



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**

**"FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET
RICH PLASMA IN PERIARTHRITIS SHOULDER"**

By

DR. AJAY KURAHATTI MBBS, D.ORTHO

Under the Guidance of

DR. D.SATYARUP D.ORTHO, M.S.ORTHO

PROFESSOR



**DEPARTMENT OF ORTHOPAEDICS,
SRI DEVARAJ URS MEDICAL COLLEGE,
TAMAKA, KOLAR-563101**

MAY-2019

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

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled “**FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHROSITIS SHOULDER**” is a bonafide and genuine research work carried out by me under the guidance of **Dr. D. SATYARUP**, Professor, 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 2019 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. AJAY KURAHATTI

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 “**FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHRITIS SHOULDER**” is a bonafide research work done by **Dr. AJAY KURAHATTI**, 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:

DR. D. SATYARUP D ORTHO, MS ORTHO

Place: Kolar

Professor

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 “**FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHRITIS SHOULDER**” is a bonafide research work done by **DR. AJAY KURAHATTI** under direct guidance and supervision of **DR. D. SATYARUP** Professor, 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 “**FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHROSITIS SHOULDER**” is a bonafide research work done by **DR. AJAY KURAHATTI**, under the direct guidance and supervision of **DR. D.SATYARUP**, Professor 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

DR. SREERAMULU P N

PRINCIPAL

Sri Devaraj Medical College.

Tamaka, Kolar

Date :

Place. :

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. AJAY KURAHATTI

Post-Graduate student in the subject of

ORTHOPAEDICS at Sri Devaraj Urs Medical College, Kolar

to take up the Dissertation work entitled

**“FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA
IN PERIARTHRITIS 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**

COPY RIGHT

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. AJAY KURAHATTI

Place: Kolar



ABSTRACT

BACKGROUND:

The annual incidence of periarthritis shoulder is between 3%-5% among general population and as high as 20% among individuals with diabetes¹. A variety of treatment modalities have been advised but best modality of treatment is subjected to debate². Intra-articular injection of Platelet Rich Plasma (PRP) is an emerging treatment option and its efficacy needs to be examined and hence the study was conducted.

OBJECTIVES:

- To observe and analyse functional outcome of intraarticular injection of platelet rich plasma in Periarthritis shoulder.
- To analyse improvements in active and passive range of motions, and visual analogue score and QuickDASH Scores.

METHODS:

Patients were screened to find their eligibility to study. Consent was taken and they were included in the study. The patients were injected intra-articularly with platelet rich plasma. The surgeon injects a single dose of 2 ml of the PRP 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 was directed anteriorly and medially towards the coracoid process. 2 to 3 cm depth was reached with a 20 gauge needle. Xrays, ultrasound were done if necessary. Home exercises were advised for all the patients. Findings were recorded and outcomes were measured before the injection and during all the follow-ups. Patients were assessed at 3 weeks, 6 weeks and 12 weeks. Outcome measures like visual analogue score for pain and shortened version of disabilities of arm, shoulder and hand, QuickDASH for functional ability were measured. Photographs and videos were taken wherever necessary.

RESULTS :

Out of 46 patients, 21 were males and 25 females. Minimum age of patient included was 30 years and maximum of 80 years. Mean age of patients was 51.19 years. Non dominant shoulder was affected in 27 patients and dominant shoulder in 19 patients. 11 patients had diabetes mellitus. Mean active abduction improved from the baseline of 65.1° to 133.04° , mean active flexion improved from the baseline of 82.6° to 147.28° , mean active external rotation improved from the baseline of 25° to 70.02° , mean active internal rotation improved from



the baseline of 18.91⁰ to 68.58⁰ at the end of 6 weeks follow up. VAS score improved from 6.19 to 1.84 at 12 weeks post procedure. Functional ability, assessed with QuickDASH score showed improvement with successive follow-ups from 81.5 to 22.9. 52.2% of study patients had excellent results, 43.5% and 4.3% of patients had good and fair results respectively.

CONCLUSION:

This study observes that PRP injection is a reliable, productive, efficient and safe mode of treatment in periarthrititis of shoulder.

KEY WORDS:

Platelet Rich Plasma(PRP), Periarthritis Shoulder, Frozen Shoulder, Adhesive Capsulitis, Visual Analogue Scale, QuickDASH score, Range of Motion.

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. KASTURI KURAHATTI** and **Sri. PANDURADDI KURAHATTI** for giving me continuous encouragement, unfailing support and unconditional love throughout my life. Also, my gratitude goes to my **BROTHERS DEEPU, VICKY** and **SISTERS IN LAW NAMRATHA, SMITHA** and my **NEPHEW SHIVANSH** for always being there to help me in all ways possible for them .*

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. D. SATYARUP** Professor, 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. Without his constant supervision and advice, completion of this dissertation would have been impossible.*

*I am sincerely thankful to **Dr. ARUN H S** , Professor and Head, Department of Orthopaedics, 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.*

*I wholeheartedly acknowledge **Dr. B. SHAIKH NAZEER, Dr. S N PATIL, 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 HARIPRASAD and Dr PRABHU E,** 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 P A PATIL, Dr ASHIK BARY,** assistant professors & **Dr MANOJ , Dr UTKARSH , Dr KARTHIK** 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 ROGER, Dr SACHIN ,Dr ABHIJIT ,Dr RAM ,Dr SAGAR K , Dr SREEJITH, Dr ABHISHEK , Dr UMESH, Dr. SHARATH, Dr ABHIMANYU, DR. HARSHA, DR. AYANAKSH** 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 AJAY KURAHATTI

TABLE OF CONTENTS

S. No	Content	Page No.
1	INTRODUCTION	1
2	OBJECTIVES	3
3	REVIEW OF LITERATURE	4
4	MATERIALS AND METHODS	60
5	RESULTS	70
6	DISCUSSION	138
7	CONCLUSION	165
8	SUMMARY	168
9	BIBLIOGRAPHY	170
10	ANNEXURES	
	PROFORMA	183
	KANNADA CONSENT FORM	189
	ENGLISH CONSENT FORM	191
	KANNADA INFORMATION SHEET	193

	ENGLISH INFORMATION SHEET	195
	VAS SCORE	197
	QUICKDASH SCORE	198
	KEY TO MASTER CHART	201
	MASTER CHART	205

LIST OF TABLES

S. No:	Title	Page No.
1	Age Incidence	70
2	Sex Incidence	72
3	Side Incidence	73
4	Associated comorbidities	74
5	Active Abduction	75
6	Passive Abduction	76
7	Active Flexion	77
8	Passive Flexion	78
9	Active Internal Rotation	79
10	Passive Internal Rotation	80
11	Active External Rotation	81
12	Passive External Rotation	82
13	VAS score	83
14	QuickDASH score	84

S.No:	Title	Page No.
15	Functional Ability 1	85
16	Functional Ability 2	86
17	Functional Ability 3	87
18	Functional Ability 4	88
19	Functional Ability 5	89
20	Functional Ability 6	90
21	Functional Ability 7	91
22	Functional Ability 8	92
23	Symptom Severity 1	93
24	Symptom Severity 2	94
25	Symptom Severity 3	95
26	Functional Ability Outcome According to QuickDASH score	97
27	Patient Demographics	141
28	Functional Assessment	142
29	Active Abduction	144

S. No:	Title	Page No.
30	Passive Abduction	146
31	Active Flexion	148
32	Passive Flexion	150
33	Active External Rotation	152
34	Passive External Rotation	154
35	Active Internal Rotation	156
36	Passive Internal Rotation	158
37	VAS score	161
38	QuickDASH	163

LIST OF CHARTS

S.No:	Title	Page No.
1	Age Incidence	71
2	Sex Incidence	72
3	Side Incidence	73
4	Associated co-morbidities	74
5	Active Abduction	75
6	Passive Abduction	76
7	Active Flexion	77
8	Passive Flexion	78
9	Active Internal Rotation	79
10	Passive Internal Rotation	80
11	Active External Rotation	81
12	Passive External Rotation	82
13	VAS score	83
14	QuickDASH score	84

S. No:	Title	Page No.
15	Functional Ability 1	85
16	Functional Ability 2	86
17	Functional Ability 3	87
18	Functional Ability 4	88
19	Functional Ability 5	89
20	Functional Ability 6	90
21	Functional Ability 7	91
22	Functional Ability 8	92
23	Symptom Severity 1	93
24	Symptom Severity 2	94
25	Symptom Severity 3	95
26	Functional Ability Outcome According to QuickDASH score	97
27	Patient Demographics	141
28	Functional Assessment	142
29	Active Abduction	144

30	Passive Abduction	146
31	Active Flexion	148
32	Passive Flexion	150
33	Active External Rotation	152
34	Passive External Rotation	154
35	Active Internal Rotation	156
36	Passive Internal Rotation	158
37	VAS score	161
38	QuickDASH	163

LIST OF FIGURES

S. No	Title	Page No.
1	SHOULDER JOINT - ANTERIOR VIEW	16
2	MUSCLES OF SHOULDER - ANTERIOR VIEW	16
3	SHOULDER JOINT - POSTERIOR VIEW	17
4	MUSCLES OF SHOULDER - POSTERIOR VIEW	17
5	ACROMIOCLAVICULAR JOINT	18
6	SHOULDER JOINT - SYNOVIAL SHEATH AND MEMBRANE	19
7	SHOULDER JOINT - CAPSULE	20
8	SHOULDER JOINT - OUTLET VIEW	21
9	CLINICAL PRESENTATION	27
10	ARTHROGRAM OF ADHESIVE CAPSULITIS	27
11	PRP PREPARATION	64

LIST OF ABBREVIATION

PA	-	Periarthritis
PRP	-	Platelet Rich Plasma
ROM	-	Range Of Motion
VAS	-	Visual Analogue Scale
DASH	-	Disability Of Arm, Shoulder and Hand
HLA	-	Human Leukocyte Antigen
MRI	-	Magnetic Resonance Imaging
AC joint	-	Acromioclavicular joint
SC joint	-	Sternoclavicular joint
TENS	-	Transcutaneous Electrical Nerve Stimulation
NSAID	-	Non Steroidal Anti-Inflammatory Drugs
No.	-	Number
RBS	-	Random Blood Sugar
rpm	-	rotations per minute
CNS	-	Central nervous system
CVS	-	Cardiovascular system
RS	-	Respiratory system
IR	-	Internal rotation
ER	-	External rotation

INTRODUCTION

Periarthritis (PA) shoulder is characterized by insidious onset, progressive pain and loss of active and passive mobility in the glenohumeral joint¹. It usually presents between ages of 40 and 70 years. The annual incidence of periarthritis shoulder is between 3%-5% among general population and 20% among individuals with diabetes¹.

The underlying pathology is soft tissue fibrosis and inflammation of the capsule, ligaments and rotator interval¹. Periarthritis shoulder is seen most commonly in post - traumatic patients, soft tissue injury of shoulder patients and patients with cardiac problems and diabetes.

A broad range of treatment options have been preferred which include oral non-steroidal anti-inflammatory drugs (NSAIDS) as well as intra-articular injection of corticosteroids, intra-articular injection of hyaluronic acid, physical therapy exercises, deep heat modalities, manipulation under anesthesia, hydrodilation, arthroscopic release, but the best treatment is still debated². Intra-articular corticosteroid injection is one among commonly used treatment modalities in periarthritis shoulder.

Platelet rich plasma has emerged recently as a new technology which is believed to stimulate re-vascularisation of soft tissue and

increase the concentration of growth factors to improve and accelerate tendon healing.

Platelet rich plasma is autologous blood with concentration of platelets above baseline values. One million platelets per milliliter of concentrate is the working definition of therapeutic PRP³.

Platelet Rich Plasma (PRP) is an emerging treatment option and its efficacy needs to be examined and hence the study was conducted.

OBJECTIVES OF STUDY

- To observe and analyze functional outcome of intra-articular injection of platelet rich plasma in periarthritis shoulder.
- To analyze improvements in active and passive range of motions, visual analogue scale and quickDASH Scores.

REVIEW OF LITERATURE

Periarthritis shoulder is a common disease that causes significant morbidity⁴. The term frozen shoulder was first described in 1934 by Codman. The prevalence of frozen shoulder in diabetic patients has been observed to be between 10-20%⁵. Periarthritis shoulder has an incidence of 3-5% in the general population⁶.

Periarthritis shoulder affects the glenohumeral joint and limits active and passive movement because of fibrosis of joint capsule, which decreases joint space⁷.

Conservative management is beneficial for a great majority of periarthritis shoulder patients. Physiotherapy with passive mobilization and capsular stretching are the most commonly used techniques⁴. Furthermore, corticosteroid injections are known to cause long term clinical problems such as increased probability of capsule rupture, post-injection pain, subcutaneous atrophy and skin depigmentation⁸.

Use of corticosteroid and sometimes hyaluronic acid injections for frozen shoulder can produce good outcomes with physical therapy. In periarthritis shoulder patients, studies have shown that there are no major differences in improvement after 6 months of treatment, when corticosteroid alone is used or used along with hyaluronic acid.

In a 2016 study by Aslani et al, for treatment of PA shoulder with intra-articular PRP injection, functional improvement of 70% based on the DASH questionnaire was noted with good overall satisfaction (subjective improvement of 70%). The author advocated the positive effects of PRP on healing during shoulder adhesive capsulitis with good functional improvement and the need for further studies to assess the role of PRP⁸.

In a 2017 randomised comparative study conducted by Kothari et al, for 195 periarthrits shoulder patients at a tertiary care hospital (Safdarjang Hospital, New Delhi) observed significant improvement with the use of PRP (single injection) over steroid injection and ultrasonic therapy with functional improvement in active shoulder range of motion with respect to abduction, flexion, external rotation and internal rotation along with improved VAS and quickDASH scores. The authors recommended the use of intra-articular injection of PRP as a safe and efficient in treatment of PA shoulder compared to steroid injection and ultrasonic therapy and recommended the need for further studies assessing the role of multiple PRP injections with longer follow up periods¹.

In a 2018 randomised control study conducted by Lin et al, 60 patients with PA shoulder were treated with PRP and procaine and the results obtained by general shoulder assessment and VAS scores showed

significant improvement and prolonged efficiency in PRP group. The author recommends the use of PRP and procaine as an effective treatment of PA shoulder with PRP being superior and suggested the need for further large scale clinical trials⁹.

In a 2018 study by Jeyaraman et al, 50 PA shoulder patients receiving PRP therapy showed superior VAS and DASH scores at first month follow up compared with 50 patients who were treated with hydrodissection. PRP patients showed better pain relief, functional range of movements and improved quality of life. By the end of 1 year, there were a significant improvement in the mean VAS and DASH scores and mean range of movements. The author concludes platelet rich plasma injection is a biological novel agent in reducing inflammation, scarring and fibrosis of tissues and improving the range of movements and quality of life in a long term sequelae in patients with adhesive capsulitis of shoulder¹⁰.

In a 2019 study conducted by Barman et al., 30 PA shoulder patients were treated with single injection of PRP and 30 patients treated with intra-articular corticosteroid injection among which PRP group showed significant improvement in passive abduction, internal and external rotations compared to corticosteroid group with no major complications were observed in any patients. At the end of 12 week

follow up, PRP was found to be more effective in terms of improving pain, disability and shoulder ROM¹¹.

PRP is the part of whole blood containing proteins and growth factors and carries greater concentration of platelets than normal blood. Platelet rich plasma development via centrifugation has been simplified greatly for usage in office scenarios as well as operating rooms¹².

Connective tissue healing for example tendon healing, occurs in three phases: inflammation, proliferation, and remodeling in which the unique combination and concentration of bioactive molecules that exist within PRP have profound effects⁸.

The first stage (or "inflammatory phase") is an acute response lasting several days in which an inflammatory response results in infiltration of the wound site with leukocytes, platelets and erythrocytes¹³.

PRP is autologous concentration of platelets. It can produce collagen and growth factors and might increase stem cells, which consequently enhances the healing process by delivering high concentrations of alpha-granules containing biologically active moieties (such as Platelet derived growth factors - alpha and beta, Vascular endothelial growth factor, Epithelial growth factor, Transforming growth factors - β 1 and 2) to the areas of soft tissue damage^{8,14,15}.

Researchers have shown the positive effects of PRP on different soft tissue damages such as chronic elbow tendinopathy, chronic achilles tendinopathy, and rotator cuff tendon tears⁸.

Posterior approach to shoulder is preferred to anterior approach as it is a method under scrutiny and has the benefit of avoiding major neurovascular structures like the cephalic vein, brachial plexus, and axillary artery which come in way through the anterior approach.

BIOMECHANISM OF PLATELET RICH PLASMA

Platelet-rich plasma provides a matrix for the migration of tissue-forming cells, including fibroblasts that are responsible for collagen synthesis and endothelial cells involved in angiogenesis¹⁶. During normal tissue healing, trapped platelets become activated and degranulate, resulting in the release of the granule content. Alpha granules of the platelets have been shown to contain mitogenic and chemotactic growth factors important in healing such as PDGF, TGF, VEGF, EGF and IGF^{17,18,19}.

Release of PDGF can have a chemotactic effect on monocytes, neutrophils, fibroblasts, mesenchymal stem cells, and osteoblasts. PDGF is also a powerful mitogen for fibroblasts and smooth muscle cells²⁰. TGF is another growth factor released from platelet granules. TGF is a mitogen for fibroblasts, smooth muscle cells, and osteoblasts. In addition, it promotes angiogenesis and extracellular matrix production^{20,21}. VEGF promotes angiogenesis and can promote healing and also aid in endochondral ossification. EGF, another platelet contained growth factor, is a mitogen for fibroblasts, endothelial cells and also is useful in healing²¹. IGF, another platelet-contained growth factor, regulates bone maintenance and is also an important modulator of cell apoptosis, and in combination with PDGF, can promote tissue regeneration^{19,22}. Platelet

concentrates are potentially useful in tissue healing applications because they function as both a tissue sealant and a drug delivery system that contains a host of powerful mitogenic and chemotactic growth factors.

The dense granules of platelets contain adenosine, serotonin, histamine, and calcium. Adenosine is a nucleoside that plays an important role in many biochemical processes, including transfer of energy. Adenosine is a primary cytoprotective agent that prevents tissue damage. Adenosine receptor activation has been shown to have an anti-inflammatory effect during the inflammatory process²³. Adenosine also has the ability to increase IL-10 production by macrophages in some cases²⁴. This increase in IL-10 could indicate a change in the character of the macrophage to an anti-inflammatory state. In other instances, it appears that adenosine can function to activate macrophages to produce pro-inflammatory cytokines, IL-1 and IL-18²⁵. Serotonin is a monoamine neurotransmitter. This hormone can be exponentially more effective at increasing capillary permeability than even histamine²⁶. Serotonin also acts as a chemo-attractant for fibroblasts and increases their proliferation. Interestingly, macrophage cells have receptors that are sensitive to serotonin. Serotonin injected locally into tissue induces an influx of macrophages into that tissue²⁷. Serotonin has also been shown to effect macrophages by suppression of IFN- γ -induced 1a expression at sites of inflammation²⁸. Histamine is a biogenic amine involved in local

immune responses. Locally, it also acts as a vasodilator. Histamine enhances permeability of the microvascular system of capillaries and venules. This increased permeability is due to the contraction of endothelial cells and removal of fenestrated diaphragms blocking gaps in the endothelial lining²⁹. This increase in membrane permeability allows inflammatory and immune cells greater access to marginate and enter the local area. Histamine is also a strong activator of macrophages. Calcium is the final component of the dense granules. Calcium may also be required in cell migration and regeneration in the remodeling phase. The unique combination and concentration of bioactive molecules that exist within PRP have profound effects on the inflammatory, proliferative, and remodeling phases of tissue healing³⁰.

Joint changes such as synovitis, degeneration of ligaments and hypertrophy of the joint capsule are involved in the pathogenesis of many joint diseases which is countered by the autologous biological action of PRP in which the platelet-derived growth factors are used during the healing process for regenerative purposes, to stimulate processes such as angiogenesis, mitogenesis, cell proliferation, and cell migration to chemo-attractants^{31,32}. Anitua et al., contended that intra-articular administration of plasma rich in growth factors may be beneficial in restoring the hyaluronic acid concentration and balancing angiogenesis, but it does not counteract the effects of interleukin-1 β on synovial cells³³.

Akeda et al compared the response of adult porcine chondrocytes cultured in the presence of 10% PRP, 10% platelet poor plasma, or 10% fetal bovine serum, and reported that PRP treatment was associated with significantly higher DNA and proteoglycan content, as well as enhanced collagen synthesis³⁴. Bendinelli et al. suggested that expression of the chemokine receptor CXCR4 was reduced in chondrocytes exposed to activated PRP, which may have clinical significance in the management of inflamed synovium (for example, in terms of reducing the expression of matrix-metalloproteinases and other cartilage-matrix degrading enzymes). It can be presumed that PRP promotes the restoration of joint homeostasis by inhibiting synoviocyte production of inflammatory mediators³⁵.

ANATOMY OF SHOULDER JOINT:

The shoulder is the proximal joint of the upper limb and the most mobile of all the joints in the human body. It produces three dimensional range of movement, which is not possible for any other joints. It is ball and socket variety joint. The humeral head constitutes a near hemisphere, inclining medially upwards and slightly backwards. Glenoid cavity is shallow and points laterally and forwards. The glenoid labrum adds flexibility to the edges of the glenoid fossa³⁶.

The shoulder is not a single joint - it is complex joint formed by glenohumeral, sternoclavicular, acromioclavicular and scapulothoracic joints. The shoulder joint is designed more for mobility than for stability. The stability comes from rotator cuff mainly³⁷.

The musculotendinous cuff formed by supraspinatus, infraspinatus, teres minor and subscapularis which covers and reinforces the anterior, superior and posterior aspects of the glenohumeral joint, and these tendons are “true active ligaments”³⁸.

The fibrous capsule envelope the joint, attached outside the glenoid labrum medially, and encroaches on the coracoid process to cover the origin of biceps brachii (long head). It is so lax that the bones can be distracted for 2 to 3 cm. This accords with a very broad range of movement.

The fibrous capsule is supported above by supraspinatus tendon, below by long head of triceps brachii, behind by infraspinatus and in front by subscapularis tendons. Inferiorly, capsule is least supported and also subjected to greatest strain.

Capsule usually has 2-3 openings, an anterior below the coracoid process, another between tuberosities³⁹.

The three glenohumeral ligaments include;

1. Coraco-humeral ligament: Extends from root of coracoid process to the neck of the humerus opposite the greater tuberosity.
2. Transverse humeral ligament: It bridges the upper part of bicipital groove between two tuberosities.
3. The glenoid labrum, is the fibro cartilagenous rim which covers the margins of the glenoid cavity, thus increasing the depth of the cavity. It is triangular in section⁴⁰.

Many bursae adjoin the joint:

1. The subacromial bursa between deltoid muscle and capsule.
2. Sometimes behind the coracobrachialis.
3. and 4. Anterior and posterior to the tendon of latissimus dorsi.
5. Between the subscapularis tendon and articular capsule.
6. Frequently between coracoid process and capsule.

-
7. On the superior acromial aspect.
 8. Sometimes between the infraspinatus tendon and capsule occasionally opening into the joint.
 9. Between teres major and long head of triceps³⁹.

Related muscles are - subscapularis (in front), supraspinatus (above), infraspinatus and teres minor (behind), long head of triceps (below), long bicipital tendon (intracapsular). Deltoid covers the joint from behind, in front and laterally⁴¹.

The long tendon of biceps traverse the joint in synovial sheath which continues into the inter tubercular sulcus as far as the surgical neck.

FIGURE NO: 1. SHOULDER JOINT - ANTERIOR VIEW

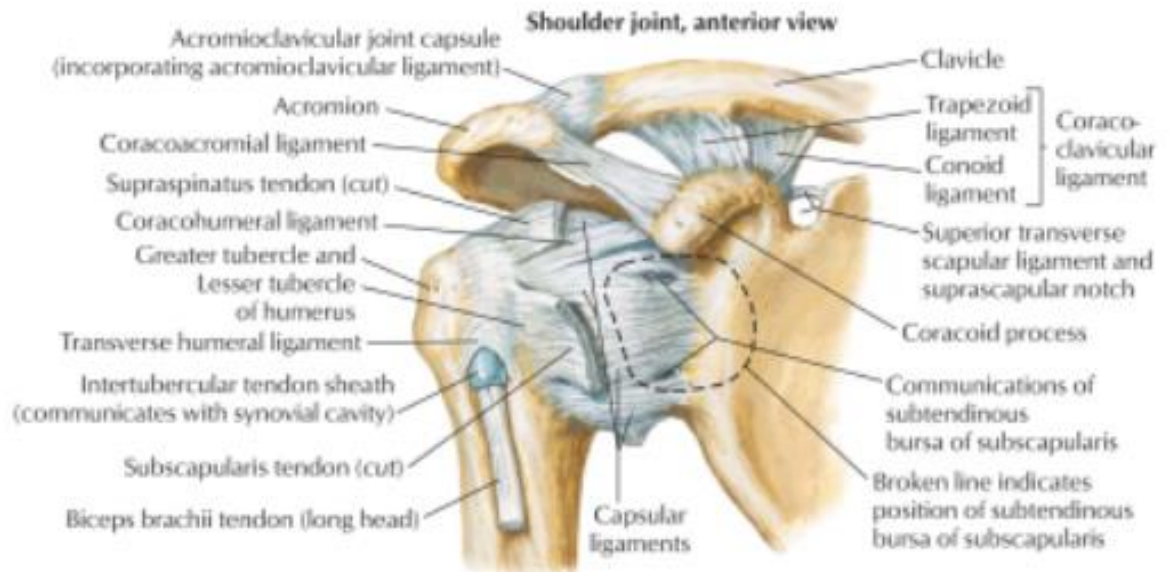


FIGURE NO: 2. MUSCLES OF SHOULDER - ANTERIOR VIEW

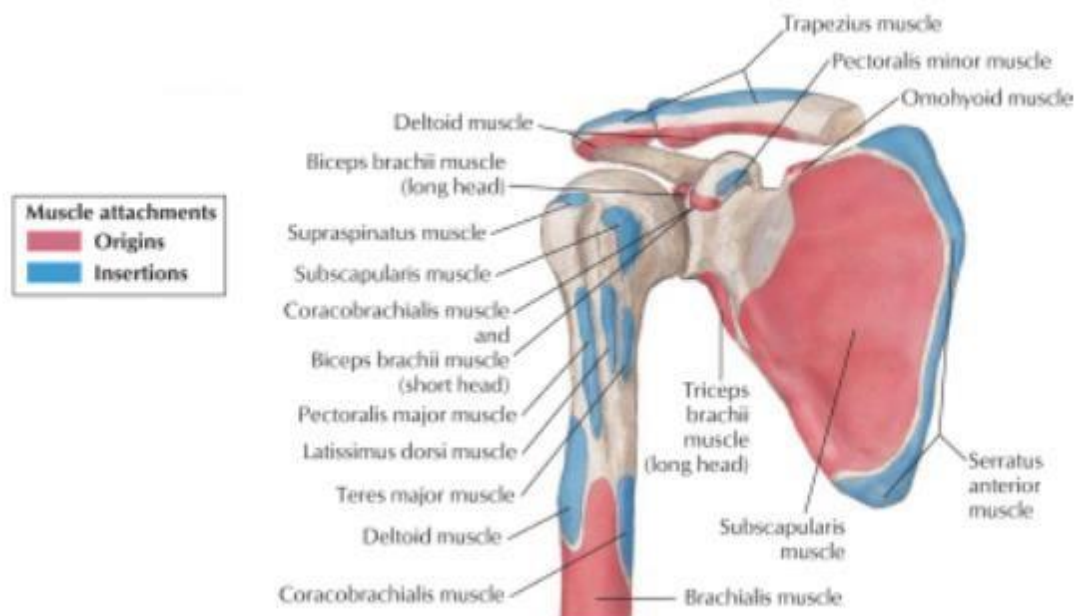


FIGURE NO: 3. SHOULDER JOINT - POSTERIOR VIEW

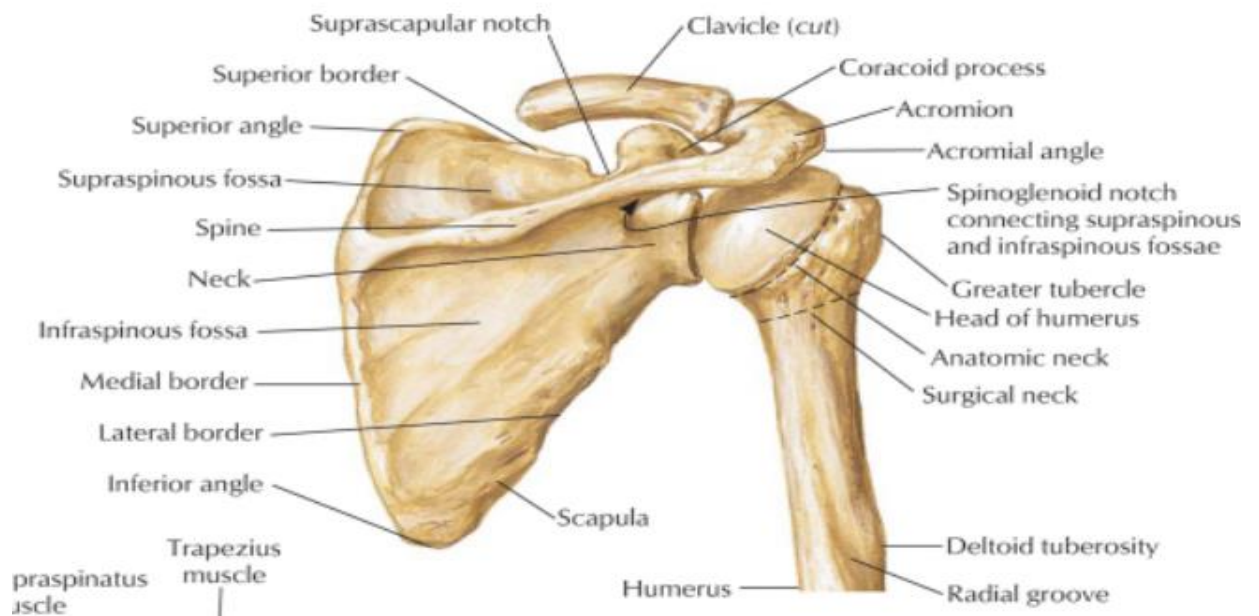


FIGURE NO: 4. MUSCLES OF SHOULDER - POSTERIOR VIEW

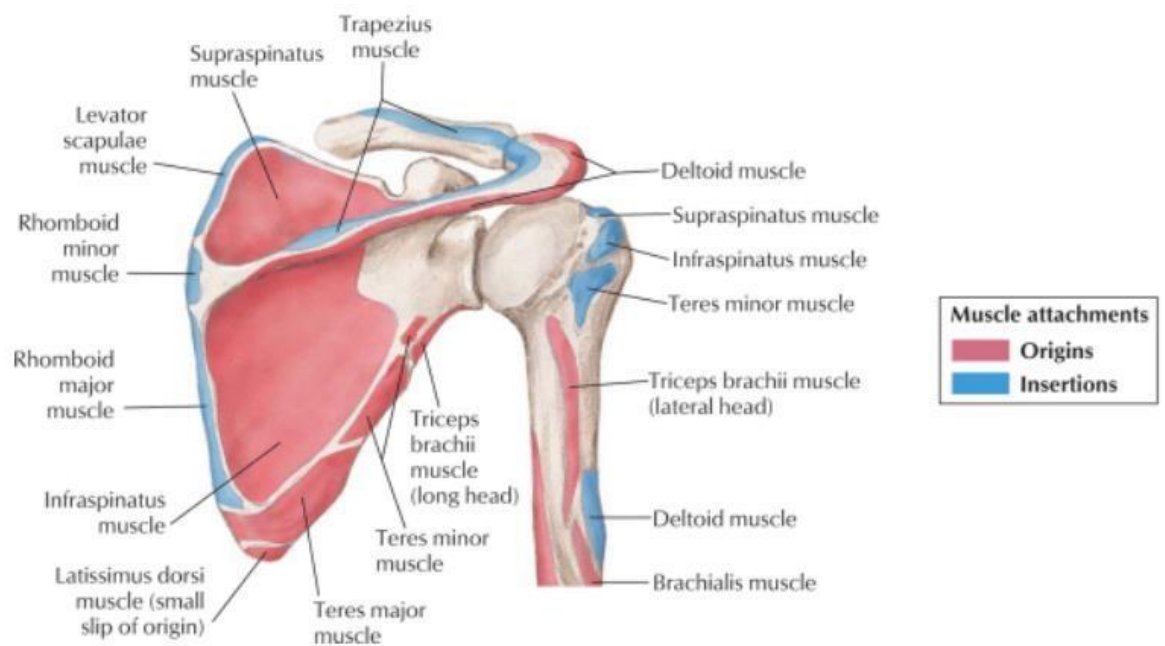
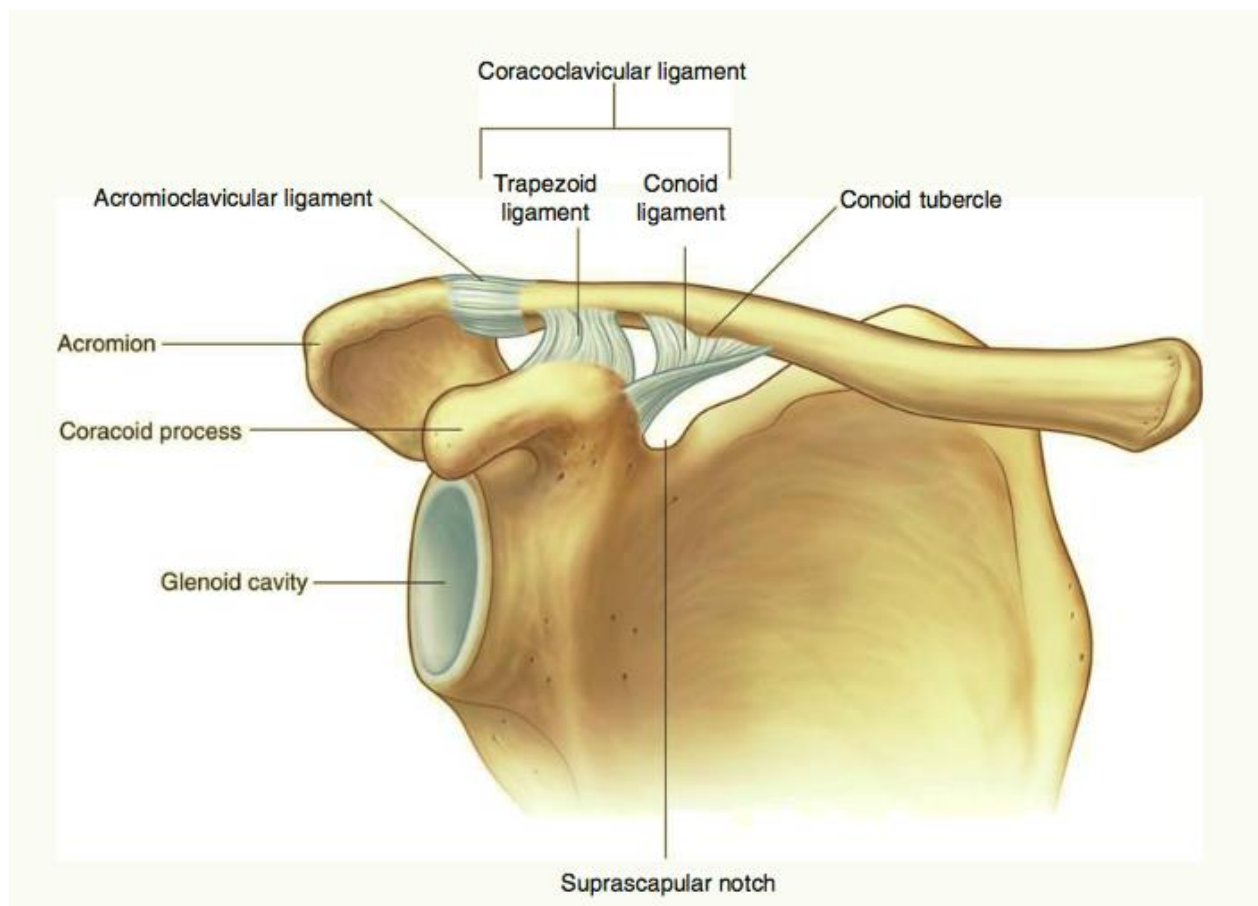


