were female. (Table 3 & Figure 3)

Figure 3: Pie chart of gender in the study population (N=50)

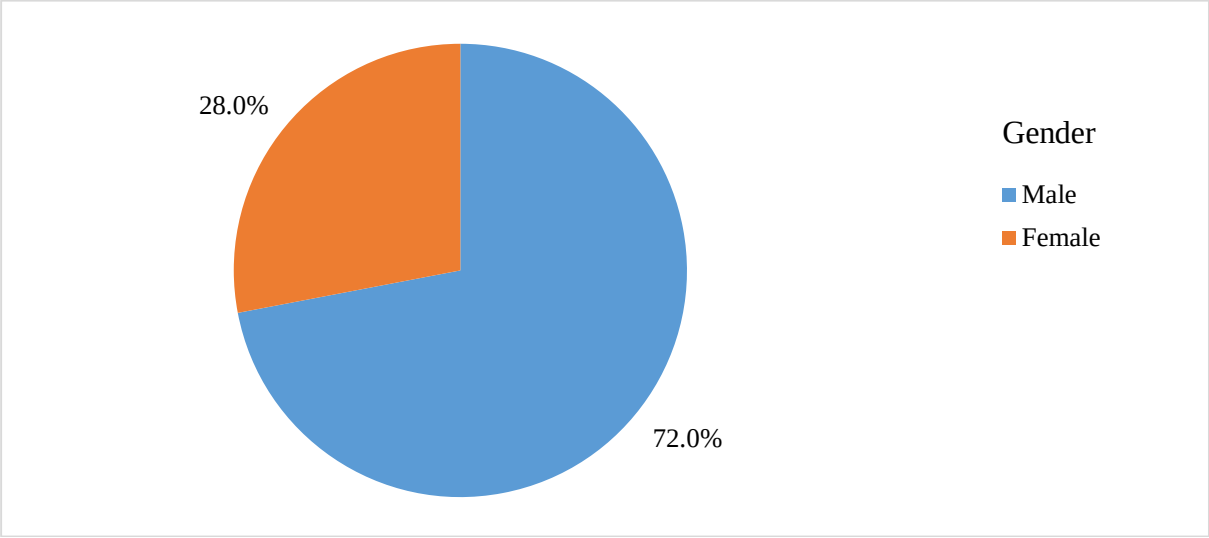


Table 4: Descriptive analysis of side in the study population (N=50)

Side	Frequency	Percentages
Dominant	23	46.0%
Not dominant	27	54.0%

Among the study population, 23 (46%) participants had dominant. (Table 4 & figure 4)

Figure 4: Bar chart of side in the study population (N=50)

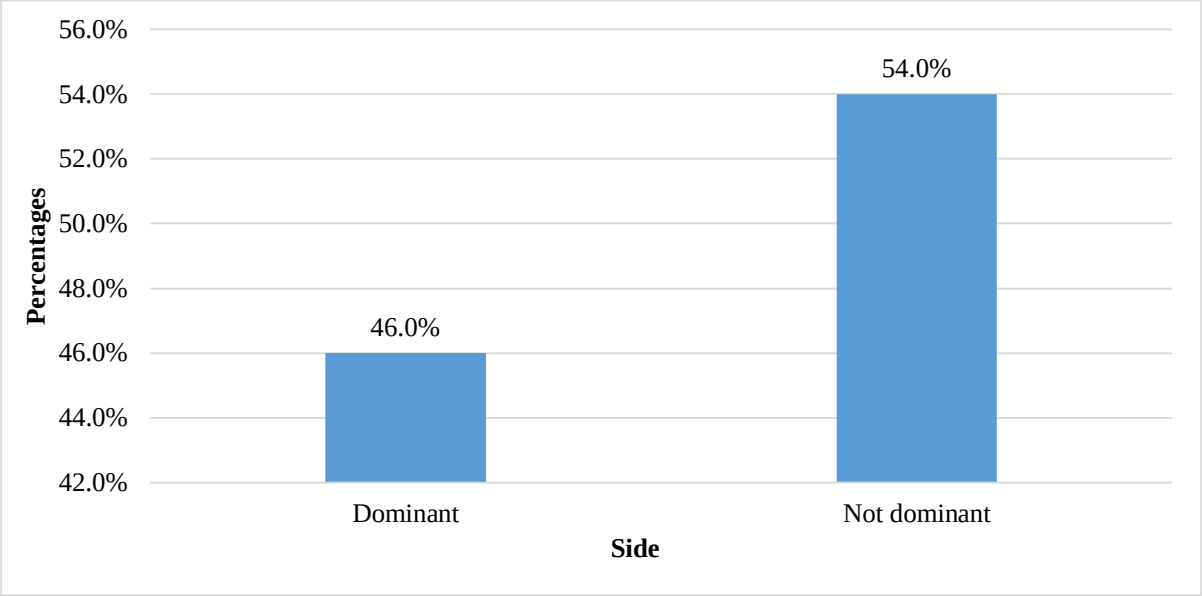


Table 5: Descriptive analysis of comorbidities in the study population (N=50)

Comorbidities	Frequency	Percentages
DM	22	44.0%
HTN	8	16.0%
IHD	1	2.0%
Nil	19	38.0%

Among the study population, 22 (44%) participants had diabetes, 8 (16%) participants had hypertension, and only 1 (2%) participant had IHD. (Table 5 & Figure 5)

Figure 5: Bar chart of comorbidities in the study population (N=50)

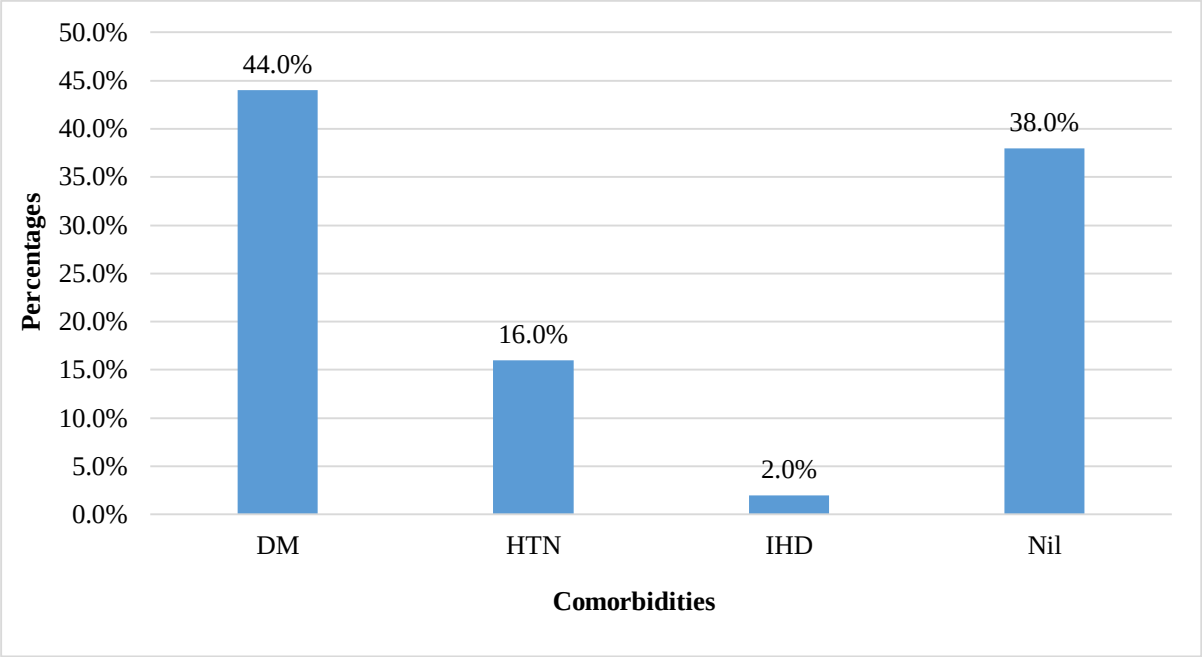


Table 6: Descriptive analysis of pain score in the study population (N=50)

Pain on The Time of	Presentation	Post distension	3rd week	6th week	12th week
0 (Complete disability)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
1 (Marked pain)	46 (92.0%)	9 (18.0%)	0 (0%)	0 (0%)	0 (0%)
2 (Moderate pain)	4 (8.0%)	37 (74.0%)	27 (54.0%)	4 (8.0%)	3 (6.0%)
3 (After the usual activity)	0 (0%)	4 (8.0%)	21 (42.0%)	33 (66.0%)	13 (26.0%)
4 (Slight)	0 (0%)	0 (0%)	2 (4.0%)	13 (26.0%)	27 (54.0%)
5 (None)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (14.0%)

Among the people with pain at presentation, 46 (92.0%) participants had marked pain and 4 (8.0%) participants had moderate pain. Among the people with pain at post distension, 9 (18.0%) participants had marked pain, 37 (74.0%) participants had moderate pain and 4 (8.0%) participants had after the usual activity. Among the people with pain at 3rd week, 27 (54.0%) participants had moderate pain, 21 (42.0%) participants had after the usual activity and 2 (4.0%) participants had slight. Among the people with pain at 6th week, 4 (8.0%) participants had moderate pain, 33 (66.0%) participants had after the usual activity and 13 (26.0%) participants

had slight. Among the people with pain at 12th week, 13 (26.0%) participants had after the usual activity and 27 (54.0%) participants had slight. (Table 6 & Figure 6 to 11)

Figure 6: Clustered bar chart of pain score in the study population (N=50)

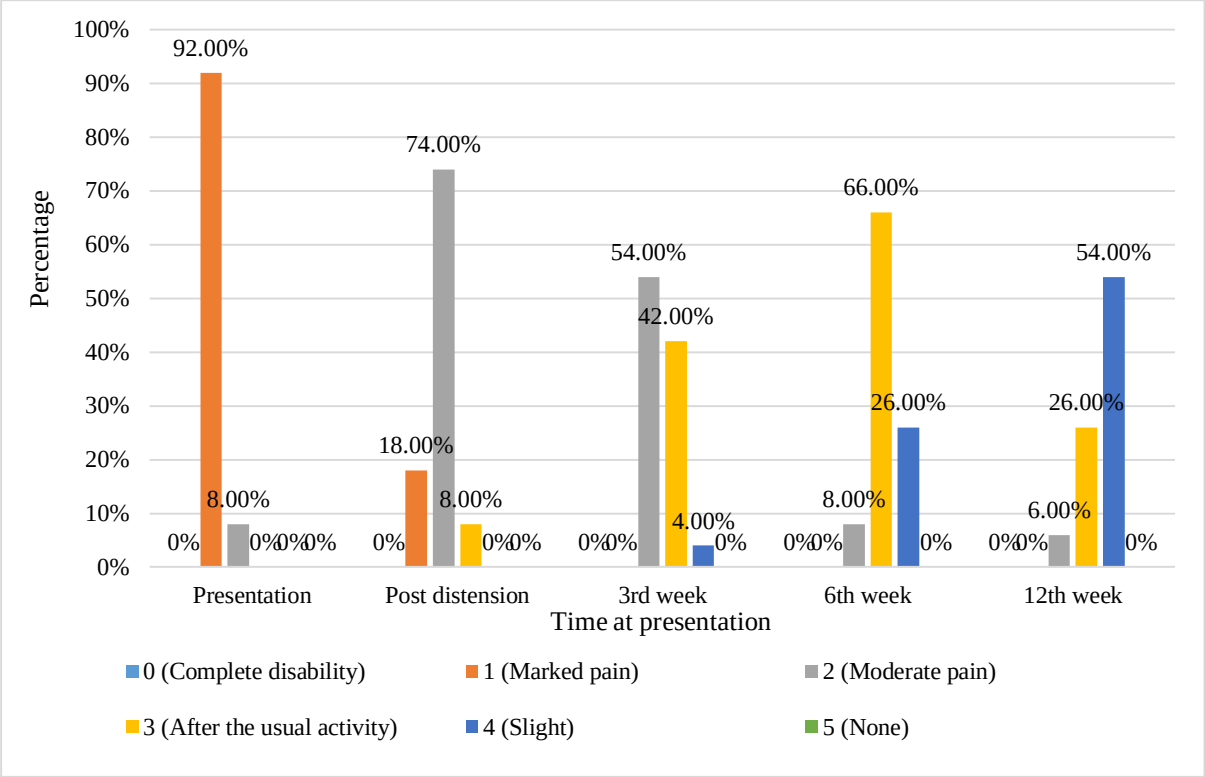


Figure 7: Bar chart of pain on the time of presentation in the study population (N=50)

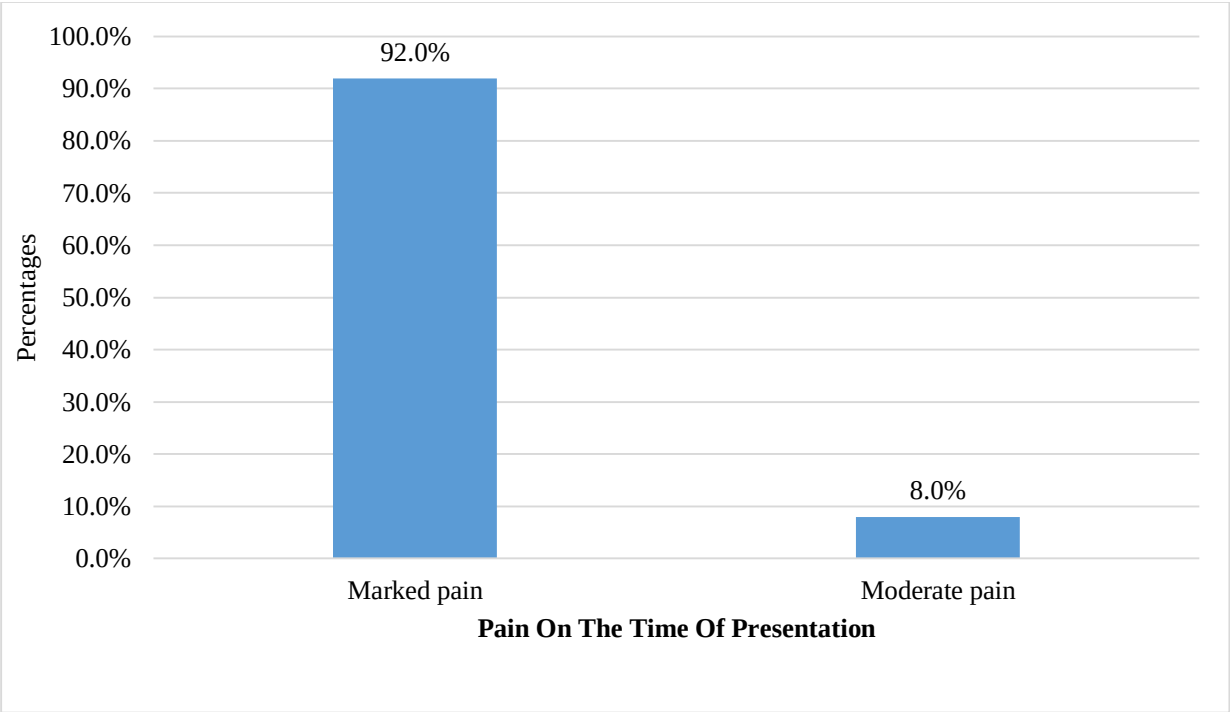


Figure 8: Bar chart of pain at immediately post distension in the study population (N=50)

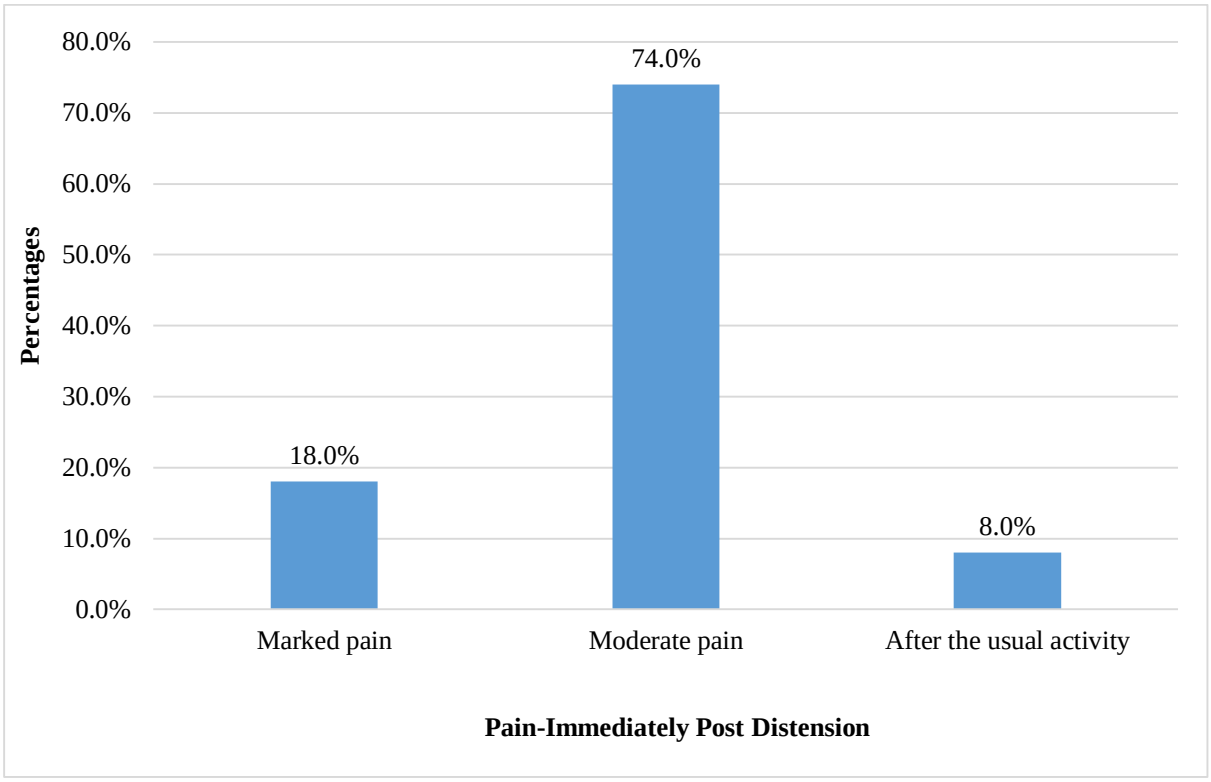


Figure 9: Bar chart of pain at 3rd week in the study population (N=50)

