"A PROSPECTIVE COMPARATIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME OF INTRAARTICULAR INJECTION THERAPY WITH PLATELET-RICH PLASMA VERSUS CORTICOSTEROID FOR PERIARTHRITIS SHOULDER"

BY

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

In partial fulfilment of the requirements for the degree of

MASTER OF SURGERY

IN

ORTHOPAEDICS

Under the Guidance of

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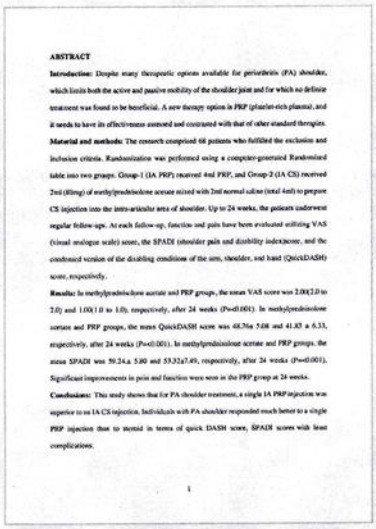

ABSTRACT

Introduction: Despite many therapeutic options available for periarthritis (PA) shoulder, which limits both the active and passive mobility of the shoulder joint and for which no definite treatment was found to be beneficial. A new therapy option is PRP (platelet-rich plasma), and it needs to have its effectiveness assessed and contrasted with that of other standard therapies.

Material and methods: The research comprised 68 patients who fulfilled the exclusion and inclusion criteria. Randomization was performed using a computer-generated Randomized table into two groups. Group-1 (IA PRP) received 4ml PRP, and Group-2 (IA CS) received 2ml (80mg) of methylprednisolone acetate mixed with 2ml normal saline (total 4ml) to prepare CS injection into the intra-articular area of shoulder. Up to 24 weeks, the patients underwent regular follow-ups. At each follow-up, function and pain have been evaluated utilizing VAS (visual analogue scale) score, the SPADI (shoulder pain and disability index)score, and the condensed version of the disabling conditions of the arm, shoulder, and hand (QuickDASH) score, respectively.

Results: In methylprednisolone acetate and PRP groups, the mean VAS score was 2.00(2.0 to 2.0) and 1.00(1.0 to 1.0), respectively, after 24 weeks (P=<0.001). In methylprednisolone acetate and PRP groups, the mean QuickDASH score was 48.76a 5.08 and 41.83 a 6.33, respectively, after 24 weeks (P=<0.001). In methylprednisolone acetate and PRP groups, the mean SPADI was 59.24.a 5.80 and 53.32a7.49, respectively, after 24 weeks (P=<0.001). Significant improvements in pain and function were seen in the PRP group at 24 weeks.

Conclusions: This study shows that for PA shoulder treatment, a single IA PRP injection was superior to an IA CS injection. Individuals with PA shoulder responded much better to a single PRP injection than to steroid in terms of quick DASH score, SPADI scores with least complications.

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ABBREVIATIONS

S.NO	ABBREVIATION	EXPLANATION
1	PA	Periarthritis
2	PRP	Platelet rich plasma
3	IA PRP	Intraarticular Platelet rich plasma
4	IA CS	Intraarticular Corticosteroid
5	CS	Corticosteroid
6	VAS	Visual Analog Scale
7	SPADI	Shoulder Pain and Disability Index
8	QuickDASH	Shortened version of Disabilities of Arm, Shoulder and Hand
9	FS	Frozen shoulder
10	AC	Adhesive capsulitis
11	ROM	Range of motion
12	NSAIDs	Non-steroidal anti-inflammatory drugs
13	DM	Diabetes Mellitus
14	HTN	Hypertension
15	CVA	Cerebrovascular accidents
16	AC	Acromioclavicular
17	CHL	Coracohumeral ligament
18	SGHL	Superior glenohumeral ligament
19	MGHL	Middle glenohumeral ligament
20	IGHL	Inferior glenohumeral ligament
21	LHBT	Long head of Biceps tendon