FIGURE NO: 5. ACROMIOCLAVICULAR JOINT



**FIGURE NO: 6. SHOULDER JOINT - SYNOVIAL SHEATH AND
MEMBRANE**

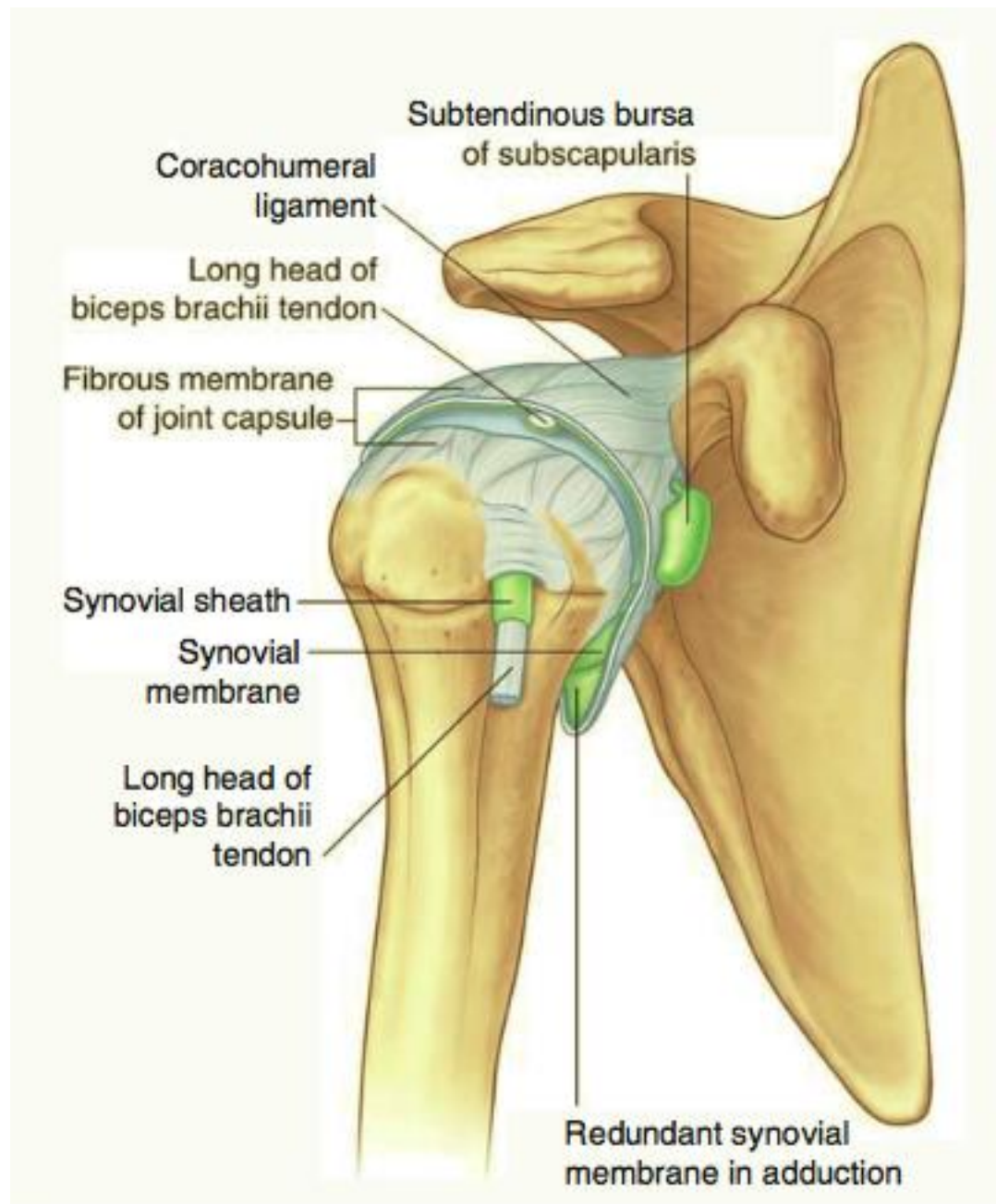


FIGURE NO: 7. SHOULDER JOINT - CAPSULE

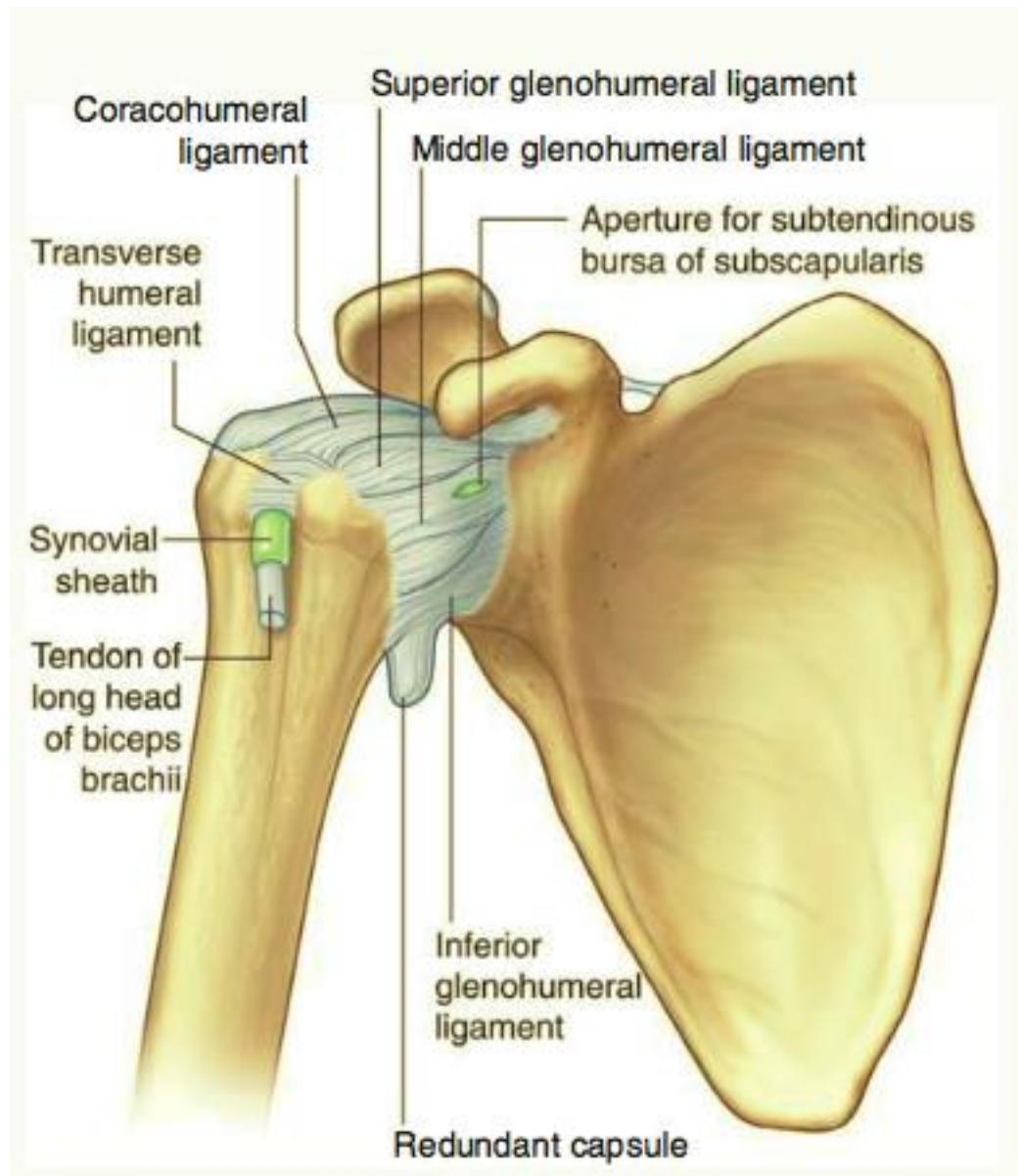
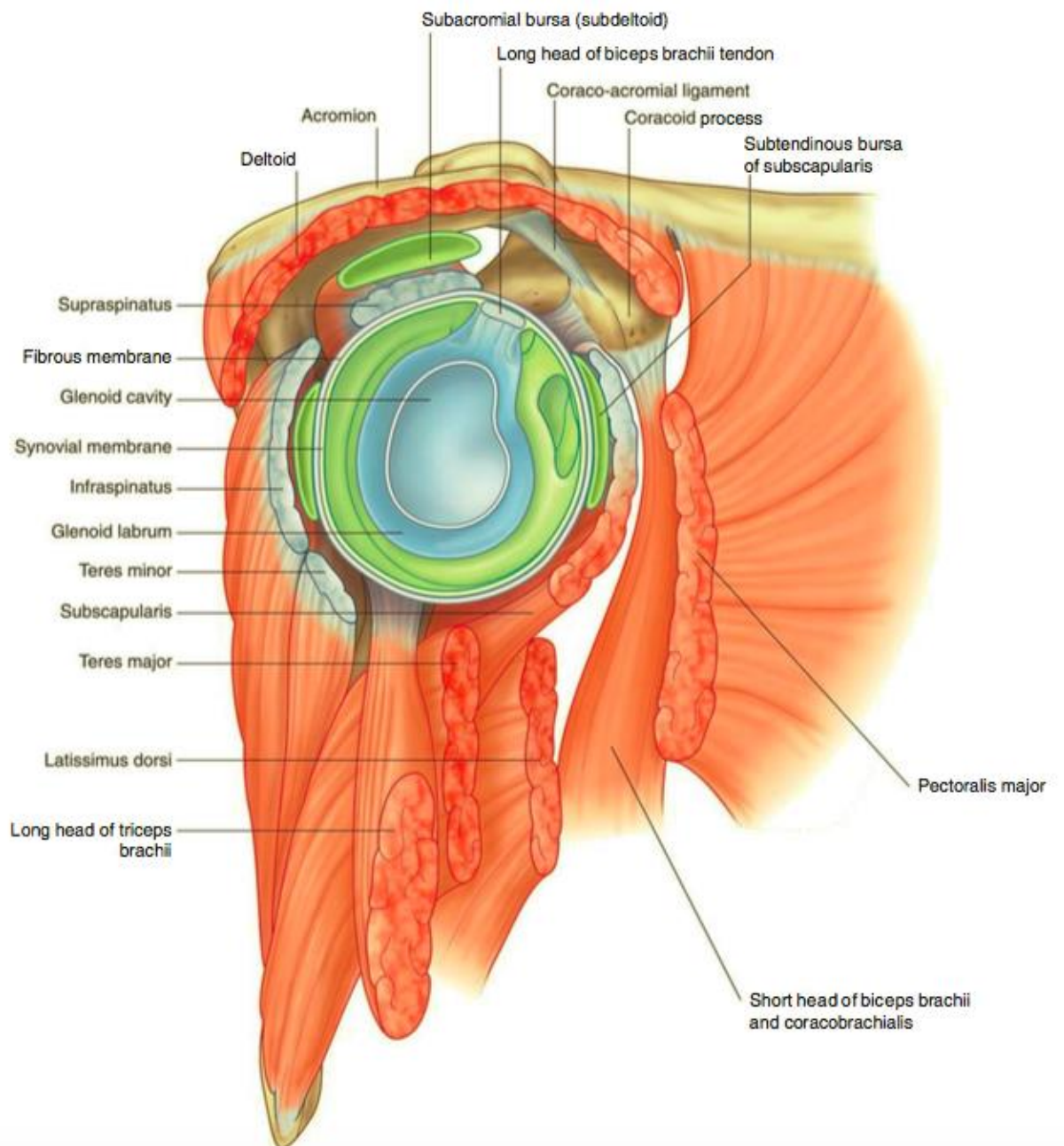


FIGURE NO: 8. SHOULDER JOINT - OUTLET VIEW



Muscles of glenohumeral joint:

There are five prime movers of the joint. They are deltoid and four other muscles which are known collectively as the rotator cuff muscles. They are - supraspinatus, infraspinatus, subscapularis and teres minor. These muscles constitute rotators of the humerus but are also of great importance in abduction⁴².

When studied histologically the capsule consists of bundles of type I, III and V collagens aligned with the axis of tensile strength of the capsule. Collagen types I and III are interstitial collagen molecules and accounts for the majority of the total body collagen. They occur as fibrous supporting elements. Type V collagen is another class of peculiar collagen. The tissue that surrounds the joint cavity in the form of fibrillar, condensed capsule is continuous with dense periosteal connective tissue³⁶.

Movements that can occur at the gleno-humeral joint are forward flexion (90 degree), backward extension (45 degree) abduction (180 degree), adduction (45 degree) internal rotation and external rotation (90 degree each). Abduction at the shoulder is a complex co-ordinated movement involving deltoid and the rotator cuff. The latter holds the head in the glenoid cavity while the deltoid assisted by supraspinatus produces abduction⁴³.

The supraspinatus, the teres minor, and the infraspinatus have their insertion at the greater tuberosity and act to rotate humerus laterally. The subscapularis which attaches to the lesser tuberosity is the internal rotator of humeral head. Latissimus dorsi and pectoralis major are adductors of the arm. The trapezius and serratus anterior produces upward rotation of glenoid⁴³.

PATHOLOGY OF PERIARTHRITIS SHOULDER:

The pathologic anatomy was described in detail by Neviaser in 1945. It is primarily an inflammatory reaction in the capsule and synovium that subsequently leads to the formation of adhesions, specifically at axillary fold and in the capsular attachment at the anatomical neck of the humerus.

Recent arthroscopic evaluation of patients with arthrographically documented adhesive capsulitis has established four stages of the disease.

- Stage I (Pre-adhesive stage): Most patients are symptomless.
- Stage II (Acute adhesive synovitis): Proliferative synovitis occurs and early adhesions form.
- Stage III (Stage of maturation): Has less synovitis with loss of axillary fold.

-
- Stage IV (Chronic stage): Adhesions are fully mature and markedly restrictive⁴⁴.

Nicholson noted in patients that in active elevation, the scapula moved laterally and superiorly to compensate for glenohumeral motion⁴⁵.

J.S. Neviaser described adhesive capsulitis. He was the one who observed, at sub synovial layer of capsule, chronic inflammation with fibrosis and perivascular infiltration. This is consistent with a reparative process⁴⁶.

Donald O. Fareed, and **William R. Gallivan Jr.**, postulated that as the shoulder joint is the most mobile joint in the body, it has a great amount of redundant articular capsule necessary to allow complete range of motion (ROM). In patients, redundancy of anterior synovial fold between the biceps and subscapularis tendons was observed. A redundant, invaginated segment of synovial tissue that underlies the long head of biceps tendon was also observed. In individuals with long standing subacromial tenosynovitis, this invaginated synovial tissue was inflamed and often adherent to the adjacent subscapularis tendon, biceps tendon, and humeral head. In the process of insufflating the joint with cooled ringier's lactate, the inflamed invaginated synovial tissue receded into the sub-coracoid recess into the synovial fold's normal anatomical position. In early patients with frozen shoulder syndrome, arthrograms demonstrated that the normal synovial recesses were absent

and marked adhesions were present prior to treatment. Following treatment (Hydraulic distension) the sub coracoid recesses and other synovial recesses were evident.

The primary lesion occurs at the triangular anatomic synovial fold between tendons of long head of biceps brachii and subscapularis. Even the small amount of inflammation forms adhesions between joint capsule and surrounding anatomic structures. This creates the frozen shoulder syndrome⁴⁷.

McLaughlin, in 10% of his cases, noted a nonspecific proliferative synovitis. He noticed that capsular folds and pouches were obliterated by adhesions of the adjacent synovial surfaces. The rotator cuff muscle bellies become inelastic, contracted, fixed and biceps tendon sheath was frequently involved⁴⁵.

Simmonds noticed increase in vascularity in the joint capsule. He postulated that a chronic inflammatory reaction in the supraspinatus tendon was the underlying cause⁴⁸.

Lundberg, on histological examination, found synovial cells largely unchanged. He reported seeing a more compact, dense collagen layer in the shoulder capsule. These findings were confirmed at electron microscopic examinations, showing a more compact arrangement of collagen fibres⁴⁹.

According to **McNab** postulations, degeneration of the collagen is initiated by the partial loss of blood supply at insertion of subscapularis tendon. The localized degeneration of the collagen was then thought to induce an auto immune response. He felt that the round cell infiltrate and lymphoid cells found in capsule could be interpreted as auto immune but the recent reports have failed to identify any statistically significant clinical or lab evidence of immunological basis for this condition⁴⁵.

Reeves commented that acute inflammatory changes were not observed in the synovium when the shoulders were exposed at open manipulation⁵⁰. Pathoanatomically, the common denominator is an inflammatory proliferation followed by thickening, scarring and retraction of joint capsule. The inflammatory process often starts at the rotator interval and may extend to the subacromial space⁵¹.

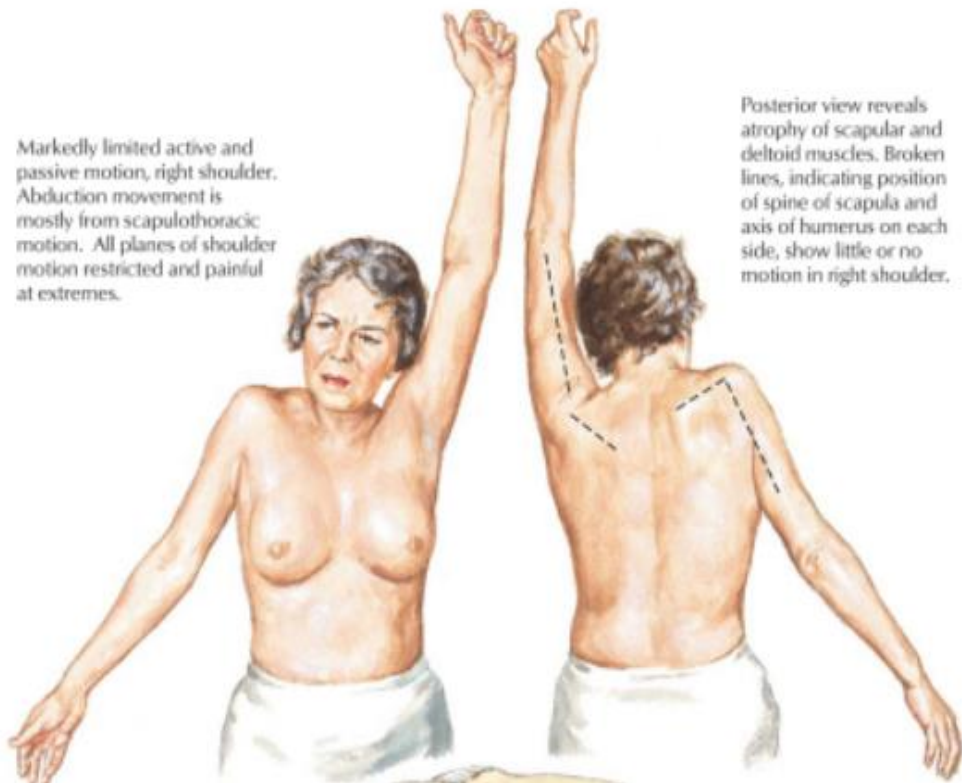


FIGURE NO: 9. CLINICAL PRESENTATION

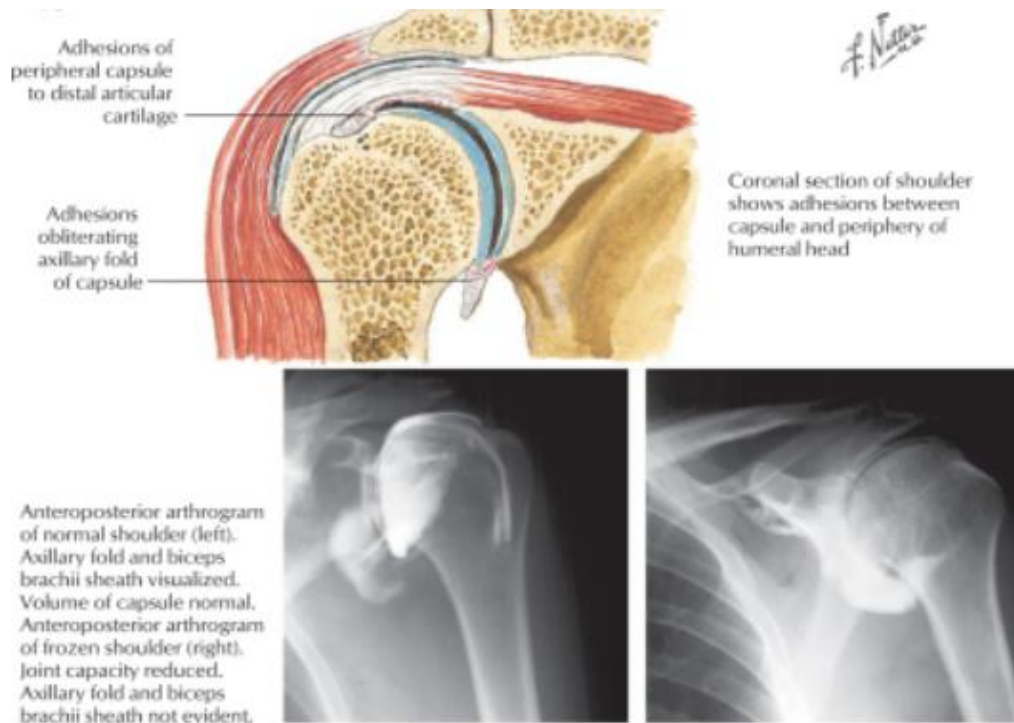


FIGURE NO: 10. ARTHROGRAM OF ADHESIVE CAPSULITIS

DIAGNOSIS OF PERIARTHRITIS SHOULDER:

It relies on history and clinical examination. By definition it is an idiopathic condition and diagnosis of exclusion. One must rule out rotator cuff tears, arthritis, fractures, neglected dislocations, calcific tendinitis, cerebral and pulmonary lesions, local tumors, referred pain, thoracic and abdominal lesions, hysterical pain, avascular necrosis and other bone diseases⁴⁷.

There is consensus on the specifics of which restriction of shoulder motion are required to be diagnosed as frozen shoulder. For the function of the upper extremity, allowing the arm to be positioned widely in space away from the body, the normal mobile shoulder is a crucial one.

Bruckner and Nye⁵², believed that a loss of 20% of glenohumeral abduction and loss of 40 degree of external rotation in patients associated with night pains were sufficient for diagnosing frozen shoulder.

Lundberg⁵³ included patients with painful, stiff shoulder, localized to glenohumeral joint and whose combined elevation was less than 135 degree.

Rizk and associates used the following clinical criteria:

- A passive combined abduction of less than 100 degree
- Less than 50 degree of external rotation.
- Less than 70 degree of internal rotation

-
- Less than 140 degree of forward elevation.

Neviaser and **Kay** believed that abduction should be limited to less than 90 degree, to be diagnosed as frozen shoulder. **Quigley** insisted that patients have less than 45 degree of glenohumeral abduction and less than 50⁰ of normal rotation with the arm at the side⁴⁵.

Patients with less than 30 degrees of external rotations, 130 degrees of forward elevation, 120 degrees of combined abduction were considered for diagnosis. Limitation of internal rotation is variable from person to person⁴⁵.

CLASSIFICATION OF FROZEN SHOULDER:

Classification eases selection of treatment choice and predicting outcome.

Lundberg divides patients into two groups:

- 1) Primary frozen shoulder.
- 2) Secondary frozen shoulder.

Patients who had post traumatic restriction of movements were considered as secondary periarthrits shoulder and primary periarthrits shoulder patients are the ones who had no particular findings⁴⁶.

Arthrographic criteria was used by **Reeves** for classification where post traumatic stiffness group had a decreased volume and abnormal subscapularis bursa fullness. The arthrographic findings showed normal

areas of biceps tendon sheath. The second group of patients with suspected frozen shoulder had a more restricted arthrogram showing markedly decreased joint volume ⁵⁰.

Kay clinically classified these patients on the basis of degree of shoulder restriction. The term early capsulitis was coined to describe those patients with restricted shoulder movement, who has combined abduction more than 90 degree. He reserved the term frozen shoulder for those with combined abduction < 90 degree.

Withers⁵⁴ classified frozen shoulder with patients examined under general anesthesia. Irritative capsulitis was the term used for those with pain and stiffness as well as full range of motion under the anesthesia.

A better classification by **J.S. Neviaser**⁵⁵ used combination of clinical and arthrographic criteria were those with a combined shoulder abduction > 90 degrees and joint volume moderately reduced at arthrography (10-12 ml) were classified under the heading - Painful stiff shoulder. Any condition about the shoulder with apparent limitation of motion was also included in this group. It is an apparent limitation because of absence of true capsular contracture. Patients whose abduction < 90 degrees and marked restriction joint volume restriction (5- 10 ml) were designated as having adhesive capsulitis⁴⁵.

INCIDENCE:

Frozen shoulder is encountered in all adult age group but is far more common during 5th and 6th decade⁵⁶. Uncommon in less than 40 years or over the age of 70⁵⁷.

Frozen shoulder is more common in people who have sedentary occupations than in manual labourers⁴⁴.

Frozen shoulder is associated with predisposing conditions like calcific tendinitis, coronary artery disease, shoulder surgeries, injuries of the extremity which requires immobilization. It's frequency is increased in females, with non dominant arm more commonly involved⁵⁸. In between 5 and 10% of cases, both shoulders are simultaneously affected⁵⁶.

PREDISPOSING FACTORS:

1) **Age incidence:** It is uncommon below 40 years or over the age of 70.

Patients are usually middle aged, with the mean age for males being greater than females (55 years compared to 52 years)⁴⁶.

2) **Trauma:** It is observed that frozen shoulder occurs with major trauma to the shoulder or other parts of the extremity. The post surgery frozen shoulder can be prevented by careful post operative exercises⁵⁸.

3) **Immobilization period:** It is seen in most patients with frozen shoulder, it is the time duration during which the shoulder has been relatively immobilized⁴⁶.

In a prospective study, **Bruckner and Nye**⁵² in a neurosurgical unit noted 5-9 times increase in the incidence of the same. In their patient group, the positive risk factors were correlating to the period during which normal shoulder mobility was prevented for a variety of reasons.

Binder and colleagues found 50% of their patients received no advice about the care of the painful shoulder from the primary care physician on initial assessment and out of those receiving advice, 75% were asked to rest the shoulder and only 25% were told to exercise the shoulder⁴⁵.

4) **Diabetes mellitus:** In general population the incidence is about 2-5%, whereas among diabetics it is 10-20%⁵⁷. Insulin dependent diabetics have a higher incidence (36%) and the incidence of bilateral involvement is still higher (46%). So whenever a patient comes with the bilateral shoulder pain, investigations should exclude diabetes. Patients with frozen shoulder and diabetes are more likely to have retinopathy. Patients who are insulin dependent for more than 10 years have a more serious risk. Despite treatment, on going disability in these patients increases significantly⁴⁵.

-
- 5) **Cervical disc disease:** The peak incidence of cervical disc degeneration coincides with that of frozen shoulder⁵⁸.
 - 6) **Hyperthyroidism:** Shoulder disorder resolves with the correction of hyperthyroidism⁴⁶.
 - 7) **Thoracic disorders:** Patients treated for tuberculosis in sanatoria had higher incidence of periarthritis shoulder as reported by Johnston. Saha reported association of emphysema and periarthritis shoulder. Upper lobe bronchogenic carcinoma was also associated with shoulder disease. Long standing association of ischaemic heart disease with frozen shoulder is well known and changes in the management of cardiac patients towards more ambulatory care have reduced its incidence⁴⁵.
 - 8) **Intracranial pathology and frozen shoulder:** Patients with hemiplegia, cerebral haemorrhage, tumours have an increased risk for frozen shoulder⁴⁵.
 - 9) **Periarthritic personality:** Coventry coined this term to describe one component of a three part theory on the pathogenesis of frozen shoulder. Coventry noted most patients have a peculiar emotional constitution like inability to tolerate pain, refusing to take any personal initiative to treat themselves and expecting other people to get them well. Personality behaviour may be secondary to the pain as believed by **Quigley. Tyber**, a psychiatrist reported on 55 patients

with painful shoulders who he treated with Lithium and Amitriptyline to give good improvement. In 148 patients with frozen shoulder, there were no signs of personality disorder using the Maudsley personality inventory, according to **Wright** and **Haq**. The role of psychological factors should be considered at best⁴⁵.

CLINICAL PRESENTATION:

Frozen shoulder is a clinical syndrome rather than a specific diagnostic entity. A high suspicion index is needed for proper diagnosis. Not all patients are typical, but an awareness of typical clinical course of primary frozen shoulder and secondary frozen shoulder is essential⁵⁹.

Primary frozen shoulder:

This condition rarely recurs in the same shoulder. Involvement is unilateral in most of the patients. Subsequent involvement of other shoulder may occur in 20% cases. Classically there are three stages to the clinical course of the primary frozen shoulder.

- 1) The freezing stage
- 2) The frozen stage
- 3) The thawing stage

The freezing stage:

Also called as painful stage. There is a gradual onset of diffuse, non localised shoulder pain. Progressive onset of pain lasting for weeks to months before they consult orthopaedic surgeon is the usual description of the patients. The pain worsens at night and is exacerbated by lying on the side of affected shoulder. Patients have disturbed sleep and anxiety commonly. The time duration of the phase varies from 2-9 months. Due to patient's reduced use of the affected upper limb, there is minimal discomfort. It is difficult usually to obtain a history of precipitating factors.

The frozen stage:

Also called as stiffening stage. The painful stage is usually followed by progressive loss of shoulder motion. This may last for 4-12 months. Patient cannot use his shoulder in daily activities like dressing, washing hair or personal hygiene as there is restriction of shoulder motion.

The functional restrictions do not coincide with the objectively measured shoulder motion. Patient may present with difficulty in reaching out for objects, using the back pocket etc., inability to reach the back of the head or interscapular area is expressed by female patients. The pattern of shoulder movement restriction is characteristic, first

external rotation, second internal rotation and then abduction. Most of the patients will have a restriction of external rotation of less than 30 degree.

Internal rotation is limited when the patient cannot lift thumb past second lumbar vertebra, the abduction is restricted allowing less than 110 degree and about 10% with negligible glenohumeral movement. Patients often experience a dull ache and a periscapular pain punctuated by sharp pains which occur when the arm comes to it's free range of motion. As the motion is regained in some patients, pain subsides.

The thawing stage:

Final stage includes gradual regaining of motion and it is measured in weeks or months, rather than in days. As motion slowly increases, there is progressive lessening of discomfort. The time taken is quite unpredictable. Time taken by the patients to regain functional ROM may be 6-9 months, sometimes it may be even upto 2 years. Shoulder movement is regained gradually without specific treatment^{46,47}.

Secondary frozen shoulder:

Precipitating event can be identified in these patients. There may have been a recent episode of shoulder pain, due to overuse. Localized shoulder pain suggesting a subacromial bursitis or tendinitis may have occurred which may cause discomfort. Frozen shoulder may develop

following soft tissue injury or a fracture. Frozen shoulder has reduced recently due to emphasis on early mobilization of shoulder. Frozen shoulder may also be due to a partial thickness tear of the rotator cuff which has been misinterpreted as an intrinsic shoulder pain or any inflammatory condition of the shoulder joint or adjacent soft tissue. These stages noted in primary frozen shoulder are not seen in secondary frozen shoulder.

CLINICAL EXAMINATION:

Frozen shoulder is a symptom complex with restriction of passive motion of shoulder. A complete examination of upper limbs, spine, trunk is essential to rule out other intrinsic and extrinsic causes of frozen shoulder.

As recommended by the Society of American Shoulder and Elbow surgeons, the minimum examination of shoulder movements must include

- 1) Measurement of passive forward elevation with the patient in supine position and measuring the angle between arm and thorax.
- 2) Passive external rotation with the arm at the side and measuring the angle between forearm and the sagittal plane, with the elbow flexed to 90 degree.

-
- 3) Active forward elevation is measured with patient in standing or sitting and measuring the angle between arm and the trunk in the sagittal plane.
 - 4) Active internal rotation is measured by asking patient to reach behind the back with the tip of the thumb of the affected hand and noting the spinous process level.
 - 5) Active abduction is measured as the angle the arm makes with the trunk in plane of the scapula.

By assessing the glenohumeral movement, independent of scapulothoracic motions, we can gain further information. To do this, scapula should be stabilized against the chest wall by direct pressure on the axillary border of the scapula. While measuring glenohumeral rotation, both clavicle and scapula must be stabilized. An examination of muscle strength in different planes of shoulder motion is helpful.