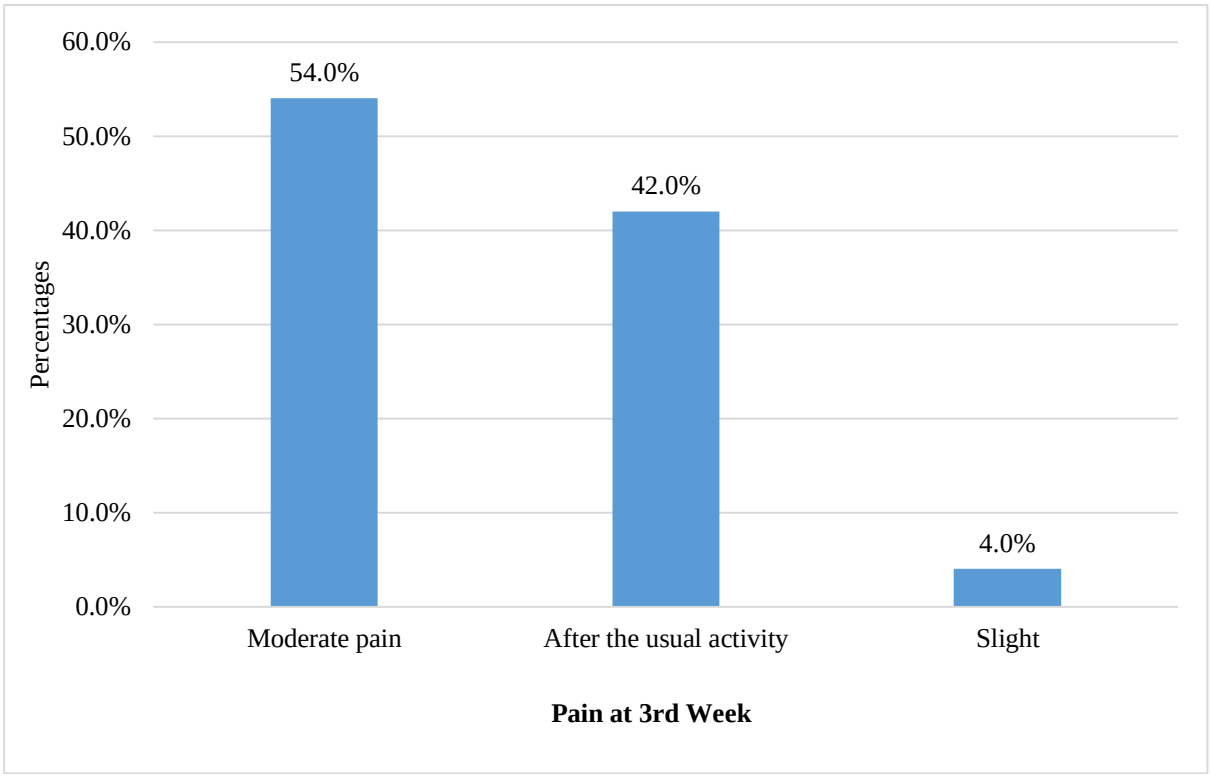


Figure 10: Bar chart of pain at 6th week in the study population (N=50)

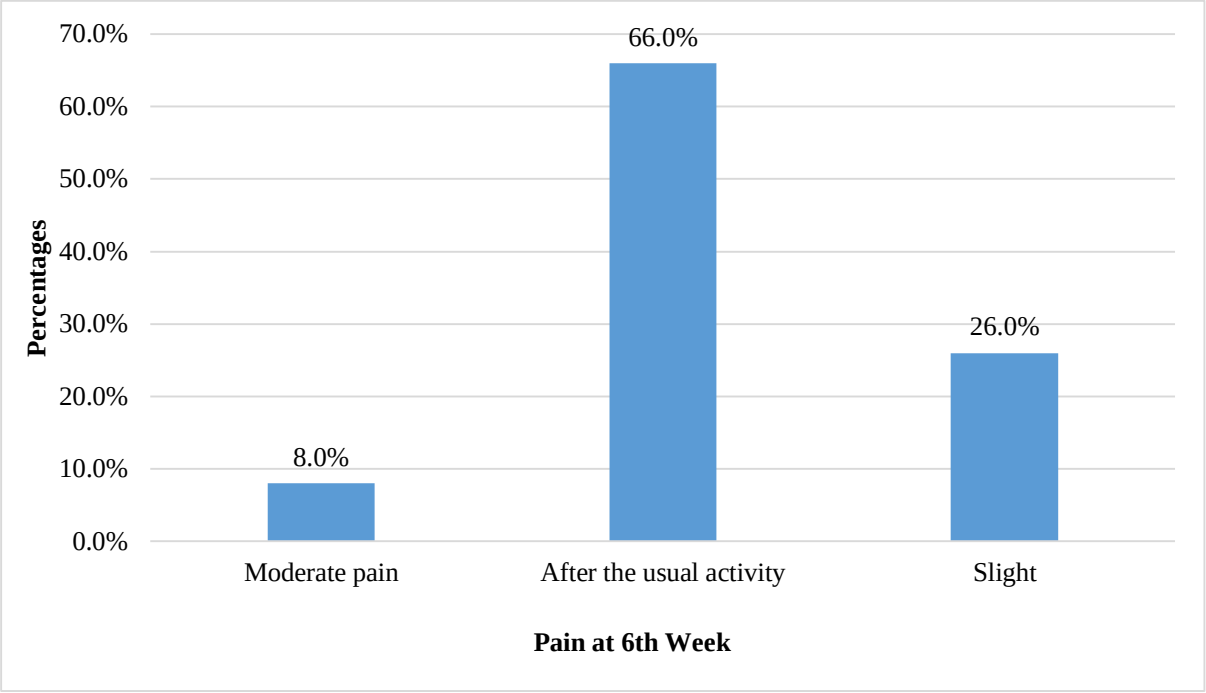


Figure 11: Bar chart of pain at 12th week in the study population (N=50)

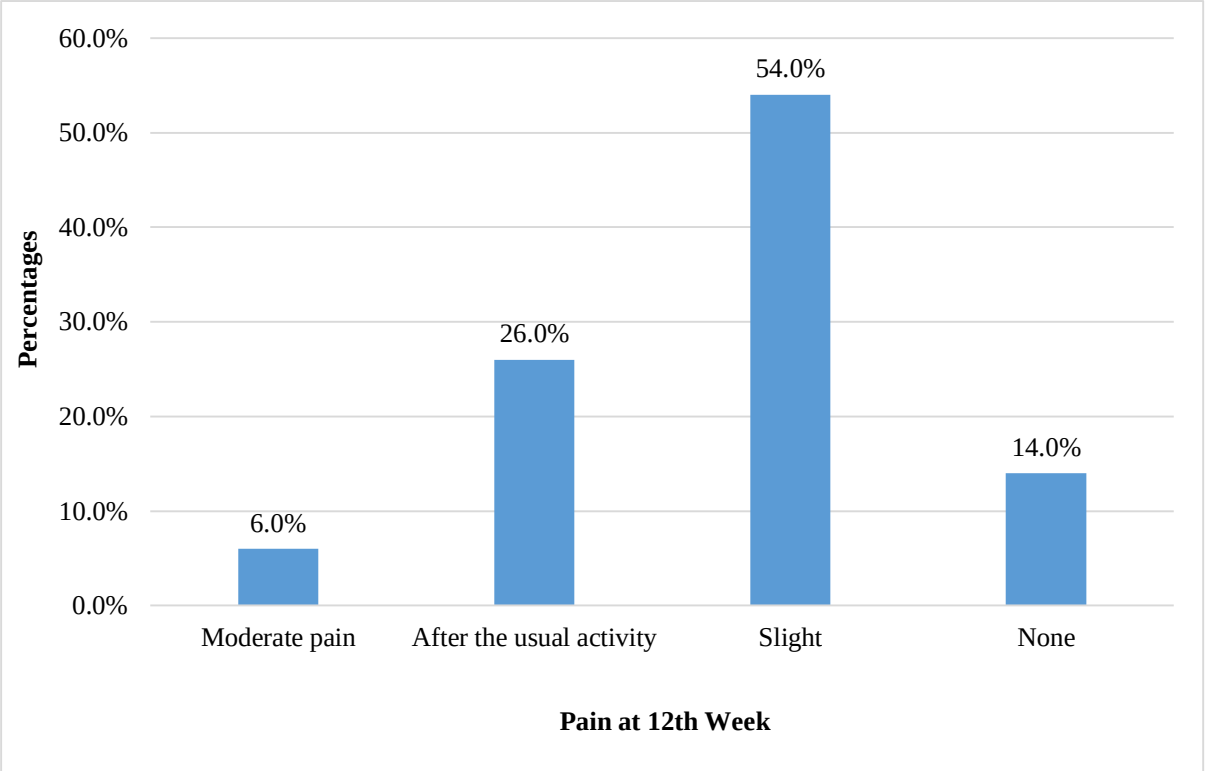


Table 7: Comparison of mean flexion on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

Follow up time periods	Flexion Mean ± SD	P value
On the time of presentation	70.2 ± 23.6	<0.001
Immediately post distension	99.1 ± 25.83	
at 3rd week	120.8 ± 23.81	
at 6th week	140.98 ± 24.16	
at 12th week	153.9 ± 21.48	

The mean flexion on the time of presentation was 70.2 ± 23.6, it was 99.1 ± 25.83 at immediately post distension, it was 120.8 ± 23.81 at 3rd week, it was 140.98 ± 24.16 at 6th week, and it was 153.9 ± 21.48 at 12th week. The difference in flexion at different follow up periods was statistically significant. (P value <0.001). (Table 6 & figure 12)

Figure 12: Comparative error bar chart of Comparison of mean flexion on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

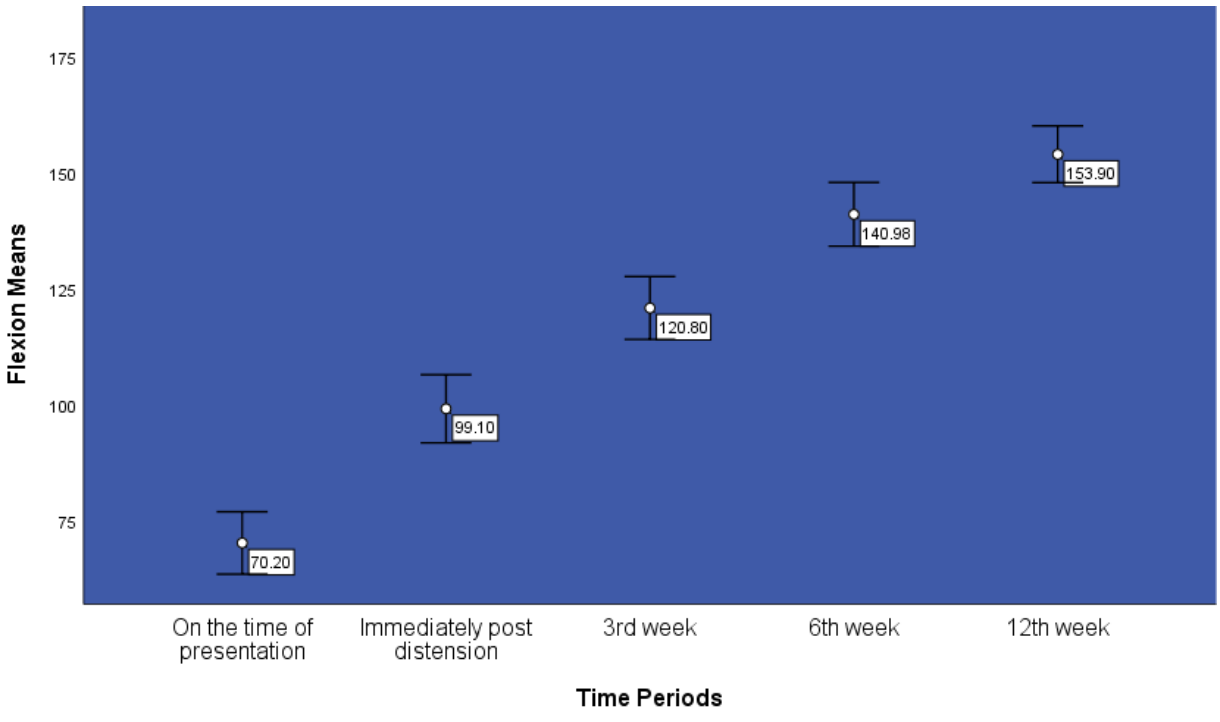


Table 8: Comparison of mean Abduction on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

Follow up time periods	Abduction Mean ± SD	P value
On the time of presentation	71.7 ± 27.91	<0.001
Immediately post distension	103.4 ± 25.28	
at 3rd week	130 ± 26.86	
at 6th week	145.4 ± 24.41	
at 12th week	155.1 ± 22.05	

The mean Abduction on the time of presentation was 71.7 ± 27.91, it was 103.4 ± 25.28 at immediately post distension, it was 130 ± 26.86 at 3rd week, it was 145.4 ± 24.41 at 6th week, and it was 155.1 ± 22.05 at 12th week. The difference in Abduction at different follow up periods was statistically significant. (P value <0.001). (Table 7 & figure 13)

Figure 13: Comparative error bar chart of Comparison of mean Abduction on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

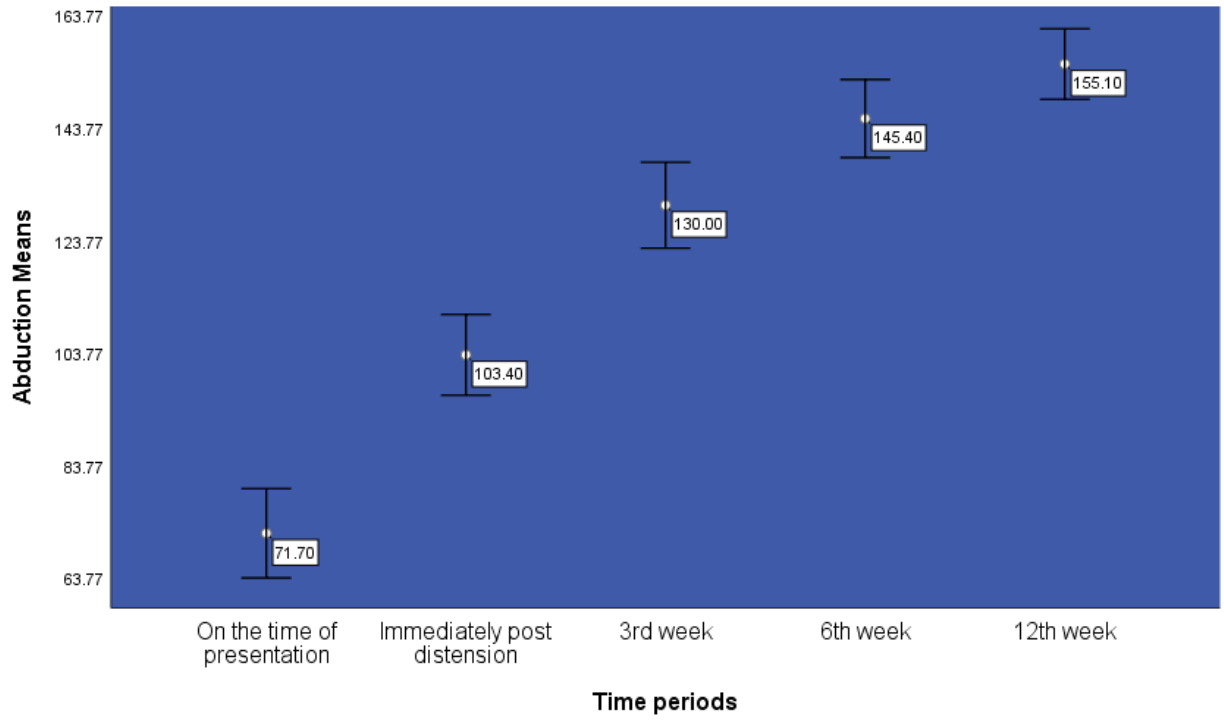


Table 9: Comparison of mean Internal Rotation on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

Follow up time periods	Internal Rotation Mean ± SD	P value
On the time of presentation	28.3 ± 10.58	<0.001
Immediately post distension	47.5 ± 12.13	
at 3rd week	62.1 ± 15.81	
at 6th week	72.3 ± 15.16	
at 12th week	79.3 ± 13.05	

The mean internal rotation on the time of presentation was 28.3 ± 10.58, it was 47.5 ± 12.13 at immediately post distension, it was 62.1 ± 15.81 at 3rd week, it was 72.3 ± 15.16 at 6th week and it was 79.3 ± 13.05 at 12th week. The difference in internal rotation at different follow up periods was statistically significant. (P value <0.001). (Table 8 & figure 14)

Figure 14: Comparative error bar chart of Comparison of mean Internal Rotation on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

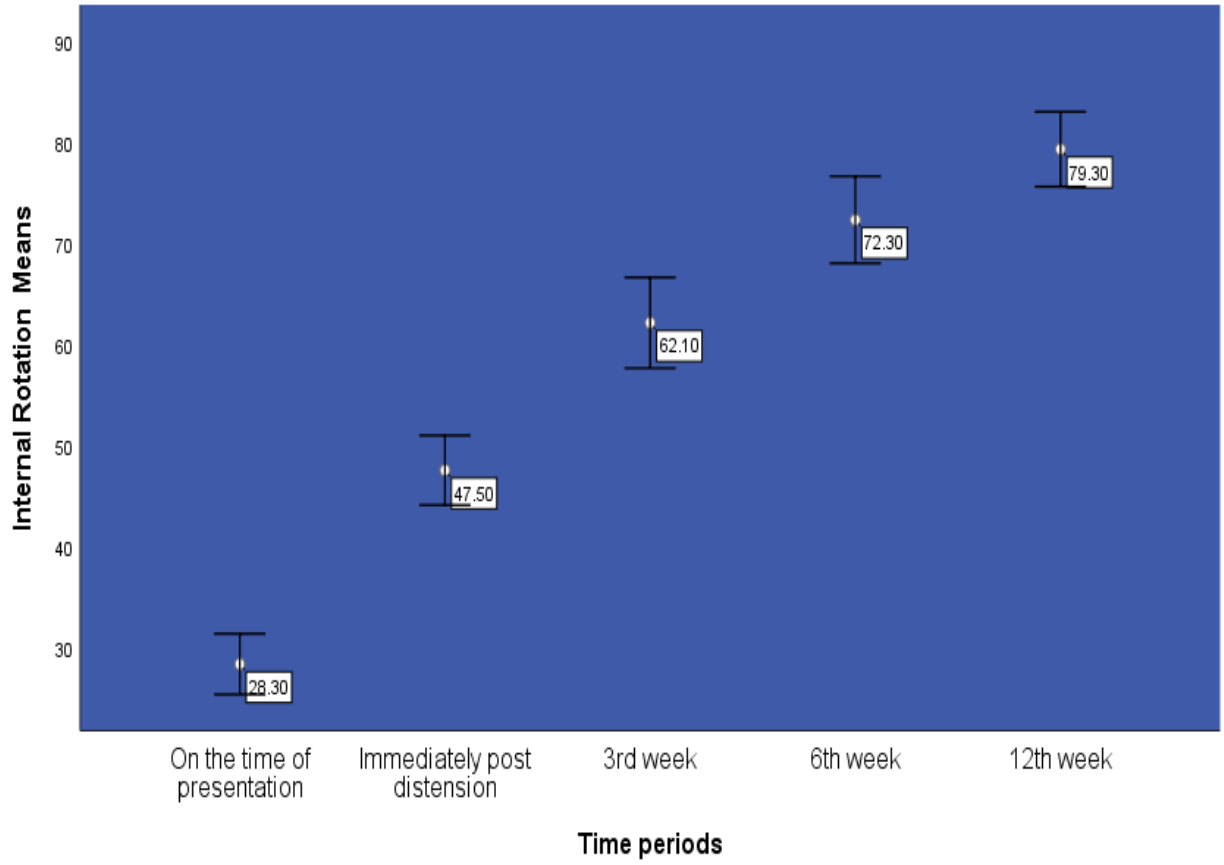


Table 10: Comparison of mean External Rotation on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

Follow up time periods	External Rotation Mean ± SD	P value
On the time of presentation	21.7 ± 5.77	<0.001
Immediately post distension	31.4 ± 5.63	
at 3rd week	39.1 ± 6.6	
at 6th week	46.4 ± 5.81	
at 12th week	52.8 ± 6.16	

The mean external rotation on the time of presentation was 21.7 ± 5.77, it was 31.4 ± 5.63 at immediately post distension, it was 39.1 ± 6.6 at 3rd week, it was 46.4 ± 5.81 at 6th week and it was 52.8 ± 6.16 at 12th week. The difference in external rotation at different follow up periods was statistically significant. (P value <0.001). (Table 9 & figure 15)

Figure 15: Comparative error bar chart of Comparison of mean External Rotation on the time of presentation and immediately post distension and 3rd week and 6th week and 12th week follow up time periods (N=50)