Resisting specific muscle action may uncover a tendinitis component. Such an examination, performed routinely at each visit allows documentation of initial restriction and any progress during follow up⁴⁵.

The onset is insidious and develops due to non usage of the shoulder. The arm is hanging constantly at the side.

Some vague antecedent injury may be blamed, for increasing pain and stiffness in the shoulder. Pain is located over the anterolateral aspect

of shoulder joint and radiate to the anterior aspect of upper arm and occasionally to the flexor aspect of forearm.

Discomfort is worse at night and disturbs the sleep. Tenderness is generalized over humeral head and over the bicipital groove.

ROM is restricted in all planes of movement and pain increases at the extremes of motion.

Muscular spasm is observed in all muscles in acute stage, particularly in pectoralis major and scapular muscles⁶⁰.

Posture characteristically is altered. Patients hold the affected arm in internal rotation and adduction.

Mild atrophy of deltoid and supraspinatus muscle may be seen. Signs of reflex sympathetic dystrophy often develop in the hand. Swelling of the fingers, shining atrophic skin, mottled dusky discoloration, coldness, hyperhidrosis or hypohidrosis are some of the findings⁶⁰.

INVESTIGATIONS:

1. a). Blood examination:

Includes hemoglobin, total count, differential count and they are usually normal. Erythrocyte sedimentation rate may be normal, it is reported to be raised in 20% of the patients. Routine serum biochemistry is also within normal limits⁴⁵.

An association with HLA: B 27, histocompatibility antigen has been reported with increased “C” reactive protein.

There were less immunoglobulins and reduced transformation of lymphocytes by phytohaemagglutinin. The auto immune theory of **McNab** is appealing but is not proven^{48,61}.

b). Routine urine examination is done to rule out diabetes mellitus.

2. Roentgenograms:

Roentgenograms of the shoulder are usually negative in frozen shoulder⁴⁷. A minimum examination consists of antero-posterior view taken at right angles to the plane of the scapula. An axillary view should be taken to rule out dislocations, fracture and osteophytes.

A mild to moderate degree of osteopenia may be seen due to restricted range of movements⁵⁹.

3. Radionuclear scan assessment:

Increased uptake of Technetium99 by patients with frozen shoulder is observed by **Binder, Bulgen** et al. The explanation for this increased uptake of bone seeking isotope (Technetium99) is unclear. Radionuclear scans are very sensitive and will show inflammation.

AI Binder et al do not consider that arthrography or technetium diphosphonate scanning performed at presentation contributes to the assessment of the painful stiff shoulder⁶².

4) Arthrography:

The joint volume is significantly decreased (often under 5 ml) with presence of loss of distensibility of joint. Marked irregularity of the joint outline was also sometimes seen.

J.S. Neviaser described arthrographic findings for the first time. He described combination of a distorted joint outline, reduced joint volume, and variable refilling of the bicipital tendon sheath. Decreased shoulder joint capacity to 10-12 ml and variable lack of filling of the subscapularis bursa and axillary fold are currently accepted characteristic findings^{45,58}. This procedure insures an accurate diagnosis of the disease⁶³. A better correlation is reported between clinical range of shoulder motion and the severity of capsular retraction at arthrography.

Different authors have recorded the volume of fluid that can be injected during arthrography, so that the capsular contraction is quantified. The biceps tendon sheath is outlined arthrographically in a majority of cases of frozen shoulder, but the extent of filling is variable.

Arthrography helps to find the tears of the joint capsule during manipulation under general anesthesia. No tears of the rotator cuff were found following manipulation under general anesthesia. In the clinical research setting, selecting patients by the shoulder arthrography findings standardizes the patients' groups.

Arthrography is an invasive procedure and it's routine use in the patients having typical clinical presentation of frozen shoulder, needs assessment. When clinical findings are well documented, there remains a puzzling group of patients (6-20%) who will have a normal arthrogram. When the patients fails to improve following specific treatment modality, shoulder arthrogram is the source of additional information⁴⁵. Arthrography is preferred for evaluating periarthritic conditions⁶¹.

5) Arthroscopic examination:

Robert H Miller IE observed that evaluation and treatment of periarthritis shoulder are relative indications. With experience gained from the arthroscopic examination of the knee, shoulder arthroscopy saw it's initial development in late 70's and early 80's. There was contracted anterior joint capsule but no intra-articular adhesion as observed by early investigators. A mild to moderate synovitis with areas of increased vascularity and obliteration of the subscapularis bursa was also described⁴⁶.

Due to the limited external rotation found in frozen shoulder patients, visualization of inferior recess may be difficult. There remains a controversy of interpretation as to what is happening in the inferior recess. Some believe that the axillary pouch may be deformed but deny seeing obliteration of the recess⁴⁵.

Shoulder arthroscopy gives adequate attention to variations in normal shoulder anatomy⁶⁴.

Neviaser et al documented arthroscopically, four stages of the frozen shoulder. But its role in the diagnosis of frozen shoulder is not established. Neviaser defined four stages of arthroscopic changes in adhesive capsulitis.

- **Pre-adhesive stage:** (Mild Synovitis) Patients present with minimal or no limitation of motion. There is a fibrinous synovial inflammation detectable only by arthroscopy.
- **Acute adhesive stage:** Acute adhesive synovitis; there is the proliferative synovitis and early adhesion formation .
- **Stage of maturation:** Has less synovitis with loss of axillary fold.
- **Chronic Stage:** Adhesions are fully mature and markedly restrictive⁴⁵.

6) Magnetic Resonance Imaging of the shoulder:

Joseph. P. Iannotti et al's data demonstrated the value of MRI. in the definition of spectrum of lesions of the rotator cuff and abnormalities of the capsule and labrum .

Although MRI was accurate (Joseph) in the evaluation of capsular mechanism of the shoulder in their study, the accuracy highly depends on

the technical issues including the use of high field strength magnet and properly designed surface coils, the ability to obtain oblique sections, and good homogeneity of the magnetic field⁶⁵.

7) Computed Arthrotomography:

It is accurate as MRI. Computed arthrotomography is invasive and hence less preferred to MRI⁶⁵.

DIFFERENTIAL DIAGNOSIS:

The differentiation between the stiff and painful shoulder without any joint capsule involvement and with capsule involvement (True adhesive capsulitis) must be established before a rational treatment can be prescribed. Arthrography establishes the correct diagnosis of adhesive capsulitis. (R.J. Neviaser)⁴⁴.

1. Stiff and painful shoulder group includes any disorder of the shoulder which is painful and causes apparent restriction of movement. Key word is “apparent” because true capsular contracture doesn't occur in these patients.

Pain limits the clinical motion at the extremes of function. Conditions that contribute to the clinical picture of a stiff and painful

shoulder include calcific tendinitis, non calcific tendinitis of rotator cuff, bicipital tenosynovitis, arthrosis of glenohumeral joint or AC joints, incomplete or complete tear of rotator cuff; hemarthrosis and synovitis.

The onset of pain may be more acute and severe in this group than in those patients with adhesive capsulitis.

There may be history of repetitive over head activity or trauma that precipitated the painful episode. On physical examination, although motion seems restricted, there is no mechanical restriction at the limits of passive motion that exists with true capsular contracture. These patients resist further motion because pain prevents it. Radiological assessment is valuable in eliminating calcific tendinitis. Arthrogram is the sole key indicator of the presence or absence of capsular contracture⁴⁴.

Injection of local anesthesia into subacromial bursa will improve the passive movement in the tendinitis-bursitis group while having little effect on frozen shoulder⁵⁸.

Prolonged post traumatic shoulder immobilization, chest wall deformities, scoliosis result in restricted scapulo-thoracic motion. Congenital abnormalities like Klippel Feil and Sprengel's deformities are potential causes for scapulo-thoracic motion restriction. These should be identified by thorough history and examination and confirmed by X-ray if present.

2. **Osteochondromatosis** may mimic frozen shoulder. There will be typical catching and locking episodes in these patients. X-rays, arthrography and arthroscopy should be done if necessary⁴⁵.

3. A **painful acromioclavicular joint** presents similarly as a frozen shoulder and must be suspected when tenderness over acromioclavicular joint is present. Symptoms in primary acromioclavicular disorder are relieved by injection of 1 ml of 1 % lignocaine into the joint.

4. **Inflammatory arthritis** is considered when assessing painful stiff shoulders. The possibility of septic arthritis should also be considered⁵⁸. Primary degenerative glenohumeral arthritis, post traumatic arthritis may have clinical symptoms like frozen shoulder. However, with a careful history, examination and x-rays, they can be easily differentiated from frozen shoulder⁵⁸.

5. **Referred pain**, from the cervical spine, radiating to the shoulder and upper arm may precede the shoulder pain and stiffness. Intra thoracic lesions like bronchogenic tumour of apex and intra abdominal disorders may result in pain referred to shoulder⁴⁵.

6. **Reflex sympathetic dystrophy** and frozen shoulder have many common features. Shoulder hand syndrome is a type of reflex sympathetic dystrophy involving the hands and is characterized by painful disability of the shoulder associated with diffuse swelling, severe tenderness and vasomotor changes in hands and digits of the limb⁶⁰.

TREATMENT MODALITIES AVAILABLE FOR FROZEN SHOULDER:

There is unanimity of opinion that the best form of treatment is prevention. Some observers think that this is a self limiting process that will resolve within a year without particular treatment modality. The form of therapy depends on the patients function at the time of evaluation, clinical findings and the stage when patients seek treatment. Treatment is modified depending on the patient's response⁴⁴.

Prevention:

Primary concern of the surgeon should be prevention of frozen shoulder. The incidence of trauma related frozen shoulder is greatly reduced by early mobilization of shoulder. Despite pain, avoiding prolonged immobilization prevents frozen shoulder⁴⁶.

1) General treatment:

In early stages, pain can be relieved by rest, analgesics without muscle relaxants, non-steroidal anti-inflammatory drugs or TENS (Transcutaneous Electrical Nerve Stimulation).

In flared up cases codeine is useful. Patients on exercise do better than those only on analgesics. So short periods of pendulum exercises should be started at the earliest (about 1-2 min/hr)⁴⁵.

2) Home exercise programme:

The main stay of treatment is home exercise program for short periods of five times a day. A physiotherapist may assist patients in teaching exercises, monitoring their conduct, and documenting the patient's progress. It may begin with warming the shoulder using warm shower or heating pad. Deep breathing and relaxation techniques decrease muscular resistance causing gentle force application on the tight capsule. Similarly, a yard stick or broom handle is used to gain external rotation, in supine position.

The range of motion are easily documented according to number of degrees of forward elevation, external rotation, abduction and the segment of posterior anatomy that can be touched with thumb. A chart of these ranges is recorded and shown it to patient in each visit, so they may be rewarded for their progress.

Patients are advised to use the affected shoulder during their daily activities.

The gains on the home exercises are usually slow. They are supposed to continue the exercises indefinitely once a day basis even after a full range is regained. The gains on the home program help in management of the frozen shoulder⁵⁹.

3) Physical therapy:

It is found to be less effective when modalities like short wave diathermy, application of heat or ice, infrared or ultrasound are used alone. They have an effect on pain control and muscle relaxation. Patients should be explained about the natural history of their condition and advised about the importance of exercises by physiotherapist⁶⁶.

Rizk et al reported only 60% of patients achieved pain free sleep in 4-5 months. Ultrasound in doses of 0.5-2 watts per square centimeter is used for it's tissue extensibility as well as thermal effect. It does not offer any advantage over heat and exercises⁶⁷.

4) Stretching Exercises:

As pain is brought under control, a stretching program is started in external rotation, internal rotation and forward elevation. Since many patients will develop impingement like symptoms, it is preferable to avoid stretching into abduction initially⁴⁴.

5) Strengthening for General Rehabilitation:

For the glenohumeral joint, the main movers (the deltoid, latissimus dorsi and pectoralis major muscles), the position adjusters and the fine tuners (the rotator cuff muscles) especially the subscapularis for internal rotation and the infraspinatus and the teres minor muscles for

external rotation are strengthened. For the scapula, the trapezius, serratus anterior and rhomboid muscles are strengthened.

6) Mobilization technique:

The technique depends on the patient's presentation and whether the treatment is for pain, stiffness or both. The patient is recumbent on his back and his elbow flexed to 90 degree. The physician exerts gentle pull on the patient's upper arm with rhythmic passive movements. The patient's elbow is thrust upward with the physician's chest in a counter arc during the mobilization movements. The motions are performed in upward, downward, backward and lateral directions, one after the other.

After mobilization, which lasts 5-10 minutes, the patient is allowed to get up. These exercises are to be done 6-8 times daily within the limits of the pain, each exercise being performed at least 20 times⁶⁸.

7) Steroid injection:

Roy and Oldham, have reported local steroid injections to be highly effective but he noted that the improvement in pain and range of movement was short lived. The rationale is based on that the steroid injection have a strong local anti-inflammatory effect⁶⁶.

Following are the common injection protocols:

a) Paired injections: **D.Y. Bulgen** et al observed that steroid treatment results are less satisfactory than those of **Roy** et al. Bulgen used steroid injection methyl-prednisolone acetate 20 mg and 1% lignocaine hydrochloride 0.5 ml which were injected into the subacromial bursa and a similar amount into the shoulder joint by anterior route weekly for three weeks. These were compared with standards receiving normal saline. The results were similar among the two groups, when assessed for pain and movement, after 2-6 weeks⁶⁶.

Richardson et al⁶⁹ monitored intra-articular injections by arthrography. His findings were consistent with that of Weiss.

Roy et al observed that patients with stiff shoulder who were treated with paired injection of methyl prednisolone - 20 mg, injected both into the subacromial space and glenohumeral joint, weekly upto a maximum of 3 paired injection. In this group 80% had their pain abolished by two weeks, 95% were pain free in four weeks. By 8 weeks 73% achieved 150 degrees of abduction, and 53% achieved 45 degrees of external rotation, 8% of patients were considered to be treatment failure⁴⁵.

b) Intra-articular injections: **Williams** et al⁷⁰ followed a group of patients who were given three weekly injection of intra-articular hydrocortisone acetate 50 mg, and compared with a group receiving stellate ganglion block. All patients were advised an exercise program and were allowed to use NSAID analgesics. At the 12 weeks follow up,

half of the patients were improved by 75%, one quarter by 25% and another quarter remained unchanged.

At the 4 week and 3 months follow up, there was no significant difference between the two groups.

In a study group of 80 patients divided into four groups, Lee et al inferred that there was no major difference in the final range of movements when compared with those who were on exercise only and injection group.

Hollings worth et al reported on 43 patients with frozen shoulder, who were divided between two treatment arms. One group received intra-articular injection, while another received injection around the tender point about the shoulder. The injection consisted of 40 mg methyl-prednisolone acetate and 1% lidocaine. These patients were assessed at one week and if there was no improvement, the alternative injection was given. 47% pain relief in those who received 50 mg of intra-articular hydrocortisone acetate, in a 3 month follow up was reported by **Thomas** et al⁷¹.

In patients with moderate stiff shoulder, in whom pain is a major impediment to exercise, an intra-articular injection repeated 1-2 times, seems justified. The steroid injection have not shown any improvement in the rate of return of full shoulder motion. The use of intra-articular injection have theoretical merits, but evidence is equivocal⁴⁵.

c) Regional injection techniques: Regional injection of hydrocortisone acetate into the joint capsule has been proved to be fairly beneficial. Other areas of injection including region of maximum tenderness, long head of biceps, multiple injection into the subacromial bursa, into the posterior pericapsular structures, were studied by Steinbrocker with a 60% relief in pain in 6 weeks⁴⁵.

8) Myofascial trigger point approach to treatment:

It is believed that trigger points in the subscapularis is the source of pain in the shoulder and restricted ROM. Trigger zone is theorized to be in the muscle belly of the subscapularis, which can be palpated when scapula is abducted. These cause associated trigger points in the pectoralis major, pectoralis minor, latissimus dorsi and the triceps.

The peak age for frozen shoulder was the same as for those of myofascial pain syndrome as noted by **Kraft**⁷². Moderate pressure on the posterior shoulder may occasionally cause radiating pain.

The spray and stretch is immediately followed by local application of heat and active exercise of the muscle.

9) Brisement (Distension arthrography):

At the time of arthrography, distension of shoulder by progressive injection of fluid may have a beneficial effect. During distension arthrography, using serial injections, progressive injection of fluid generates intra-articular pressure of 1000-1500 mmHg. In shoulder,

where there is still a demonstrable subscapularis bursa at arthrography, the joint volume can be distended by serial injections, with the pressure ranging between 1200-1800 mmHg.

Distension arthrography is reported to be most useful in moderately restricted shoulders. Pain relief may occur without significant change in motion. It can be repeated in an effort to get further improvement, as there is no post distension pain⁷³.

10) Manipulative procedure:

The goal of treatment by manipulation is to shorten the symptomatic course of the disease. Lundberg observed that there was an increased rate of return of shoulder mobility after manipulation, but there was no effect on total duration⁶⁰.

a) Manipulation under anesthesia has been the source of controversy in treatment of painful stiff shoulders. The patients should be co-operative for the successful manipulation. The patient should also be aware of the risk of manipulation like fractures, post manipulation pain, rotator cuff tears, capsular tears, traction injury of nerves around the shoulder.

Procedure:

Under general anesthesia the arm is moved slowly and passively in all directions. An assistant at the head of the table fixes the scapula. The surgeon flexes the elbow and abducts the patients arm slowly. At that time only, the head of the humerus is pressed medially and caudally.

Sudden release of resistance to movement accompanied by audible snapping sounds suggests freeing of adhesions. Excess force is not used for fear of fracturing the humerus. Any increase of movement obtained with a minimal manipulation should be accepted. Over next 24 to 48 hours, pain is managed with application of a ice pack and by use of NSAIDS, while 90 degree abduction is maintained by holding the hand above the head. As soon as tolerance to pain permits, active exercises are initiated to preserve ROM. Patients should be informed of its recurrence if exercises are neglected. Manipulation can be repeated, if necessary, in stages without exceeding the safety limits, to achieve full ROM, post manipulation care is most important⁶⁰.

Contraindications for manipulation:

Absolute:

- 1) Frozen shoulder that is due to fractures or dislocation around shoulder.
- 2) Osteopenia of bones around shoulder
- 3) Non-cooperative patients after the post manipulation exercise program.

Relative:

- 1) Patients with acute and irritable peri arthritis shoulder ⁴⁴.

Reports show about 70% improvement in 3 months, one should keep in mind the potential injuries and proper precautions are to be taken⁴⁵.

b) Manipulation with systemic steroids: The steroids did not decrease the post manipulation pain. It was believed that, they hastened the recovery. If possible, systemic steroid should be avoided to avoid their risks⁴⁵.

c) Manipulation and steroid injection: In the effort to relieve post manipulation pain and inflammation, several authors have recommended injecting corticosteroids during manipulation and 33-83% of improvement were noted⁷⁴.

d) Manipulation under local anesthesia: With or without arthrogram controlled manipulation of the shoulder under local anesthesia was recommended. 61-79% of patients regained normal ROM and pain was reduced in 68-70% of the patients⁷⁵.

11. Oral corticosteroids:

For their anti inflammatory effect systemic steroids have also been recommended for management of frozen shoulder. But their side effects should be kept in mind while considering their use⁴⁵.

12. Stellate ganglion block:

Is used presuming that frozen shoulder is a type of autonomic dysfunction in it's management. The ganglion block offers moderately significant advantages when compared to other treatment modalities⁴⁵.

13. Traction:

Manipulative technique is being reported using traction to bring the humerus into abduction. By Rizk et al, TENS (Transcutaneous Electrical Nerve Stimulation) unit was used to control pain⁶⁷.

Technique: Fifteen minutes of traction in progressive abduction, repeated upto 8 times on every 28 physiotherapy visits, over an 8 week period.

They reported that pain relief and ROM were improved when compared to those receiving conventional physiotherapy⁶⁷.

14. Arthroscopic distension:

HSU Syc, Chan KM, compared arthroscopic distension with manipulation and reported that arthroscopic distension is good alternative to manipulation, as it is more controllable and helps in diagnosis and also identifying the pathologic focus in the joint⁷⁶.

15. Operative management:

Arthroscopic release: Patients with idiopathic adhesive capsulitis who still have limited mobility even after physical therapy, manipulation under anesthesia, may undergo open soft tissue release (arthroscopic capsular release)⁷⁷.

Procedure: Consisted of resection of the inflamed synovium between the supraspinatus and subscapularis, followed by progressive division of the affected ligaments and joint capsule.

The author concluded that, such treatment of the affected part is effective particularly for patients with diabetes mellitus⁷⁸.

The author also concluded that, arthroscopic capsular release offers a new treatment alternative, which reduces pain and improves mobility of joint with little operative morbidity. At the same time any concomitant lesions can be treated⁷⁷.

COMPLICATIONS:

Complications following treatment:

Frozen shoulder is a self limiting disorder, that resolves with time in most of the cases. There might be residual loss of objectively measured shoulder motion. Although loss occurs in upto 70% of cases, it represents only a functional problem in 10-15% of the patients. Some patients have persistent pain for which other methods of treatment are considered⁴⁵. The complications of great concern are those of over treatment. The potential complications of manipulation, including dislocation and fractures must be weighed against the benefits⁴⁶.

There is also risk of stretching of brachial plexus and other peripheral nerves when the arm is abducted. There is a small percentage risk of infection with intra-articular injection, more so in diabetics. The use of both NSAIDs and systemic steroids have risk of gastric and

systemic complications. Neviaser, in severe degree of periarthritits shoulder has observed, even disturbed his or her life style⁴⁵.

MATERIALS AND METHODS

SOURCE OF DATA:

This prospective analytical study on 46 cases with frozen shoulder were conducted in Department of Orthopaedics , R L Jalappa Hospital, Kolar on out-patient and in-patient basis, meeting the inclusion and exclusion criteria.

STUDY PERIOD : 12 months with patient follow up at 3, 6 and 12 weeks from November 2017 to October 2018.

STUDY DESIGN : Prospective analytical study.

SAMPLE SIZE : 46

SAMPLE SIZE ESTIMATION:

Sample size was estimated based on VAS scores with an average variance of 1.96 from study done in year 2017 to detect a difference of 9.5% difference in Mean VAS scores with 80% power and with 95% confidence interval, the sample size required is 41 cases. Expecting patient drop out rate of 10 % during follow up, final sample size is estimated as $41+5=46^1$.

$$\text{Sample size}(n) = \frac{2 \sigma^2 (Z_{1-\alpha} + Z_{1-\beta})^2}{d^2}$$

$$\sigma = 1.4$$

$$Z_{1-\alpha} = 1.96 \text{ (95\% confidence interval)}$$

$$Z_{1-\beta} = 0.842 \text{ (80\% power)}$$

$$d = \text{effect size 9.5\% difference in mean score}$$

METHOD OF COLLECTION OF DATA:

Inclusion criteria:

1. Patients with Periarthritis of shoulder (Shaffer's criteria was considered).
2. Aged more than 30 years.

Exclusion criteria:

1. Massive Rotator cuff tears
2. Shoulder instability
3. Neurological disorders affecting shoulder.
4. Previous history of any treatment.
5. Local skin lesions.

SHAFFER'S CRITERIA⁷⁹:

- A minimum of 1 month of shoulder pain and stiffness for which no other cause could be identified.
- Documented restriction of passive glenohumeral and scapulothoracic motion of 100° of abduction or less,
- And less than 50% of external rotation when compared to the contralateral shoulder.

Patients were screened to find their eligibility to study. Consent was taken and they were included in the study. Patients were selected without consideration of the duration of symptoms, sex of the patient, severity of the disease, whether associated with co-morbid conditions like diabetes, hypertension and other variables.

Pre operative screening tests including hemoglobin, total white blood cell count, differential count, platelet count, random blood sugar, fasting blood sugar, post prandial blood sugar, glycated hemoglobin, erythrocyte sedimentation rate, C-reactive protein, rheumatoid factor, anti-streptolysin O titres and serum uric acid were done. Pre operative plain radiographs of the affected shoulder were done to exclude other shoulder diseases.

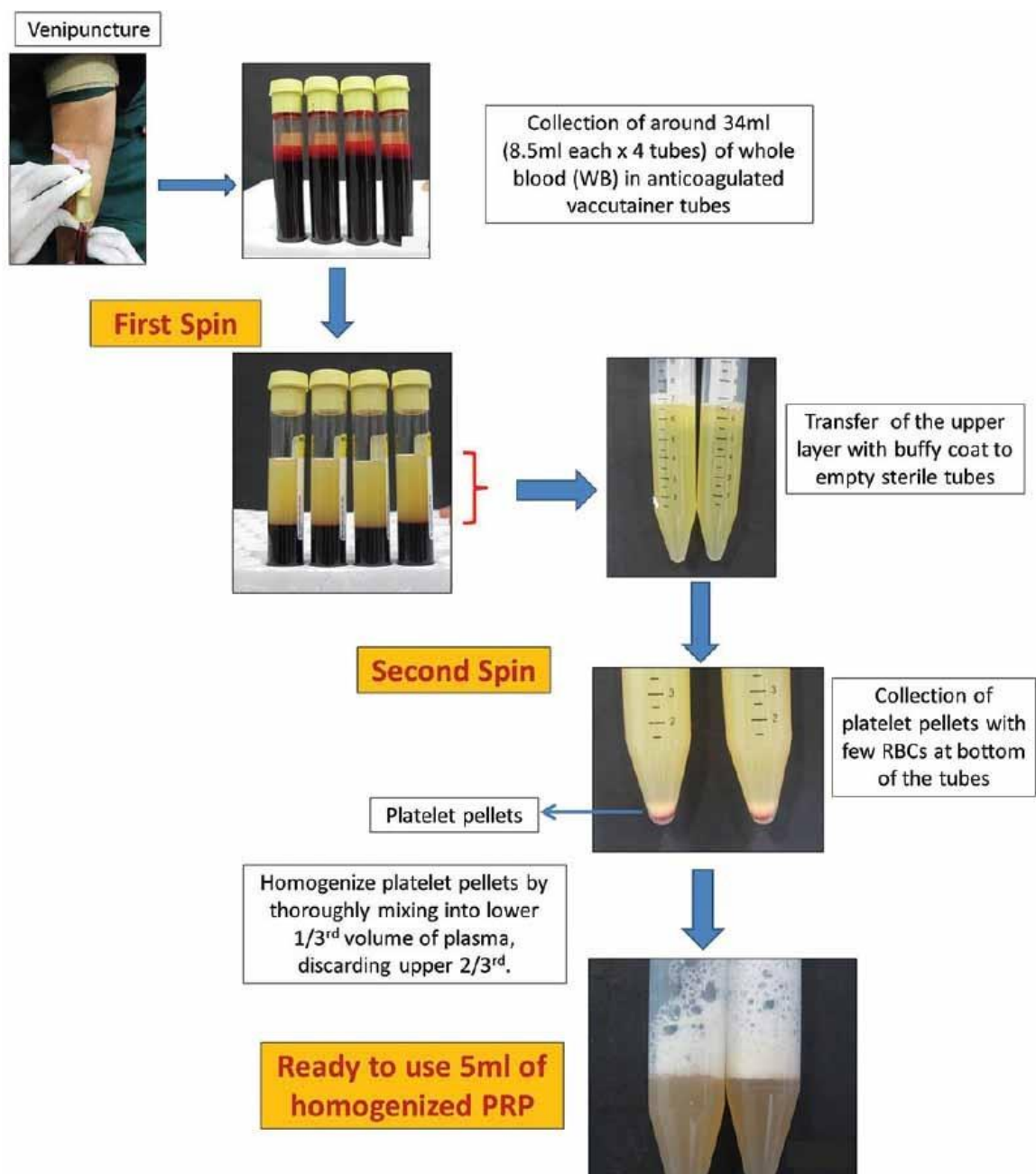
PREPARATION OF PLATELET RICH PLASMA:

PRP was prepared by a process known as differential centrifugation. In differential centrifugation, acceleration force is adjusted to sediment specific cellular constituents depending on different specific gravity.

Under aseptic precautions, 18 ml of the patient's peripheral whole blood was obtained using an 18 - gauge needle. Then, 2 ml sodium citrate was added to the collected blood (in ratio of 1:9), and around 2 ml

of PRP was extracted by a double - centrifugation technique at 1300 rpm for 10 minutes to separate erythrocytes and then again at 3500 rotations per minute for 10 minutes to concentrate platelets using the Rotek Laboratory Centrifuge^{80,81}.

FIGURE NO: 11. PRP PREPARATION



Procedure:

All the patients got intra-articular injection of platelet rich plasma. The surgeon injected a single dose of 2 ml of the platelet rich plasma into the intra-articular 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 was directed anteriorly and medially towards the coracoid process. 2 to 3 cm depth was reached with a 20 gauge needle. (A study by Agirman showed that the mean joint depth was 43.5 mm at posterior and 27.1 mm at anterior side). X-rays, ultrasound were done if necessary. ROM exercises were advised for all the patients at their residence. Findings were recorded and outcomes were measured before the injection and during all the follow-ups. Patients were followed up at 3 weeks, 6 weeks and 12 weeks. Outcome measures like active and passive range of motion, visual analogue scale for pain and quickDASH for function were measured. Photographs and videos were taken wherever necessary.

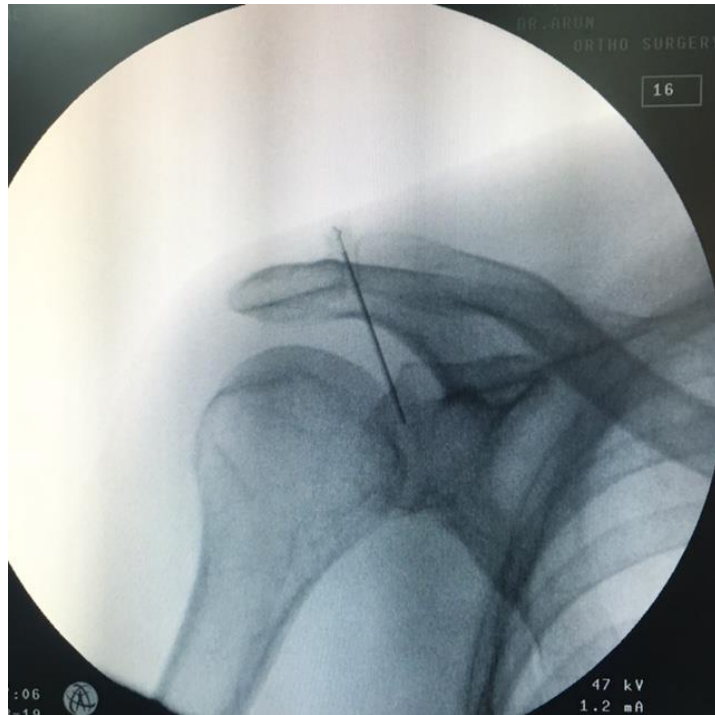
CENTRIFUGE MACHINE



PRE PROCEDURE SCREENING RADIOGRAPH



C-ARM IMAGE



STATISTICAL ANALYSIS:

Data was entered into microsoft excel data sheet and was analyzed using statistical package for the social sciences (SPSS) 22 version software. Categorical data was represented in the form of frequencies and proportions.

The present study is purely a descriptive study and the observations are tabulated with graphical representations of data. Microsoft excel and microsoft word was used to obtain various types of graphs such as bar diagram, pie diagram, line diagram and cone diagram. Hence statistical analysis is not necessary.

RESULTS

OBSERVATIONS:

In this study, 46 patients with frozen shoulder were studied on out-patient and in-patient basis at R L Jalappa Hospital of Sri Devaraj Urs medical college, Kolar from November 2017 to October 2018. Following observations were made.

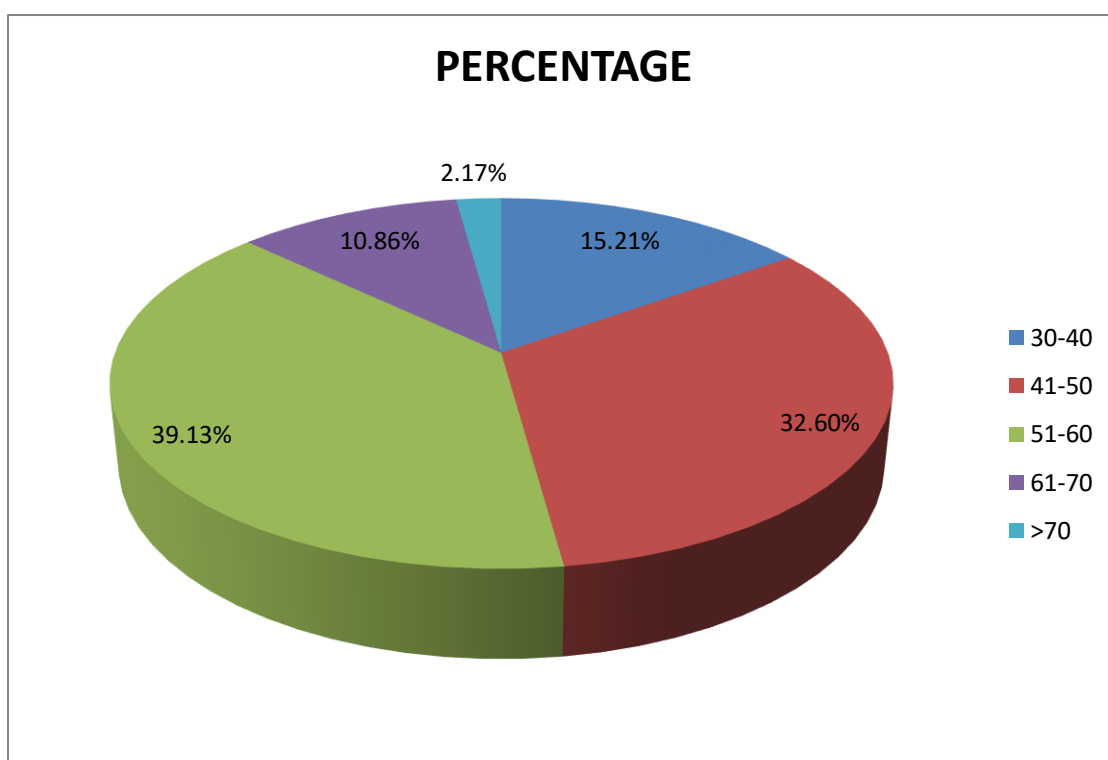
DEMOGRAPHIC FEATURES OF THE PATIENTS:

AGE INCIDENCE:

TABLE NO: 1

AGE	NO. OF PATIENTS	PERCENTAGE
30-40	7	15.21%
41-50	15	32.6%
51-60	18	39.13%
61-70	5	10.86%
>70	1	2.17%

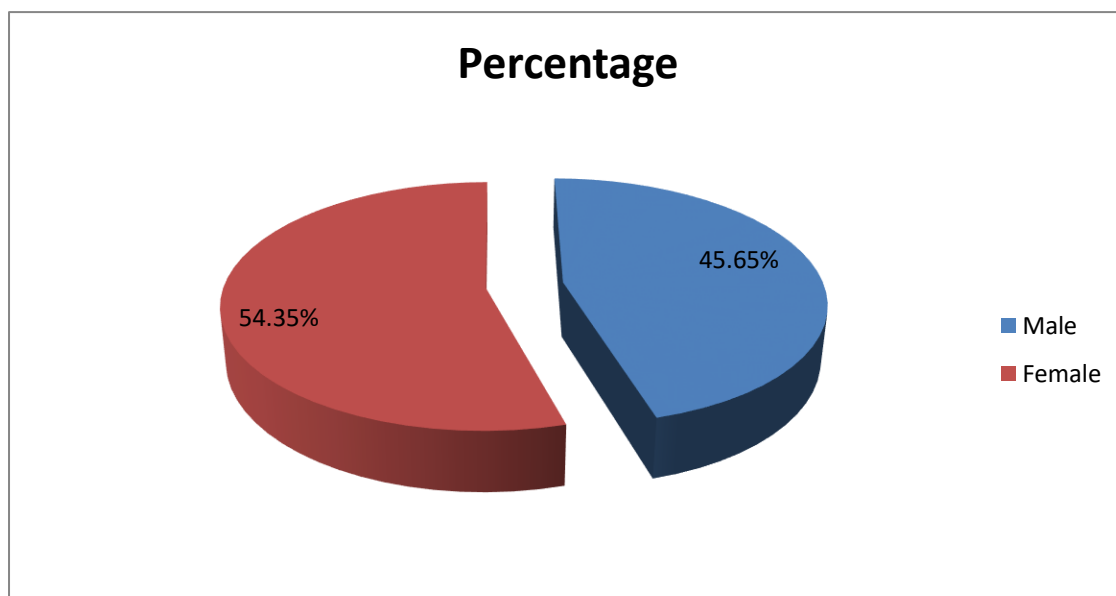
CHART NO : 1



The average age was 51.19 years. The youngest patient was 30 years and oldest patient being 80 years old. Most of the patients lying between 40 to 60 years of age.

SEX INCIDENCE:**TABLE NO: 2**

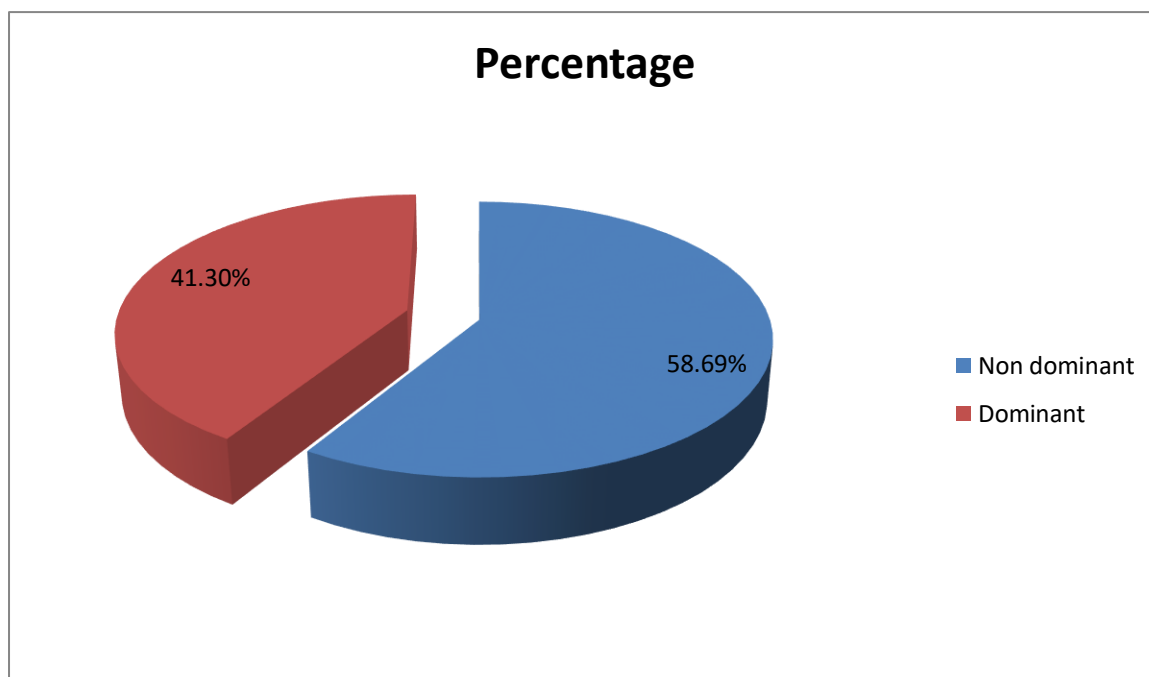
SEX	NO. OF PATIENTS	PERCENTAGE
MALE	21	45.65%
FEMALE	25	54.35%

CHART NO: 2

In this study, 25 cases were females and 21 cases were males. Male to female ratio for the whole series is 1:1.2.

SIDE INCIDENCE :**TABLE NO : 3**

SIDE	NO. OF PATIENTS	PERCENTAGE
NON DOMINANT	27	58.69%
DOMINANT	19	41.30%

CHART NO : 3

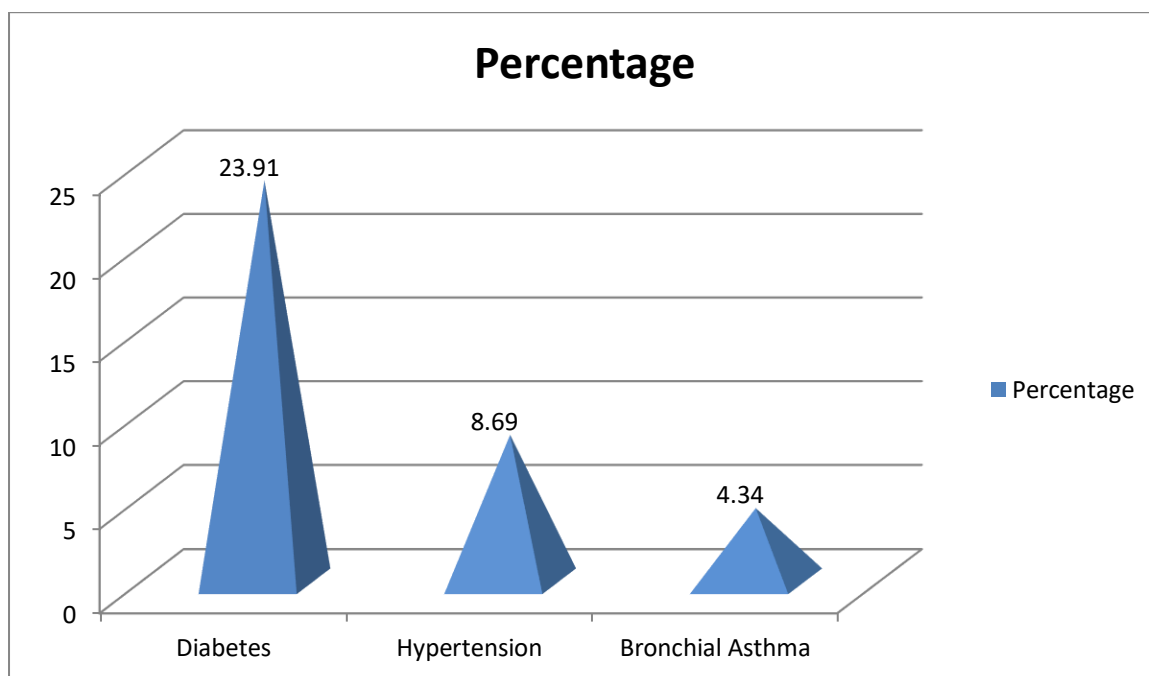
Non dominant shoulder was affected in 27(58.69%) patients and dominant shoulder was affected in 19(41.30%) patients.

ASSOCIATED CO-MORBIDITIES:

TABLE NO.: 4

	NO. OF PATIENTS	PERCENTAGE
DIABETES	11	23.91%
HYPERTENSION	4	8.69%
BRONCHIAL ASTHMA	2	4.34%

CHART NO.: 4



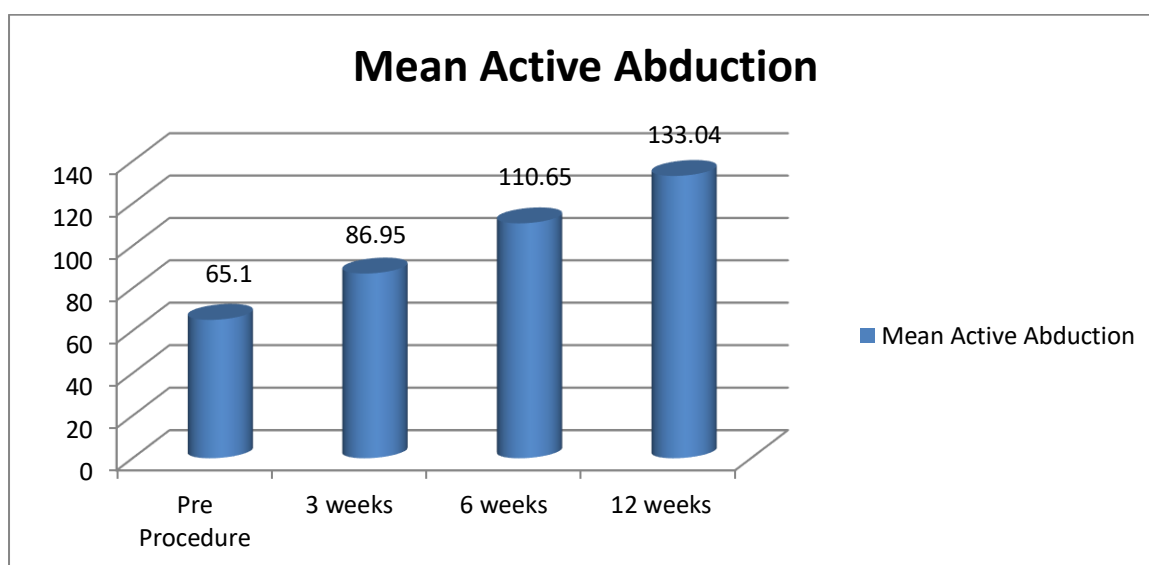
In this study, 23.91% of study population were diabetic, 8.69% were hypertensive and 4.34% were bronchial asthma patients.

ACTIVE ABDUCTION:

TABLE NO: 5

	MEAN ABDUCTION (DEGREE)
PRE PROCEDURE	65.1
3 WEEKS	86.95
6 WEEKS	110.65
12 WEEKS	133.04

CHART NO.: 5



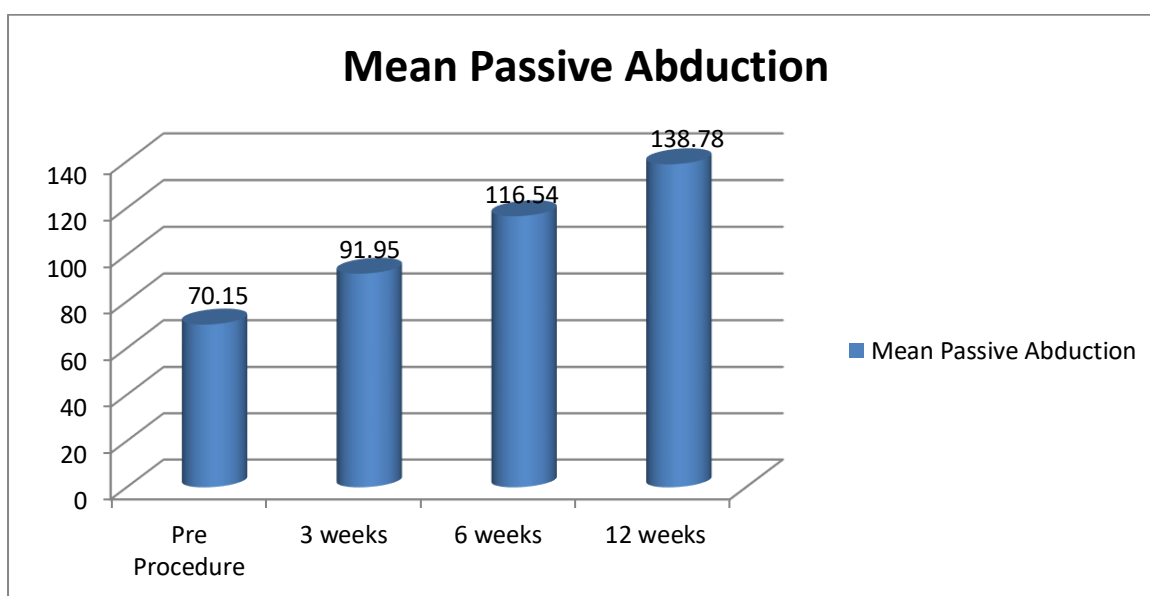
The mean active abduction of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 65.1, 86.95, 110.65, 133.04 degrees respectively.

PASSIVE ABDUCTION:

TABLE NO.: 6

	MEAN ABDUCTION (DEGREE)
PRE PROCEDURE	70.15
3 WEEKS	91.95
6 WEEKS	116.54
12 WEEKS	138.78

CHART NO.: 6



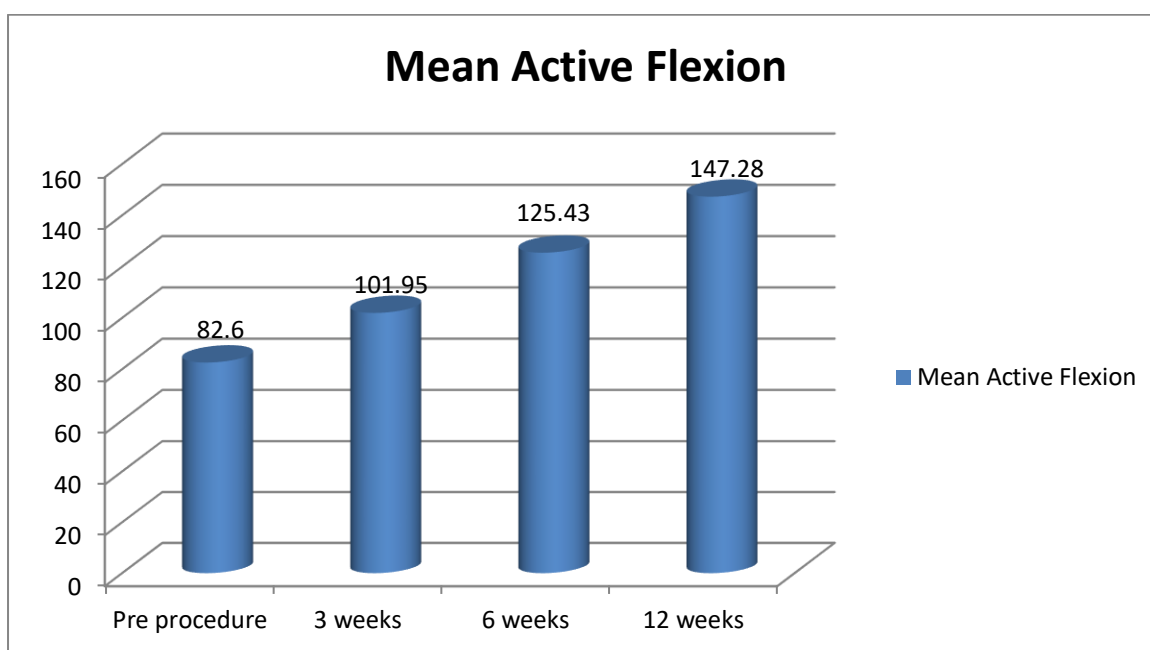
The mean passive abduction of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 70.15, 91.95, 116.54, 138.78 degrees respectively.

ACTIVE FLEXION:

TABLE NO.: 7

	MEAN FLEXION (DEGREE)
PRE PROCEDURE	82.6
3 WEEKS	101.95
6 WEEKS	125.43
12 WEEKS	147.28

CHART NO.: 7



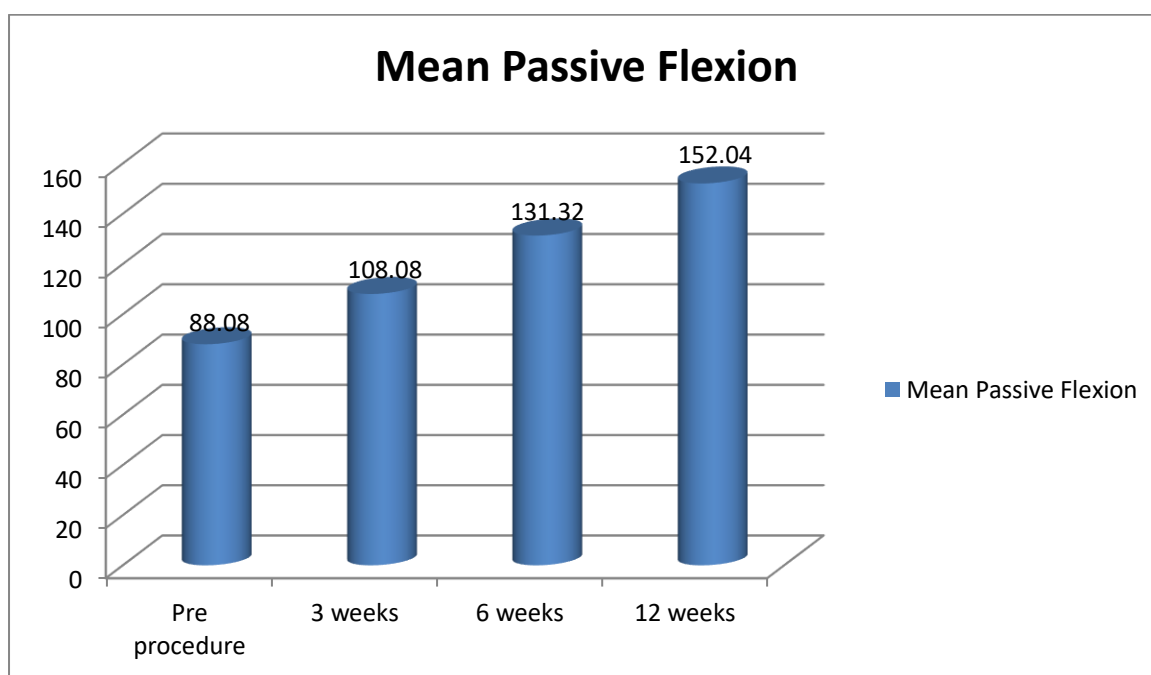
The mean active flexion of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 82.6, 101.95, 125.43, 147.28 degrees respectively.

PASSIVE FLEXION:

TABLE NO.: 8

	MEAN FLEXION (DEGREE)
PRE PROCEDURE	88.08
3 WEEKS	108.08
6 WEEKS	131.32
12 WEEKS	152.04

CHART NO.: 8



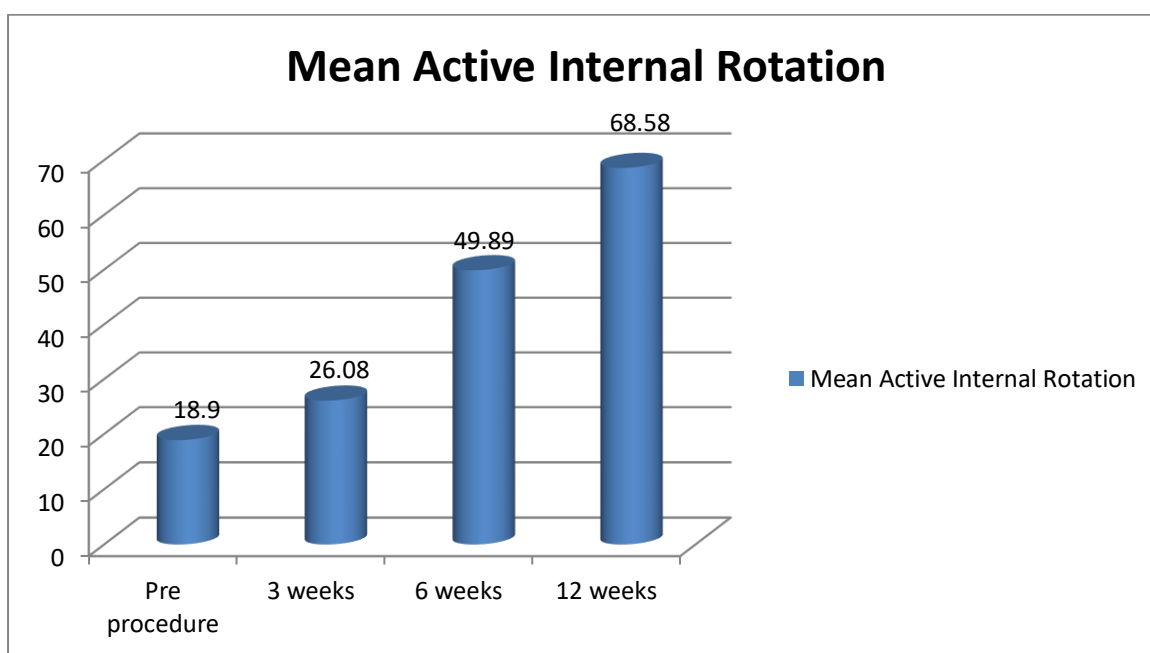
The mean passive flexion of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 88.08, 108.08, 131.32, 152.04 degrees respectively.

ACTIVE INTERNAL ROTATION

TABLE NO.: 9

	MEAN INTERNAL ROTATION (DEGREE)
PRE PROCEDURE	18.91
3 WEEKS	26.08
6 WEEKS	49.89
12 WEEKS	68.58

CHART NO.: 9



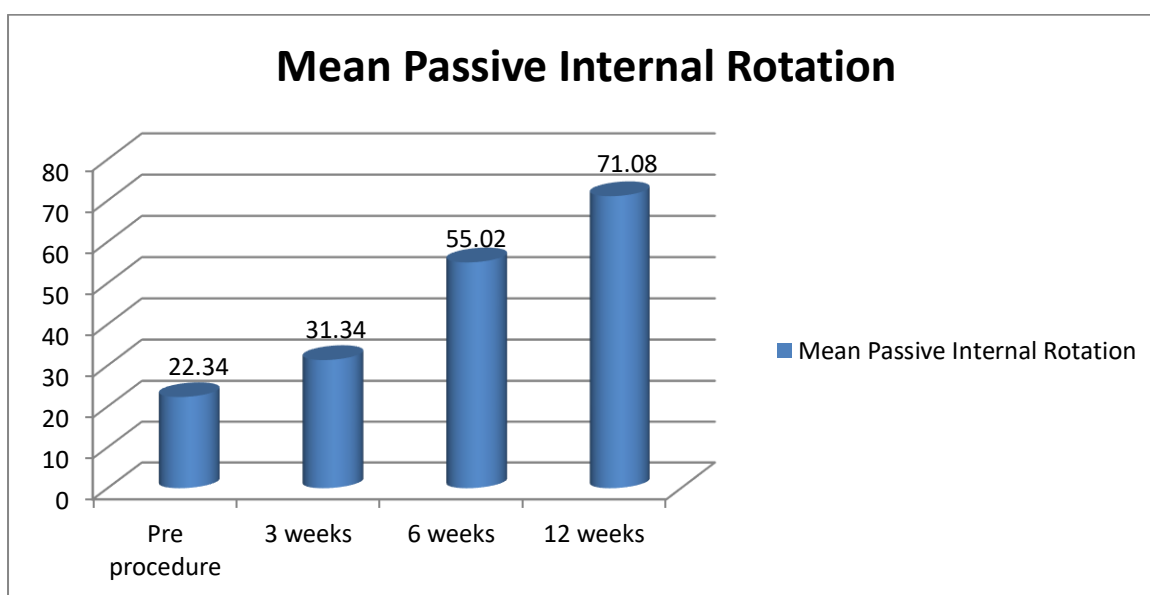
The mean active internal rotation of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 18.91, 26.08, 49.89, 68.58 degrees respectively.

PASSIVE INTERNAL ROTATION:

TABLE NO.: 10

	MEAN INTERNAL ROTATION (DEGREE)
PRE PROCEDURE	22.34
3 WEEKS	31.34
6 WEEKS	55.02
12 WEEKS	71.08

CHART NO.: 10



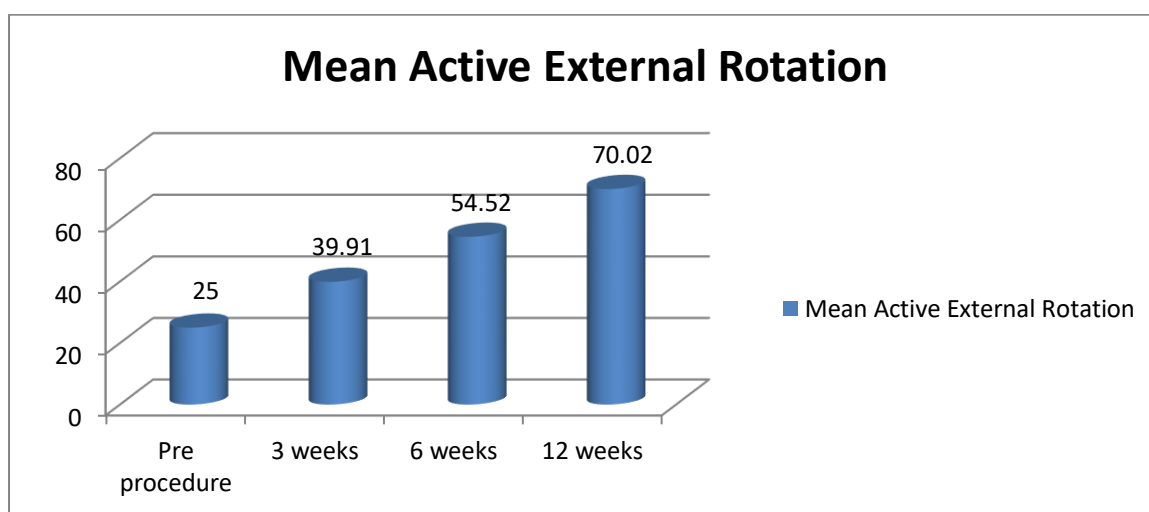
The mean passive internal rotation of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 22.34, 31.34, 55.02, 71.08 degrees respectively.

ACTIVE EXTERNAL ROTATION:

TABLE NO.: 11

	MEAN EXTERNAL ROTATION (DEGREE)
PRE PROCEDURE	25
3 WEEKS	39.91
6 WEEKS	54.52
12 WEEKS	70.02

CHART NO.: 11



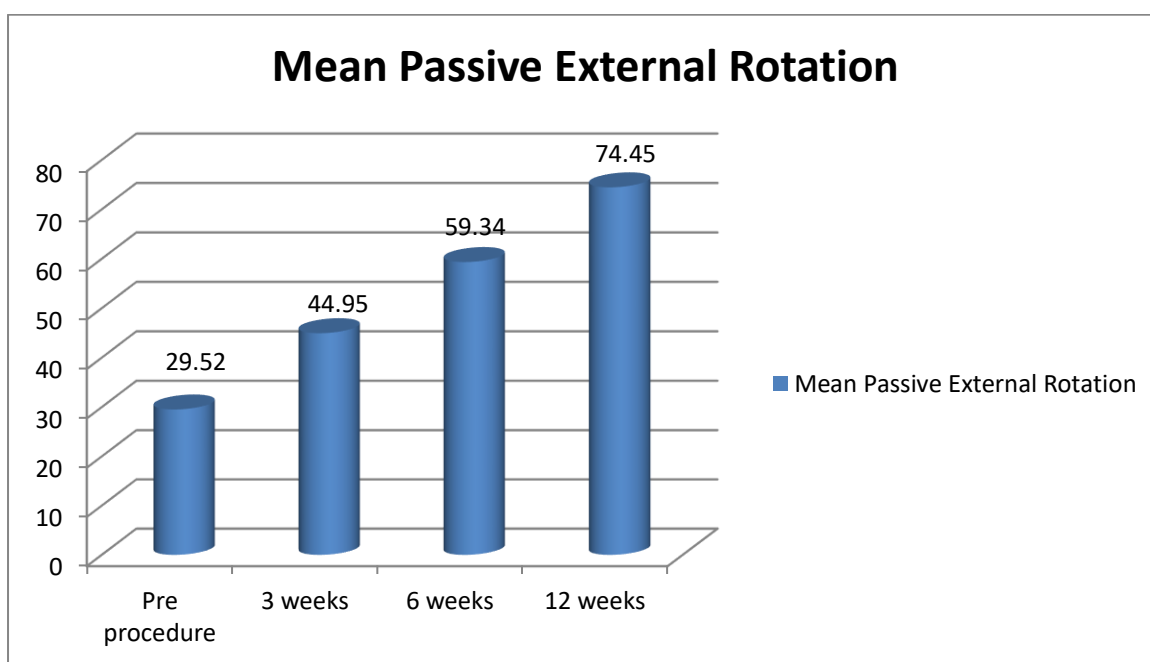
The mean active external rotation of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 25, 39.91, 54.52, 70.02 degrees respectively.

PASSIVE EXTERNAL ROTATION:

TABLE NO.: 12

	MEAN EXTERNAL ROTATION (DEGREE)
PRE PROCEDURE	29.52
3 WEEKS	44.95
6 WEEKS	59.34
12 WEEKS	74.45

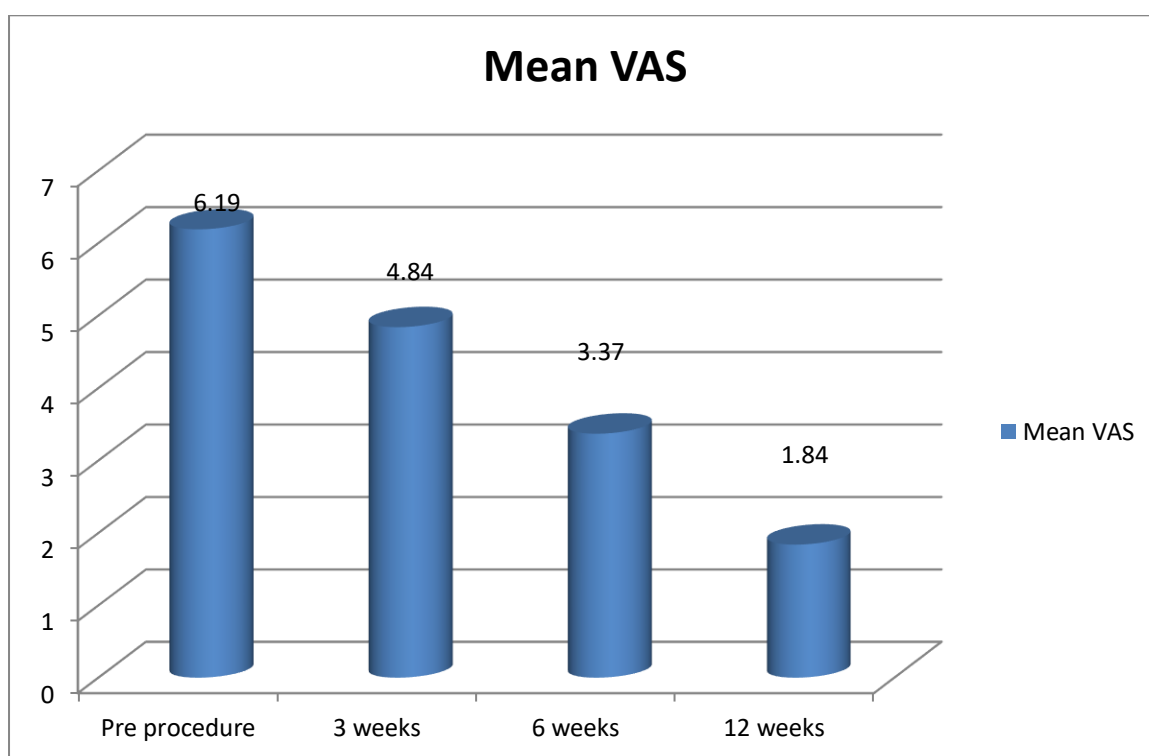
CHART NO.: 12



The mean passive external rotation of cases at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 29.52, 44.95, 59.34, 74.45 degrees respectively.

VAS SCORE:**TABLE NO.: 13**

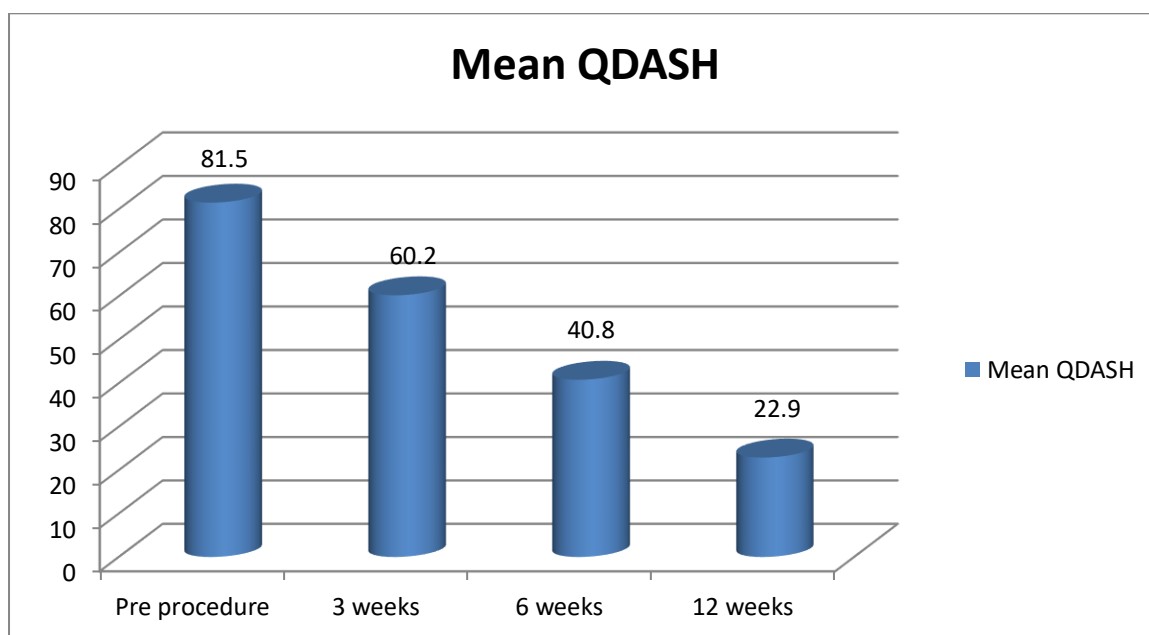
	MEAN VAS SCORE
PRE PROCEDURE	6.19
3 WEEKS	4.84
6 WEEKS	3.37
12 WEEKS	1.84

CHART NO: 13

The mean VAS score of cases for the pain at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 6.19, 4.84, 3.37, 1.84 respectively.