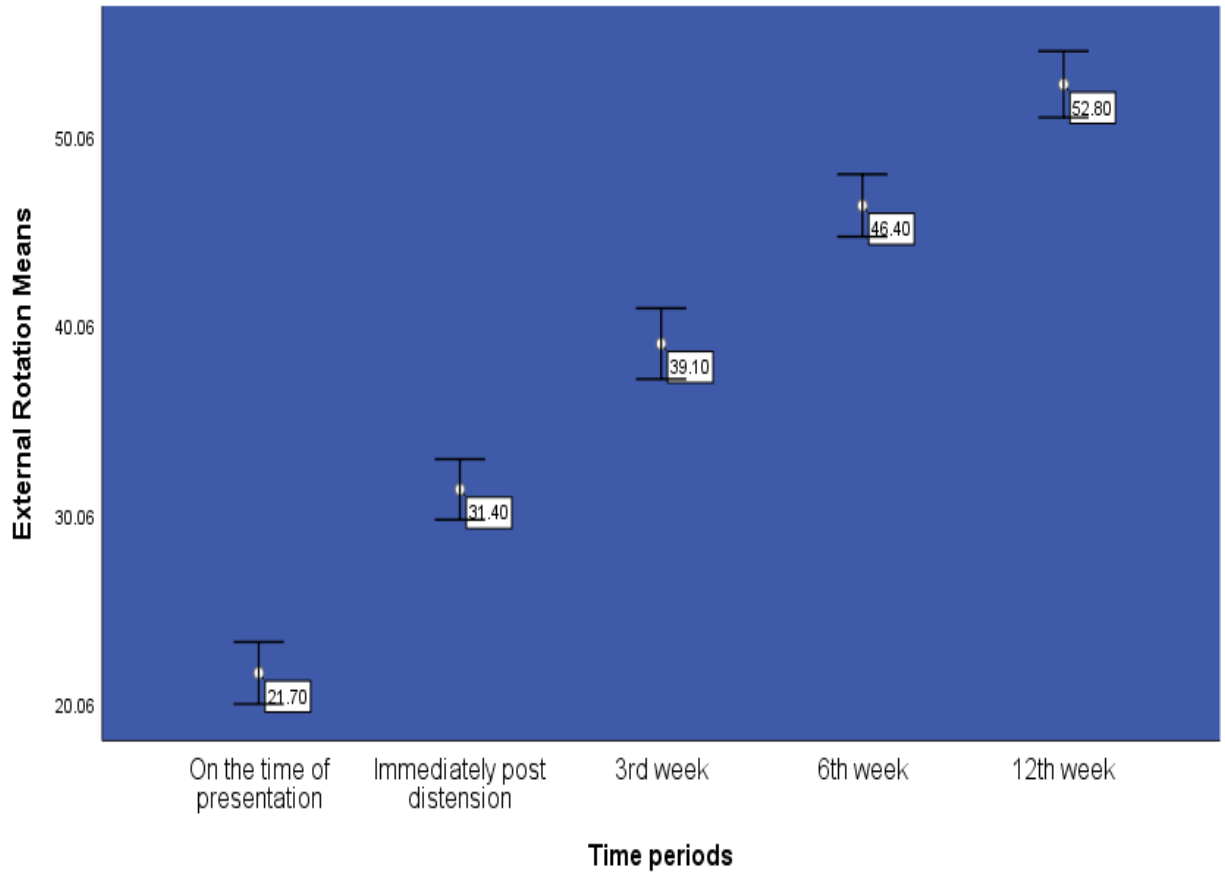


Table 11: Descriptive analysis of average range of movement in the study population (N=50)

Parameter	Mean ± SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Average Range of Movement	110.28 ± 13.46	115.00	67.50	122.50	106.45	114.10

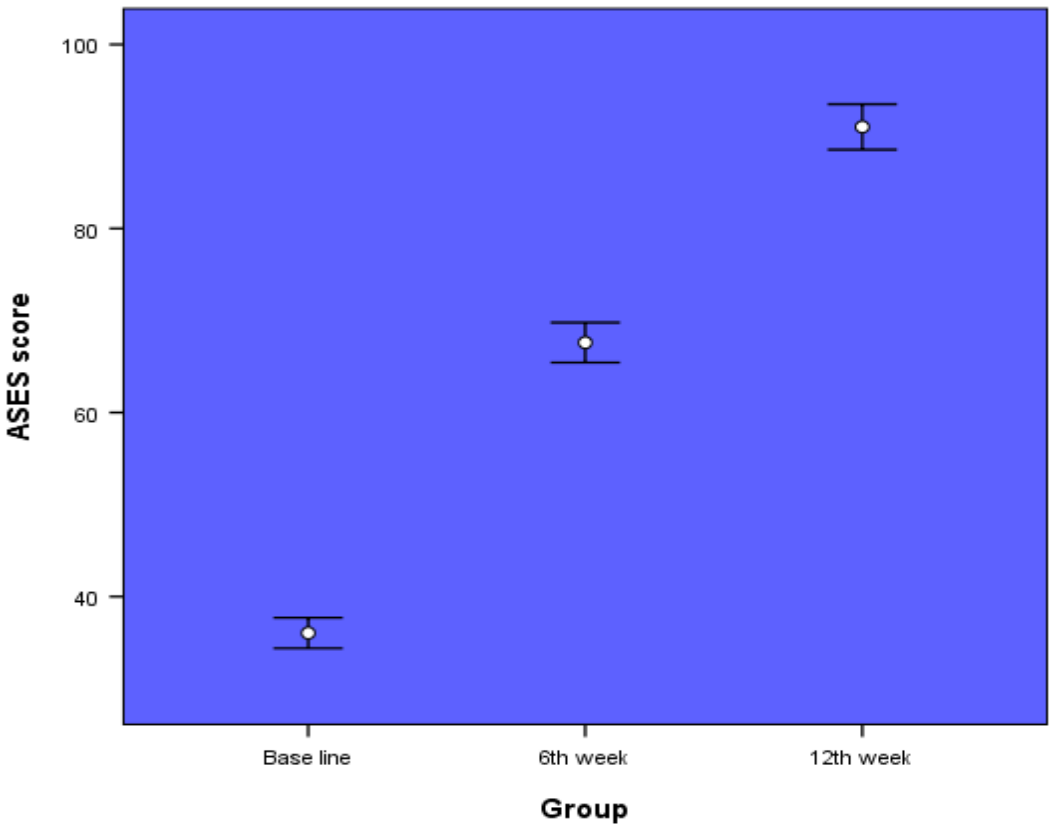
The mean average range of movement was 110.28 ± 13.46 in the study population, ranged between 67.50 to 122.50 (95% CI 106.45 to 114.10). (Table 11)

Table 12: Comparison of mean ASES score across the different time periods (N=50)

Group	ASES score Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Baseline	36.04 ± 5.84				
6th week	67.6 ± 7.64	31.56	28.60	34.52	<0.001
12th week	91.04 ± 8.68	55.00	52.04	57.96	<0.001

The mean ASES was 36.04 ± 5.84, it was 67.6 ± 7.64 at 6th week, and it was 91.04 ± 8.68 at 12th week. The differences in the ASES score at 6th week and 12th week follow up period with baseline value were statistically significant (P value <0.001). (Table 12 & figure 16)

Figure 16: Error bar chart of comparison of mean ASES score across the different time periods (N=50)



DISCUSSION

DISCUSSION:

Adhesive capsulitis is an extremely disabling disorder, characterised with pain and remitting shoulder stiffness and pain. Clinically it has symptoms of severe pain and insidious shoulder stiffness, which results in limited passive and active external rotation and forward flexion. There is a lack of consensus on universally accepted treatment modality for the patient with frozen shoulder Reviews of previous literature suggested no standard treatment regime is universally accepted. A number of different treatments have been described, including general measures such as rest and neglect to analgesics, NSAIDS, local or oral steroids, physiotherapy, distension of the joint capsule, manipulation. Recently arthroscopic treatment has also been recommended for this condition. It involves the intraarticular injection of a large amount of normal saline to distend and rupture the capsular adhesions. In this study, we evaluated the Range of movement and pain relief of shoulder following "Hydraulic distension under local anaesthesia along with a steroid" pre and post distension.

Total 50 patients were included in the study and were evaluated post operatively followed by 3 weeks, 6 weeks and 12 weeks after procedure. The average age of the study population was 52.68 ± 9.79, ranging between 30 years to 80 years (95% CI 49.90 to 55.46). It is almost similar to the study conducted by Buchbinder, R et al[46], who reported a slightly higher average age of 57.2years in their study. In the present study, 36 (72%) participants were males, and 14 (28%) participants were females. Age and sex distribution reported in the literature have been widely variable, according to Segmuller, HE et al[69], ages ranging from 22 years to 85 years were reported. In a study by shah, MA et al[65], reported that with the percentage of female subjects ranged from 48% to 84% which is contradicting our study because of the different socio-demographic characteristics of the area.

Majority of the participants 18(36%) were in 40 to 49 years age group followed by 15(30%) in 50 to 59 years age group, 12(24%) in 60 to 69 years age group, 3(6%) in 30 to 39 years age group, 2(4%) were greater than 70 years. Among the study population, 23 (46%) participants had dominant side involved. In a study conducted by Mishra, AN et al[64], 8 patients ((10%) had bilateral involvement while in 33 patients (41 %) had involvement of the dominant side that is right shoulder, while 39 patients (49 %) were found to have left shoulder involvement.

Few patients were found to have certain associated conditions like 22 (44%) participants had diabetes, 8 (16%) participants had hypertension and only 1 (2%) participant had IHD in our study. Similarly, Mishra, AN et al[64], in their study had 12 patients had diabetes mellitus, 10 patients had hypertension, 13 patients had osteoarthritis of the knee, 1 patient diagnosed with peptic ulcer, and 3 patients of bronchial asthma were seen.

Pain relief:

In the current study ASES scale (The society of American Shoulder and elbow surgeons) was used. In the current study, ASES scale was used, there were no patients with complete disability. Marked pain (grade 1) was observed on presentation in 46(92%) of the subjects. Post distension only 9(18%) had pain. No marked pain was observed at 3rd, 6th and 12 th week. Moderate pain (grade 2) was observed in 4(8%) at presentation, post distention 37 (74.0%) had moderate pain. 27 (54.0%), 4 (8.0%), 3 (6.0%) had moderate pain at 3rd, 6th and 12 th week respectively. Grade 3 (After usual activity) pain was seen in 4 (8.0%) Post distension. 21 (42.0%), 33 (66.0%), 13 (26.0%) had grade 3 pain at 3rd, 6th and 12 th week respectively. Slight pain was observed in (grade 5) 2 (4.0%), 13 (26.0%), 27 (54.0%) of population at 3rd, 6th and 12 th week respectively. Only 7 (14.0%) had no pain at 12 th week. In a study conducted by Halverson, L et al.[70], 52, % percent of patients experienced immediate pain relief and functional improvement. In another

study done by Ogilvie-Harris, DJ et al[48], among 17 patients ASES scale was used and preoperatively 2 patients had mild pain, 6 had moderate pain, 8 in severe pain. Postoperatively 11 were pain-free, 4 had mild pain, 1 had severe pain.

In the current study, The mean flexion on the time of presentation was 70.2 ± 23.6, it was 99.1 ± 25.83 at immediately post distension, it got further improved from the average of 120.8 ± 23.81 at 3rd week, to 140.98 ± 24.16 at 6th week and 153.9 ± 21.48 at 12th week. The difference in flexion at different follow up periods was statistically significant. (P value <0.001). In a study done by Vad, VD et al[61], range of flexion improved from a predistention mean of 92° to a postdistention mean of 110° and to 111° at 1 year after distention. According to Baums, MH et al. [71]mean flexion showed an improvement to 150° (6 weeks) and respectively 160° (36 months) compared to 85° preoperatively.

The mean Abduction on the time of presentation in the present study was 71.7 ± 27.91, it got better by 103.4 ± 25.28 immediately post distension, further improved by 130 ± 26.86 at 3rd week, 145.4 ± 24.41 at 6th week and it 155.1 ± 22.05 at 12th week. The difference in Abduction at different follow up periods was statistically significant. (P value <0.001). In a study done by Vad, VD et al[61], range of abduction improved from a predistention mean of 83° to a postdistention mean of 107.1° and to 106.8° at 1 year postdistention. Baums, MH et al[71], abduction improved from a mean of 70° preoperatively to a mean of 140° (6 weeks) and respectively 150° at latest follow-up (36 months).

In the current study the mean internal rotation on the time of presentation was 28.3 ± 10.58, it was 47.5 ± 12.13 immediately post distension, it was 62.1 ± 15.81 at 3rd week, it was 72.3 ± 15.16 at 6th week and it was 79.3 ± 13.05 at 12th week. The difference in internal rotation at different follow up periods was statistically significant. (P value <0.001). According to Baums, MH et al.[71] IR shows an improvement to a mean of 50° (6 weeks) and of 60° in the final examination.

The mean external rotation on the time of presentation was 21.7 ± 5.77, it was 31.4 ± 5.63 at immediately post distension, it was 39.1 ± 6.6 at 3rd week, it was 46.4 ± 5.81 at 6th week and it was 52.8 ± 6.16 at 12th week. The difference in external rotation at different follow up periods was statistically significant. (P value <0.001). Baums, MH et al.[71] Average ER in adduction improved from 10° preoperatively to 45° (6 weeks) and respectively, 65° in the latest follow-up assessment.

In a study conducted by Mao, CY et al[72], on 12 patients flexion, Abduction, Internal rotation, External rotation among acute cases preoperatively was 111 ± 10, 101 ± 18, 64± 12, 24 ± 8 respectively. Postoperatively it was 153 ± 11, 143 ± 12, 83 ± 7, 69 ± 15 respectively. The difference in ROM pre and post operatively was statistically significant. (P value <0.001). Flexion, Abduction, Internal rotation, External rotation among chronic cases pre operatively was 113 ± 20, 103 ± 25, 60± 8, 29 ± 11 respectively. Postoperatively it was 148 ± 16, 149 ± 13, 86 ± 9, 63 ± 13 respectively. The difference in ROM pre and post operatively was statistically significant. (P value <0.001).

The mean ASES was 36.04 ± 5.84 at the base line; it was 67.6 ± 7.64 at 6th week and 91.04 ± 8.68 at 12th week. The differences in the ASES score at 6th week and 12th week follow up period with baseline value were statistically significant (P value <0.001). Similar results were obtained

by study conducted by Baums, MH et al[71], the mean AES was 35 pre operatively and 91 (62-96) postoperatively. In another study by Nicholson, GP et al[73], the average ASES score enhanced to 93 (mean, 35.5 preoperative) which provided immediate and dramatic benefit to patients suffering from frozen shoulder.

Hydraulic distension is a cost-effective, safe, reliable, modality in treating the painful, chronically distressing adhesive capsulitis. This treatment can be practiced as an out-patient therapy without any specialised equipments. It has absolutely no side effects, when performed with the right technique under aseptic precautions. Hence, we conclude that hydraulic distension under local anesthesia with steroid can be considered as a first-line management option in patients with frozen shoulder.

CONCLUSIONS

CONCLUSIONS:

- Total 50 patients were included in the study and were evaluated post operatively followed by 3 weeks, 6 weeks, and 12 weeks after the procedure. The average age of the study population was 52.68 ± 9.79, ranging between 30 years to 80 years.
- In the present study, 36 (72%) participants were males, and 14 (28%) participants were females.
- Majority of the participants 18(36%) were in 40 to 49 years age group followed by 15(30%) in 50 to 59 years age group, 12(24%) in 60 to 69 years age group, 3(6%) in 30 to 39 years age group, 2(4%) were greater than 70 years.
- Few patients were found to have certain associated conditions like 22 (44%) participants had diabetes, 8 (16%) participants had hypertension, and only 1 (2%) participant had IHD.
- In the current study ASES scale (The society of American Shoulder and elbow surgeons) was used. In the current study, ASES scale was used, there were no patients with complete disability. Marked pain (grade 1) was observed on presentation in 46(92%) of the subjects. Post distension, only 9(18%) had pain. No marked pain was observed at 3^{rd}, $6^{th,}$ and 12 th week. Moderate pain (grade 2) was observed in 4(8%) at presentation, post distention 37 (74.0%) had moderate pain. 27 (54.0%), 4 (8.0%), 3 (6.0%) had moderate pain at 3^{rd}, 6^{th} and 12 th week, respectively. Grade 3 (After usual activity) pain was seen in 4 (8.0%) Post distension. 21 (42.0%), 33 (66.0%), 13 (26.0%) had grade 3 pain at 3^{rd}, 6^{th} and 12 th week respectively. Slight pain was observed in (grade 5) 2 (4.0%), 13 (26.0%), 27 (54.0%) of population at 3^{rd}, 6^{th} and 12 th week respectively. Only 7 (14.0%) had no pain at 12 th week.

- The mean flexion on the time of presentation was 70.2 ± 23.6, it was 99.1 ± 25.83 at immediately post distension, it got further improved from the average of 120.8 ± 23.81 at 3rd week, to 140.98 ± 24.16 at 6th week and 153.9 ± 21.48 at 12th week.
- The mean Abduction on the time of presentation in the present study was 71.7 ± 27.91, it got better by 103.4 ± 25.28 immediately post distension, further improved by 130 ± 26.86 at 3rd week, 145.4 ± 24.41 at 6th week and it 155.1 ± 22.05 at 12th week. The difference in Abduction at different follow up periods was statistically significant. (P value <0.001).
- In the current study, the mean internal rotation on the time of presentation was 28.3 ± 10.58, it was 47.5 ± 12.13 immediately post distension, it was 62.1 ± 15.81 at 3rd week, it was 72.3 ± 15.16 at 6th week and it was 79.3 ± 13.05 at 12th week. The difference in internal rotation at different follow up periods was statistically significant. (P value <0.001).
- The mean external rotation on the time of presentation was 21.7 ± 5.77, it was 31.4 ± 5.63 at immediately post distension, it was 39.1 ± 6.6 at 3rd week, it was 46.4 ± 5.81 at 6th week, and it was 52.8 ± 6.16 at 12th week. The difference in external rotation at different follow up periods was statistically significant. (P value <0.001).
- The mean ASES was 36.04 ± 5.84 at baseline; it was 67.6 ± 7.64 at 6th week and 91.04 ± 8.68 at 12th week. The differences in the ASES score at 6th week and 12th week follow up period with baseline value were statistically significant (P value <0.001).

LIMITATION

LIMITATION:

- Considering the limited sample size, the generalisability of the study findings to other populations may be limited.
- A randomised trial with appropriate controls would have been a better study design.

RECOMMENDATION

RECOMMENDATION:

- High quality, adequately powered randomised controlled trials comparing the most common interventions to a sham procedure would be the ideal way to improve the current evidence base.
- Further studies with appropriate controls are needed to confirm the true efficacy of hydraulic distension.

SUMMARY

SUMMARY

Frozen shoulder is an extremely disabling condition, presenting with and remitting shoulder pain and stiffness. Although many treatment options have been proposed for the frozen shoulder syndrome, each has limitations. Hydro dilation technique was developed in order to loosen the reported contraction and adhesion. We evaluated the range of movement and pain relief of shoulder following "Hydraulic distension under local anaesthesia along with a steroid" pre and post distension. A total of 50 patients were included in the study and were evaluated post operatively followed by 3 weeks, 6 weeks and 12 weeks after the procedure. The average age of the study population was 52.68 ± 9.79. There were no patients with complete disability. Marked pain (grade 1) was observed on presentation in 46(92%) of the subjects. Post distension only 9(18%) had pain. Grade 3 (After usual activity) pain was seen in 4 (8.0%) Post distension. 21 (42.0%), 33 (66.0%), 13 (26.0%) had grade 3 pain at 3rd, 6th and 12 th week respectively. Slight pain was observed in (grade 5) 2 (4.0%), 13 (26.0%), 27 (54.0%) of population at 3rd, 6th and 12 th week respectively. Flexion, abduction, internal rotation, external rotation movements of the shoulder have improved post distention and were statistically significant at 3rd, 6th, 12 th week. The mean ASES was 36.04 ± 5.84 at baseline; it was 67.6 ± 7.64 at 6th week and 91.04 ± 8.68 at 12th week. The differences in the ASES score at the 6th week and 12th week follow up period with baseline value were statistically significant (P value <0.001). So the present study concluded that Hydraulic distension is a safe, reliable, cost-effective modality in treating the chronically distressing painful condition of frozen shoulder.