QuickDASH SCORE:**TABLE NO.: 14**

	MEAN QDASH SCORE
PRE PROCEDURE	81.5
3 WEEKS	60.2
6 WEEKS	40.8
12 WEEKS	22.9

CHART NO: 14

The mean Q Dash score of cases for the functional ability at pre-procedure, follow up at 3 weeks, 6 weeks and 12 weeks were 81.5, 60.2, 40.8, 22.9 respectively.

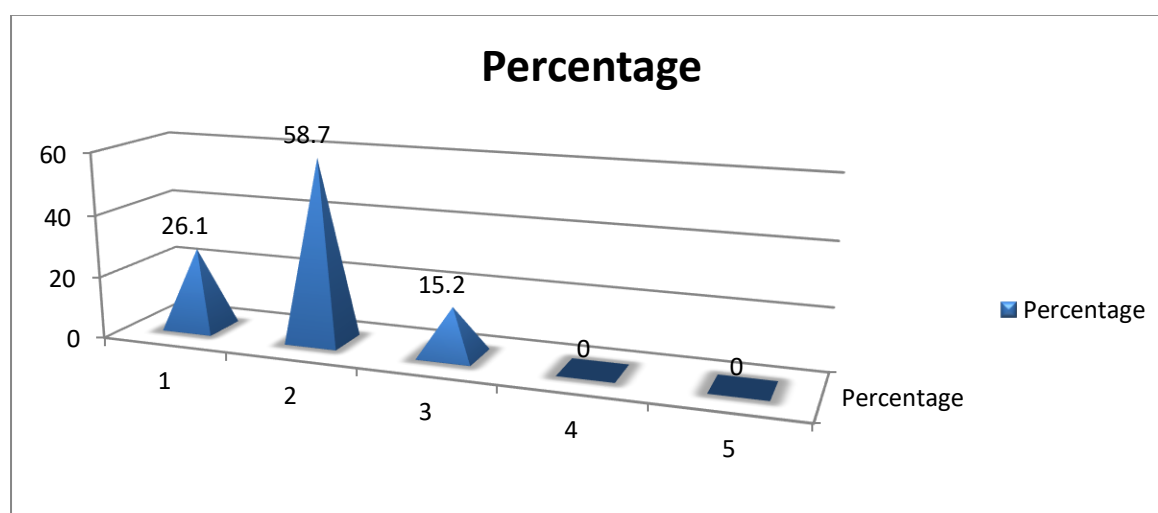
QUICKDASH SCORING IS BASED ON THE FOLLOWING FUNCTIONAL ABILITY AND THE SEVERITY OF THE SYMPTOMS:

FUNCTIONAL ABILITY 1: Open a tight or new jar

TABLE NO.: 15

Score	No. Of Patients	Percentage
1	12	26.1%
2	27	58.7%
3	7	15.2%
4	0	0%
5	0	0%

CHART NO.: 15



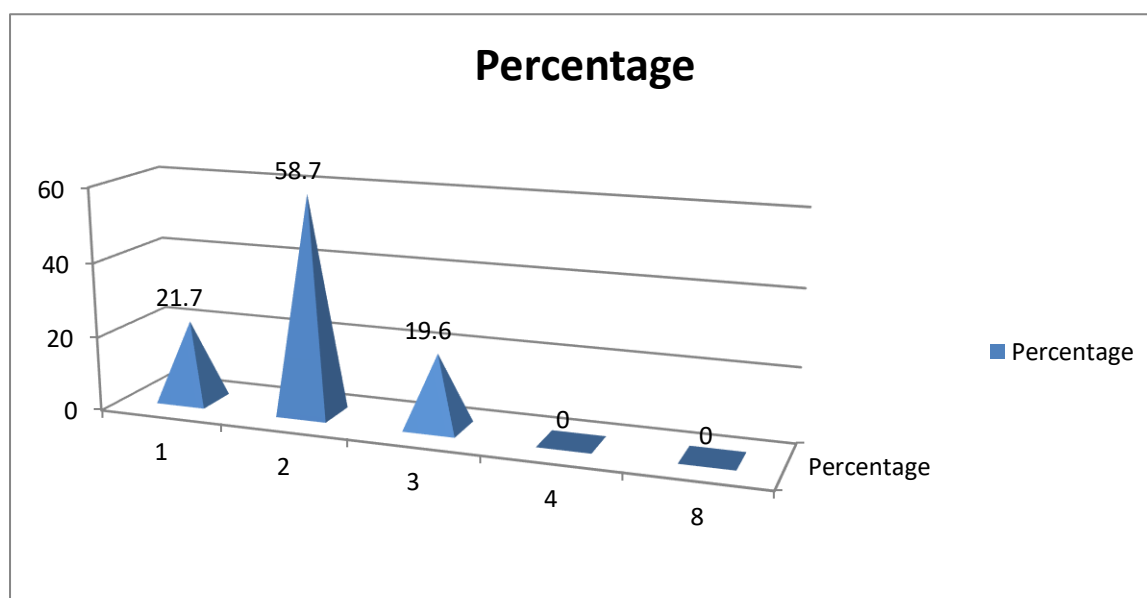
About 58.7 % of patients had mild difficulty in opening a tight jar , 26.1% had no difficulty and no patients had disability of doing the activity.

FUNCTIONAL ABILITY 2: Do heavy household chores (e.g., wash walls, floors).

TABLE NO.: 16

Score	No. Of Patients	Percentage
1	10	21.7%
2	27	58.7%
3	9	19.6%
4	0	0%
5	0	0%

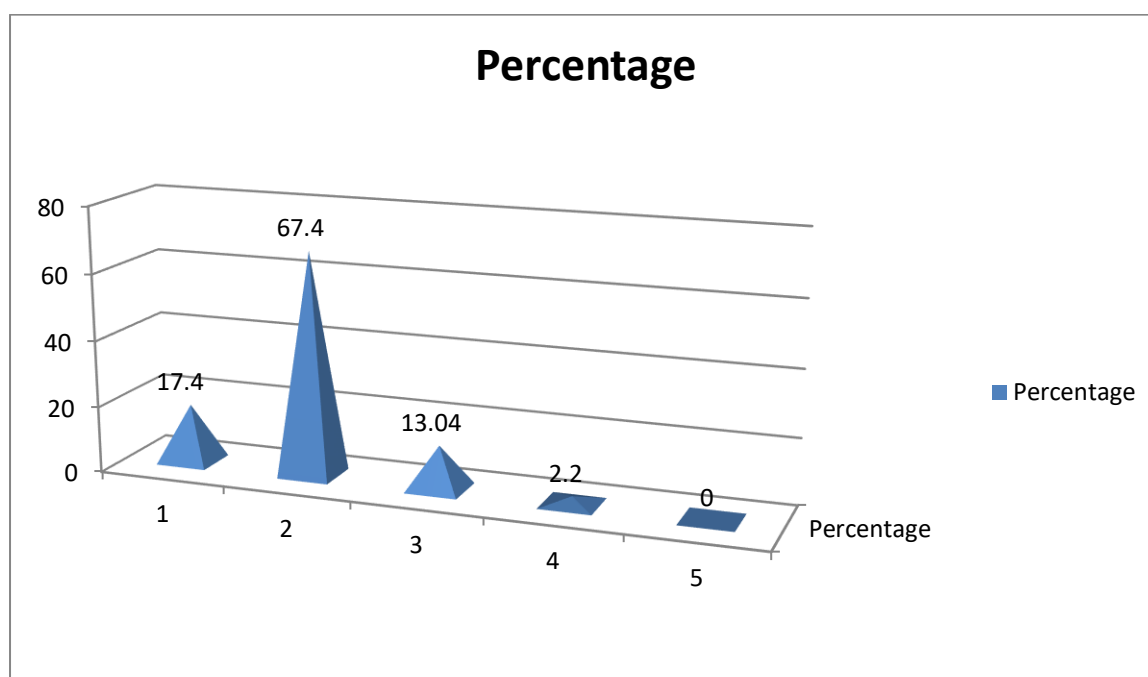
CHART NO.:16



58.7% patients had mild difficulty in doing heavy household activities like washing floors and walls , 21.7% are comfortable with no difficulty and no patient had complete disability to do the activity.

FUNCTIONAL ABILITY 3: Carry a shopping bag or briefcase.**TABLE NO.: 17**

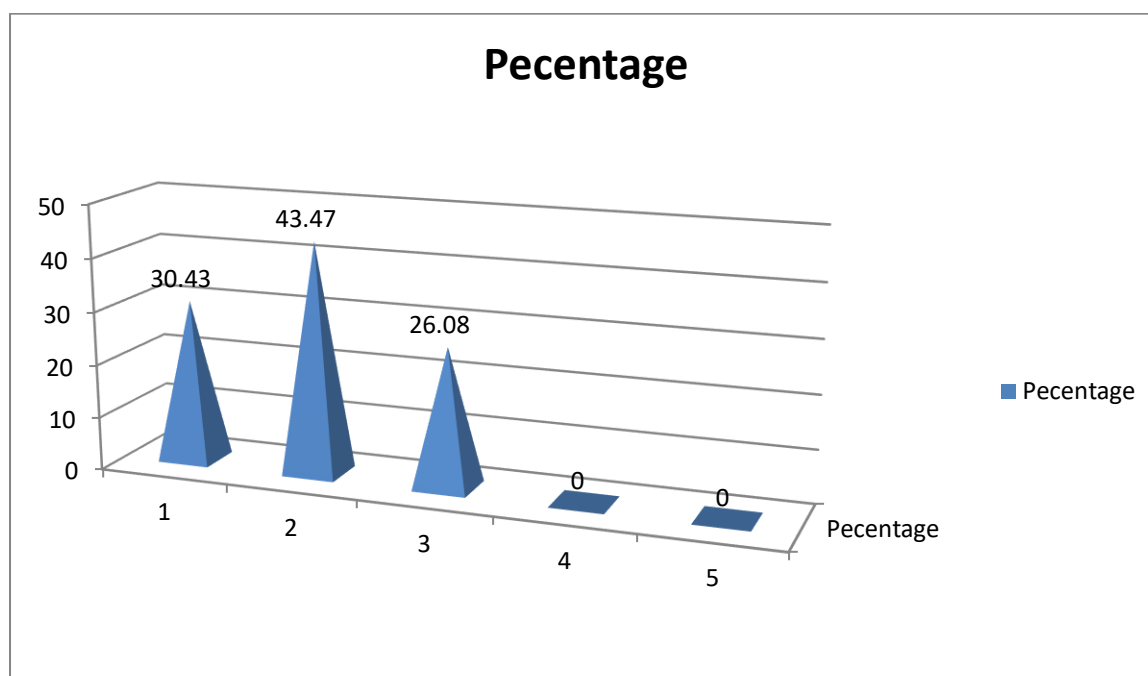
Score	No. Of Patients	Percentage
1	8	17.4%
2	31	67.4%
3	6	13.04%
4	1	2.2%
5	0	0%

CHART NO.: 17

67.4% of patients had mild difficulty in carrying a briefcase or a shopping bag, 17.4% had no difficulty in doing the activity and no patient had complete disability.

FUNCTIONAL ABILITY 4: Wash your back.**TABLE NO.: 18**

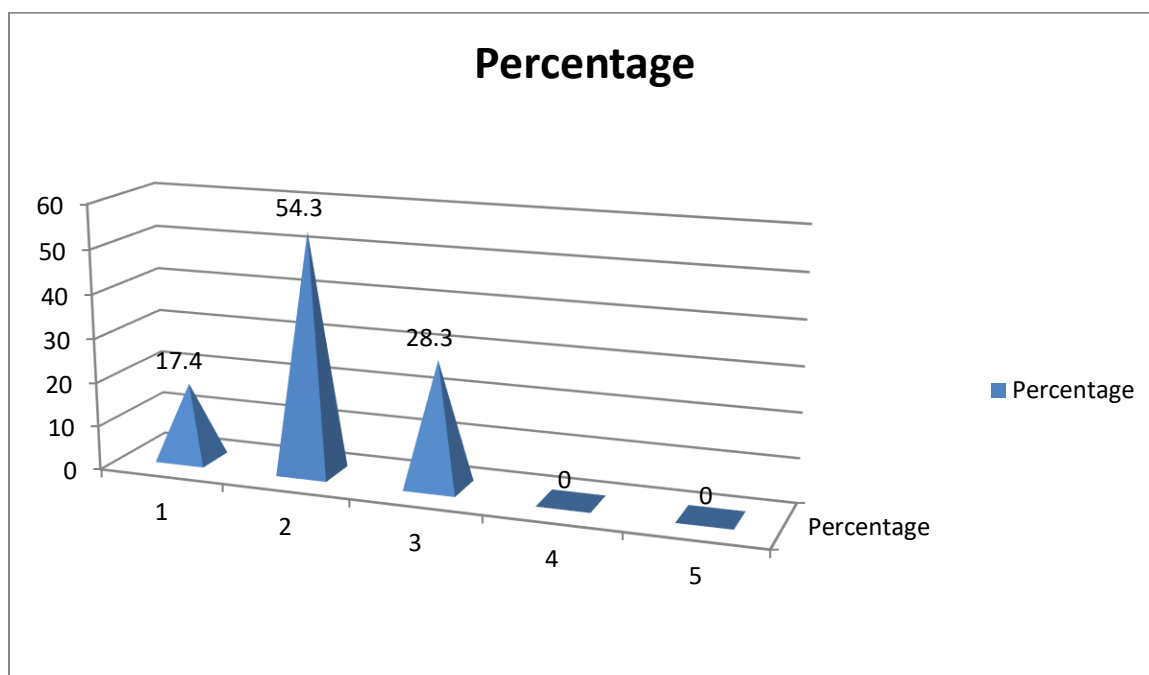
Score	No. Of Patients	Percentage
1	14	30.43%
2	20	43.47%
3	12	26.08%
4	0	0%
5	0	0%

CHART NO.: 18

43.47 % of patients had mild difficulty in washing their back, 30.43 % of patients had no difficulty and no patients had disability to do the activity.

FUNCTIONAL ABILITY 5: Use a knife to cut food.**TABLE NO.: 19**

Score	No. Of Patients	Percentage
1	8	17.4%
2	25	54.3%
3	13	28.3%
4	0	0%
5	0	0%

CHART NO.: 19

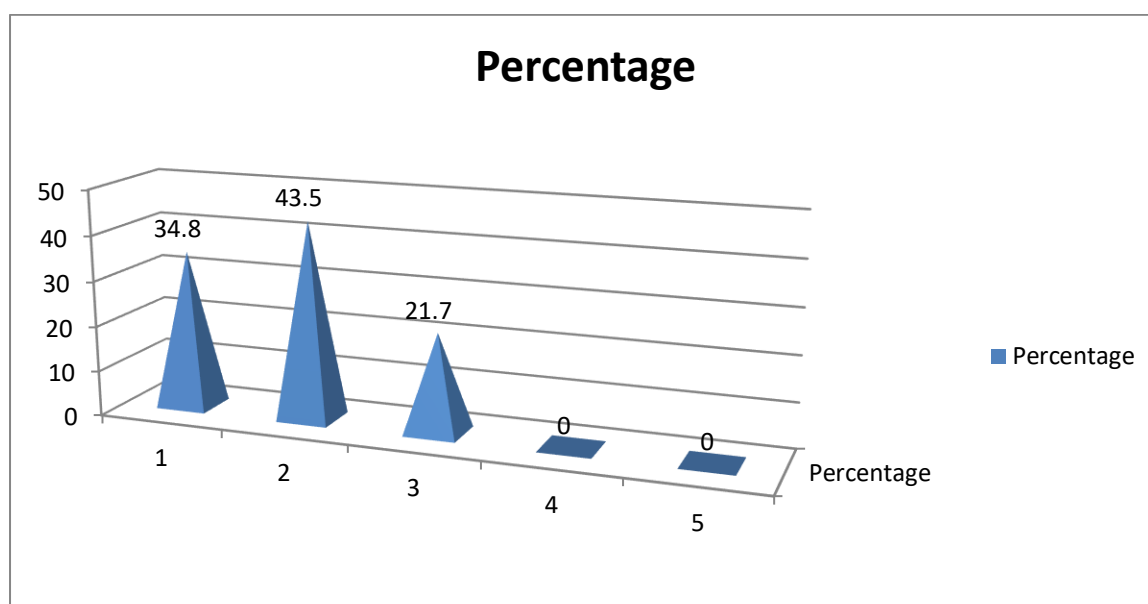
54.3% had mild difficulty in using their affected upper limb for use of knife for preparation of food, 28.3% had moderate difficulty in doing so and no patients were completely unable to do the activity.

FUNCTIONAL ABILITY 6: Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).

TABLE NO.: 20

Score	No. Of Patients	Percentage
1	16	34.8%
2	20	43.5%
3	10	21.7%
4	0	0%
5	0	0%

CHART NO.:20



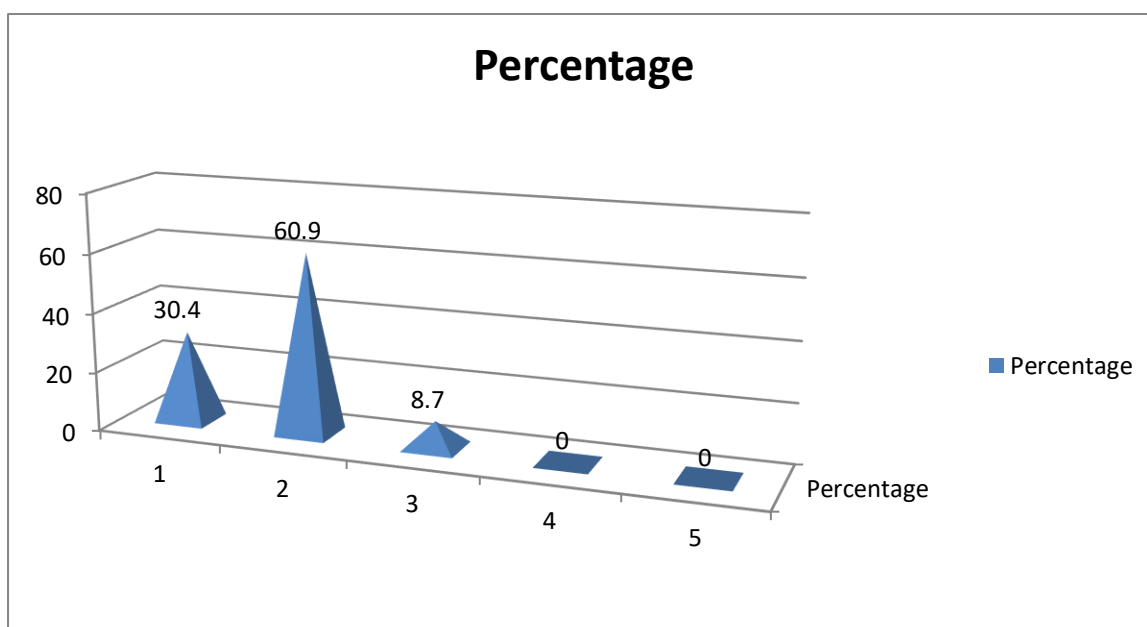
43.5% patients had mild difficulty in performing in the recreational activities using affected arm, shoulder or hand, 34.8% had no difficulty and no patients had complete disability to perform recreational activities.

FUNCTIONAL ABILITY 7: During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbors or groups?

TABLE NO.: 21

Score	No. Of Patients	Percentage
1	14	30.4%
2	28	60.9%
3	4	8.7%
4	0	0%
5	0	0%

CHART NO.: 21



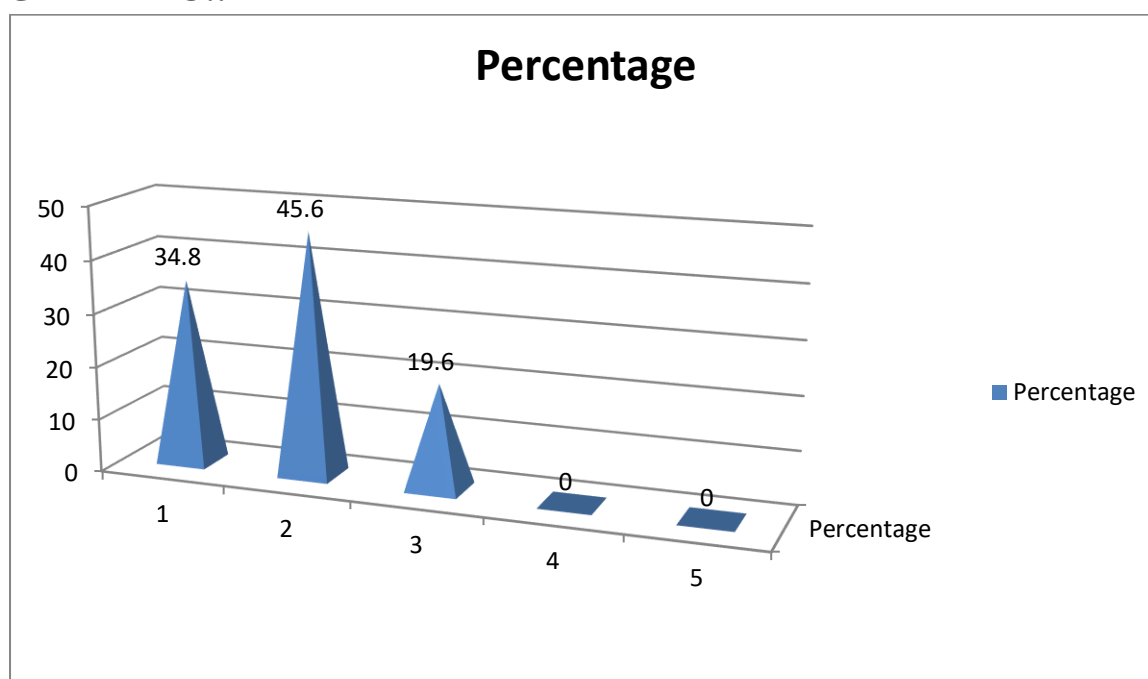
60.9 % of patients had mild difficulty in participating in normal social activities with family and friends, 30.4 % had no difficulty and no patient had a complete disability to do the normal social activities.

FUNCTIONAL ABILITY 8: During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?

TABLE NO.: 22

Score	No. Of Patients	Percentage
1	16	34.8%
2	21	45.6%
3	9	19.6%
4	0	0%
5	0	0%

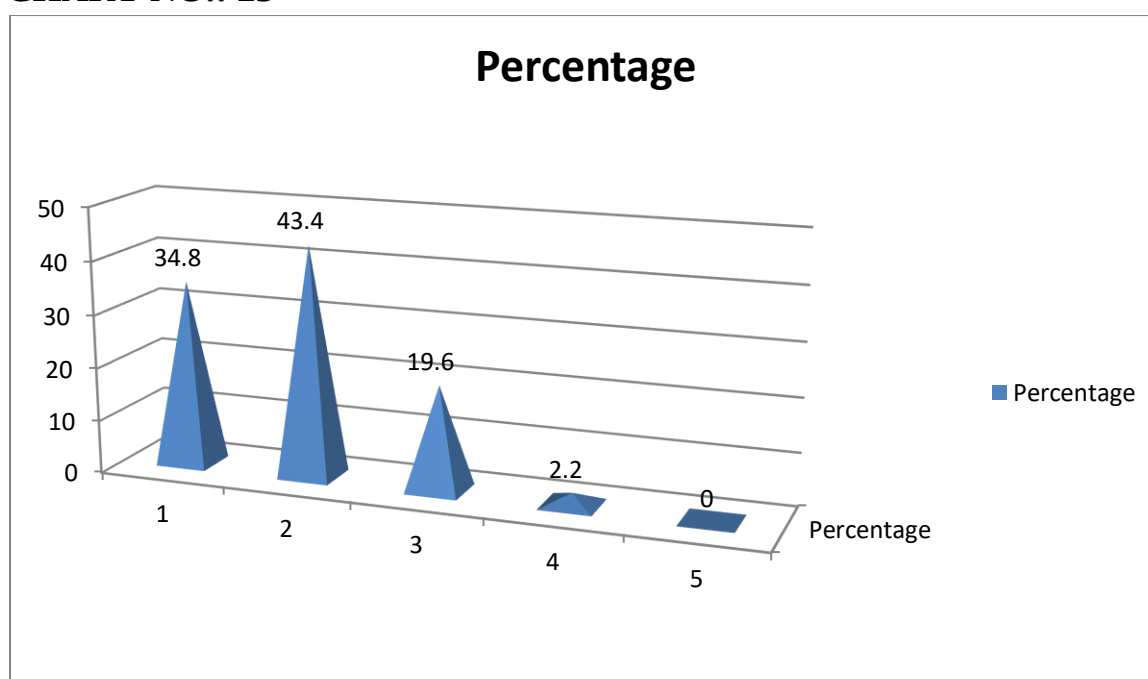
CHART NO.: 22



45.6 % of patients had mild difficulty at their work, 34.8 % had no difficulty and no patients had complete disability at the work.

SYMPTOM SEVERITY 1: Arm, shoulder or hand pain.**TABLE NO.: 23**

Score	No. Of Patients	Percentage
1	16	34.8%
2	20	43.4%
3	9	19.6%
4	1	2.2%
5	0	0%

CHART NO.: 23

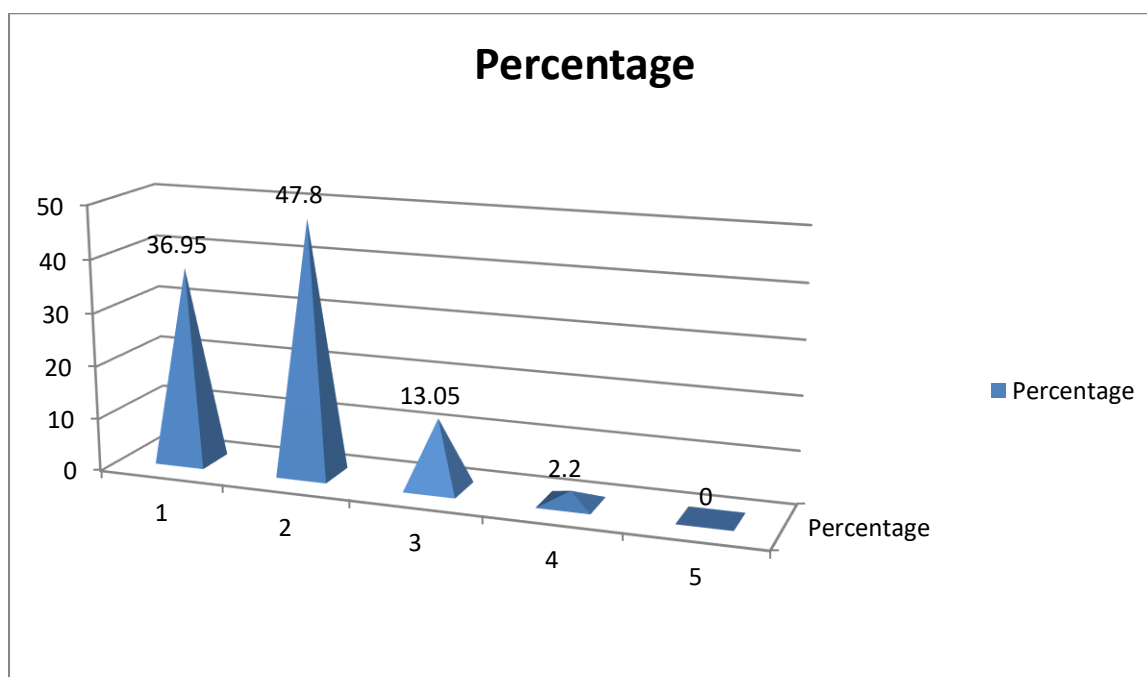
43.4 % of patients had mild tolerable pain of the affected shoulder, arm and hand not affecting their daily routine, 34.8% of patients had no pain and no patients had severe pain to affect their sleep.

SYMPTOM SEVERITY 2: Tingling (pins and needles) in your arm, shoulder or hand.

TABLE NO.: 24

Score	No. of Patients	Percentage
1	17	36.95%
2	22	47.8%
3	6	13.05%
4	1	2.2%
5	0	0%

CHART NO.: 24



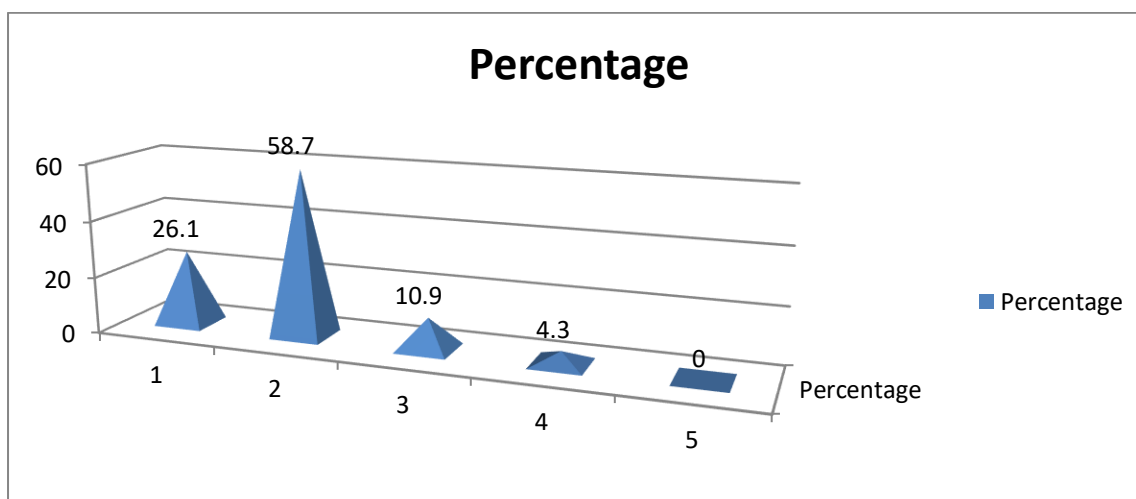
47.8% of patients had minimal, tolerable amount of numbness, pins and needles sensation over their affected shoulder, arm and hand, 36.95 % of patients had no such sensations and no patients had severe numbness, pins and needles.

SYMPTOM SEVERITY 3: During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?

TABLE NO.: 25

Score	No. Of Patients	Percentage
1	12	26.1%
2	27	58.7%
3	5	10.9%
4	2	4.3%
5	0	0%

CHART NO.: 25



58.7% of patients had minimal sleep disturbances due to pain at the affected shoulder, arm or hand, 26.1% had no sleep disturbance, and no patient was severely disturbed so the he had to wake up from sleep because of the pain.

COMPLICATIONS:

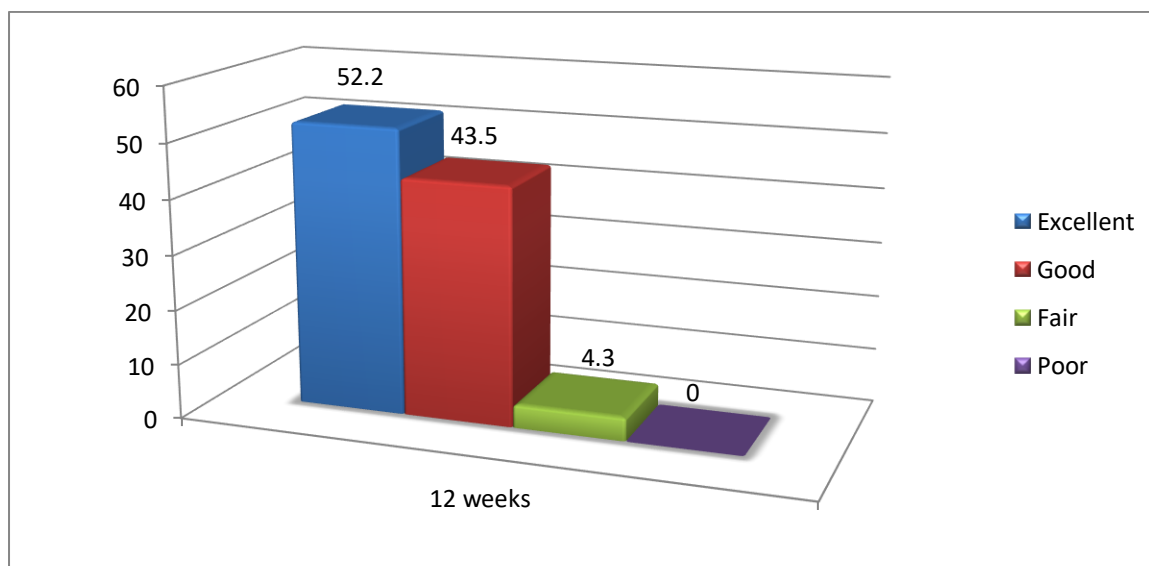
3 patients had pain at the injection site which was self limiting and reduced in three days without any medications.

FUNCTIONAL ABILITY OUTCOME ACCORDING TO QUICKDASH SCORES:

TABLE NO.: 26

FUNCTIONAL OUTCOME	NO. OF PATIENTS	PERCENTAGE
EXCELLENT	24	52.2%
GOOD	20	43.5%
FAIR	2	4.3%
POOR	0	0%
TOTAL	46	100%

CHART NO.: 26



In our study, we found that majority of study patients (52.2%) had excellent results. 43.5% and 4.3% of patients had good and fair results respectively. None had poor results.