BIBLIOGRAPHY

REFERENCE:

1. Jacobs LG, Barton MA, Wallace WA, Ferrousis J, Dunn NA, Bossingham DH. Intra-articular distension and steroids in the management of capsulitis of the shoulder. BMJ. 1991;302(6791):1498-501.

2. Uppal HS, Evans JP, Smith C. Frozen shoulder: A systematic review of therapeutic options. World J Orthop. 2015;6(2):263-8.

3. Jacobs LG, Smith MG, Khan SA, Smith K, Joshi M. Manipulation or intra-articular steroids in the management of adhesive capsulitis of the shoulder? A prospective randomized trial. J Shoulder Elbow Surg. 2009;18(3):348-53.

4. Manske RC, Prohaska D. Clinical commentary and literature review: diagnosis, conservative and surgical management of adhesive capsulitis. Shoulder Elbow. 2010;2(4):238-54.

5. van der Windt DAWM, Koes BW, Devillé W, Boeke AJP, de Jong BA, Bouter LM. Effectiveness of corticosteroid injections versus physio therapy for treatment of painful stiff shoulder in primary care: randomised trial. BMJ. 1998;317:1292-6.

6. Dodenhoff RM, Levy O, Wilson A, Copeland SA. Manipulation under anesthesia for primary frozen shoulder: effect on early recovery and return to activity. J Shoulder Elbow Surg. 2000;9(1):23-6.

7. Harryman DT, 2nd, Matsen FA, 3rd, Sidles JA. Arthroscopic management of refractory shoulder stiffness. Arthroscopy. 1997;13(2):133-47.

8. Andrén L, Lundberg BJ. Treatment of rigid shoulders by joint distension during arthrography. Acta Orthop Scand. 1965;36(1):45-53.

9. Fareed DO, Gallivan WR, Jr. Office management of frozen shoulder syndrome. Treatment with hydraulic distension under local anesthesia. Clin Orthop Relat Res. 1989(242):177-83.

10. Murnaghan JP. Adhesive capsulitis of the shoulder: current concepts and treatment. Orthopedics. 1988;11(1):153-8.

11. Rizk TE, Pinals RS. Frozen shoulder. Semin Arthritis Rheum. 1982;11(4):440-52.

12. Speed CA, Hazleman BL. Calcific Tendinitis of the Shoulder. N Engl J Med. 1999;340:1582-4.

13. Antoniou J, Duckworth DT, Harryman DT, 2nd. Capsulolabral augmentation for the the management of posteroinferior instability of the shoulder. J Bone Joint Surg Am. 2000;82(9):1220-30.

14. Shaffer B, Tibone JE, Kerlan RK. Frozen shoulder. A long-term follow-up. J Bone Joint Surg Am. 1992;74(5):738-46.

15. Binder AI, Bulgen DY, Hazleman BL, Roberts S. Frozen shoulder: a long-term prospective study. Ann Rheum Dis. 1984;43(3):361-4.

16. Sarwark JF. Essentials of musculoskeletal care. 4th ed. Rosemont, IL: American Academy of Orthopedic Surgeons; 2010.

17. Sattar MA, Luqman WA. Periarthritis: another duration-related complication of diabetes mellitus. Diabetes Care. 1985;8(5):507-10.

18. Bagheri F, Ebrahimzadeh MH, Moradi A, Bidgoli HF. Factors Associated with Pain, Disability and Quality of Life in Patients Suffering from Frozen Shoulder. Arch Bone Jt Surg. 2016;4(3):243-7.

19. Petersson CJ, Redlund-Johnell I. The subacromial space in normal shoulder radiographs. Acta Orthop Scand. 1984;55(1):57-8.

20. Moore KL, Dalley AF, Agur AMR. Clinically Oriented Anatomy. 7th ed: Lippincott Williams and Wilkins; 2013.

21. Sheridan MA, Hannafin JA. Upper extremity: emphasis on frozen shoulder. Orthop Clin North Am. 2006;37(4):531-9.

22. Boyle-Walker KL, Gabard DL, Bietsch E, Masek-VanArsdale DM, Robinson BL. A profile of patients with adhesive capsulitis. J Hand Ther. 1997;10(3):222-8.

23. Harris JD, Griesser MJ, Copelan A, Jones GL. Treatment of adhesive capsulitis with intra-articular hyaluronate: A systematic review. Int J Shoulder Surg. 2011;5(2):31-7.

24. Arkkila PE, Kantola IM, Viikari JS, Rönnemaa T. Shoulder capsulitis in type I and II diabetic patients: association with diabetic complications and related diseases. Ann Rheum Dis. 1996;55(12):907-14.

25. Huang SW, Lin JW, Wang WT, Wu CW, Liou TH, Lin HW. Hyperthyroidism is a risk factor for developing adhesive capsulitis of the shoulder: a nationwide longitudinal population-based study. Sci Rep. 2014;4(1):4183.

26. Smith SP, Devaraj VS, Bunker TD. The association between frozen shoulder and Dupuytren's disease. J Shoulder Elbow Surg. 2001;10(2):149-51.

27. Bunker TD, Anthony PP. The pathology of frozen shoulder. A Dupuytren-like disease. J Bone Joint Surg Br. 1995;77(5):677-83.

28. Lubis AM, Lubis VK. Matrix metalloproteinase, tissue inhibitor of metalloproteinase and transforming growth factor-beta 1 in frozen shoulder, and their changes as response to intensive stretching and supervised neglect exercise. J Orthop Sci. 2013;18(4):519-27.

29. Lho YM, Ha E, Cho CH, Song KS, Min BW, Bae KC, et al. Inflammatory cytokines are overexpressed in the subacromial bursa of frozen shoulder. J Shoulder Elbow Surg. 2013;22(5):666-72.

30. Hand GC, Athanasou NA, Matthews T, Carr AJ. The pathology of frozen shoulder. J Bone Joint Surg Br. 2007;89(7):928-32.

31. Ling Y, Peng C, Liu C, Zhang N, Yue S. Gene polymorphism of IL-6 and MMP-3 decreases passive range of motion after rotator cuff repair. Int J Clin Exp Pathol. 2015;8(5):5709-14.

32. Kim YS, Kim JM, Lee YG, Hong OK, Kwon HS, Ji JH. Intercellular adhesion molecule-1 (ICAM-1, CD54) is increased in adhesive capsulitis. J Bone Joint Surg Am. 2013;95(4):e181–8.

33. Raykha CN, Crawford JD, Burry AF, Drosdowech DS, Faber KJ, Gan BS, et al. IGF2 expression and β-catenin levels are increased in Frozen Shoulder Syndrome. Clin Invest Med. 2014;37(4):E262-7.

34. Lewis J. Frozen shoulder contracture syndrome - Aetiology, diagnosis and management. Man Ther. 2015;20(1):2-9.

35. Le HV, Lee SJ, Nazarian A, Rodriguez EK. Adhesive capsulitis of the shoulder: review of pathophysiology and current clinical treatments. Shoulder Elbow. 2017;9(2):75-84.

36. Gokalp G, Algin O, Yildirim N, Yazici Z. Adhesive capsulitis: contrast-enhanced shoulder MRI findings. J Med Imaging Radiat Oncol. 2011;55(2):119-25.

37. Zhao W, Zheng X, Liu Y, Yang W, Amirbekian V, Diaz LE, et al. An MRI study of symptomatic adhesive capsulitis. PLoS One. 2012;7(10):e47277.

38. Mengiardi B, Pfirrmann CW, Gerber C, Hodler J, Zanetti M. Frozen shoulder: MR arthrographic findings. Radiology. 2004;233(2):486-92.

39. Ryu KN, Lee SW, Rhee YG, Lim JH. Adhesive capsulitis of the shoulder joint: usefulness of dynamic sonography. J Ultrasound Med. 1993;12(8):445-9.

40. Diercks RL, Stevens M. Gentle thawing of the frozen shoulder: a prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years. J Shoulder Elbow Surg. 2004;13(5):499-502.

41. Dudkiewicz I, Oran A, Salai M, Palti R, Pritsch M. Idiopathic adhesive capsulitis: long-term results of conservative treatment. Isr Med Assoc J. 2004;6(9):524-6.

42. Widiastuti-Samekto M, Sianturi GP. Frozen shoulder syndrome: comparison of oral route corticosteroid and intra-articular corticosteroid injection. Med J Malaysia. 2004;59(3):312-6.

43. Loew M, Heichel TO, Lehner B. Intraarticular lesions in primary frozen shoulder after manipulation under general anesthesia. J Shoulder Elbow Surg. 2005;14(1):16-21.

44. Sharma RK, Bajekal RA, Bhan S. Frozen shoulder syndrome. A comparison of hydraulic distension and manipulation. Int Orthop. 1993;17(5):275-8.

45. Quraishi NA, Johnston P, Bayer J, Crowe M, Chakrabarti AJ. Thawing the frozen shoulder. A randomised trial comparing manipulation under anaesthesia with hydrodilatation. J Bone Joint Surg Br. 2007;89(9):1197-200.

46. Buchbinder R, Green S, Forbes A, Hall S, Lawler G. Arthrographic joint distension with saline and steroid improves function and reduces pain in patients with painful stiff shoulder: results of a randomised, double blind, placebo controlled trial. Ann Rheum Dis. 2004;63(3):302-9.

47. Harryman DT, 2nd, Matsen FA, 3rd, Sidles JA. Arthroscopic management of refractory shoulder stiffness. J Shoulder Elbow Surg. 1996;5(2):S24.

48. Ogilvie-Harris DJ, Biggs DJ, Fitsialos DP, MacKay M. The resistant frozen shoulder. Manipulation versus arthroscopic release. Clin Orthop Relat Res. 1995(319):238-48.

49. Pearsall AW, 4th, Osbahr DC, Speer KP. An arthroscopic technique for treating patients with frozen shoulder. Arthroscopy. 1999;15(1):2-11.

50. Wu WT, Chang KV, Han DS, Chang CH, Yang FS, Lin CP. Effectiveness of Glenohumeral Joint Dilatation for Treatment of Frozen Shoulder: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Sci Rep. 2017;7(1):10507.

51. Tveitå EK, Tariq R, Sesseng S, Juel NG, Bautz-Holter E. Hydrodilatation, corticosteroids and adhesive capsulitis: a randomized controlled trial. BMC Musculoskelet Disord. 2008;9(1):53.

52. Vastamäki H, Kettunen J, Vastamäki M. The natural history of idiopathic frozen shoulder: a 2-to 27-year followup study. Clin Orthop Relat Res. 2012;470(4):1133-43.

53. Kim K, Lee KJ, Kim HC, Lee KJ, Kim DK, Chung SG. Capsule preservation improves short-term outcome of hydraulic distension in painful stiff shoulder. J Orthop Res. 2011;29(11):1688-94.

54. Bell S, Coghlan J, Richardson M. Hydrodilatation in the management of shoulder capsulitis. Australas Radiol. 2003;47(3):247-51.

55. Callinan N, McPherson S, Cleaveland S, Voss DG, Rainville D, Tokar N. Effectiveness of hydroplasty and therapeutic exercise for treatment of frozen shoulder. J Hand Ther. 2003;16(3):219-24.

56. Mulcahy KA, Baxter AD, Oni OO, Finlay D. The value of shoulder distension arthrography with intraarticular injection of steroid and local anaesthetic: a follow-up study. Br J Radiol. 1994;67(795):263-6.

57. Rizk TE, Gavant ML, Pinals RS. Treatment of adhesive capsulitis (frozen shoulder) with arthrographic capsular distension and rupture. Arch Phys Med Rehabil. 1994;75(7):803-7.

58. Robinson CM, Seah KT, Chee YH, Hindle P, Murray IR. Frozen shoulder. J Bone Joint Surg Br. 2012;94(1):1-9.

59. Smith CD, Hamer P, Bunker TD. Arthroscopic capsular release for idiopathic frozen shoulder with intra-articular injection and a controlled manipulation. Ann R Coll Surg Engl. 2014;96(1):55-60.

60. Gam AN, Schydlowsky P, Rossel I, Remvig L, Jensen EM. Treatment of "frozen shoulder" with distension and glucorticoid compared with glucorticoid alone. A randomised controlled trial. Scand J Rheumatol. 1998;27(6):425-30.

61. Vad VB, Sakalkale D, Warren RF. The role of capsular distention in adhesive capsulitis. Arch Phys Med Rehabil. 2003;84(9):1290-2.

62. Khan AA, Mowla A, Shakoor MA, Rahman MR. Arthrographic distension of the shoulder joint in the management of frozen shoulder. Mymensingh Med J. 2005;14(1):67-70.

63. Singh GP. Comparison intra articular steroid vs. hydraulic distention for the treatment of frozen shoulder. J Univ Coll Med Sci. 2013;1(1):3-9.

64. Mishra AN, Mishra S, Dhungana HN. A study of clinical evaluation of effectiveness of hydraulic distension of shoulder in the management of frozen shoulder. Int J Orthod. 2017;3(2):675-7.

65. Shah MA, Khan I. Comparison Between Manipulation under Anesthesia and Hydraulic Distension for Treatment of Frozen Shoulder. Ann King Edward Med Univ. 2008;14(1):26-.

66. Manoj KR, Siddhartha M. Effectiveness of hydraulic distension of shoulder in the management of frozen shoulder. Int J Ortho Sci. 2016;2(4):27-30.

67. Kirkwood BR, Sterne JA. Essential medical statistics: John Wiley & Sons; 2010.

68. IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

69. Segmüller HE, Taylor DE, Hogan CS, Saies AD, Hayes MG. Arthroscopic treatment of adhesive capsulitis. J Shoulder Elbow Surg. 1995;4(6):403-8.

70. Halverson L, Maas R. Shoulder joint capsule distension (hydroplasty): a case series of patients with "frozen shoulders" treated in a primary care office. J Fam Pract. 2002;51(1):61-3.

71. Baums MH, Spahn G, Nozaki M, Steckel H, Schultz W, Klinger HM. Functional outcome and general health status in patients after arthroscopic release in adhesive capsulitis. Knee Surg Sports Traumatol Arthrosc. 2007;15(5):638-44.

72. Mao CY, Jaw WC, Cheng HC. Frozen shoulder: correlation between the response to physical therapy and follow-up shoulder arthrography. Arch Phys Med Rehabil. 1997;78(8):857-9.

73. Nicholson GP. Arthroscopic capsular release for stiff shoulders: effect of etiology on outcomes. Arthroscopy. 2003;19(1):40-9.

ANNEXURES

PROFORMA

TITLE: A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION ALONG WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER.

Serial No: O.P/IP No:

Patient Name: DOA:

Age: Date of procedure done:

Sex: DOD:

Address: Hospital:

Unit:

Occupation

HISTORY

Insidious onset

Bilateral

Static

PRESENTING SYMPTOMS

1. Pain in the Shoulder
   - Acute onset / Insidious Onset
   - Duration
   - Unilateral / Bilateral
   - Disturbed sleep
   - Type of pain
   - Rest pain
   - Aggravating / Relieving factor
2. Restricted movements
   - Progressive / Static
   - Duration
3. Others

PAST HISTORY

1) H/o Trauma

2) Immobilisation of shoulder for other causes

3) Diabetic Non-Diabetic

4) H/o pulmonary TB / COPD / Hepatitis / AIDS

5) H/o Thyroid dysfunction

6) IHD

7) Hemiplegia

8) Cerebral haemorrhage

FAMILY HISTORY

H/o TB / Diabetes Mellitus / Hypertension / Bronchial asthma

PERSONAL HISTORY

Smoker/Non-Smoker	Since years
Alcoholic/Non-Alcoholic	Since years
Married / Single.	Widow / Widower

Diet: Veg / Non-Veg / Mixed

Appetite : Good / Loss of appetite

Sleep : Disturbed / Un disturbed

Bladder : Regular / Not regular

Bowel : Regular / Not regular

GENERAL PHYSICAL EXAMINATION

1. Build	2.BP
3. Pulse	4.Temperature

5. Respiratory Rate

6. Pallor / Icterus / Clubbing / Cyanosis / Pedal Oedema / Lymphadenopathy

SYSTEMIC EXAMINATION

CVS	PA
RS	CNS

LOCAL EXAMINATION OF SHOULDER JOINT Inspection

Attitude

Deformity

Side affected	Right	Left
	Dominant	Non Dominant
Wasting of muscles around shoulder	Present	Absent

Scar / Sinuses

Palpation

Temperature changes

Tenderness

Deformity

INVESTIGATIONS

Blood Hb%

TC

DC

ESR

RBS

HIV / HBs Ag

Urine Albumin Sugar Microscopy

Plain x-ray of shoulder AP View :

TREATMENT

Previous Treatment Received

1) Anti-inflammatory analgesics
2) Hydrocortisone infiltration
3) Physiotherapy
4) Manipulation
5) Others

PRESENT TREATMENT

1) The material used for injection

Xylocaine

Betamethasone

Normal saline

2) Approach to the shoulder Anterior Posterior

Quantity of normal saline used : ml

Post distention side effects : Yes / No

Post distension advice given

a. Antiinflammatory analgesics
b. Antibiotics
c. Exercises
d. Physiotherapy

RANGE OF MOTION

Pain score	Pre distension	Post distension	Follow up		
			3weeks	6weeks	12weeks
Active elevation					
Active abduction					
Active E.R					
Active I.R					

FUNCTIONAL SCORE

Functional score	Pre distension	Post distension	Follow up		
			3weeks	6weeks	12weeks
Use back pocket or tuck sari at back					
Touch the opposite axilla					
Eating					
Combing hair					
Use of hand over head					

ASES Score

Pre Distension	6 weeks	12 weeks

ASES Score

8) Is it difficult for you to put on a coat?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

9) Is it difficult for you to sleep on the affected side?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

10) Is it difficult for you to wash your back/do up bra?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

11) Is it difficult for you manage toiletting?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

12) Is it difficult for you to comb your hair?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

13) Is it difficult for you to reach a high shelf?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

14) Is it difficult for you to lift 10lbs. (4.5kg) above your shoulder?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

15) Is it difficult for you to throw a ball overhand?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

16) Is it difficult for you to do your usual work?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

17) Is it difficult for you to do your usual sport/leisure activity?
- ○ Unable to do
- ○ Very difficult to do
- ○ Somewhat difficult
- ○ Not difficult

Print page | Close Window | Reset

To save this data please print or Save As CSV

Nb: This page cannot be saved due to patient data protection so please print the filled in form before closing the window.

The Total ASES score is: 0

Page design : Aaron Rooney

Reference : American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form, patient self-report section: reliability, validity, and responsiveness.Michener LA, McClure PW, Sennett BJ.J Shoulder Elbow Surg. 2002 Nov-Dec;11(6):587-94.

PATIENT INFORMATION SHEET

Study title: A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION WITH STEROID UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER.

Study location: R L Jalappa Hospital and Research Centre attached to Sri DevarajUrs Medical College, Tamaka, Kolar.

Details-

Patients aged >30years diagnosed having Frozen shoulder by the department of orthopaedics to R.L.Jalappa Hospital will be included in this study.

Patients in this study will have to undergo routine blood (CBC, RFT,FBS ,PPBS ,HbA1c, blood grouping, virology) investigations and xray of Chest with B/L shoulder AP view (pre procedure & follow up period).

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in the study, we will collect information (as per proforma) from you or a person responsible for you or both. Relevant history will be taken. This information collected will be used only for the dissertation and publication.

All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care you will get will not change if you don't wish to participate. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

For further information contact

Dr.ROGER KENNEDY. X (Postgraduate),
Department of ORTHOPAEDICS,
SDUMC, Kolar
CONTACT NO:9003844487

INFORMED CONSENT FORM

I…….AGED. SEX…… UHID NO:... UNRESERVEDLY AND IN MY FULL SENSES HERE BY GIVE MY CONSENT TO TAKE PART IN A PROSPECTIVE STUDY ON ROLE OF HYDRAULIC DISTENSION UNDER LOCAL ANAESTHESIA IN THE MANAGEMENT OF FROZEN SHOULDER. STUDY WHICH INCLUDES UNDERGOING A PROCEDURE INTRA-ARTICULAR LOCAL ANAESTHESIA FOLLOWED BY DISTENSION WITH NORMAL SALINE AND STEROID WITH MANUPULATION WHICH INCLUDES SCREENING X-RAY OF PRE PROCEDURE AND POST PROCEDURE DURING FOLLOW UP VISITS.
I HAVE BEEN EXPLAINED THAT MY CLINICAL FINDINGS, INVESTIGATIONS LIKE ROUTINE BLOOD(CBC,RFT,BLOOD GROUPING TYPING,VIROLOGY) INVESTIGATIONS AND X-RAYS,DOES NOT INVOLVE ANY COST. INTRA PROCEDURE FINDINGS, CLINICAL COURSE WILL BE ASSESSED AND DOCUMENTED FOR STUDY PURPOSE
NATURE AND RISKS INVOLVED IN THE PROCEDURES HAVE BEEN EXPLAINED TO ME IN MY UNDERSTANDABLE LANGUAGE, TO MY SATISFACTION. FOR ACADEMIC AND SCIENTIFIC PURPOSE, THE OPERATION/PROCEDURE USED FOR STATISTICAL MEASUREMENTS. I HEREBY GIVE MY CONSENT FOR THE SAME.

SIGNATURE OF THE PATIENT
NAME:

SIGNATURE OF THE GUIDE
NAME:

SIGNATURE OF THE WITNESS
NAME :

SIGNATURE OF THE EXAMINER
NAME:

DATE:
PLACE:

ಮಾಹಿತಿಯುಕ್ತ ಸಮ್ಮತಿ ಪತ್ರ

ದಿನಾಂಕ:

ಮತ್ತು ಸಮ್ಮತಿದೃಢೀಕರಣ

ನಾನು _____

ನನ್ನಪೂರ್ಣಅರಿವಿನಲ್ಲಿ, ಯಾವುದೇಬಲವಂತವಿಲ್ಲದೆಅಥವಾಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೇ "ಸ್ಥಳೀಯ ಅರಿವಳಿಕೆ ಅಡಿಯಲ್ಲಿ ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆಯನ್ನು ಭುಜದಕೀಲಿನ ಒಳಗೆಗೆದುಕೊಳ್ಳಲು" ಅಥವಾ ಯಾವುದೇ ಇತರ ವಿಧಾನಸೂಕ್ತವೋ ಅದಕ್ಕೆ, ನನ್ನ ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆ ನೀಡುತ್ತಿದ್ದೇನೆ. ಅದುರೋಗನಿರ್ಣಯದ / ಅಥವಾಚಿಕಿತ್ಸೆಯವಿಧಾನ / ಬಯಾಪ್ಸಿ/ ಕಾರ್ಯಾಚರಣೆ ಆಗಿರಬಹುದಾಗಿದೆ. ಈಸೂಜಿಮದ್ದುನ್ನು ನನಗೆ / ನನ್ನಮಗ / ನನ್ನಮಗಳು / ನನ್ನವಾರ್ಡ್ _____ ವಯಸ್ಸಿನ _____ಗೆಯಾವುದೇಸೂಕ್ತ ಅರಿವಳಿಕೆಕೊಡಬಹುದು. ಅದರ ಪ್ರಕೃತಿ ಮತ್ತು ವಿಧಾನದಲ್ಲಿ (ಶಸ್ತ್ರಚಿಕಿತ್ಸಕಮತ್ತುಅರಿವಳಿಕೆಯ) ಒಳಗೊಂಡ ಅಪಾಯಗಳ ಬಗ್ಗೆ ನನಗೆ ತೃಪ್ತಿಯಾಗಿ ವಿವರಿಸಲಾಗಿದೆ. ನನಗೆ "ಹೆಪ್ಪುಗಟ್ಟಿದ ಭುಜದ ನಿರ್ವಹಣೆಗೆ ಸ್ಥಳೀಯ ಅರಿವಳಿಕೆ ಅಡಿಯಲ್ಲಿ ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆಯ ಪಾತ್ರದ ಬಗ್ಗೆ ಒಂದು ನಿರೀಕ್ಷಿತ ಅಧ್ಯಯನ

"ಎಂಬ ವೈದ್ಯಕೀಯ ಸಂಶೋಧನೆಯ ಬಗ್ಗೆ ಸಂಪೂರ್ಣವಾಗಿ ವಿವರಿಸಿದ್ದಾರೆ.

ನಾನು ಮಾಹಿತಿಯ ಕೈಪಿಡಿಯನ್ನು ಓದಲು ಮತ್ತು ನಾನು ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ ಅವಕಾಶವನ್ನು ಹೊಂದಿದ್ದೆನು. ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ, ನನಗೆ ತೃಪ್ತಿಯಾಗಿ ಉತ್ತರಗಳನ್ನು ನೀಡಲಾಗಿದೆ. ನಾನು ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಂಡು ಭಾಗವಹಿಸಲು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಯನ್ನು ಕೊಡುತ್ತಿದ್ದೇನೆ. ನಾನು ನನ್ನಇತಿಹಾಸ ಒದಗಿಸಲು, ದೈಹಿಕಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಲು, ಇಂಜೆಕ್ಷನ್ವಿಧಾನಗಳಿಗೆ ಒಳಪಡಲು, ತನಿಖೆಗೆ ಒಳಗಾಗಲು, ಅದರ ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳನ್ನು ಇತ್ಯಾದಿ ವೈದ್ಯರುಗಳಿಗೆ / ಸಂಸ್ಥೆಗೆ ಇತ್ಯಾದಿಗಳಿಗೆ ಒದಗಿಸಲು ಒಪ್ಪಿಗೆ ನೀಡುತ್ತಿದ್ದೇನೆ. ಕಾರ್ಯಾಚರಣೆಯ / ವಿಧಾನದಮಾಹಿತಿಯನ್ನು, ಇತ್ಯಾದಿಯನ್ನು ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ, ವೀಡಿಯೊಗ್ರಾಫಿಯನ್ನು ಅಥವಾ ಛಾಯಾಗ್ರಹಣಮಾಡಬಹುದು. ರೋಗಿಯ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಗೆ ಯಾವುದೇ ವೆಚ್ಚವಿಲ್ಲ. ಎಲ್ಲಾಡೇಟಾವನ್ನು / ಮಾಹಿತಿಯನ್ನು ಪ್ರಕಟಿತ ಅಥವಾ ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸಬಹುದು. ನಾನು ವೈದ್ಯರುಗಳನ್ನು / ಸಂಸ್ಥೆಯನ್ನು ಇತ್ಯಾದಿ, ವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ಅಹಿತಕರ ಪರಿಣಾಮಗಳಾದಲ್ಲಿ ಹೊಣೆಯಾಗಿಸುವುದಿಲ್ಲ.

ಈ ಸಮ್ಮತಿಸುವ ಪತ್ರ ಮತ್ತು ರೋಗಿಯ ಮಾಹಿತಿಕೈಪಿಡಿಯ ಒಂದು ಪ್ರತಿಯನ್ನು ನನಗೆ ಕೊಟ್ಟಿದ್ದಾರೆ.

_____ _____ _____

(ರೋಗಿಯ ಪರಿಚಾರಕನ ಸಹಿ & ಹೆಸರು) (ರೋಗಿಯ / ಗಾರ್ಡಿಯನ್ನ ಸಹಿ / ಹೆಬ್ಬೆಟ್ಟಿನ ಗುರುತು & ಹೆಸರು)

(ರೋಗಿಯ ಸಂಬಂಧ)

ಸಾಕ್ಷಿ:

_____

(ಸಂಶೋಧಕನ / ವೈದ್ಯರಸಹಿ&ಹೆಸರು)

	SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR -563 101.	FORMAT NO.	
		ISSUE NO.	
	Information Sheet	REV. NO.	
		DATE	

ಮಾಹಿತಿಹಾಳೆ

ಪ್ರಧಾನ ಸಂಶೋಧಕ ರಹೆಸರು: ಡಾ. ರೋಜರ್ ಕೆನ್ನೆಡಿ

ಸಂಸ್ಥೆಹೆಸರು: ಶ್ರೀದೇವರಾಜ ಅರಸು ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಮತ್ತು ಶ್ರೀದೇವರಾಜ ಅರಸು ಉನ್ನತ ಶಿಕ್ಷಣ ಅಕಾಡೆಮಿ: ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ, ಭಾರತ - 563101.ಆಸ್ಥಿಚಿಕಿತ್ಸೆಇಲಾಖೆ

ಪರಿಚಯ:

ನಾವು 1. ಡಾ. ರೋಜರ್ ಕೆನ್ನೆಡಿ ಸ್ನಾತಕೋತ್ತರಟ್ರೇನೀ ಆರ್ಥೋಪೆಡಿಕ್ಸ್ವಿಭಾಗ, ಶ್ರೀದೇವರಾಜ್ಅರಸ್ವೈದ್ಯಕೀಯಕಾಲೇಜು, ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ, ಭಾರತ - 563101 " ಹೆಪ್ಪುಗಟ್ಟಿದ ಭುಜದ ನಿರ್ವಹಣೆಗೆ ಸ್ಥಳೀಯ ಅರಿವಳಿಕೆ ಅಡಿಯಲ್ಲಿ ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆಯ ಪಾತ್ರದ ಬಗ್ಗೆ ಒಂದು ನಿರೀಕ್ಷಿತ ಅಧ್ಯಯನ" (ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ) ಎಂಬ ಪ್ರಯೋಗದ ಮೇಲೆ ಅಧ್ಯಯನ ಮಾಡುತಿದ್ದೇವೆ. ನೀವು ಮೇಲಿನ ಸಂಶೋಧನಾ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಿಮಗೆ ಆಹ್ವಾನ. ನಮ್ಮ ಅಧ್ಯಯನದ ಉದ್ದೇಶ - ಹೆಪ್ಪುಗಟ್ಟಿದ ಭುಜದ ಕಾಯಿಲೆಗೆ ಭುಜದ ಕೀಲಿನ ಒಳಗೆ ಕೊಡುವ ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆ ವಿಶ್ಲೇಷಿಸಿ ಅಧ್ಯಯನ ಮಾಡುವುದು. ಅಧ್ಯಯನದ ಅವಧಿ ಹನ್ನೆರಡು ತಿಂಗಳು.

ಸಂಶೋಧನೆ ಪ್ರಕಾರ: ನಿರೀಕ್ಷಿತ ಅನಾಲಿಟಿಕಲ್ಸ್ಟಡಿ

ಏಕೆ ಈ ಸ್ಪರ್ಧಿ ಆಯ್ಕೆ?: ಹೆಪ್ಪುಗಟ್ಟಿದ ಭುಜದ ಕಾಯಿಲೆ ಇರುವ ಎಲ್ಲಾರೋಗಿಗಳನ್ನು ಒಳಗೂಡಿಸುವಿಕೆ ಮತ್ತು ಬಹಿಷ್ಕರಣ ಮಾನದಂಡಗಳ ಪ್ರಕಾರ ಆರಿಸಲಾಗುತ್ತದೆ.

ವಾಲಂಟರಿ ಭಾಗವಹಿಸುವಿಕೆ: ಹೌದು

ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಅಪಾಯಗಳು: ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆ ಹೆಪ್ಪುಗಟ್ಟಿದ ಭುಜದ ಕಾಯಿಲೆಗೆ ಚಿಕಿತ್ಸೆಯ ವಿಧಾನವಾಗಿದೆ. ಸ್ಪರ್ಧಿ ತನ್ನ ಲಕ್ಷಣಗಳು ಮತ್ತು ಕಾರ್ಯಗಳನ್ನು ಸುಧಾರಣೆಗಳು ಪ್ರಯೋಜನಗಳನ್ನು ಹೊಂದಿದೆ. ಹೈಡ್ರಾಲಿಕ್ ವಿತರಣೆ ಅಪಾಯಗಳು ಕನಿಷ್ಠ ಮತ್ತು ಸಾಮಾನ್ಯಅಲ್ಲ.

ಗೌಪ್ಯತೆ: ಅಭ್ಯರ್ಥಿಯ ಗೌಪ್ಯತೆಯನ್ನು ನಿರ್ವಹಿಸಲಾಗುವುದು.

ಸ್ವಾತಂತ್ರ್ಯ : ಅಭ್ಯರ್ಥಿಯು ಭಯವಿಲ್ಲದೇ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹೊರಹೋಗಬಹುದು.

ಯಾರನ್ನು ಸಂಪರ್ಕಿಸಬೇಕು; ಡಾ. ರೋಜರ್ ಕೆನ್ನೆಡಿ ಆರ್ಥೋಪೆಡಿಕ್ಸ್ಇಲಾಖೆ, ಕೊಠಡಿ ಸಂಖ್ಯೆ 204, ಸ್ನಾತಕೋತ್ತರ ಪುರುಷರ ಹಾಸ್ಟೆಲ್, SDUMC, ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ - 563101. ಮೊಬೈಲ್ನಂ 9003844487, ಇಮೇಲ್: coolroger.3@gmail.com.

MASTER SHEET

S. No	Age	Sex	IP no	Side	CO	P-0	P-PD	P-3	P-6	P-12	F-0	F-PD	F-3	F-6	F-12	A-0	A-PD	A-3
1	58	M	596354	Dominant		1	2	3	4	4	70	70	90	120	140	80	100	140
2	38	M	308547	Dominant	DM	2	3	3	4	5	60	70	110	140	160	90	100	150
3	38	F	619118	Non dominant	DM	1	2	3	3	4	70	80	110	140	170	90	110	160
4	46	M	669922	Dominant		1	2	3	3	4	70	70	100	140	165	90	110	160
5	49	M	637141	Dominant		1	2	2	3	3	60	70	100	120	160	80	110	165
6	48	F	637162	Dominant	DM	1	2	2	3	4	80	100	120	144	160	90	130	165
7	61	M	638143	Non dominant	DM	1	2	3	3	4	120	140	140	160	160	110	130	170
8	56	F	680821	Non dominant		2	3	4	4	5	100	130	140	150	165	150	160	160
9	63	M	605275	Dominant	DM	1	1	2	3	3	100	120	130	145	145	100	120	130
10	62	F	79135	Dominant	DM	1	2	3	3	4	100	140	150	160	160	130	150	160
11	52	M	632157	Non dominant	DM	2	3	3	4	4	100	120	130	150	160	100	120	140
12	52	M	683294	Dominant	DM	1	2	2	3	3	60	80	100	120	140	80	100	110
13	41	F	690601	Non dominant	HTN	2	3	4	4	5	120	140	150	160	170	120	150	160
14	65	M	688633	Non dominant	HTN	1	2	3	3	4	90	120	160	160	170	90	130	150
15	48	M	693077	Dominant	DM	1	2	2	3	4	100	140	150	170	170	90	130	140
16	48	M	693070	Non dominant		1	2	3	3	3	90	110	120	130	140	100	110	120
17	45	F	693191	Non dominant	HTN	1	2	2	3	4	120	145	160	170	170	120	150	160
18	61	M	628603	Dominant	DM	1	2	2	3	4	120	140	150	160	170	90	120	140
19	68	M	694283	Non dominant	DM	1	2	3	4	5	60	90	100	150	170	70	100	120
20	58	M	690794	Non dominant	HTN	1	2	2	3	3	60	80	90	90	110	70	100	110
21	50	F	698280	Dominant	HTN	1	2	3	3	4	70	100	120	150	170	70	130	150
22	65	M	698390	Non dominant	IHD	1	2	3	4	5	90	140	160	170	170	100	160	170
23	62	M	690138	Dominant	DM	1	2	2	3	4	60	140	160	160	170	45	100	140
24	45	F	312367	Non dominant		1	2	2	3	3	60	80	90	110	130	70	90	100
25	61	M	637649	Non dominant	HTN	1	2	3	3	4	50	90	140	150	170	50	100	120
26	45	F	548234	Dominant	HTN	1	2	3	4	4	40	70	100	150	150	40	80	150
27	80	M	703649	Dominant	DM	1	1	2	2	2	50	90	110	160	170	40	90	140
28	59	M	703964	Dominant	DM	1	2	3	4	4	40	80	120	160	170	30	90	140
29	50	F	90941	Non dominant	HTN	1	1	2	2	3	40	60	80	90	110	50	70	80
30	50	M	707707	Non dominant	DM	1	2	3	4	4	40	100	140	170	170	60	110	160
31	50	M	707762	Dominant	DM	1	1	2	3	4	50	100	140	170	170	40	90	140
32	41	M	538195	Dominant		1	2	2	3	4	40	90	120	150	170	30	90	110
33	65	M	90299	Dominant		1	2	2	3	3	50	70	100	110	130	30	70	100
34	55	F	689247	Non dominant		1	2	3	4	4	40	90	110	140	170	60	100	140
35	70	M	717599	Non dominant	DM	1	2	3	3	4	80	120	140	160	170	70	100	120
36	30	M	718773	Non dominant		1	1	2	3	3	50	70	100	110	130	50	70	100
37	41	M	721224	Dominant	DM	1	2	2	3	3	70	100	110	130	140	60	80	100
38	49	M	718529	Non dominant		1	2	2	3	3	80	100	120	130	140	60	80	100
39	48	M	721240	Non dominant		1	1	2	2	2	40	60	80	80	90	30	50	60
40	65	F	716886	Dominant		1	2	3	3	4	60	90	140	150	160	70	100	130
41	45	M	725371	Non dominant	DM	1	2	2	3	4	70	120	140	160	170	80	110	140
42	42	M	315735	Dominant		1	2	3	4	5	80	110	130	150	160	50	90	120
43	57	F	764888	Non dominant	DM	1	2	2	3	4	70	100	120	150	170	70	100	130
44	51	M	729226	Non dominant		1	1	2	3	3	50	80	100	120	130	60	90	100
45	60	M	745910	Non dominant	DM	1	2	2	3	4	60	90	120	150	170	50	80	120
46	44	M	719183	Dominant		1	2	3	4	5	80	110	130	150	160	40	90	130
47	53	M	748319	Non dominant		1	2	2	3	4	80	120	140	160	160	60	100	120
48	41	F	767760	Dominant		1	2	2	3	3	50	60	80	100	120	50	60	80
49	48	M	749108	Non dominant		1	1	2	2	2	40	60	70	80	90	40	60	70
50	55	M	611380	Non dominant	DM	1	1	2	3	4	80	110	130	150	160	90	110	130