CLINICAL CASE I

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE I

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE I

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP

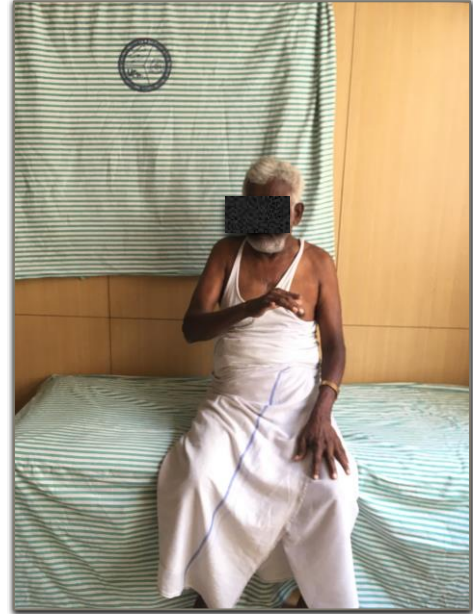


CLINICAL CASE I
INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE I

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE I

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II
INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE II

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

EXTENSION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE III

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

EXTENSION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE IV

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

EXTENSION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE V

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

ABDUCTION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

FLEXION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

EXTENSION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

EXTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



CLINICAL CASE VI

INTERNAL ROTATION

PRE PROCEDURE



3 WEEKS FOLLOW UP



12 WEEKS FOLLOW UP



DISCUSSION

In this study, a descriptive term “Periarthritis Shoulder” is used to describe a clinical syndrome where the patient has a minimum of 1 month of shoulder pain and stiffness for which no other cause could be identified, documented restriction of passive glenohumeral and scapulo-thoracic motion of 100° of abduction or less, and less than 50% of external rotation when compared to the contralateral shoulder.

1) Age incidence: In this study the average age documented was 51.19 years which was similar to findings of studies conducted by **Kothari** et al¹, **Sharma** et al⁸², **Robert** et al⁸³. 33 of the 46 cases were in 5th and 6th decade. It was observed that frozen shoulder was common in 5th and 6th decades of life. R.J. Neviaser, and T.J. Neviaser, have noted that frozen shoulder is very commonly affected the patients between the age group of 40 to 60 years⁵⁹.

2) Sex incidence: The male female ratio in this study is 1: 1.20. Most authors have documented female preponderance. **Kothari** et al¹ recorded a male preponderance.

3) Side affected: In our study, the non dominant shoulder was most commonly involved with involvement 58.69% of patients showing

similar findings with studies by **Robert** et al⁸³, **Sharma** et al⁸² and **Pushpakaran** et al⁸⁴. Most authors have concluded that there is significant difference in the involvement of dominant arm and non dominant arm⁴⁴.

4) Associated diseases: It was observed that association of diabetes mellitus is very common, particularly in insulin dependent diabetes mellitus^{44,45}. 11 cases of diabetes mellitus were identified in this study and these were non insulin dependent and were under control. 4 cases were hypertensive and under treatment. We noticed 2 cases of bronchial Asthma. We did not notice any thyroid disorders in this study.

Investigations:

Routine investigations were done for all patients as mentioned earlier. No specific relationship has been established between them.

Urine examination and RBS were done routinely for all patients to rule out diabetes mellitus. We have noticed 11 patients of diabetes mellitus.

We have found that shoulder X-ray in all the patients with frozen shoulder were apparently normal except for 2 cases with mild osteoporotic changes.

Treatment of frozen shoulder:

All the patients were managed with intra-articular PRP injection. The procedure was well tolerated by the patients.

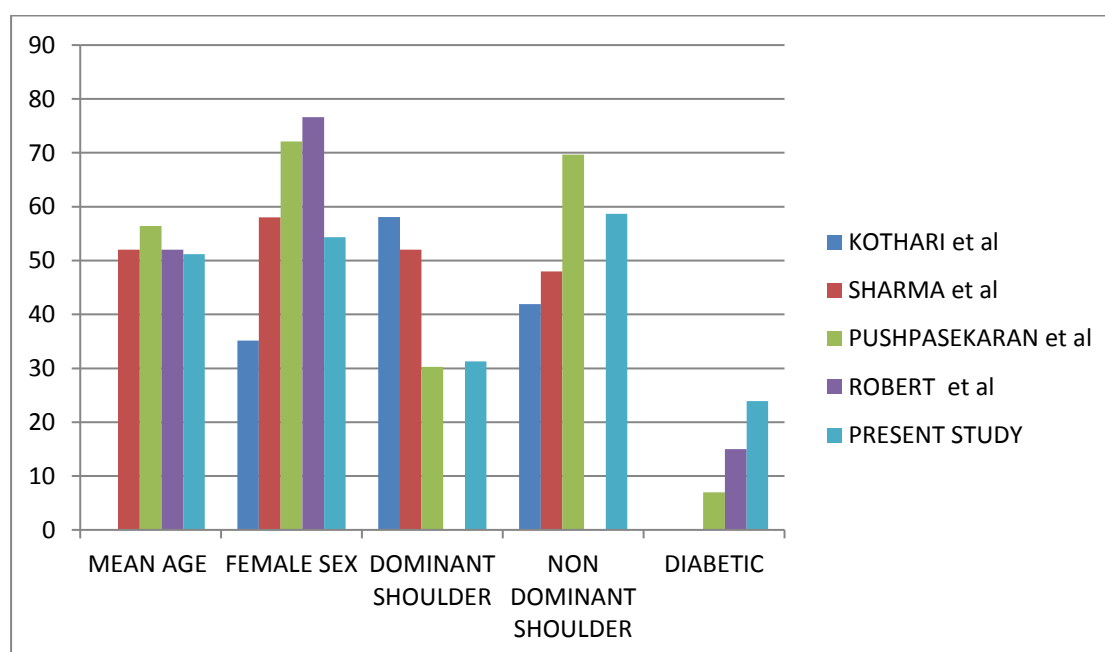
Pain: Almost all the patients had severe pain and disturbed sleep before treatment. Diffuse shoulder pain particularly during rotational movements was noticed. Tenderness over the glenohumeral joint was present in majority of the patients. 30 patients out of 46 patients were previously treated with oral NSAID but without much relief. The pain relief was observed at 3 weeks and further improvement observed at consecutive follow ups.

PATIENT DEMOGRAPHICS:

TABLE NO.: 27

STUDY	KOTHARI et al ¹	SHARMA et al ⁸²	PUSHPASEKARAN et al ⁸⁴	ROBERT et al ⁸³	PRESENT STUDY
MEAN AGE	51.9	52	56.4	52	51.19
SEX	MALE 64.83%	FEMALE 58 %	FEMALE 72.1%	FEMALE 76.6%	FEMALE 54.35%
DOMINANT SHOULDER	58.1%	52%	30.3%	----	31.31%
NON DOMINANT SHOULDER	41.9%	48%	69.7%	----	58.69%
DIABETIC	----	-----	6.97%	15%	23.91%

CHART NO.: 27

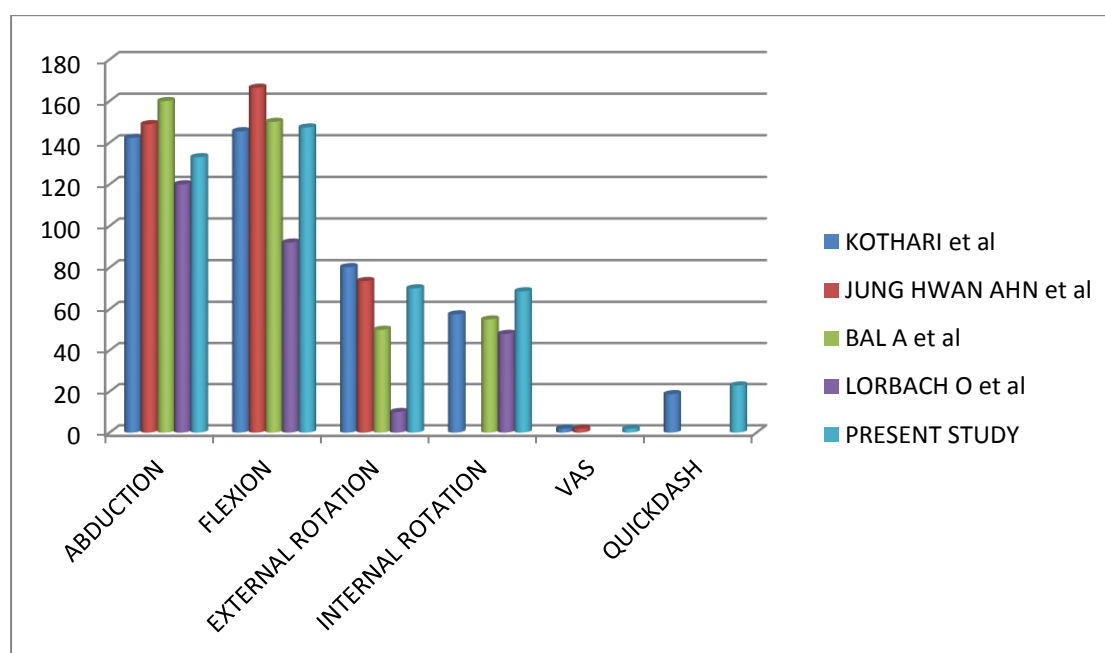


FUNCTIONAL ASSESSMENT:

TABLE NO.: 28

	KOTHARI et al ¹	JUNG HWAN AHN et al ⁸⁵	BAL A et al ⁸⁶	LORBACH O et al ⁸⁷	PRESENT STUDY
ABDUCTION	142.3	148.9	160	120	133.04
FLEXION	145.5	166.4	150	92	147.28
EXTERNAL ROTATION	80.2	73.5	50	10	70.02
INTERNAL ROTATION	57.5	-----	55	48	68.58
VAS	1.9	1.9	-----	-----	1.84
QUICKDASH	18.7	-----	-----	-----	22.9

CHART NO.:28



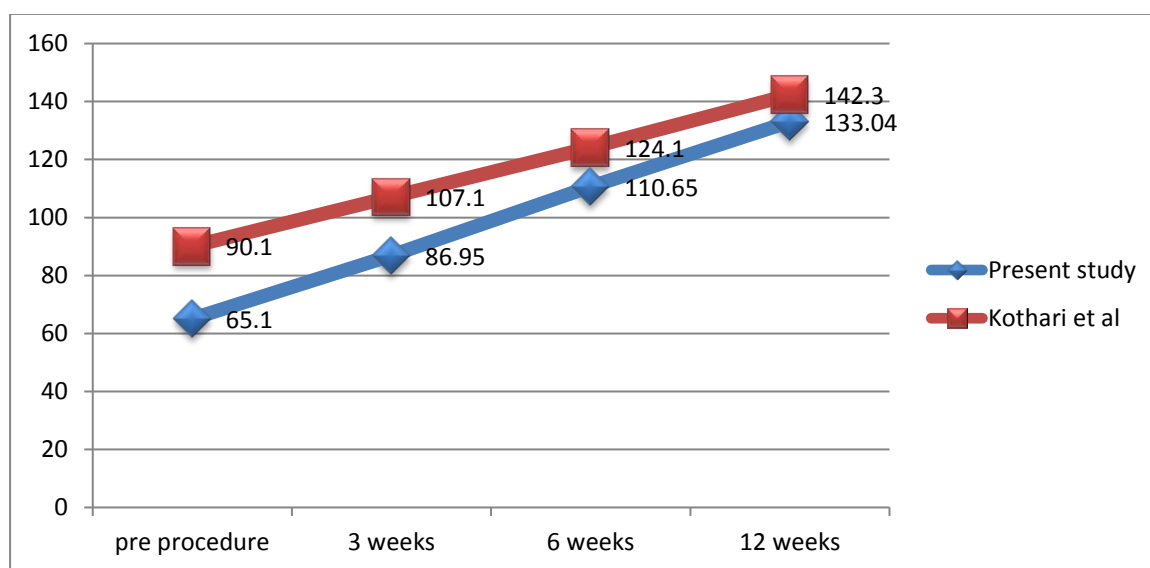
The mean range of motion of abduction, flexion and rotations of the present study are comparable with most of the studies like **Kothari** et al¹, **Jung Hwan Ahn** et al⁸⁵, **Bal A** et al⁸⁶ but ROM of patients of our study are much better comparably with the study conducted by **Lorbach O** et al⁸⁷.

ACTIVE ABDUCTION:

TABLE NO.: 29

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	90.1 ⁰	107.1 ⁰	124.1 ⁰	142.3 ⁰
Present study	65.1 ⁰	86.95 ⁰	110.65 ⁰	133.04 ⁰

CHART NO.: 29



Mean active abduction improved from the baseline of 65.1⁰ to 133.04⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean active abduction improved from the baseline of 90.1⁰ to 142.3⁰ at the end of the follow up.

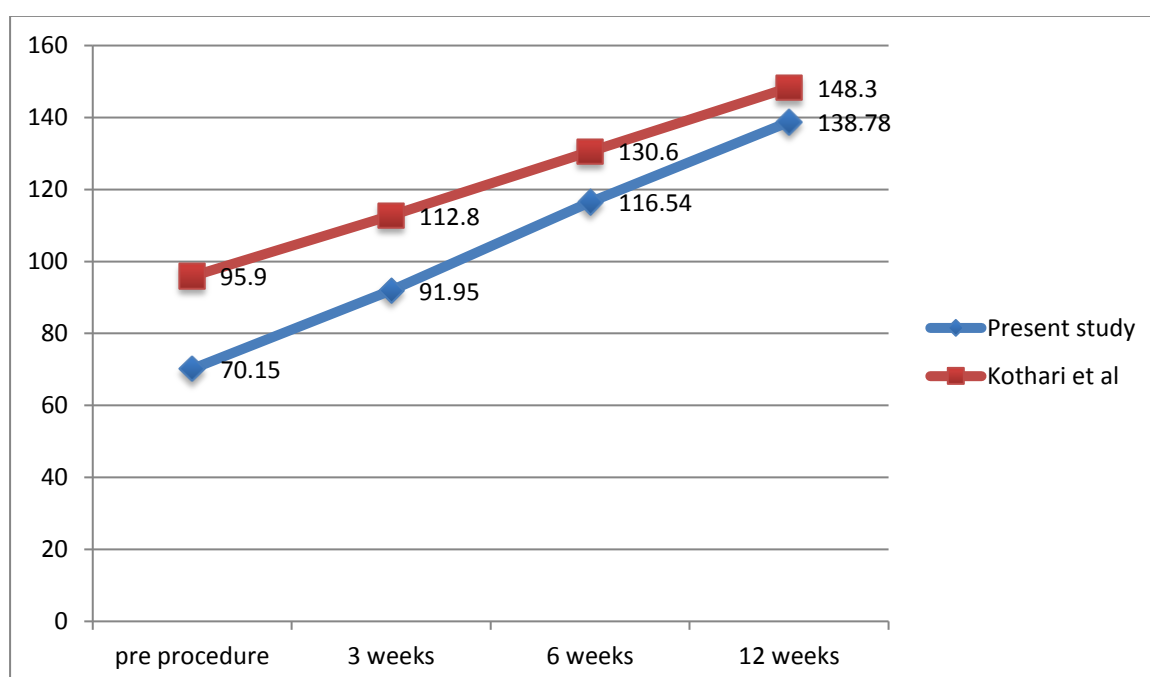
The increase in the mean active abduction of the patients in this study is 21.85^0 (25%) from baseline to 3 weeks, is 23.7^0 (21.46%) from 3 weeks to 6 weeks, is 22.4^0 (16.9%) from 6 weeks to 12 weeks. The increase in active abduction improvement is more in first 6 weeks follow up, followed by decrease at 12th week follow up. The increase in the mean active abduction of the patients in **Kothari** et al¹ study is 17^0 (15.9%) from baseline to 3 weeks, is 17^0 (13.7%) from 3 weeks to 6 weeks, is 18.2^0 (12.8%) from 6 weeks to 12 weeks. And also the improvement in active abduction of patients in our study is more compared to those in **Kothari** et al¹.

PASSIVE ABDUCTION:

TABLE NO.: 30

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	95.9 ⁰	112.8 ⁰	130.6 ⁰	148.3 ⁰
Present study	70.15 ⁰	91.95 ⁰	116.54 ⁰	138.78 ⁰

CHART NO.: 30



Mean passive abduction improved from the baseline of 70.15⁰ to 138.78⁰ in present study, whereas in study conducted by **Kothari et al¹**, Mean passive abduction improved from the baseline of 95.9⁰ to 148.3⁰ at the end of the follow up.

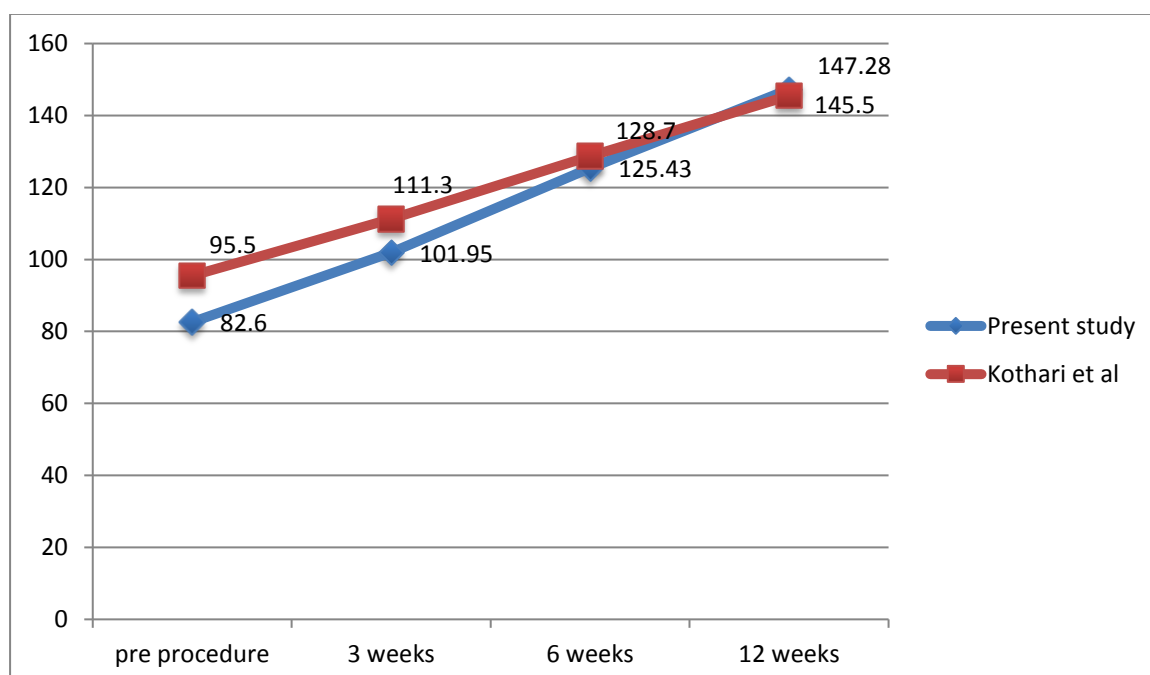
The increase in the mean passive abduction of the patients in this study is 21.8⁰(23.7%) from baseline to 3 weeks, 24.59⁰(21.1%) from 3 weeks to 6 weeks, 22.24⁰ (16.02%) from 6 weeks to 12 weeks. The increase in active abduction improvement is similar in all the follow ups. The increase in the mean passive abduction of the patients in **Kothari et al¹** study is 16.9⁰(14.9%) from baseline to 3 weeks, is 17.8⁰(13.6%) from 3 weeks to 6 weeks, is 17.7⁰(11.9%) from 6 weeks to 12 weeks. And also the improvement in passive abduction of patients in our study is more compared to those in **Kothari et al¹**.

ACTIVE FLEXION:

TABLE NO.: 31

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	95.5 ⁰	111.3 ⁰	128.7 ⁰	145.5 ⁰
Present study	82.6 ⁰	101.95 ⁰	125.43 ⁰	147.28 ⁰

CHART NO.: 31



Mean active flexion improved from the baseline of 82.6⁰ to 147.28⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean active flexion improved from the baseline of 95.5⁰ to 145.5⁰ at the end of the follow up.

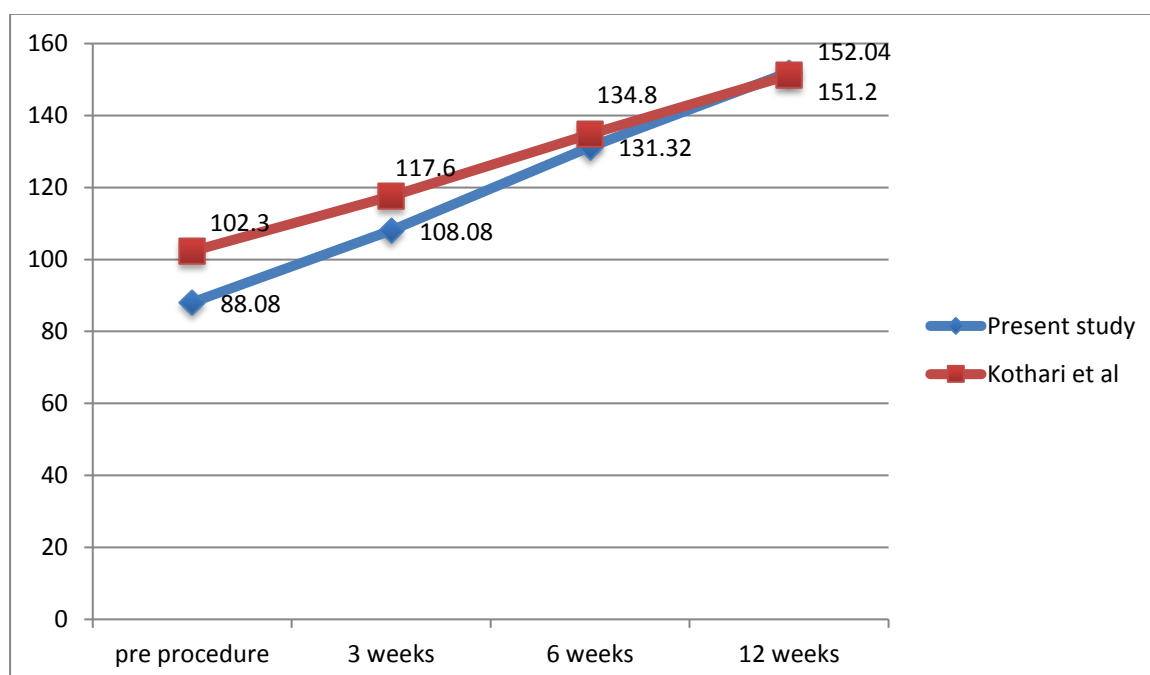
The increase in the mean active flexion of the patients in this study is 19.35^0 (18.9%) from baseline to 3 weeks, 23.48^0 (18.7%) from 3 weeks to 6 weeks, 21.85^0 (14.8%) from 6 weeks to 12 weeks. The increase in active flexion improvement is similar in all the follow ups. The increase in the mean active flexion of the patients in **Kothari** et al¹ study is 15.8^0 (14.2%) from baseline to 3 weeks, is 17.4^0 (13.5%) from 3 weeks to 6 weeks, is 16.8^0 (11.5%) from 6 weeks to 12 weeks. And also the improvement in active flexion of patients in our study is more compared to those in **Kothari** et al¹.

PASSIVE FLEXION:

TABLE NO.: 32

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	102.3 ⁰	117.6 ⁰	134.8 ⁰	151.2 ⁰
Present study	88.08 ⁰	108.08 ⁰	131.32 ⁰	152.04 ⁰

CHART NO.: 32



Mean passive flexion improved from the baseline of 88.08⁰ to 152.04⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean passive flexion improved from the baseline of 102.3⁰ to 151.2⁰ at the end of the follow up.

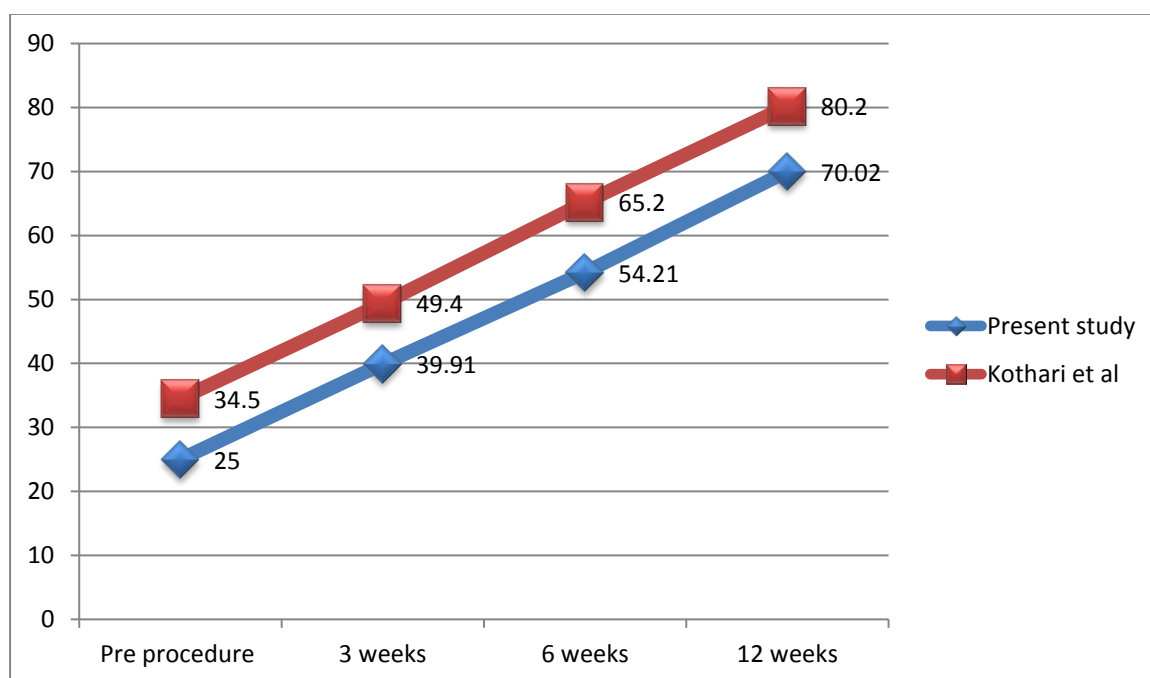
The increase in the mean passive flexion of the patients in this study is 20^0 (18.5%) from baseline to 3 weeks, 23.24^0 (17.69%) from 3 weeks to 6 weeks, 20.72^0 (13.62%) from 6 weeks to 12 weeks. The increase in passive flexion improvement is similar in all the follow ups. The increase in the mean passive flexion of the patients in **Kothari et al**¹ study is 15.3^0 (13.01%) from baseline to 3 weeks, is 17.2^0 (12.75%) from 3 weeks to 6 weeks, is 16.4^0 (10.84%) from 6 weeks to 12 weeks. And also the improvement in passive flexion of patients in our study is more compared to those in **Kothari et al**¹.

ACTIVE EXTERNAL ROTATION.:

TABLE NO.: 33

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	34.5 ⁰	49.4 ⁰	65.2 ⁰	80.2 ⁰
Present study	25 ⁰	39.91 ⁰	54.21 ⁰	70.02 ⁰

CHART NO.: 33



Mean active external rotation improved from the baseline of 25⁰ to 70.02⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean active external rotation improved from the baseline of 34.5⁰ to 80.2⁰ at the end of the follow up.

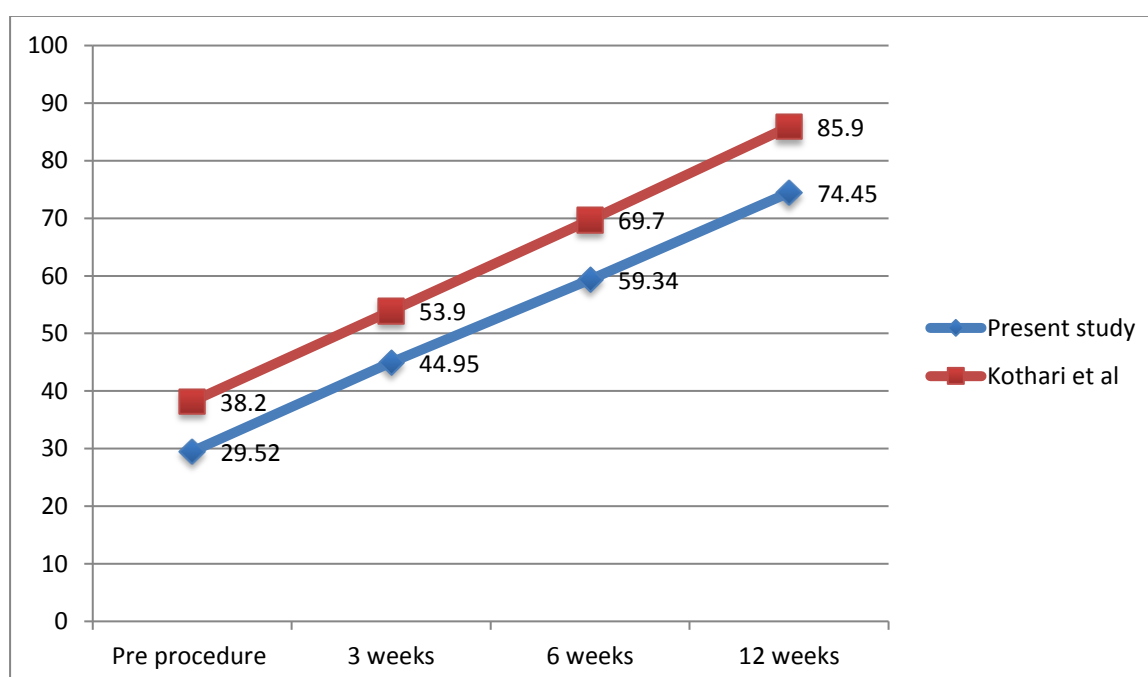
The increase in the mean active external rotation of the patients in this study is 14.91° (37.35%) from baseline to 3 weeks, 14.3° (26.37%) from 3 weeks to 6 weeks, 15.81° (22.57%) from 6 weeks to 12 weeks. The increase in active external rotation improvement is similar in all the follow ups. The increase in the mean active external rotation of the patients in **Kothari** et al¹ study is 14.9° (30.16%) from baseline to 3 weeks, is 15.8° (24.23%) from 3 weeks to 6 weeks, is 15° (18.7%) from 6 weeks to 12 weeks. And also the improvement in active external rotation of patients in our study is more compared to those in **Kothari** et al¹.

PASSIVE EXTERNAL ROTATION:

TABLE NO.: 34

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al ¹	38.2 ⁰	53.9 ⁰	69.7 ⁰	85.9 ⁰
Present study	29.52 ⁰	44.95 ⁰	59.34 ⁰	74.45 ⁰

CHART NO.: 34



Mean passive external rotation improved from the baseline of 29.52⁰ to 74.45⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean passive external rotation improved from the baseline of 38.2⁰ to 85.9⁰ at the end of the follow up.

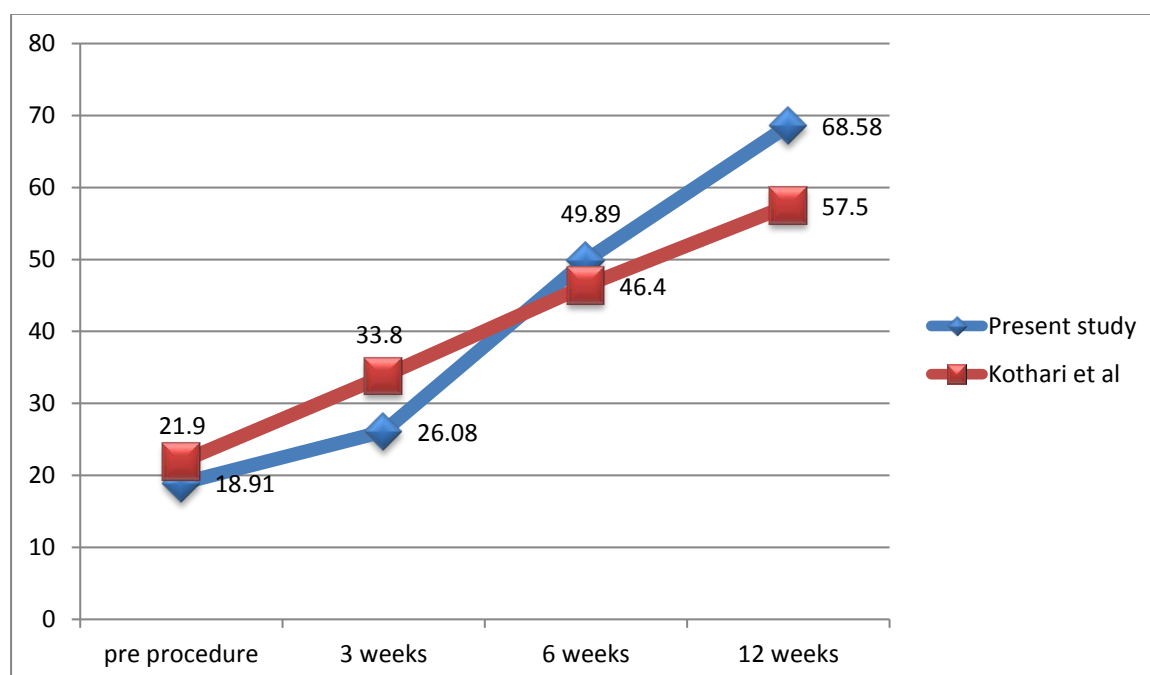
The increase in the mean passive external rotation of the patients in this study is 15.43⁰(34.32%) from baseline to 3 weeks, 14.39⁰(24.28%) from 3 weeks to 6 weeks, 15.11⁰(20.29%) from 6 weeks to 12 weeks. The increase in mean passive external rotation improvement is similar in all the follow ups. The increase in the mean passive external rotation of the patients in **Kothari** et al¹ study is 15.7⁰(29.12%) from baseline to 3 weeks, is 15.8⁰(22.66%) from 3 weeks to 6 weeks, is 16.2⁰(18.85%) from 6 weeks to 12 weeks. And also the improvement in mean passive external rotation of patients in our study is more compared to those in **Kothari** et al¹.

ACTIVE INTERNAL ROTATION:

TABLE NO.: 35

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	21.9 ⁰	33.8 ⁰	46.4 ⁰	57.5 ⁰
Present study	18.91 ⁰	26.08 ⁰	49.89 ⁰	68.58 ⁰

CHART NO.: 35



Mean active internal rotation improved from the baseline of 18.91⁰ to 68.58⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean active internal rotation improved from the baseline of 21.9⁰ to 57.5⁰ at the end of the follow up.