S.No	A-6	A-12	IR-0	IR-PD	IR-3	IR-6	IR-12	ER-0	ER-PD	ER-3	ER-6	ER-12	Avg ROM	Avg FUN	ASES score Base line	ASES 6th week	ASES 12th week
1	160	160	20	30	50	60	70	15	30	40	45	50	105	4	30	70	100
2	160	160	30	30	40	60	70	20	40	45	50	60	112.5	4	41	60	90
3	170	170	30	40	50	60	70	15	30	30	35	40	112.5	4	30	65	80
4	170	170	30	40	50	60	70	10	25	35	45	50	113.75	4	33	70	100
5	165	160	20	30	50	50	50	20	40	50	50	60	107.5	3	30	65	98
6	170	170	30	50	60	60	70	20	30	35	45	50	112.5	4	32	70	100
7	170	170	30	50	60	60	70	30	35	40	50	60	115	4	50	65	90
8	170	170	50	60	60	70	90	25	35	40	50	50	118.75	4	40	60	80
9	140	155	40	50	50	60	80	20	30	40	50	50	107.5	3	30	65	100
10	170	170	30	50	50	60	80	20	25	30	40	45	113.75	4	44	70	100
11	160	170	50	60	70	90	90	30	40	40	45	50	117.5	4	30	65	90
12	130	140	30	40	60	70	80	30	40	45	50	50	102.5	4	40	60	100
13	160	160	40	60	80	90	90	20	30	40	45	60	120	4	45	60	90
14	150	160	45	65	80	80	90	15	20	30	45	45	116.25	4	43	70	90
15	160	170	50	65	80	80	90	15	25	35	40	50	120	4	40	60	100
16	130	140	40	50	60	70	80	20	30	35	45	50	102.5	3	44	60	90
17	170	170	40	65	80	90	90	25	30	45	50	60	122.5	4	40	75	98
18	160	170	50	60	80	90	90	20	30	35	45	45	118.75	4	30	60	100
19	140	170	30	40	60	80	90	15	20	30	35	45	118.75	4	36	75	100
20	120	130	20	40	50	60	70	25	35	45	50	55	91.25	3	30	60	90
21	160	170	30	45	60	80	90	20	30	35	35	45	118.75	4	40	65	98
22	170	170	40	60	80	80	90	20	30	40	45	50	120	4	34	70	90
23	160	170	20	60	80	90	90	30	40	40	50	60	122.5	4	30	60	100
24	110	120	30	50	60	70	75	20	35	45	45	55	95	3	43	60	90
25	150	160	20	50	40	90	80	15	25	30	40	50	115	4	33	75	100
26	150	170	10	40	40	60	80	15	20	30	35	45	111.25	4	36	70	80
27	170	170	20	40	60	90	90	15	30	35	45	50	120	4	39	65	98
28	160	170	20	50	90	90	90	15	25	25	35	40	117.5	4	30	70	90
29	100	120	30	40	50	60	70	15	30	40	50	55	88.75	3	33	60	70
30	170	170	20	60	90	90	90	20	30	40	50	60	122.5	4	37	65	100
31	160	170	30	60	80	90	90	25	30	45	50	60	122.5	4	33	70	90
32	140	170	30	60	90	90	90	30	35	45	55	60	122.5	4	20	85	90
33	110	130	20	40	50	55	60	30	35	45	50	60	95	3	40	70	70
34	160	170	40	60	80	90	90	25	30	40	55	60	122.5	4	30	60	90
35	160	170	30	65	80	90	90	30	35	45	55	60	122.5	4	44	85	98
36	120	130	30	40	50	55	60	20	30	45	50	55	93.75	3	35	70	70
37	110	120	20	40	50	60	70	30	40	45	50	60	97.5	3	43	60	80
38	110	130	10	20	30	45	50	30	35	40	50	60	95	3	31	75	80
39	80	90	10	20	30	35	45	20	30	35	40	45	67.5	2	30	60	86
40	160	170	30	60	80	90	90	20	30	45	50	50	117.5	4	36	85	100
41	160	170	20	40	60	70	90	30	40	55	55	60	122.5	4	30	60	80
42	140	160	30	60	70	80	90	25	35	40	45	50	115	4	32	65	90
43	150	170	20	50	70	80	90	30	40	45	55	60	122.5	4	43	65	88
44	120	130	30	40	55	60	70	20	30	35	45	50	95	3	36	80	90
45	140	170	20	40	60	70	80	30	40	50	55	60	120	4	41	85	80
46	150	160	30	60	80	90	90	20	30	35	45	50	115	4	39	70	90
47	140	160	10	40	60	80	90	25	30	40	45	50	115	4	32	80	100
48	100	110	20	30	45	55	60	20	30	45	50	55	86.25	3	35	60	89
49	85	90	20	30	45	50	55	15	20	25	35	45	70	2	37	60	89
50	150	160	20	50	70	80	90	15	30	30	45	55	116.25	4	42	70	100

KEY OF THE MASTER SHEET

S.No. - Serial number

IP No. - Inpatient number

CO. - Co morbidities

P-0 - Pain score pre procedure

P-PD. - Pain score post procedure

P-3 - Pain score at 3 weeks follow up

P-6. - Pain score at 6 weeks follow up

P-12 - Pain score at 12 weeks follow up

F-0. - Flexion of shoulder pre procedure

F-PD. - Flexion of shoulder post procedure

F-3 - Flexion of shoulder at 3 weeks follow up

F-6. - Flexion of shoulder at 6 weeks follow up

F-12. - Flexion of shoulder at 12 weeks follow up

A-0 - Abduction of shoulder pre procedure

A-PD. - Abduction of shoulder post procedure

A-3. - Abduction of shoulder at 3 weeks follow up

A-6 - Abduction of shoulder at 6 weeks follow up

A-12. - Abduction of shoulder at 12 weeks follow up

IR-0. - Internal rotation of shoulder pre procedure

IR-PD. - Internal rotation of shoulder post procedure

IR-3. - Internal rotation of shoulder at 3 weeks follow up

IR-6. - Internal rotation of shoulder at 6 weeks follow up

IR-12. - Internal rotation of shoulder at 12 weeks follow up

ER-0. - External rotation of shoulder pre procedure

ER-PD. - External rotation of shoulder post procedure

ER-3. - External rotation of shoulder at 3 weeks follow up

ER-6. - External rotation of shoulder at 6 weeks follow up

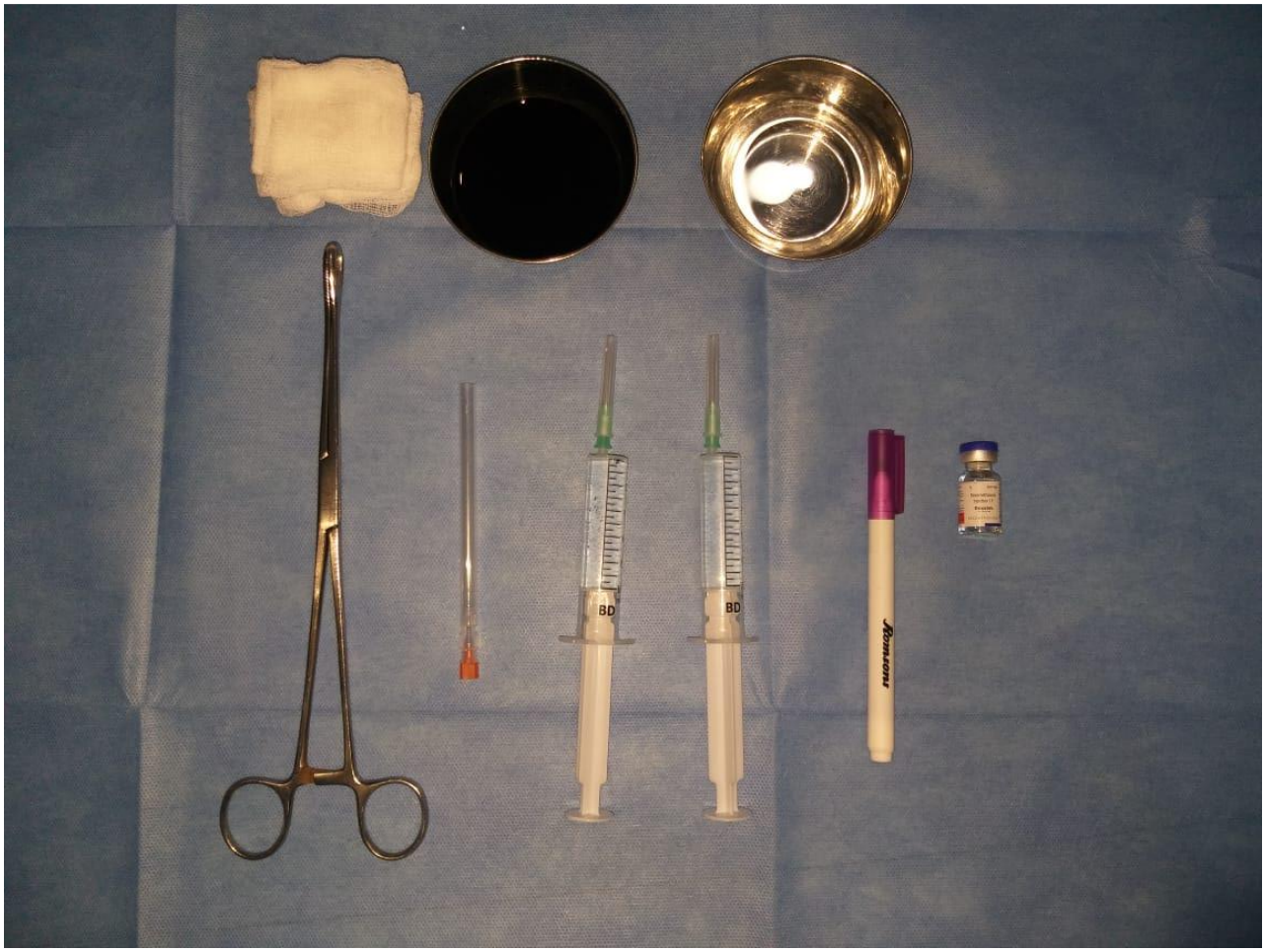
ER-12. - External rotation of shoulder at 12 weeks follow up

Avg ROM - Average Range of Motion of shoulder

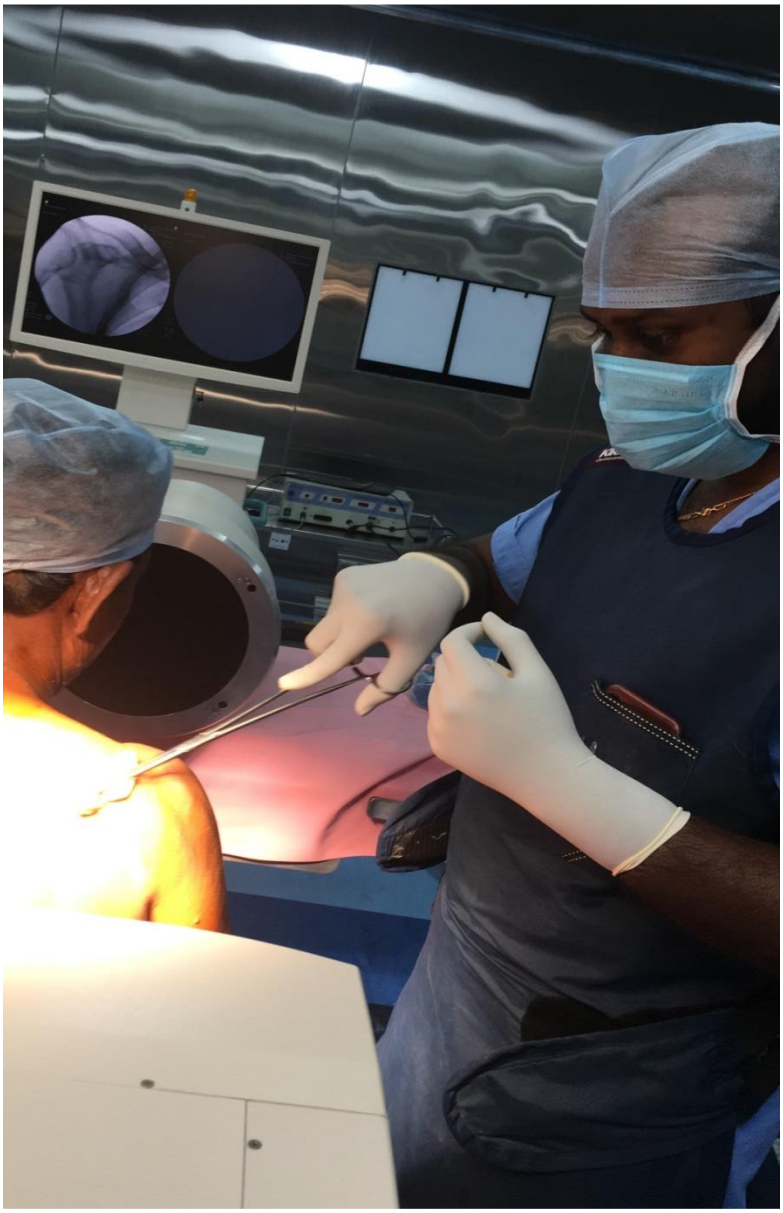
Avg FUN - Average functional ASES score

INTRA OP IMAGES

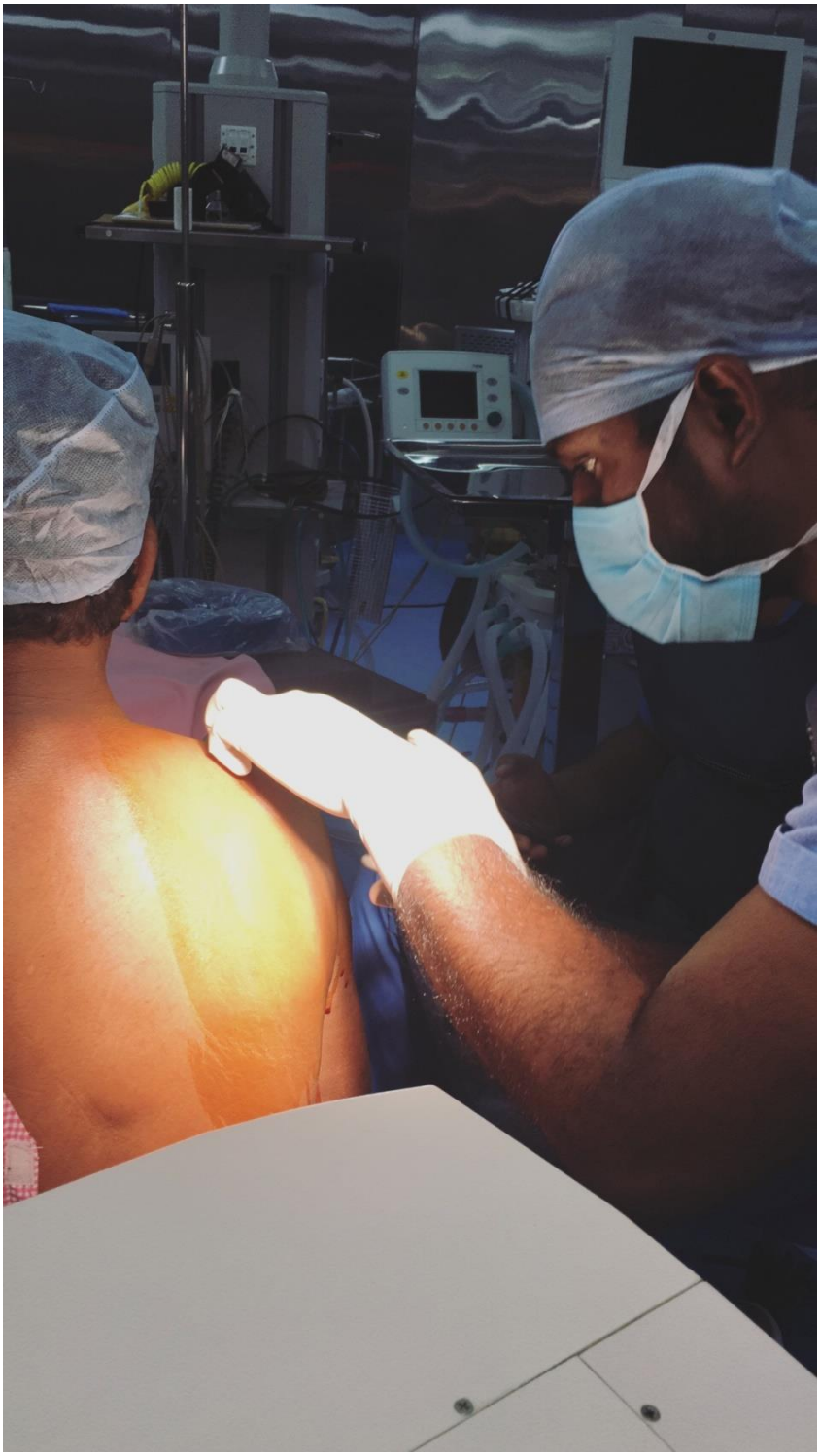
Clinical images 1: Materials for the procedure



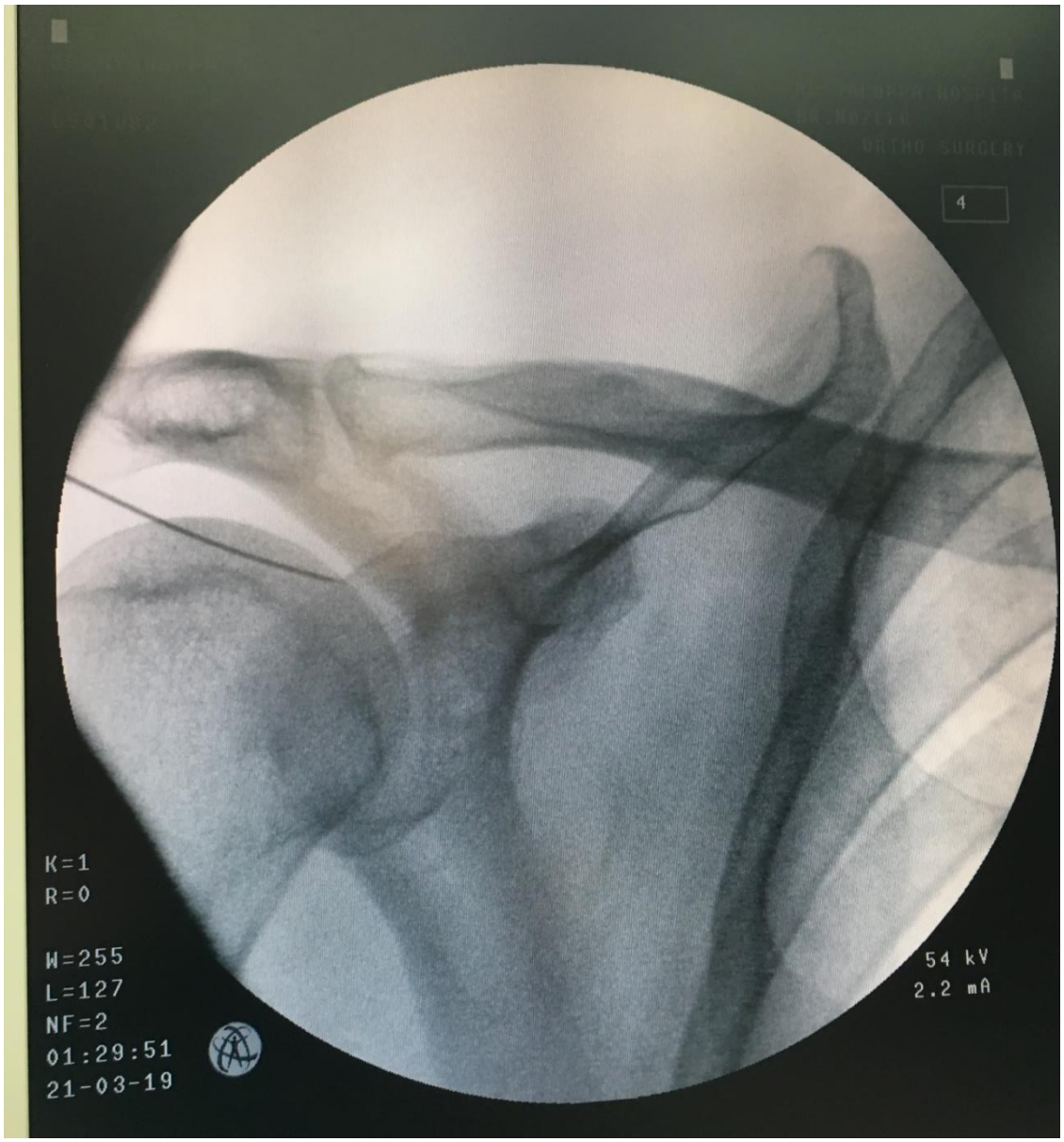
Clinical image 2: Sterile Preparation of the Shoulder



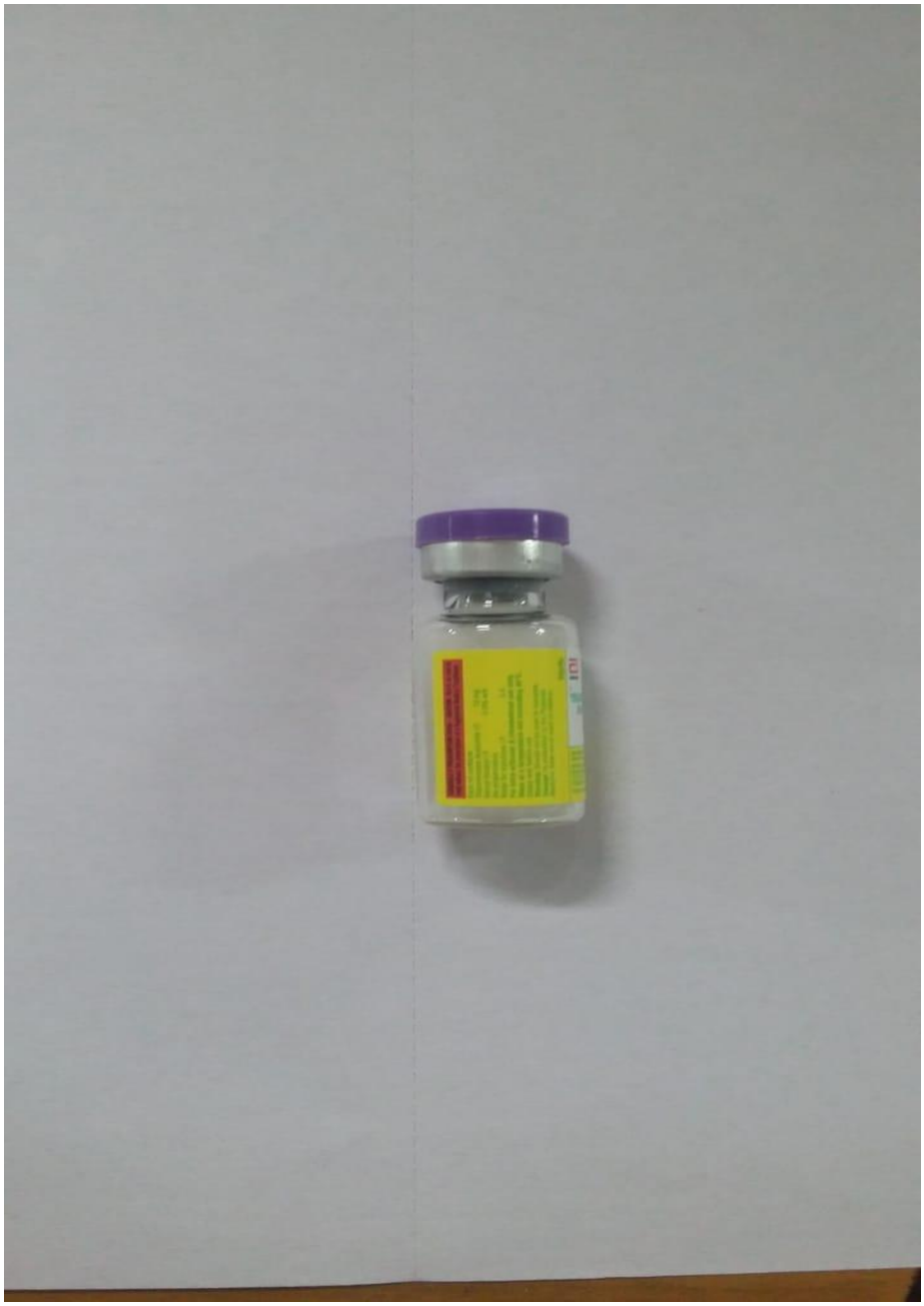
Clinical image 3: C -arm Guided Intra articular Hydraulic distension