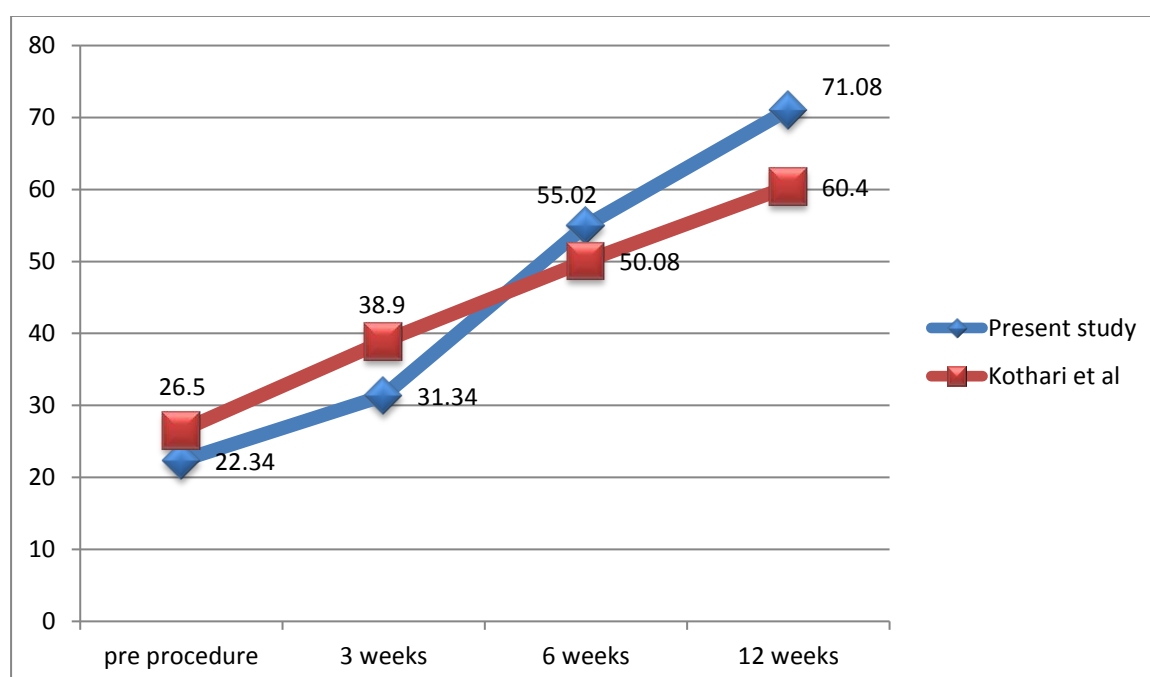
The increase in the mean active internal rotation of the patients in this study is 7.17⁰(27.49%) from baseline to 3 weeks, 13.8⁰(49.72%) from 3 weeks to 6 weeks, 18.69⁰ (27.25%) from 6 weeks to 12 weeks. The increase in active internal rotation improvement is similar in all the follow ups. The increase in the mean active internal rotation of the patients in **Kothari** et al¹ study is 11.9⁰(35.2%) from baseline to 3 weeks, is 12.6⁰(27.15%) from 3 weeks to 6 weeks, is 11.1⁰(19.3%) from 6 weeks to 12 weeks. And also the improvement in mean active internal rotation of patients in our study is more compared to those in **Kothari** et al¹.

PASSIVE INTERNAL ROTATION:

TABLE NO.: 36

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al¹	26.5 ⁰	38.9 ⁰	50.8 ⁰	60.4 ⁰
Present study	22.34 ⁰	31.34 ⁰	55.02 ⁰	71.08 ⁰

CHART NO.: 36



Mean passive internal rotation improved from the baseline of 22.34⁰ to 71.08⁰ in present study, whereas in study conducted by **Kothari et al¹**, mean passive internal rotation improved from the baseline of 26.5⁰ to 60.4⁰ at the end of the follow up.

The increase in the mean passive internal rotation of the patients in this study is 9°(28.71%) from baseline to 3 weeks, 23.68°(43.63%) from 3 weeks to 6 weeks, 16.06°(22.59%) from 6 weeks to 12 weeks. The increase in mean passive internal rotation improvement is similar in all the follow ups. The increase in the mean passive internal rotation of the patients in **Kothari** et al¹ study is 12.4°(31.87%) from baseline to 3 weeks, is 11.9°(23.42%) from 3 weeks to 6 weeks, is 9.6°(15.89%) from 6 weeks to 12 weeks. And also the improvement in mean passive internal rotation of patients in our study is more compared to those in **Kothari** et al¹.

The results of the present study were in relation to the study conducted by **Kothari** et al¹, which was conducted to assess the efficacy of PRP injection, corticosteroid injection and ultrasonic therapy in the treatment of periarthrititis shoulder. Assessment of patients was done at 0, 3, 6 and 12 weeks. PRP treatment showed statistically significant improvement in pain and functional ability score and mean active shoulder ROM at 12 weeks. Even the study results showed statistically significant improvement in the passive range of motion ,pain and disability score at 12 weeks. Also, at 6th week, PRP treatment resulted in statistically significant improvements over ultrasonic therapy.

The current prospective study demonstrates that intra-articular PRP injection significantly improves pain and disability. Our study results also showed an improvement in the VAS score from 6.19 to 1.84. Intra-articular PRP injection showed a good improvement over the steroids, suggesting its usage as the current treatment in the frozen shoulder. This was proved in a study conducted by **Sakeni RA** et al⁸⁸, which concluded that intra-articular PRP injection is a good rescue for painful stiff shoulder particularly for resistant cases as with diabetes mellitus, and with long duration of illness. Also, its efficacy can be observed with less frequent injections.

A case report reported by **Aslani H** et al⁸, on intra-articular PRP injection for patient with periarthritis shoulder showed that post first injection, the patient reported 60% improvement regarding diurnal shoulder pain, and no night pain.

Range of motion scoring-

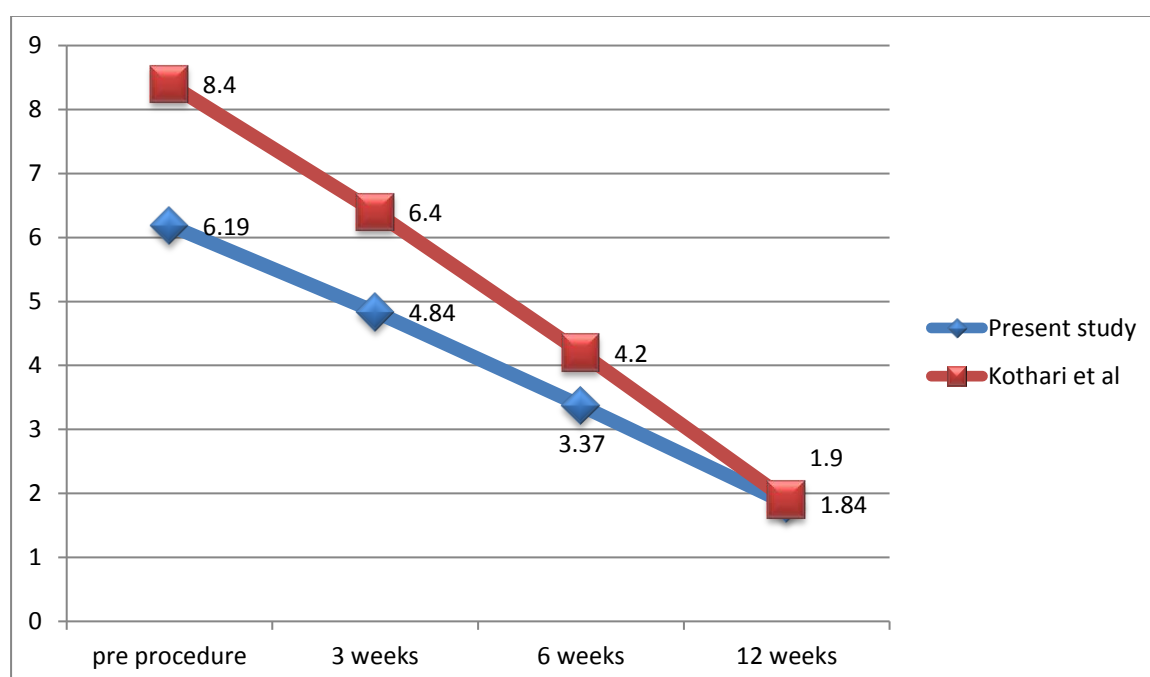
All patients in our study had good range of motion which was comparable to all the studies taken into account for comparison.

VAS SCORE:

TABLE NO.: 37

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al ¹	8.4	6.4	4.2	1.9
Present study	6.19	4.84	3.37	1.84

CHART NO.: 37



Pain scoring–

VAS score improved from 6.19 to 1.84 within 12 weeks post procedure.

This was superior to findings of **Kothari et al¹** 30 and **Jung Hwan Ahn et al⁸⁵** where final score was 1.9.

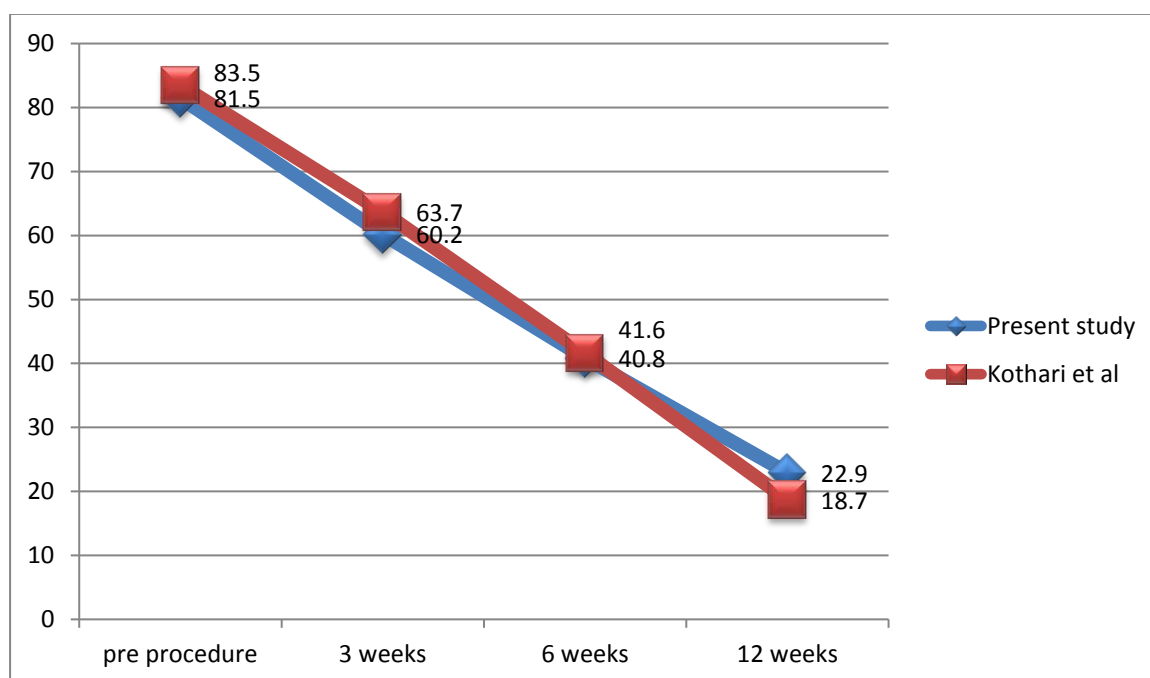
The decrease in the mean VAS score of the patients in this study is 1.35(21.8%) from baseline to 3 weeks, 1.47(30.4%) from 3 weeks to 6 weeks, 1.53(45.4%) from 6 weeks to 12 weeks. The reduction of pain is slower initially, and progressively reduces more at 6 weeks and 12 weeks follow up. The decrease in the mean VAS score of the patients in **Kothari** et al¹ study is 2(23.8%) from baseline to 3 weeks, is 2.2(34.3%) from 3 weeks to 6 weeks, is 2.3(54.7%) from 6 weeks to 12 weeks. And also progressive reduction of pain of patients in each follow up in our study is similar compared to those in **Kothari** et al¹.

QuickDASH SCORE:

TABLE NO.: 38

Authors	Baseline	3 weeks	6 weeks	12 weeks
Kothari et al ¹	83.5	63.7	41.6	18.7
Present study	81.5	60.2	40.8	22.9

CHART NO.: 38



Functional ability scoring –

Functional ability was assessed with QuickDASH scoring showed improvement with successive follow-ups from 81.5 to 22.9. This was comparable to QuickDASH score of study by **Kothari** et al¹.

The decrease in the mean QuickDASH score of the patients in this study is 21.3(26.1%) from baseline to 3 weeks, 19.4(32.2%) from 3 weeks to 6 weeks, 17.9(43.9%) from 6 weeks to 12 weeks. The improvement in functional ability progressively increased in each follow up until 12 weeks. The decrease in the mean QuickDASH score of the patients in **Kothari** et al¹ study is 19.8(23.7%) from baseline to 3 weeks, is 22.1(34.7%) from 3 weeks to 6 weeks, is 22.9(55%) from 6 weeks to 12 weeks. And also progressive improvement of functional ability of patients in each follow up in our study is similar compared to those in **Kothari** et al¹.

CONCLUSION

- In this study of 46 patients treated with intra-articular injection of PRP for periarthritis shoulder, following conclusions were drawn.
- Elderly females were more commonly affected with Periarthritis shoulder with increased incidence in the age group of 5th and 6th decade of life .
- Periarthritis Shoulder affects non dominant shoulder more than the dominant shoulder.
- Periarthritis Shoulder was found to be significantly associated with diabetes mellitus.
- The functional outcome of the diabetic patients with Periarthritis Shoulder was similar compared to non diabetic patients.
- The mean active and passive abduction, flexion, internal and external rotations have significantly improved following the procedure at the end of follow up.
- The pain significantly reduced in all of the patients when assessed with visual analogue score at the end of 12 weeks follow up.
- All the patients were found to have improved daily activity of living like opening a tight or new jar, washing back, carrying briefcase, washing walls and washing floors.

-
- The mean QuickDASH score suggested that functional ability improved in all the study patients by the end of 12 weeks follow up.
 - Pain at the injection site was self limiting and resolved without any medication.
 - The best improvement in their range of movements was observed in flexion and in abduction compared to rotations.
 - In periarthrititis shoulder, intra-articular PRP injection is found to be beneficial in the patients who were treated previously with analgesics alone or with exercises alone.
 - This study observes that intra-articular PRP injection is a reliable, productive, efficient and safe mode of treatment in periarthrititis of shoulder.

LIMITATIONS OF STUDY

- Though it is a prospective study, the study was done for a shorter duration of time and with limited sample size.
- The intra-articular injection of the PRP was given based on the clinical examination which is also a limitation of this study as better imaging modalities could be used to confirm the position of the needle.
- The diagnosis of periarthriti shoulder is essentially a clinical diagnosis and it is a diagnosis of exclusion rather than confirmation unlike other painful conditions of the shoulder. This itself is a limitation to the study and a future diagnostic investigative modality for confirmation of this diagnosis could overcome this limitation.

SUMMARY

Aim of this study is to evaluate the outcome of periarthrits shoulder with intra-articular injection of PRP.

Periarthritis shoulder is not a uncommon condition in the rural population. It is a common cause of shoulder pain and restricted movement. Inspite of being treated for over a hundred years, the definition, diagnosis, pathology and most efficacious treatments are still largely unclear.

Though many other methods of treatment have been tried, beginning from conservative methods like analgesics, ROM exercises to use of intra-articular or oral steroids, hydraulic-distension of joint, pain and shoulder stiffness are still haunting the patients as well as orthopaedic surgeons.

We treated 46 patients with periarthrits shoulder using intra-articular injection of platelet rich plasma. There were 21 males and 25 females with maximum age of 80 years and minimum of 30 years with mean of 51.19 years. Non dominant shoulder was affected in 58.69 % of patients. 23.91% of patients were diabetic, 8.69 % hypertensive and 4.34 % patients had bronchial asthma.

The study reflects the increasing importance of platelet rich plasma in treatment of periarthritits shoulder ,especially when steroids are contraindicated in such patients.

Concomitant home exercises program along with intra-articular PRP injection was found to be beneficial for periarthritits shoulder.

In this study, single injection of Platelet Rich Plasma resulted in significant improvement in range of motion of shoulder, pain and function. Under total aseptic precautions, when performed with a right technique it has no side effects.

In this study we observed that intra-articular PRP injection is a safe, reliable, cost effective procedure in the management of periarthritits shoulder.

.

BIBLIOGRAPHY

1. Kothari SY, Srikumar V, Singh N. Comparative Efficacy of Platelet Rich Plasma Injection, Corticosteroid Injection and Ultrasonic Therapy in the Treatment of Periarthritis Shoulder. JCDR. 2017;11(5):15–8.
2. Chauhan S, Kothari SY, Laisram N. Comparison of ultrasonic therapy, sodium hyaluronate injection and steroid injection in the treatment of periarthritis shoulder. IJPMR. 2012;23(3):105–10.
3. Dhurat R, Sukesh M. Principles and Methods of Preparation of Platelet-Rich Plasma: A Review and Author's Perspective. J Cutan Aesthetic Surg. 2014;7(4):189–97.
4. Uppal HS, Evans JP, Smith C. Frozen shoulder: A systematic review of therapeutic options. World J Orthop. 2015;6(2):263–8.
5. Uddin MM, Khan AA, Haig AJ, Uddin MK. Presentation of frozen shoulder among diabetic and non-diabetic patients. J Clin Orthop Trauma. 2014;5(4):193–8.
6. Huang YP, Fann CY, Chiu YH, Yen MF, Chen LS, Chen HH, et al. Association of diabetes mellitus with the risk of developing adhesive capsulitis of the shoulder: a longitudinal population-based followup study. Arthritis Care Res (Hoboken). 2013;65(7):1197–202.
7. Robinson CM, Seah KT, Chee YH, Hindle P, Murray IR. Frozen shoulder. J Bone Joint Surg Br. 2012;94(1):1–9.

-
8. Aslani H, Nourbakhsh ST, Zafarani Z, Ahmadi-Bani M, Ananloo ME, Beigy M, et al. Platelet-Rich Plasma for Frozen Shoulder: A Case Report. *Arch Bone Jt Surg*. 2016;4(1):90–3.
 9. Lin J. Platelet-rich plasma injection in the treatment of frozen shoulder: A randomized controlled trial with 6-month follow-up. *Int J Clin Pharmacol Ther*. 2018;56(8):366-71.
 10. Jeyaraman M, Ramesh R, Prajwal GS, Hardik J. Dhamsania. The comparative and prospective study on efficacy and functional outcome of autologous platelet rich plasma injection vs hydrodissection in adhesive capsulitis of shoulder. *Int J Res Orthop*. 2018;4(6):1-6
 11. Barman A , Mukherjee S , Sahoo J , Maity R , Rao PB , Sinha MK , Sahoo D , Tripathy S , Patro BK , Bag ND et al. Single intra-articular platelet-rich plasma versus corticosteroid injections in the treatment of adhesive capsulitis of the shoulder: a cohort study. *Am J Phys Med Rehabil*. 2019;7(4):5-8
 12. Gautam VK, Verma S, Batra S, Bhatnagar N, Arora S. Platelet-rich plasma versus corticosteroid injection for recalcitrant lateral epicondylitis: clinical and ultrasonographic evaluation. *J Orthop Surg (Hong Kong)*. 2015;23(1):1–5.

-
13. Greenspoon JA, Moulton SG, Millett PJ, Petri M. The Open OrthopaedicsJournal. 2016;10(6):09-14.
 14. Eppley BL, Woodell JE, Higgins J. Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. PlastReconstr Surg. 2004;114(6):1502–8.
 15. Heldin CH, Westermark B. Mechanism of action and *in vivo* role of platelet-derived growth factor. Physiol Rev. 1999;79(4):1283–316.
 16. Lin PH, Kirko MK, von Fraunhofer JA, Greisler HP. Wound healing and inflammatory response to biomaterials. In C. C. Chu, J. A. von Fraunhofer, and H. P. Greisler (Eds.), Wound Healing Closure and Devices. Boca Raton, Fla.: CRC Press, 1997;7-24.
 17. Slater M, Patava J, Kingham K, Mason RS. Involvement of platelets in stimulating osteogenic activity. J. Orthop. Res. 1995;13:655.
 18. Kevy SV, Jacobson MS, Blasetti L, Fagnant A. Preparation of growth factor enriched autologous platelet gel. Presented at the 27th Annual Meeting of the Society for Biomaterials, St. Paul, Minn., April 26, 2001.
 19. Spencer EM, Tokunaga A, Hunt KT. Insulin like growth factor binding protein-3 is present in the granules of platelets. Endocrinology 1993;132: 996.

-
20. Hosgood G. Wound healing: The role of platelet-derived growth factor and transforming growth factor beta. *Vet. Surg.* 1993;22:490.
 21. Bennett SP, Griffiths GD, Schor AM, Leese GP, Schor SL. Growth factors in the treatment of diabetic foot ulcers. *Br. J. Surg.* 2003;90:133.
 22. Schilephake H. Bone growth factors in maxillofacial skeletal reconstruction. *Int. J. Oral Maxillofac. Surg.* 2002;31:469.
 23. Awad AS, Huang L, Ye H. Adenosine A2A receptor activation attenuates inflammation and injury in diabetic nephropathy. *Am J Physiol Renal Physiol* 2006;290(4):828–37.
 24. Nemeth ZH, Lutz CS, Csoka B. Adenosine augments IL-10 production by macrophages through an A2B receptor-mediated posttranscriptional mechanism. *J Immunol* 2005;175(12):8260–70.
 25. Cruz CM, Rinna A, Forman HJ. ATP activates a reactive oxygen species dependent oxidative stress response and secretion of pro-inflammatory cytokines in macrophages. *J Biol Chem* 2007;282(5):2871–9.
 26. Parratt JR, West GB. Release of 5-hydroxytryptamine and histamine from tissues of the rat. *J Physiol* 1957;137:179–92.
 27. Los G, De Weger RA, Van den Berg DT. Macrophage infiltration in tumors and tumor-surrounding tissue: influence of serotonin and

-
- sensitized lymphocytes. *Cancer Immunol Immunother* 1988;26(2):145–52.
28. Sternberg EM, Trial J, Parker CW. Effect of serotonin on murine macrophages: suppression of Ia expression by serotonin and its reversal by 5-HT₂ serotonergic receptor antagonists. *J Immunol* 1986;137(1):276–82.
29. Majno G, Gilmore V, Leventhal M. On the mechanism of vascular leakage caused by histamine type mediators. A microscopic study in vivo. *Circ Res* 1967;21(6):833–47.
30. Lansdown AB. Calcium: a potential central regulator in wound healing in the skin. [review]. *Wound Repair Regen* 2002;10(5):271–85.
31. Ayhan E, Kesmezacar H, Akgun I. Intraarticular injections (corticosteroid, hyaluronic acid, platelet rich plasma) for the knee osteoarthritis. *World J Orthop*, 2014;5:351–61.
32. Martel-Pelletier J, Boileau C, Pelletier JP, Roughley PJ. Cartilage in normal and osteoarthritis conditions. *Best Pract Res Clin Rheumatol*, 2008;22:351–84.
33. Anitua E, Sanchez M, Nurden AT, Zalduendo MM, de la Fuente M, Azofra J et al. Platelet-released growth factors enhance the secretion of hyaluronic acid and induce hepatocyte growth factor production

-
- by synovial fibroblasts from arthritic patients. *Rheumatology*, 2007;46:1769–72.
34. Akeda K, An HS, Okuma M, Attawia M, Miyamoto K, Thonar EJ et al. Platelet-rich plasma stimulates porcine articular chondrocyte proliferation and matrix biosynthesis. *Osteoarthritis Cartilage*, 2006;14:1272–80.
35. Bendinelli P, Matteucci E, Dogliotti G, Corsi MM, Banfi G, Maroni P et al. Molecular basis of anti-inflammatory action of platelet-rich plasma on human chondrocytes: mechanisms of NF- κ B inhibition via HGF. *J Cell Physiol*, 2010;225:757–66.
36. Kaltsas DS. Comparative study of the properties of the shoulder joint capsule with those of other joint capsules. *ClinOrthopRelat Res*. 1983;19(173):20–6.
37. Jobe FW, Moynes DR, Brewster CE. Rehabilitation of shoulder joint instabilities. *OrthopClin North Am*. 1987;18(3):473–82.
38. Sarrafian SK. Gross and functional anatomy of the shoulder. *ClinOrthopRelat Res*. 1983;10(173):11–9.
39. Soames RW. Skeletal system. Chapter. 6 In : Williams PL (editor). *Gray's anatomy*. 38thed. London : ELBS Churchill living stone. 1995: 627-34.
40. Chaurasia BD. The shoulder joint. Chapter10. In: *Human anatomy regional and applied dissection and clinical*. 4th ed.2004;(1):142-7.

-
41. Buchbinder R, Green S, Youd JM, Johnston RV, Cumpston M.
Arthrographic distension for adhesive capsulitis (frozen shoulder).
Cochrane Database Syst Rev. 2008;1:CD007005.
 42. Singh GP. Comparison intra articular steroid vs. hydraulic distention
for the treatment of frozen shoulder. Journal of Universal College Of
Medical Sciences 2013;1(1):1-7
 43. Decker GA. Shoulder joint. Chapter 33.In : Lee MC Gregor's
Synopsis of surgical anatomy 12thed. UK : John wright and sons HD
techno house Redcliffe way Bristol.1986:433-54.
 44. Neviaser RJ, Neviaser TJ. The frozen shoulder diagnosis and
management. Clinical orthopaedics and related research. 1987;223:
59-64.
 45. Murnaghan JP. Chapter 21: Frozen shoulder. In: Rockwood CA Jr,
editor. The shoulder.Vol (2). Philadelphia: W.B. Saunders company;
1990:837-62.
 46. Robert H, Miller II, Azar FM. Shoulder and elbow injuries. Chapter
44. In :Canale ST (editor). Campbell's operative orthopaedics.12th ed.
Vol (3).Philadelphia : Mosby.2013:2235-6.
 47. Fareed DO, Gallivan WR Jr. Office management of frozen shoulder
syndrome. Treatment with hydraulic distension under local anesthesia.
ClinOrthopRelat Res. 1989;242:177-83.

-
48. Bulgen D, Hazleman B, Ward M, McCallum M. Immunological studies in frozen shoulder. *Ann Rheum Dis.* 1978;37(2):135–8.
 49. Esch JC. Chapter 15: Frozen shoulder. In: Whipple TL, editor. *Surgical Arthroscopy : The shoulder and elbow.* Philadelphia: J.B. Lippincott company. 1993:201–8.
 50. Reeves B. The natural history of the frozen shoulder syndrome. *Scand J Rheumatol.* 1975;4(4):193–6.
 51. Hertel R. [The frozen shoulder]. *Orthopaed.* 2000 Oct;29(10):845–51.
 52. Bruckner FE, Nye CJ. A prospective study of adhesive capsulitis of the shoulder (“frozen shoulder”) in a high risk population. *Q J Med.* 1981;50(198):191–204.
 53. Bo J. Lundberg; The Frozen Shoulder: Clinical and Radiographical Observations the Effect of Manipulation Under General Anesthesia Structure and Glycosaminoglycan Content of the Joint Capsule Local Bone Metabolism. *ActaOrthop Scand.* 1969;40(119):1–59.
 54. Withers RJ. The painful shoulder; review of 100 personal cases with remarks on the pathology. *J Bone Joint Surg Br.* 1949;31(3):414–7.
 55. Neviaser JS. Adhesive capsulitis and the stiff and painful shoulder. *OrthopClin North Am.* 1980;11(2):327–31.
 56. Lippmann RK. The frozen shoulder. *The Surgical Clinics of North America.* Philadelphia: W.B. Saunders company. 1957:367–83.

-
57. Clement RGE, Ray AG, Davidson C, Robinson CM, Perks FJ. Frozen shoulder : long-term outcome following arthrographic distension. *Acta Orthop Belg.* 2013;79:368–74.
58. Neviaser RJ. Painful conditions affecting the shoulder. *Clinical orthopaedics and related research* 1983;173:63-69.
59. Matsen FA 3rd, Kirby RM. Office evaluation and management of shoulder pain. *Orthop Clin North Am.* 1982;13(3):453–75.
60. Turek SL. The shoulder. Chapter 23. In : *Orthopaedics principles and their application.* 4th ed. Vol(2). Philadelphia : Lippincott-Raven. 2002:932-36.
61. Bulgen DY, Hazleman BL, Voak D. HLA - B27 and frozen shoulder. *The Lancet* 1976;i:1042-3.
62. Binder AI, Bulgen DY, Hazleman BL, Tudor J, Wraight P. Frozen shoulder: an arthrographic and radionuclear scan assessment. *Ann Rheum Dis.* 1984;43(3):365–9.
63. Loyd JA, Loyd HM. Adhesive capsulitis of the shoulder: arthrographic diagnosis and treatment. *South Med J.* 1983;76(7):879–83.
64. Andrews JR, Carson WG. Shoulder joint arthroscopy. *Orthopedics.* 1983;6(9):1157–62.
65. Iannotti JP, Zlatkin MB, Esterhai JL, Kressel HY, Dalinka MK, Spindler KP. Magnetic resonance imaging of the shoulder. Sensitivity,

-
- specificity, and predictive value. *J Bone Joint Surg Am.* 1991;73(1):17–29.
66. Bulgen DY, Binder AI, Hazleman BL, Dutton J, Roberts S. Frozen shoulder: prospective clinical study with an evaluation of three treatment regimens. *Ann Rheum Dis.* 1984;43(3):353–60.
67. Rizk TE, Christopher RP, Pinals RS, Higgins AC, Frix R. Adhesive capsulitis (frozen shoulder): a new approach to its management. *Arch Phys Med Rehabil.* 1983;64(1):29–33.
68. Weiser HI. Painful primary frozen shoulder mobilization under local anesthesia. *ArchPhys Med Rehabil.* 1977;58(9):406–8.
69. Richardson AT. Ernest Fletcher Lecture. The painful shoulder. *Proc R Soc Med.* 1975;68(11):731–6.
70. Williams NE, Seifert MH, Cuddigan JH, Wise RA. Treatment of capsulitis of the shoulder. *RheumatolRehabil.* 1975;14(4):236.
71. Thomas D, Williams RA, Smith DS. The frozen shoulder: a review of manipulative treatment. *RheumatolRehabil.* 1980;19(3):173–9.
72. Kraft GH, Johnson EW, Laban MM. The fibrositis syndrome. *Arch Phys Med Rehabil.* 1968;49(3):155–62.
73. Rizk TE, Gavant ML, Pinals RS. Treatment of adhesive capsulitis (frozen shoulder) with arthrographic capsular distension and rupture. *ArchPhys Med Rehabil.* 1994;75(7):803–7.
-

-
74. Haines JF, Hargadon EJ. Manipulation as the primary treatment of the frozen shoulder. *J R CollSurgEdinb*. 1982;27(5):271–5.
 75. Royen VBJ, Pavlov PW. Treatment of frozen shoulder by distension and manipulation under local anaesthesia. *IntOrthop*. 1996;20(4):207–10.
 76. Hsu SY, Chan KM. Arthroscopic distension in the management of frozen shoulder. *IntOrthop*. 1991;15(2):79–83.
 77. Warner JJ, Allen A, Marks PH, Wong P. Arthroscopic release for chronic, refractory adhesive capsulitis of the shoulder. *J Bone Joint Surg Am*. 1996;78(12):1808–16.
 78. Ogilvie-Harris DJ, Biggs DJ, Fitsialos DP, MacKay M. The resistant frozen shoulder. Manipulation versus arthroscopic release. *ClinOrthopRelat Res*. 1995;319:238–48.
 79. Shaffer B, Tibone JE, Kerlan RK; Frozen shoulder. A long-term follow-up. *J Bone Joint Surg Am*. 1992;74(5):738–46.
 80. Kececi Y, Ozsu S, Bilgir O. A cost-effective method for obtaining standard platelet-rich plasma. *Wounds*. 2014;26(8):232–8.
 81. Omar AS, Ibrahim ME, Ahmed AS, Said M. Local injection of autologous platelet rich plasma in treatment of lateral epicondylitis and plantar fascitis; randomised clinical trial. *Egypt Rheumatoid*. 2012;34(2):43–9.

-
82. Sharma SP, Baerheim A, Moe-Nilssen R, Kvale A. Adhesive capsulitis of the shoulder, treatment with corticosteroid, corticosteroid with distension or treatment-as-usual; a randomised controlled trial in primary care. *BMC MusculoskeletDisord*. 2016;17(1):232.
83. Marx RG, Malizia RW, Kenter K, Wickiewicz TL, Hannafin JA. Intra-articular Corticosteroid Injection for the Treatment of Idiopathic Adhesive Capsulitis of the Shoulder. *HSS J*. 2007;3(2):202–7.
84. Pushpasekaran N, Kumar N, Chopra RK, Borah D, Arora S. Thawing frozen shoulder by steroid injection: An evaluation and comparative study between a novel three-site injection and single-site. *Journal of Orthopaedic Surgery* 2017;25(1);1–5.
85. Ahn JH, Lee DH, Kang H, Lee MY, Kang D, Yoon SH. Early Intra-articular Corticosteroid Injection Improves Pain and Function in Adhesive Capsulitis of the Shoulder: 1-Year Retrospective Longitudinal Study. *PM R*. 2018;10(1):19–27.
86. Bal A, Eksioglu E, Gulec B, Aydog E, Gurcay E, Cakci A. Effectiveness of corticosteroid injection in adhesive capsulitis. *ClinRehabil*. 2008;22(6):503–12.
87. Lorbach O, Anagnostakos K, Scherf C, Seil R, Kohn D, Pape D. Non-operative management of adhesive capsulitis of the shoulder: oral cortisone application versus intra-articular cortisone injections. *J Shoulder Elbow Surg*. 2010;19(2):172–9.

88 . Sakeni RA, Marwan S, Alnime M. Comparison between intraarticular triamcinolone acetonide and methylprednisolone acetate injections in treatment of frozen shoulder. Saudi Med J 7;28(5);707-712.

PROFORMA

1. BASIC DATA

Name

Age/Sex

Address

Mobile No.

Indoor No.

OutdoorNo.

Date of Procedure

Date of Admission/OP

Date of Discharge

HISTORY

Pain: Location – top of shoulder / front / diffuse around shoulder
/base of neck

Side right / left

Mode of onset: spontaneous / injury / surgery

Radiation: Nil / upto elbow / upto fingers / to chest / to back interscapular area.