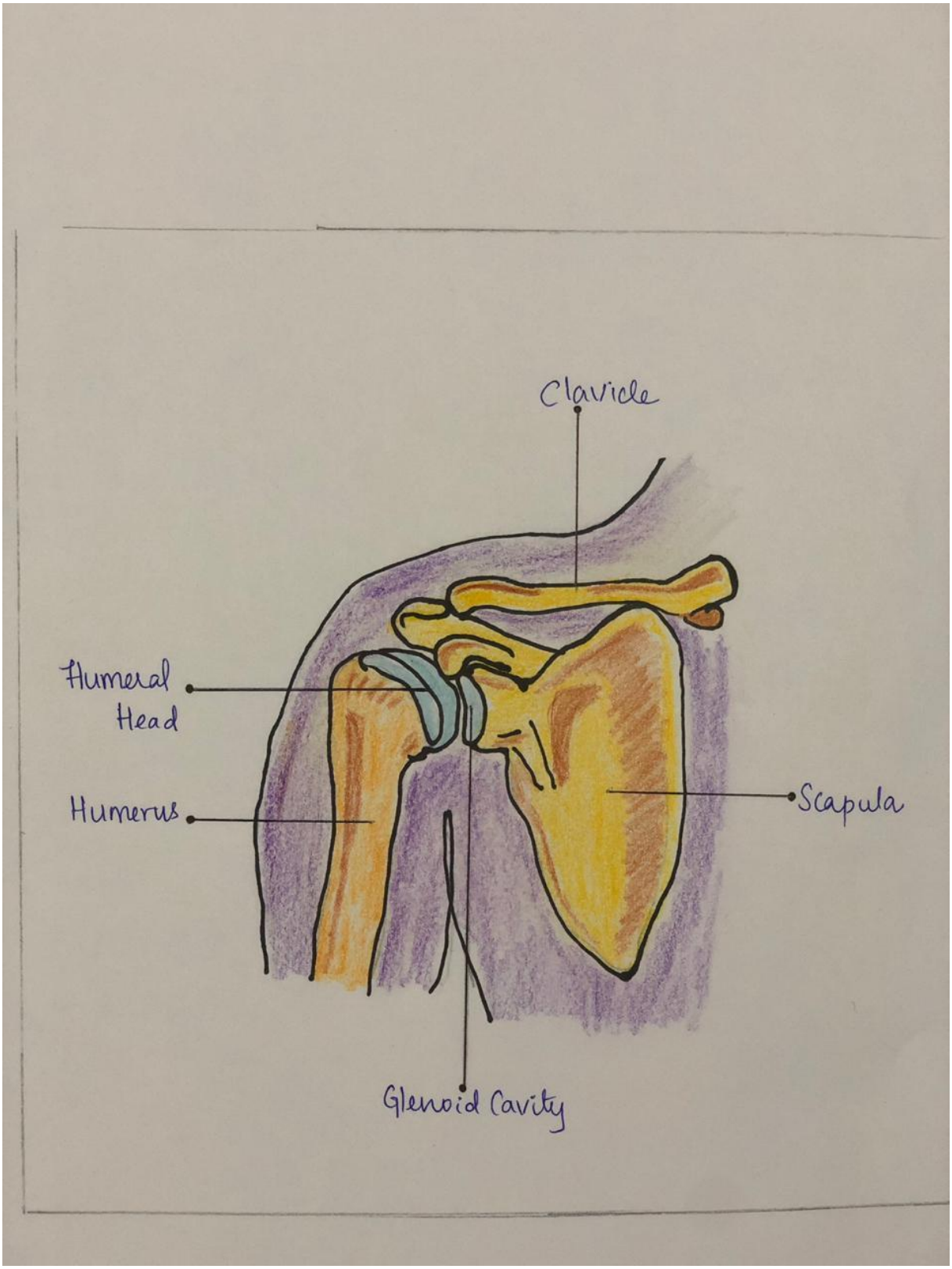
Clinical image 4: C arm Image



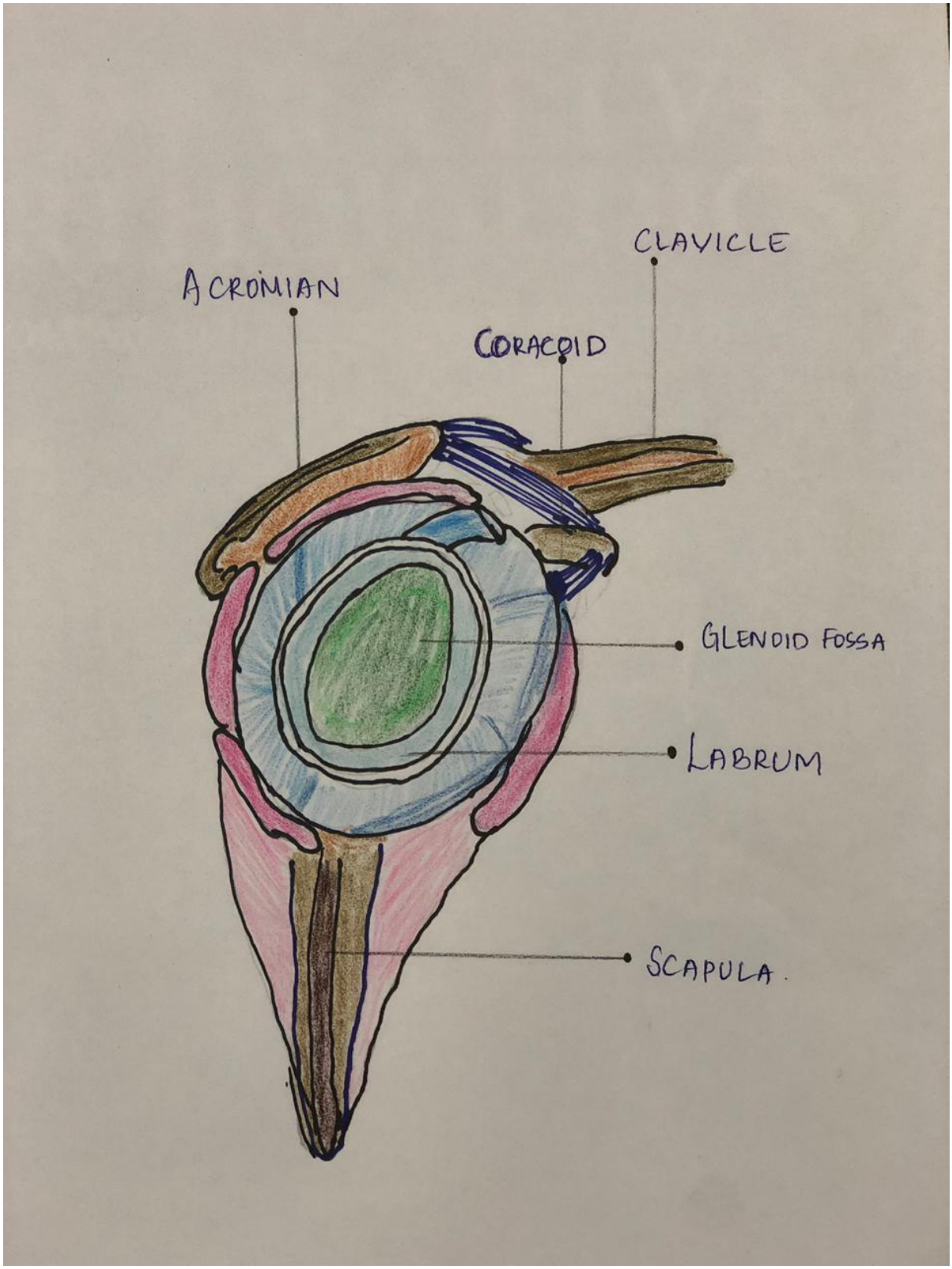
Clinical image 5: Steroid Injection



Clinical image 6: Clinical anatomy of shoulder joint



Clinical image 7: Lateral Border of the scapula with glenoid cavity

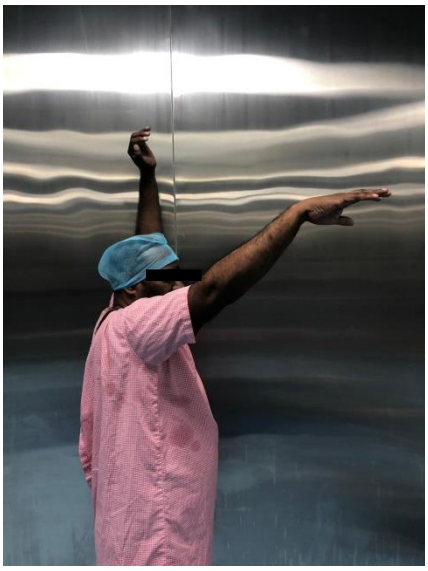


CASE: 1

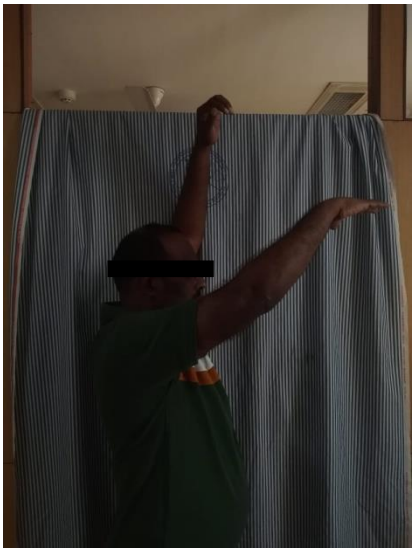
FLEXION

Pre distension

Post distension



3 Weeks



12 Weeks

ABDUCTION

Pre-Procedure

Post Distension

6 Weeks Follow Up

12 Weeks Follow Up

EXTERNAL ROTATION

Pre-Procedure

Post Procedure

6 Weeks Follow Up

12 Weeks Follow Up

INTERNAL ROTATION

Pre-Procedure

Post Distension

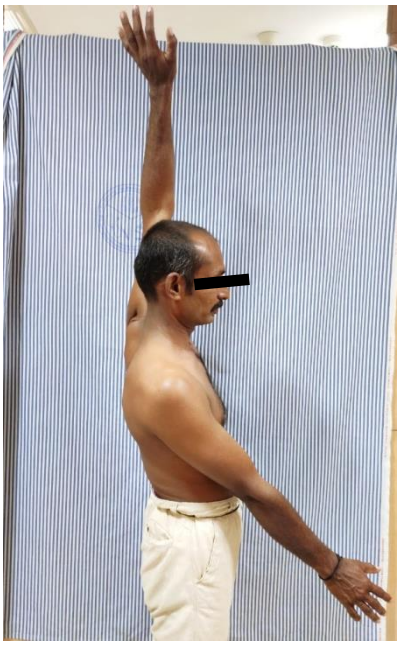
6 Weeks Follow Up

12 Weeks Follow Up

CASE: 2

FLEXION

Pre distension



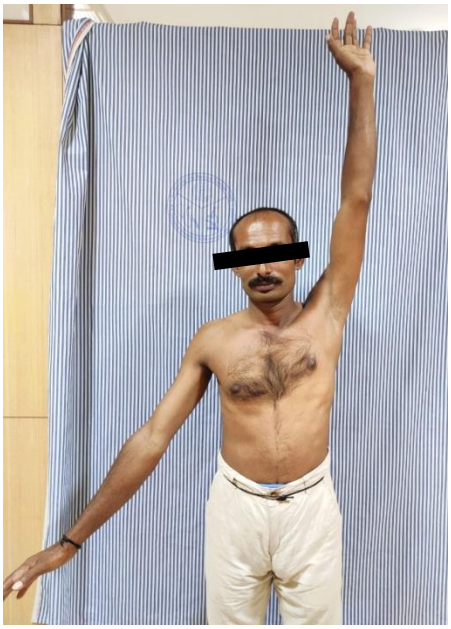
Post distension

3 Weeks

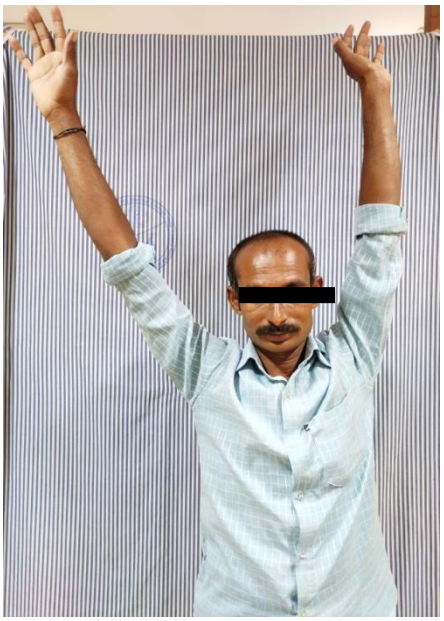
12 Weeks

ABDUCTION

Pre-Procedure

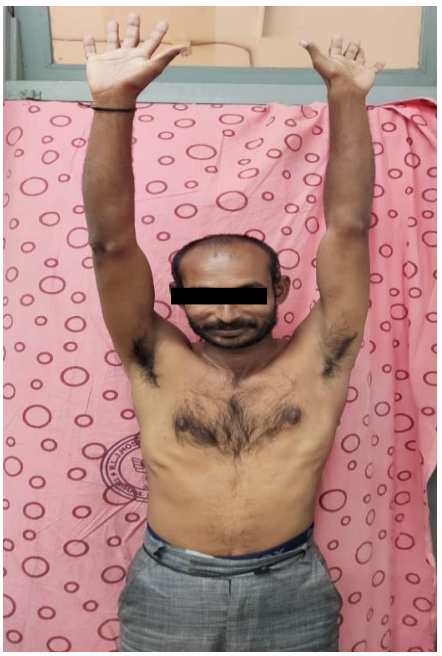


Post Distension



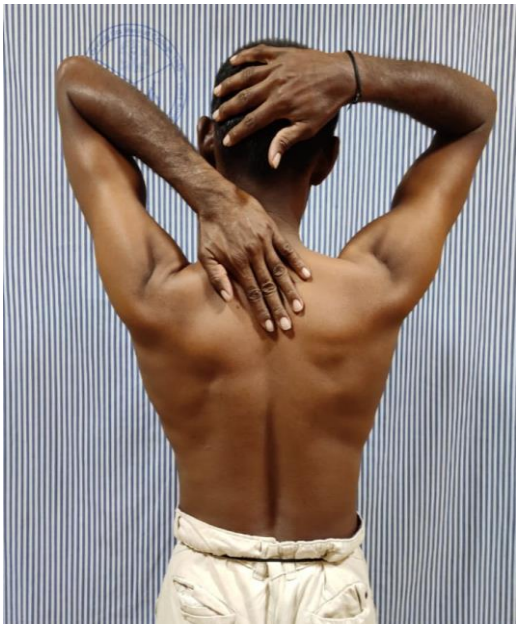
3 Weeks Follow Up

12 Weeks Follow Up

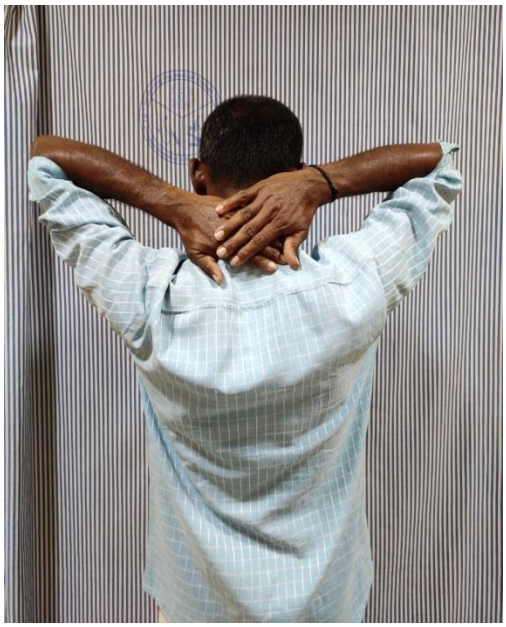


EXTERNAL ROTATION

Pre-Procedure

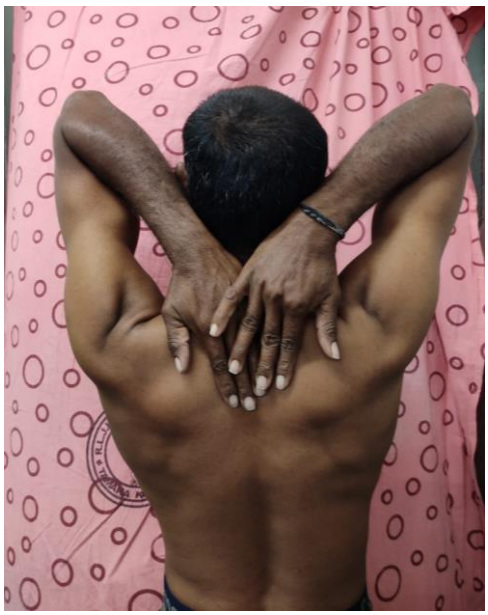


Post Procedure



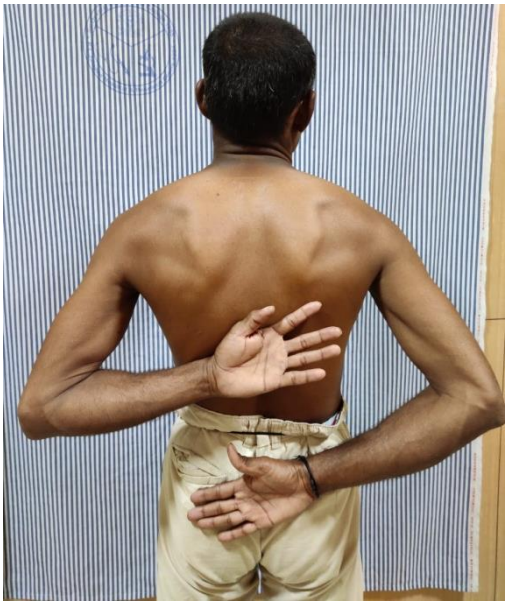
3 Weeks Follow Up

12 Weeks Follow Up

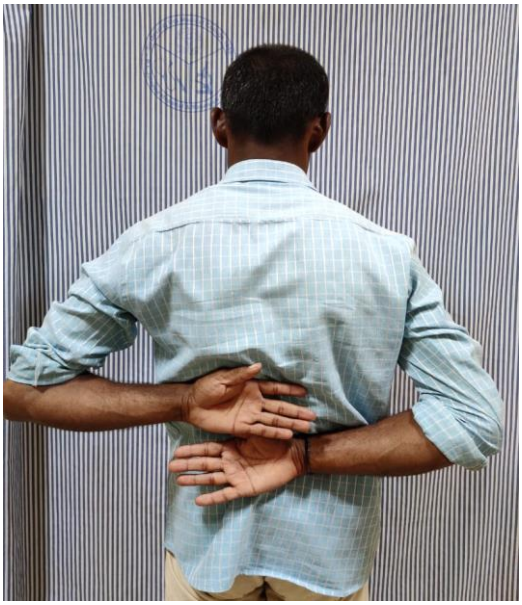


INTERNAL ROTATION

Pre-Procedure



Post Distension



3 Weeks Follow Up

12 Weeks Follow Up

CASE : 3

FLEXION

Pre-distension

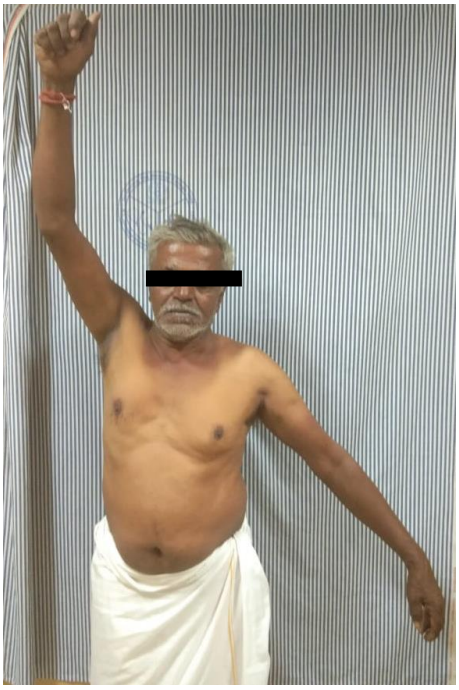
Post distension

6 Weeks

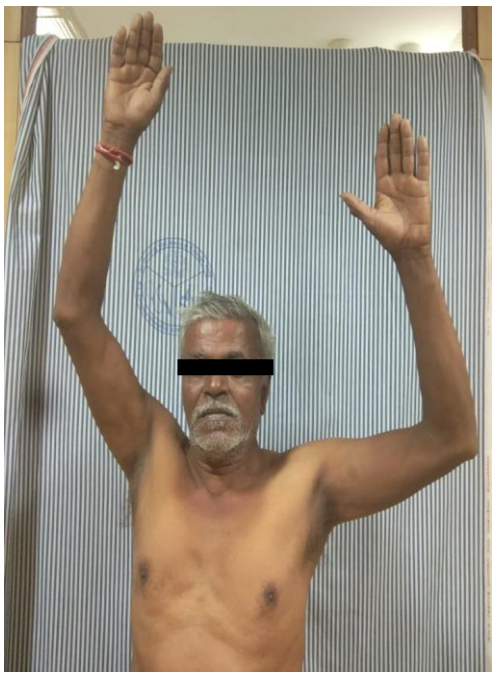
12 Weeks

ABDUCTION

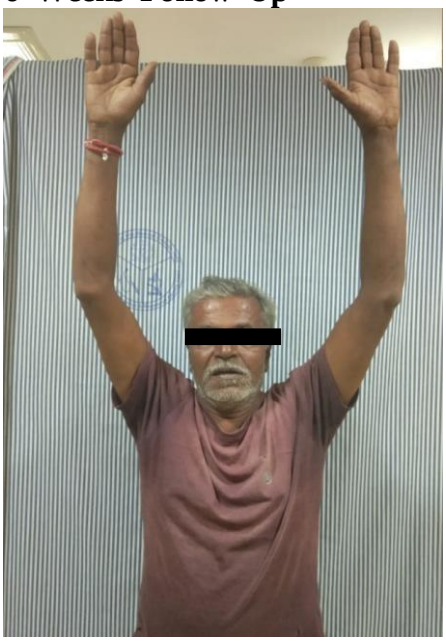
Pre-Procedure



Post Distension



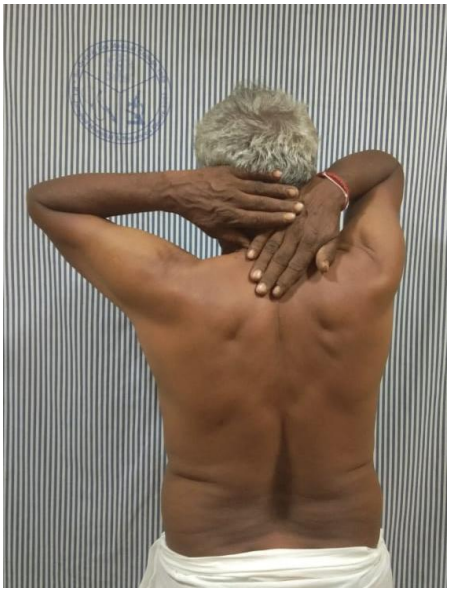
6 Weeks Follow Up



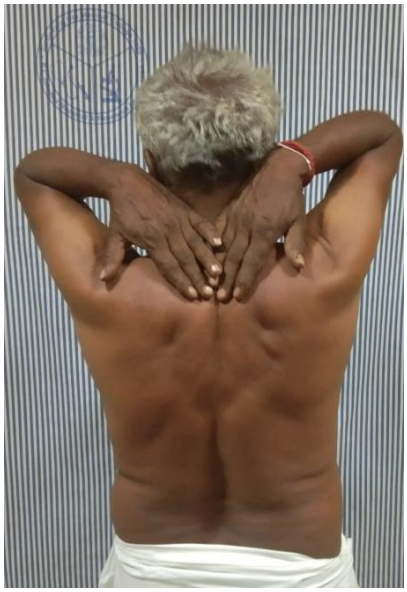
12 Weeks Follow Up

EXTERNAL ROTATION

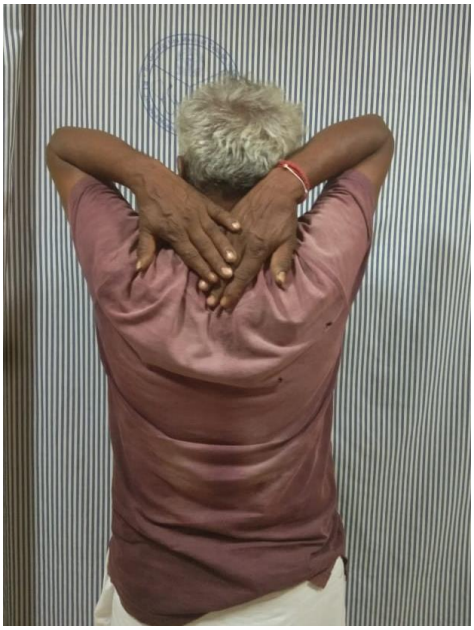
PRE-PROCEDURE



POST PROCEDURE



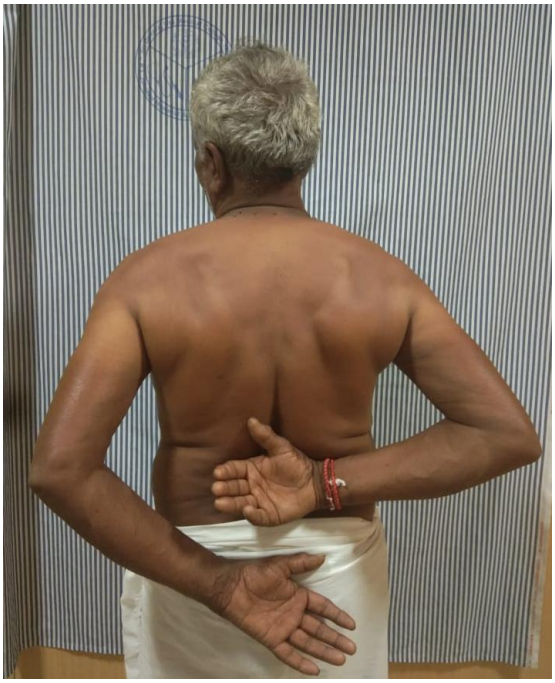
6 Weeks Follow Up



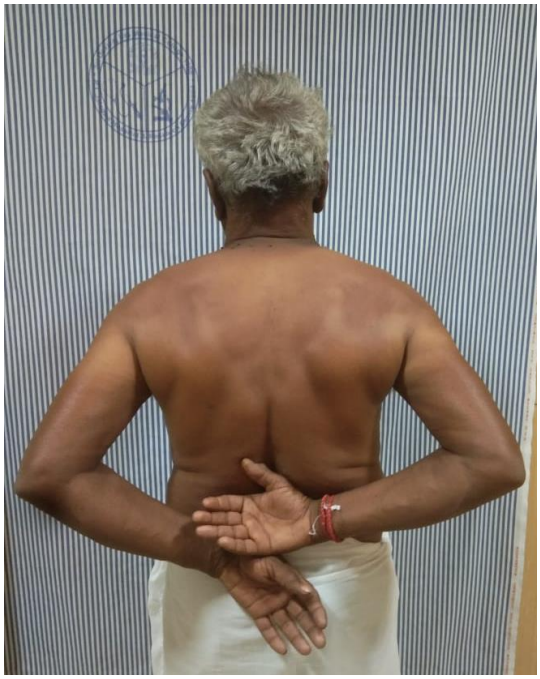
12 Weeks Follow Up

INTERNAL ROTATION

Pre-Procedure



Post Distension



6 Weeks Follow Up

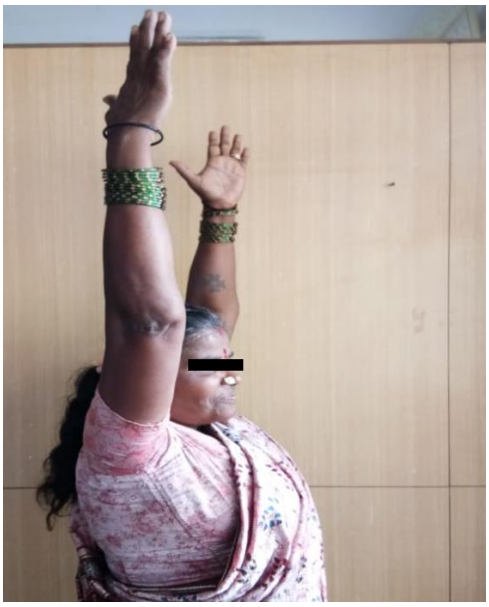
12 Weeks Follow Up

CASE : 4

FLEXION

Pre distension

Post distension



6 weeks

12 weeks

ABDUCTION

Pre-Procedure

Post Distension

6 Weeks Follow Up

12 Weeks Follow Up

EXTERNAL ROTATION

Pre-Procedure

Post Procedure

6 Weeks Follow Up

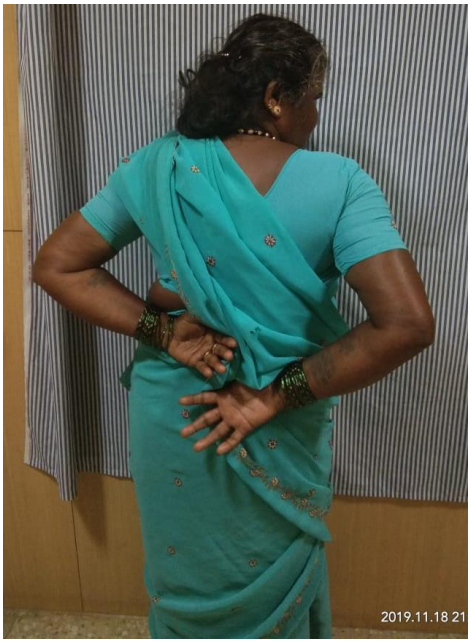
12 Weeks Follow Up

INTERNAL ROTATION

Pre-Procedure

Post Distension

6 Weeks Follow Up

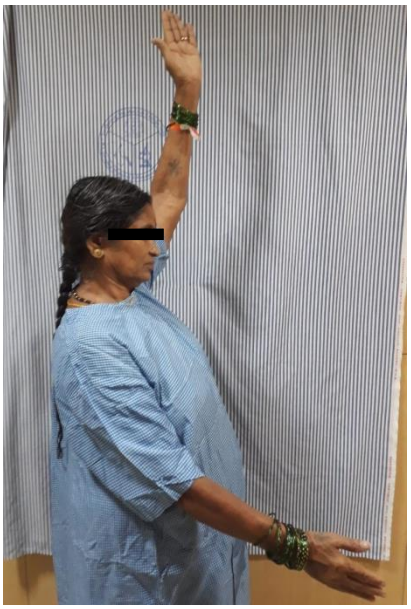


12 Weeks Follow Up

CASE : 5

FLEXION

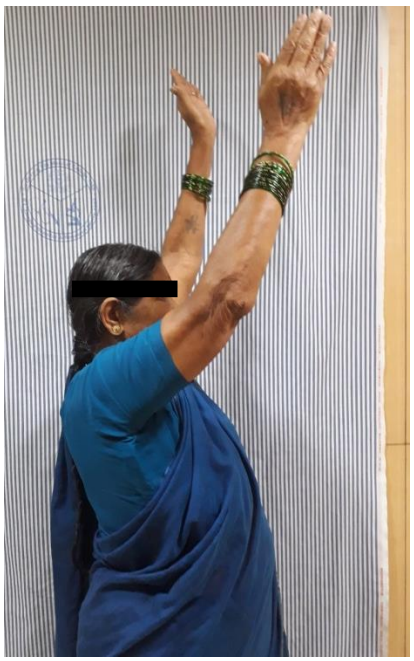
Pre distension



Post distension

6 weeks

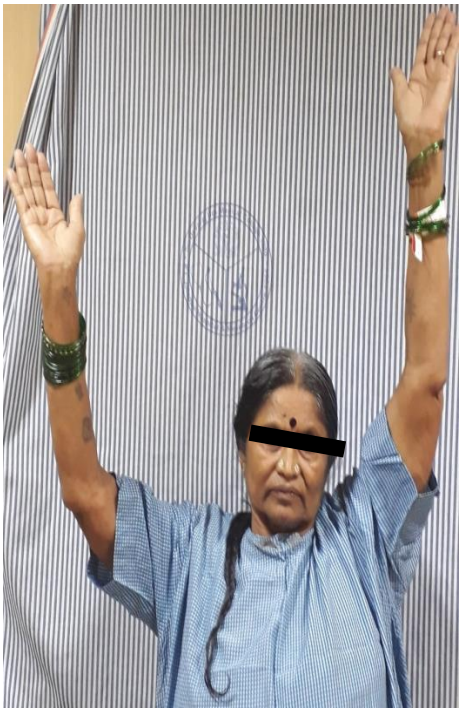
12 weeks



ABDUCTION

Pre-Procedure

Post Distension



6 Weeks Follow Up

12 Weeks Follow Up

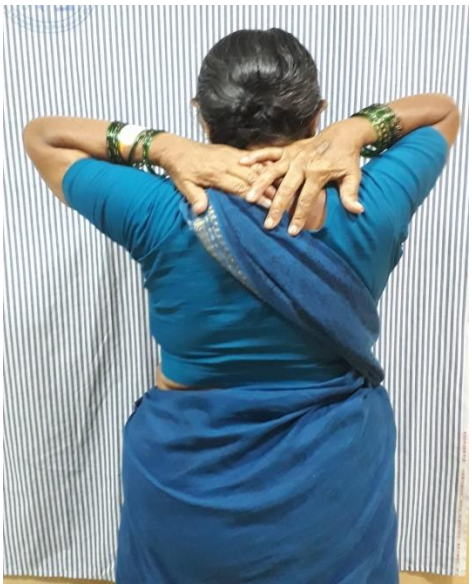
EXTERNAL ROTATION

Pre-Procedure

Post Procedure

6 Weeks Follow Up

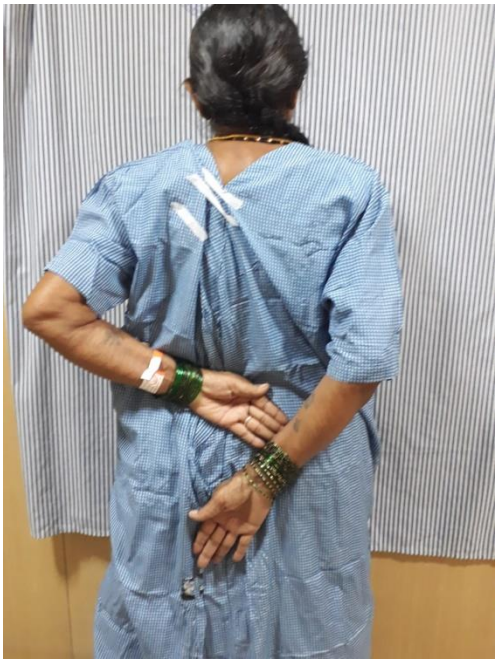
12 Weeks Follow Up



INTERNAL ROTATION

Pre-Procedure

Post Distension



6 Weeks Follow Up

12 Weeks Follow Up