Duration of symptoms :< 4 wks/4 to 6 wks / 6 to 12 wks / 3 to 6 months / > 6 months

Exacerbating and relieving factors:

Involvement of other joints:

Occupation:

Hand dominance: right / left

Level of activity/ sports:

Patient expectation:

Details for VAS Score and QUICKDASH Score:

Pre existing systemic illness

Diabetes/Thyroid disorder/ Cervical Spine/ CVS/RS/ CNS/locomotor/
TB/ anaemia/ Hypertension/ malnutrition/others

Treatment history of present illness

Previous injection

Previous operation

Physiotherapy

NSAID's / drugs

2. DIAGNOSIS

Side right / left

Inflammation: yes / no

Acute / chronic

Degenerative / Unaccustomed use / repetitive friction/surgery

Joint Tenderness: present / absent / tenderness at _____

Movements:

Flexion:

Abduction:

External Rotation:

Internal Rotation:

Power:

Able to lift _____ lbs of sand bag/spring weight balance for 5 seconds

for 3 times with 90 deg abduction with extended elbow with no pain

Cervical Spine/AC joint/SC joint/Neck anteriorly – Thyroid/ Lateral aspect of Neck – lymph nodes/ Normal / not

Adson's test – negative / positive

Associated with rotator cuff tear, Drop arm sign - yes/no

Local disease

Congenital / rheumatoid arthritis/ osteoarthritis/ osteoporosis /
tumour / osteomyelitis / previous fracture / previous injection /
previous operation.

Other clinical findings

3. INVESTIGATIONS

Routine : Blood : Hemoglobin, total white blood cell count, differential count, platelet count, random blood sugar, fasting blood sugar, post prandial blood sugar, glycated hemoglobin, erythrocyte sedimentation rate, C-reactive protein, rheumatoid factor, anti-streptolysin O titres and serum uric acid.

X ray Shoulder – Antero-posterior and lateral :

Ultrasound of Shoulder:

MRI of shoulder:

4. TREATMENT

NSAIDs.

Topical application.

Intraarticular Injection under aseptic technique platelet rich plasma - single dose of 2 ml.2 cm Below and medial to Posterolateral angle of Acromion – 2 to 3 cm deep, into intraarticular region of the shoulder.

Skin anaesthetized / no

Steroid Injection: first / second

5. POST PROCEDURE

Observation for 20 mins/ Admitted

Mobilised Immediately

NSAID's

Antibiotics Prophylactic/therapeutic/Nil

Systemic complications

Vasovagal shock / Anaphylaxis / Allergies / Hyperglycemia

Local complications

1. necrosis
2. infection suspected/established
 superficial/deep
 mild/moderate/severe
3. hematoma
4. others

Further treatment:

None/Hematoma aspirated/open dressing/ debridement/ suction
irrigation/ plastic procedure/ Physiotherapy/ steroid injection/
acromioplasty/ rotator cuff repair.

Investigations

X-rays / USG / MRI

6. TIME OF DISCHARGE

Complications

1. Systemic -healed/improved/unchanged/nil
2. Local - healed/improved/unchanged/nil

ಮಾಹಿತಿಯುಕ್ತ ಸಮ್ಮತಿ ಪತ್ರ

ದಿನಾಂಕ:

ಮತ್ತು ಸಮ್ಮತಿ ದೃಢೀಕರಣ

ನಾನು _____ ನನ್ನ

ಪೂರ್ಣ ಅರಿವಿನಲ್ಲಿ, ಯಾವುದೇ ಬಲವಂತವಿಲ್ಲದೆ ಅಥವಾ ಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೇ

“ಪ್ಲೇಟೆಟ್ಟಮ್ಸ್ ಡಾನ್ಮಾ ಸೂಜಿಮದ್ದನ್ನು ಭುಜದ ಕೀಲಿನ ಒಳಗೆಗೆದುಕೊಳ್ಳಲು” ಅಥವಾ

ಯಾವುದೇ ಇತರ ವಿಧಾನ ಸೂಕ್ತವೋ ಅದಕ್ಕೆ, ನನ್ನ ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆ ನೀಡುತ್ತಿದ್ದೇನೆ.

ಅದು ರೋಗ ನಿರ್ಣಯದ / ಅಥವಾ ಚಿಕಿತ್ಸೆಯ ವಿಧಾನ / ಬಯಾಪ್ಪಿ/ ಕಾರ್ಯಾಚರಣೆ

ಆಗಿರ ಬಹುದಾಗಿದೆ. ಈ ಸೂಜಿಮದ್ದನ್ನು ನನಗೆ / ನನ್ನ ಮಗ / ನನ್ನ ಮಗಳು / ನನ್ನ

ವಾರ್ಡ್ವಯಸ್ಸಿನ _____ಗೆಯಾವುದೇ

ಸೂಕ್ತ ಅರಿವಳಿಕೆ ಕೊಡಬಹುದು. ಅದರ ಪ್ರಕೃತಿ ಮತ್ತು ವಿಧಾನದಲ್ಲಿ (ಶಸ್ತ್ರ ಚಿಕಿತ್ಸಕ

ಮತ್ತು ಅರಿವಳಿಕೆಯ) ಒಳಗೊಂಡ ಅಪಾಯಗಳ ಬಗ್ಗೆ ನನಗೆ ತೃಪ್ತಿಯಾಗಿ

ವಿವರಿಸಲಾಗಿದೆ. ನನಗೆ "ಇಂಟ್ರಾ-ಆರ್ಟಿಕ್ಯೂಲರ್ ಪ್ಲಾಸ್ಟಿಕ್ ಇನ್ಫೆಕ್ಷನ್ ಸ್ಮಾರ್ಟ್

ಪೆರಿಥಿರಿಸಿಸ್ ಸ್ಟಾಲ್ಡರ್ನ್ ಕ್ರಿಯಾತ್ಮಕವಾದ ಔಷಧಿ" ಎಂಬ ವೈದ್ಯಕೀಯ

ಸಂಶೋಧನೆಯ ಬಗ್ಗೆ ಸಂಪೂರ್ಣವಾಗಿ ವಿವರಿಸಿದ್ದಾರೆ. ನಾನು ಮಾಹಿತಿಯ

ಕೈಪಿಡಿಯನ್ನು ಓದಲು ಮತ್ತು ನಾನು ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ ಅವಕಾಶವನ್ನು ಹೊಂದಿದ್ದೇನೆ.

ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ, ನನಗೆ ತೃಪ್ತಿಯಾಗಿ ಉತ್ತರಗಳನ್ನು ನೀಡಲಾಗಿದೆ.

ನಾನು ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಂಡು ಭಾಗವಹಿಸಲು ಸ್ವಯಂ ಪ್ರೇರಣೆಯಿಂದ

ಸಮ್ಮತಿಯನ್ನು ಕೊಡುತ್ತಿದ್ದೇನೆ. ನಾನು ನನ್ನ ಇತಿಹಾಸ ಒದಗಿಸಲು, ದೈಹಿಕ ಪರೀಕ್ಷೆಗೆ

ಒಳಗಾಗಲು, ಇಂಜೆಕ್ಷನ್ ವಿಧಾನಗಳಿಗೆ ಒಳಪಡಲು, ತನಿಖೆಗೆ ಒಳಗಾಗಲು, ಅದರ

ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳನ್ನು ಇತ್ಯಾದಿ ವೈದ್ಯರುಗಳಿಗೆ / ಸಂಸ್ಥೆಗೆ
ಇತ್ಯಾದಿಗಳಿಗೆ ಒದಗಿಸಲು ಒಪ್ಪಿಗೆ ನೀಡುತ್ತಿದ್ದೇನೆ. ಕಾರ್ಯಾಚರಣೆಯ / ವಿಧಾನದ
ಮಾಹಿತಿಯನ್ನು, ಇತ್ಯಾದಿಯನ್ನು ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ,
ವೀಡಿಯೋಗ್ರಾಫಿಯನ್ನು ಅಥವಾ ಛಾಯಾಗ್ರಹಣ ಮಾಡಬಹುದು. ರೋಗಿಯ
ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಗೆ ಯಾವುದೇ ವೆಚ್ಚವಿಲ್ಲ. ಎಲ್ಲಾ ಡೇಟಾವನ್ನು / ಮಾಹಿತಿಯನ್ನು ಪ್ರಕಟಿತ
ಅಥವಾ ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸಬಹುದು. ನಾನು ವೈದ್ಯರುಗಳನ್ನು /
ಸಂಸ್ಥೆಯನ್ನು ಇತ್ಯಾದಿ, ವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ಅಹಿತಕರ
ಪರಿಣಾಮಗಳಾದಲ್ಲಿ ಹೊಣೆಯಾಗಿಸುವುದಿಲ್ಲ.

ಈ ಸಮ್ಮತಿಸುವ ಪತ್ರ ಮತ್ತು ರೋಗಿಯ ಮಾಹಿತಿ ಕೈಪಿಡಿಯ ಒಂದು ಪ್ರತಿಯನ್ನು
ನನಗೆ ಕೊಟ್ಟಿದ್ದಾರೆ.

(ರೋಗಿಯ ಪರಿಚಾರಕನ ಸಹಿ ಮತ್ತು ಹೆಸರು)

(ರೋಗಿಯ / ಗಾರ್ಡಿಯನ್ನ ಸಹಿ)

ಸಾಕ್ಷಿ:

(ಸಂಶೋಧಕನ/ವೈದ್ಯರ ಸಹಿ ಮತ್ತು ಹೆಸರು)

Informed Consent Form & Certification of Consent

Date:

I, _____ aged _____, after being explained in my own vernacular language about the purpose of the study and the risks and complications of the procedure, hereby give my valid written informed consent without any force or prejudice for Intra-articular injection of Platelet Rich Plasma to Shoulder or any other procedure deemed fit, which is a diagnostic & / or therapeutic procedure / biopsy / transfusion / operation to be performed on me or _____ under any anaesthesia deemed fit. The nature and risks involved in the procedure (surgical and anaesthetical) have been explained to me to my satisfaction. I have been explained in detail about the Clinical Research on "FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHROSITIS SHOULDER" being conducted. *I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.* I hereby give consent to provide my history, undergo physical examination, undergo the injection procedure, undergo investigations and provide its results and documents etc to the doctor / institute etc. For academic and scientific purpose the operation / procedure, etc may be video graphed or photographed. No cost will be involved for participation of the patient. All the data may be published or used for any academic purpose. I will not hold the doctors / institute etc responsible for any untoward consequences during the procedure / study.

A copy of this Informed Consent Form and Patient Information Sheet has been provided to the participant.

(Signature & Name of Pt. Attendant)
(Relation with patient)

(Signature/Thumb impression
& Name of Patient)

Witness:

(Signature & Name of Research person /doctor)

 SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR – 563101 Information Sheet	FORM AT NO.	
	ISSUE NO.	
	REV. NO.	
	DATE	

ಮಾಹಿತಿ ಹಾಳೆ

ಪ್ರಧಾನ ಸಂಶೋಧಕರ ಹೆಸರು: ಡಾ. ಅಜಯ್ಕುರ್ಹಟ್ಟಿ

ಸಂಸ್ಥೆಹೆಸರು: ಶ್ರೀ ದೇವರಾಜ ಅರಸು ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಮತ್ತು ಶ್ರೀ ದೇವರಾಜ
ಅರಸು ಉನ್ನತ ಶಿಕ್ಷಣ ಅಕಾಡೆಮಿ: ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ, ಭಾರತ -
563101.ಆಸ್ತಿ ಚಿಕಿತ್ಸೆಇಲಾಖೆ

ಪರಿಚಯ:

ನಾವು 1.ಡಾ.ಅಜಯ್ಕುರ್ಹಟ್ಟಿ ಸ್ನಾತಕೋತ್ತರ ಟ್ರೇನಿಂಗ್ ಆಫೋಪೆಡಿಸ್ಟ್‌ರಿಕ್ ಭಾಗ, ಶ್ರೀ
ದೇವರಾಜ್ ಅರಸು ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ, ಭಾರತ -
563101 "ಇಂಟ್ರಾ-ಆರ್ಟಿಕ್ಯೂಲರ್‌ಪ್ಲಾಸ್ಟಿಕ್‌ಸ್ಮಾದ ಪೆರಿರಿಥರಿಟಿಸ್ಟ್‌ಲ್ಡರ್ನ್
ಕ್ರಿಯಾತ್ಮಕವಾದ ಔಟಾಗಮ್" (ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ) ಎಂಬ ಪ್ರಯೋಗದ ಮೇಲೆ
ಅಧ್ಯಯನ ಮಾಡುತ್ತಿದ್ದೇವೆ. ನೀವು ಮೇಲಿನ ಸಂಶೋಧನಾ ಅಧ್ಯಯನದಲ್ಲಿ
ಭಾಗವಹಿಸಲು ನಿಮಗೆ ಆಹ್ವಾನ. ನಮ್ಮ ಅಧ್ಯಯನದ ಉದ್ದೇಶ - ಪರಿಧಮನಿಯ ಭುಜದ
ಪ್ಲೇಟ್‌ಟ್ರಮ್‌ದ್ವಾರಾ ಸ್ಮಾದ ಇಂಟ್ರಾಆರ್ಟಿಕ್ಯೂಲರ್‌ಇಂಜೆಕ್ಷನ್ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶವನ್ನು

ವೀಕ್ಷಿಸಲು ಮತ್ತು ವಿಶ್ಲೇಷಿಸಿ ಅಧ್ಯಯನ ಮಾಡುವುದು. ಅಧ್ಯಯನದ ಅವಧಿ ಹನ್ನೆರಡು ತಿಂಗಳು.

ಸಂಶೋಧನೆ ಪ್ರಕಾರ: ನಿರೀಕ್ಷಿತ ಅನಾಲಿಟಿಕಲ್ಸ್ ಡಿ

ಏಕೆ ಈ ಸ್ಪರ್ಧಿ ಆಯ್ಕೆ?: ಭುಜದ ಪೆರಿಆರ್ಥ್ರೈಟಿಸ್ಕಾಯಿಲೆ ಇರುವ ಎಲ್ಲಾರೋಗಿಗಳನ್ನು ಒಳಗೊಡಿಸುವಿಕೆ ಮತ್ತು ಬಹಿಷ್ಕರಣ ಮಾನದಂಡಗಳ ಪ್ರಕಾರ ಆರಿಸಲಾಗುತ್ತದೆ.

ವಾಲಂಟರಿ ಭಾಗವಹಿಸುವಿಕೆ: ಹೌದು

ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಅಪಾಯಗಳು: ಭುಜದ ಪ್ಲೇಟೆಟ್ಸ್ ಮೃದ್ಧ ಪ್ಲಾಸ್ಮಾ ಇಂಜೆಕ್ಷನ್ನುಜದ ಪೆರಿಆರ್ಥ್ರೈಟಿಸ್ಕಾಯಿಲೆಗೆ ಚಿಕಿತ್ಸೆಯ ವಿಧಾನವಾಗಿದೆ. ಸ್ಪರ್ಧಿ ತನ್ನ ಲಕ್ಷಣಗಳು ಮತ್ತು ಕಾರ್ಯಗಳನ್ನು ಸುಧಾರಣೆಗಳು ಪ್ರಯೋಜನಗಳನ್ನು ಹೊಂದಿದೆ. ಪ್ಲೇಟೆಟ್ಸ್ ಮೃದ್ಧಪ್ಲಾಸ್ಮಾ ಅಪಾಯಗಳು ಕನಿಷ್ಠ ಮತ್ತು ಸಾಮಾನ್ಯವಲ್ಲ.

ಗೌಪ್ಯತೆ: ಅಭ್ಯರ್ಥಿಯು ಗೌಪ್ಯತೆಯನ್ನು ನಿರ್ವಹಿಸಲಾಗುವುದು.

ಸ್ವಾತಂತ್ರ್ಯ: ಅಭ್ಯರ್ಥಿಯು ಭಯವಿಲ್ಲದೇ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹೊರಹೋಗಬಹುದು.

ಯಾರನ್ನು ಸಂಪರ್ಕಿಸಬೇಕು ;ಡಾ. ಅಜಯ್ಕುರ್ಹಟ್ಟಿ, ಆರ್ಥೋಪೆಡಿಕ್ಸ್ ಇಲಾಖೆ, ಕೊರಡಿ ಸಂಖ್ಯೆ 321, ಸ್ನಾತಕೋತ್ತರ ಪುರುಷರ ಹಾಸ್ಟೆಲ್, SDUMC, ಟಮಕ, ಕೋಲಾರ, ಕರ್ನಾಟಕ - 563101.ಮೊಬೈಲ್ 8310563798, ಇ-ಮೇಲ್: ajaykurahatti@gmail.com

	SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR -563101.	FORMAT NO.	
		ISSUE NO.	
	Information Sheet	REV. NO.	
		DATE	

Information Sheet

Name of the Organisation: Sri Devaraj Urs Medical College, & Sri Devaraj Urs Academy of Higher Education, Tamaka, Kolar, Karnataka, India – 563101. Dept. of Orthopaedics.

Introduction:

I ,Dr. Ajay Kurahatti, Post Graduate, Dept. of Orthopaedics, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India – 563101, am conducting a "FUNCTIONAL OUTCOME OF INTRA-ARTICULAR PLATELET RICH PLASMA IN PERIARTHRITIS SHOULDER" The objective of our study is to observe and analyse functional outcome of intra-articular injection of platelet rich plasma in periarthrititis shoulder. Its duration will be 1 year.

Type of Research: Prospective Analytical Study

Participant Selection: All patients are injected with single dose of two ml of intra articular platelet rich plasma to affected shoulder.

Why this participant is chosen? : All patients with Periarthritis of Shoulder are chosen as per the inclusion and exclusion criteria.

Voluntary Participation: Yes

Benefits and risks: Platelet Rich Plasma injection to shoulder is the treatment method for Periarthritis of shoulder. The participant has the

benefits of improvements in his symptoms and functions. The adverse effects of the Platelet Rich Plasma are less. The risks are minimal and not common.

Confidentiality: Confidentiality of participant will be maintained.

Freedom to withdraw: The participant is free to withdraw from the study at any time without fear.

Whom to contact: Dr Ajay Kurahatti, Post Graduate, Dept. of Orthopaedics, Room No.321, PG Men's Hostel, SDUMC, Tamaka, Kolar, Karnataka - 563101.

Mobile No. 8310563798, Email: ajaykurahatti@gmail.com

QUICKDASH SCORING

The Disabilities of the Arm, Shoulder and Hand Score(QuickDash)

Clinician's name (or ref) _____

Patient's name (or ref) _____

INSTRUCTIONS: This questionnaire asks about your symptoms as well as your ability to perform certain activities. Please answer *every question*, based on your condition in the **last week**. If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* on which response would be the most accurate. It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.

Please rate your ability to do the following activities in the last week.

1. Open a tight or new jar	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable
2. Do heavy household chores (eg wash walls, wash floors)	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable
3. Carry a shopping bag or briefcase	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable
4. Wash your back	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable
5. Use a knife to cut food	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (eg golf, hammering, tennis, etc)	☐ No difficulty	☐ Mild difficulty	☐ Moderate difficulty	☐ Severe difficulty	☐ Unable

During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?

☐ Not at all ☐ Slightly ☐ Moderately ☐ Quite a bit ☐ Extremely

During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?

☐ Not limited at all ☐ Slightly limited ☐ Moderately limited ☐ Very limited ☐ Unable

Please rate the severity of the following symptoms in the last week

9. Arm, shoulder or hand pain	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme
10. Tingling (pins and needles) in your arm, shoulder or hand	☐ None	☐ Mild	☐ Moderate	☐ Severe	☐ Extreme

During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?

☐ No difficulty ☐ Mild difficulty ☐ Moderate difficulty ☐ Severe difficulty ☐ So much difficulty I can't sleep

Thank you very much for completing all the questions in this questionnaire.

To save this data please print or

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

The Disabilities of the Arm, Shoulder and Hand (quickdash) Score

(NB. A DASH score may not be calculated if there are greater than 1 missing items.)

QUICKDASH, A Shortened version of Disabilities of the Arm, Shoulder and Hand [DASH] is used to score the functional ability of the Patients. It is based on the questionnaire. The questionnaire uses symptoms and the functional ability of the patients to perform certain activities. Each of the activity has been graded from 1 to 5 as follows.

- NO DIFFICULTY - 1
- MILD DIFFICULTY - 2
- MODERATE DIFFICULTY - 3
- SEVERE DIFFICULTY - 4
- INABLITY - 5

These include:

Patient's Functional Ability based:

1. Open a tight or new jar.
2. Do heavy household chores (e.g. wash walls, wash floors)
3. Carry a shopping bag or briefcase.
4. Wash your back.
5. Use a knife to cut food.
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g. golf, hammering, tennis, etc.)

7. During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbors or groups ?

8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem ?

Severity of the symptoms based:

1. Arm, shoulder or hand pain.

2. Tingling (pins and needles) in your arm, shoulder or hand.

3. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?

After the scores are given to each question from 1 to 5, the QuickDASH scores are calculated as $[(\text{Sum of the 'n'}/n) - 1] \times 25$ where n is the total number of questions answered by the patient. And the patient has to answer minimum of 10 questions. QuickDASH scores vary from 0 to 100.

And based on the QuickDASH scores, Functional Results are classified as follows:

0 - 25 = EXCELLENT

26 - 50 = GOOD

51 - 75 = FAIR

76 - 100 = POOR

KEY TO MASTER CHART

S.No : Serial Number

UHID No: Unique Hospital Identification number

AC : Associated Comorbidities

1 : Diabetes Mellitus

2 : Hypertension

3 : Bronchial Asthma

A Abd0 : Active Abduction pre procedure

P Abd0 : Passive Abduction pre procedure

A Abd3 : Active Abduction at 3 weeks follow up

P Abd3 : Passive Abduction at 3 weeks follow up

A Abd6 : Active Abduction at 6 weeks follow up

P Abd6 : Passive Abduction at 6 weeks follow up

A Abd12 :Active Abduction at 12 weeks follow up

P Abd 12 : Passive Abduction at 12 weeks follow up

A F 0 : Active Flexion pre procedure

P F 0 : Passive Flexion pre procedure

A F 3 : Active Flexion at 3 weeks follow up

P F 3 : Passive Flexion at 3 weeks follow up

A F 6 : Active Flexion at 6 weeks follow up

P F 6 : Passive Flexion at 6 weeks follow up

A F 12 : Active Flexion at 12 weeks follow up

P F 12 : Passive Flexion at 12 weeks follow up

A IR 0 : Active Internal Rotation pre procedure

P IR 0 : Passive Internal Rotation pre procedure

A IR 3 : Active Internal Rotation at 3 weeks follow up

P IR 3 : Passive Internal Rotation at 3 weeks follow up

A IR 6 : Active Internal Rotation at 6 weeks follow up

P IR 6 : Passive Internal Rotation at 6 weeks follow up

A IR 12 : Active Internal Rotation at 12 weeks follow up

P IR 12 : Passive Internal Rotation at 12 weeks follow up

A ER 0 : Active External Rotation pre procedure

P ER 0 : Passive External Rotation pre procedure

A ER 3 : Active External Rotation at 3 weeks follow up

P ER 3 : Passive External Rotation at 3 weeks follow up

A ER 6 : Active External Rotation at 6 weeks follow up

P ER 6 : Passive External Rotation at 6 weeks follow up

A ER 12 : Active External Rotation at 12 weeks follow up

P ER 12 : Passive External Rotation at 12 weeks follow up

VAS 0 : Visual Analogue Score pre procedure

VAS 3 : Visual Analogue Score at 3 weeks follow up

VAS 6 : Visual Analogue Score at 6 weeks follow up

VAS 12 : Visual Analogue Score at 12 weeks follow up

QDASH 0 : Quick Disabilities of the Arm, Shoulder and Hand score pre procedure

QDASH 3 : Quick Disabilities of the Arm, Shoulder and Hand score at 3 weeks follow up

QDASH 6 : Quick Disabilities of the Arm, Shoulder and Hand score at 6 weeks follow up

QDASH 12 : Quick Disabilities of the Arm, Shoulder and Hand score at 12 weeks follow up

A : Open a tight or new jar

B : Do a heavy household chores

C : Carry a shopping bag or briefcase

D : Wash your back

E : Use a knife to cut food

F : Recreational activities in which you take some force or impact through your arm, shoulder or hand (eg golf, hammering, tennis, etc)

G : During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?

H : During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?

I : Arm, shoulder or hand pain

J : Tingling (pins and needles) in your arm, shoulder or hand

K : During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?

T : Total Quick Disabilities of the Arm, Shoulder and Hand score at 12 weeks follow up

FO : Functional Outcome

1 : Excellent

2 : Good

3 : Fair

4 : Poor

S.No	Name	Age	Sex	UHD No.	Side	AC	A Abd 0	P Abd 0	A Abd 3	P Abd 3	A Abd 6	P Abd 6	A Abd 12	P Abd 12	A F 0	P F 0	A F 3	P F 3	A F 6	P F 6	A F 12	P F 12	A IR 0	P IR 0	A IR 3	P IR 3	A IR 6	P IR 6	A IR 12	P IR 12	A ER 0	P ER 0	A ER 3	P ER 3	A ER 6	P ER 6	A ER 12	P ER 12	VAS 0	VAS 3	VAS 6	VAS 12	QDASH 0	QDASH 3	QDASH 6	QDASH12	A	B	C	D	E	F	G	H	I	J	K	T	FO
1	Jayalakshmi	48	F	562849	Non Dominant		55	60	70	76	90	96	130	136	75	81	85	90	105	111	120	125	20	23	35	40	45	50	65	67	24	28	41	45	55	60	71	75	6	5	4	2	84.5	63.6	43.2	27.27	2	2	2	2	3	2	2	2	2	2	2	23	2
2	Marappa	80	M	525830	Non Dominant	1,2	45	50	60	64	80	87	110	116	65	70	80	86	95	101	115	120	15	18	20	26	40	44	65	66	25	27	42	46	54	59	72	76	7	6	5	3	86.2	74.2	62.1	47.72	3	3	3	3	3	3	2	3	3	3	3	32	2
3	Puttaraju	48	M	306533	Dominant		50	56	60	66	85	91	115	120	70	75	95	102	120	127	140	146	20	24	25	30	45	51	70	72	26	28	40	44	53	59	68	74	6	4	3	2	88.3	73.4	64.6	45.45	3	3	3	2	3	2	3	3	3	3	3	31	2
4	Rathnamma	38	F	532189	Non Dominant		60	64	65	71	90	96	120	125	80	85	100	107	125	132	145	151	25	27	25	31	40	46	60	63	24	29	39	45	56	62	68	73	7	5	4	3	71.2	46.6	21.4	11.36	1	2	2	1	2	1	2	1	2	1	1	16	1
5	Gayathri	41	F	603355	Non Dominant		55	60	70	75	85	91	110	115	75	80	95	101	115	120	135	141	30	33	40	44	70	75	80	82	26	30	38	43	57	61	69	75	7	6	5	3	80.6	54.1	23.9	15.9	2	2	2	2	2	1	2	1	2	1	1	18	1
6	Shivanna	60	M	586718	Dominant	2	40	46	75	81	100	107	140	146	60	65	85	91	110	116	135	142	20	25	30	34	50	56	65	67	25	29	41	46	54	60	74	77	6	4	3	2	93.8	84.6	76.8	50	3	3	3	2	3	3	3	3	4	3	33	2	
7	Jayamma	55	F	532709	Non Dominant	1	45	51	70	74	110	117	145	151	65	66	95	102	130	135	155	160	25	29	30	35	45	51	60	63	23	27	42	47	53	59	71	76	6	5	4	2	86.5	56.4	24.3	18.18	2	2	1	2	2	1	2	2	2	2	1	19	1
8	Govindappa	49	M	573910	Dominant		60	67	85	88	115	121	150	155	85	91	110	116	135	142	160	163	10	15	20	26	45	50	65	67	27	32	40	44	52	58	71	75	5	4	4	3	85.6	59.9	45.4	29.54	2	2	3	2	2	3	2	2	2	2	2	24	2
9	Gunavathi	56	F	579026	Non Dominant		80	84	100	106	130	135	140	145	90	95	115	120	140	147	160	162	15	19	25	31	50	55	70	73	25	29	39	45	55	61	73	76	6	5	4	2	70.6	45.4	19.1	9.09	1	2	2	1	2	1	1	2	1	1	1	15	1
10	Byramma	54	F	575134	Dominant	3	75	80	95	100	115	120	130	137	85	89	110	116	130	136	155	161	25	28	30	35	60	64	80	80	26	31	38	44	57	63	73	77	6	5	3	2	83.6	72.9	51.9	29.54	2	2	2	3	2	2	2	3	2	2	2	24	2
11	Ananthappa	63	M	558689	Non Dominant	1	85	90	100	105	125	130	135	141	90	96	105	110	125	130	150	155	20	25	30	34	50	56	65	68	26	30	37	42	53	5	69	75	7	6	4	3	91.1	86.4	77.4	47.72	3	3	3	3	3	2	3	3	3	3	3	32	2
12	Sharunnisa	64	F	556905	Dominant		70	76	85	90	110	115	125	132	90	97	100	115	130	136	145	151	15	20	25	29	45	50	65	68	26	30	37	43	52	59	67	72	7	5	3	2	87.8	56.6	43.1	31.81	2	2	2	2	3	2	2	3	2	2	2	25	2
13	Rajamma	56	F	556964	Dominant		65	71	90	94	120	126	135	140	85	91	95	100	125	130	145	152	20	23	30	35	55	60	70	73	25	28	36	40	56	62	69	74	6	4	3	2	67.9	40.1	22.7	13.63	2	1	2	2	1	1	2	2	1	2	1	17	1
14	Yellappa	54	M	558406	Non Dominant	1	75	80	105	111	130	136	140	146	95	100	110	116	135	142	155	161	25	28	30	36	50	54	70	72	23	27	42	47	57	62	68	74	6	5	4	2	69.8	44.6	23.2	9.09	1	1	2	1	1	2	2	1	1	1	1	15	1
15	Yella Reddy	63	M	581400	Non Dominant	3	90	96	110	116	130	137	150	156	100	105	120	127	140	147	160	163	25	30	35	41	65	69	80	84	24	28	41	46	53	60	71	75	7	5	3	1	83.8	65.7	53.9	27.27	2	2	2	2	3	2	2	2	2	2	2	23	2
16	Subbakka	46	F	581385	Non Dominant		80	84	100	105	120	125	145	150	90	96	115	120	135	140	150	156	20	22	20	26	45	50	65	67	25	29	40	45	55	61	71	76	7	6	4	2	85.7	63.3	41.6	27.27	2	2	2	3	2	2	2	2	2	2	2	23	2
17	Vanajakshi	54	F	576445	Dominant	1	65	69	90	96	115	120	130	137	80	85	105	111	130	136	150	154	15	19	25	41	45	51	60	62	26	30	43	48	55	60	72	77	6	5	3	2	73.3	45.4	22.6	6.81	1	1	2	1	2	1	2	2	1	1	1	14	1
18	Byramma	60	F	572449	Non Dominant		55	59	80	85	100	107	125	131	70	74	100	105	120	126	145	151	10	13	20	26	50	55	70	73	27	31	41	46	53	60	73	74	6	5	4	3	84.6	61.6	39.4	27.27	2	3	2	2	2	2	2	2	2	2	2	23	2
19	Raja Reddy	50	M	567142	Non Dominant		70	74	100	105	120	126	140	146	80	84	105	110	125	130	145	152	10	14	20	24	50	55	65	67	29	33	41	45	52	58	72	76	6	4	3	1	86.4	64.2	43.6	15.9	2	2	1	1	2	1	2	2	1	2	2	18	1
20	Giddachary	60	M	554491	Dominant		80	85	105	110	125	131	145	150	90	96	110	115	135	141	160	164	15	19	20	26	45	51	65	68	25	30	40	46	51	57	73	76	6	5	3	1	72.1	43.9	24.2	13.63	1	2	2	1	2	2	1	1	1	2	2	17	1
21	Tholasamma	46	F	563379	Non Dominant	3	85	91	110	114	130	135	150	156	100	106	120	125	140	147	155	159	20	22	20	27	45	49	70	73	23	29	39	44	58	64	70	75	7	6	4	2	89.1	77.8	47.7	27.27	2	2	2	3	2	2	2	1	3	2	2	23	2
22	Krishnappa	50	M	535314	Dominant	1	45	50	70	76	100	105	125	131	65	71	90	96	110	117	140	144	15	20	25	29	50	56	70	72	22	27	37	43	55	61	70	74	7	6	4	2	82.8	62.5	41.6	15.9	2	1	2	2	2	1	1	2	1	2	2	18	1
23	Nanjundappa	69	M	555210	Non Dominant	2	65	69	85	89	110	117	130	136	85	91	100	107	125	130	145	149	15	18	20	24	45	50	65	67	21	26	40	45	53	59	69	74	6	5	3	2	73.5	47.2	24.1	13.63	2	1	2	2	2	1	1	2	2	1	1	17	1
24	Kantamma	56	F	555248	Dominant		70	76	95	98	115	121	140	145	90	96	105	112	135	140	160	163	20	23	25	29	55	61	75	78	26	31	42	47	55	62	69	75	7	6	4	1	84.7	63.1	41.7	27.27	2	2	2	3	3	2	1	1	2	3	2	23	2
25	Rudrappa	64	M	555622	Non Dominant		50	54	70	76	100	106	125	131	75	81	95	102	120	126	140	146	20	24	30	34	50	54	70	72	25	29	40	46	51	57	68	73	6	5	4	2	86.4	62.3	40.1	29.54	2	3	2	2	2	2	3	2	2	2	2	24	2
26	Savithramma	60	F	555762	Dominant		60	65	85	89	105	111	120	126	85	91	100	105	130	135	150	154	20	22	25	31	50	53	65	68	24	29	43	48	55	62	67	73	6	4	3	2	87.6	73.1	53.6	27.27	2	2	1	3	3	2	2	2	2	2	2	23	2
27	Nanjamma	60	F	587557	Non Dominant	1	65	71	90	95	105	110	115	120	85	92	95	101	115	121	135	140	25	27	25	32	45	49	60	62	23	28	44	49	56	61	69	74	6	5	3	1	74.1	45.7	23.4	13.63	2	1	2	1	2	1	2	1	1	2	2	17	1
28	Samyuktha	30	F	587562	Non Dominant		75	80	100	106	125	131	145	151	95	100	110	116	130	136	155	159	25	28	30	34	55	60	75	78	27	32	37	42	58	64	66	72	6	4	2	1	89.6	76.4	48.2	29.54	2	2	2</										