22	GH	Glenohumeral
23	AP	Anteroposterior
24	cm	Cubic centimeters
25	mm	Millimeters
26	ER	External rotation
27	MUA	Manipulation under anesthesia
28	ACR	Arthroscopic capsular release
29	PT	Physiotherapy
30	SWD	Short wave diathermy
31	ECSWT	Extracorporeal shock wave therapy
32	TGF	Tumor growth factor
33	PDGF	Platelet derived growth factor
34	VEGF	Vascular endothelial growth factor
35	EGF	Epidermal growth factor
36	IGF	Insulin-like growth factor
37	GF	Growth factor
38	PRF	Platelet rich fibrin
39	FGF	Fibroblast growth factor
40	WBC	White blood cells
41	LR PRP	Leucocyte rich Platelet rich plasma
42	LP PRP	Leucocyte poor Platelet rich plasma
43	IL	Interleukin
44	TNF	Tumor necrosis factor

45	NRS	Numerical Rating Scale
46	ADL	Activities of Daily Living
47	DASH	Disabilities of the Arm, Shoulder and Hand
48	ASES	American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form
49	SST	Simple Shoulder Test
50	CMS	Constant-Murley Score
51	RCT	Randomized control study
52	WORC	Western Ontario Rotator Cuff Index
53	IA	Intraarticular
54	RI	Rotator interval
55	CSS	Constant Shoulder Score
56	CPT	Conventional Physical Therapy
57	UCLA	University of California at Los Angeles Shoulder Score
58	NRS	Numeric Pain Scale
59	SD	Standard deviation
60	EDTA	Ethylenediaminetetraacetate
61	IQR	Interquartile range
62	USG	Ultrasound

A PROSPECTIVE COMPARATIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME OF INTRAARTICULAR INJECTION THERAPY WITH PLATELET RICH PLASMA VERSUS CORTICOSTEROID FOR PERIARTHRITIS SHOULDER

ABSTRACT

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Key words: Periarthritis shoulder (PA), IA PRP (Intra articular Platelet rich plasma injection), Intra articular Corticosteroid injection (IA CS), VAS score, SPADI score, QuickDASH score.

INTRODUCTION

INTRODUCTION

A human has the largest range of motion (ROM) in their shoulder. This flexibility allows for ROM in the sagittal plane in upper limb, including full circumduction, external rotation, internal rotation, abduction, adduction, extension, and flexion. The shoulder is also responsible for moving the scapula in many directions, including up, back, forward, and down.[1]

When the musculature surrounding the glenohumeral joint of the shoulder becomes too contracted and inflamed, a disease called variously as periarthritis, frozen shoulder, or adhesive capsulitis (AC), significant mobility restriction and chronic discomfort result.[1] The annual incidence of PA in general population ranges from 3% to 5%, and in people with high blood sugar levels, it can reach 20%.[2] It commonly appears between the decades of 40 and 70.[3] The underlying condition is characterised by fibrosis and inflammation of the soft tissues that make up the rotator cuff, ligaments and capsule.[4] The American Shoulder and Elbow Surgeons and the British Elbow and Shoulder Society have both acknowledged the lack of a precise diagnosis and diagnostic criteria for PA and have made attempts to address this.[5]

Primary (idiopathic) and secondary FS are the two subtypes. Accidents, hemiparesis, rotator cuff impingement and dysfunction, diabetes, cardiovascular disease, shoulder injuries are all examples of secondary causes of frozen shoulder.[6] Oral corticosteroids, intraarticular injections like physical therapy exercises, corticosteroids, hyaluronic acid, arthroscopic, hydrodilation, manipulation under anaesthesia, deep heat modalities are some of the treatment interventions that have been suggested, but it is still debatable which therapy is the most effective.[7]

Recent studies have shown the immediate pain-relieving and range-of-motion-improving effects of intra-articular corticosteroids.[8,9] Shoulder discomfort may be alleviated by corticosteroid injections, as shown by Buchbinder et al., which revealed positive results from both randomized and pseudo-randomized trials.[10] Griesser et al., carried out a comprehensive analysis of RCT (randomized controlled trials) where they finalized that intraarticular corticosteroid injections increase analgesic management and range of motion in the fixed or variable factor, although the results were equivalent in the long term when compared to alternative therapies.[11] According to Sun et al., comparison of steroid injection to NSAIDs (nonsteroidal anti-inflammatory) medications along with physical therapy for shoulder discomfort, both treatments were equally helpful for patients with frozen shoulders.[12] Furthermore, in contrast to non-steroidal anti-inflammatory drugs, it offered marginally better progress in function of shoulder without supremacy in analgesic management or risk of problems after 4 to 6 weeks.

On another hand, PRP therapy is a new technique for accelerating tendon repair by stimulating soft tissue revascularization and elevating levels of growth factors in the body. This is characterised as an autologous blood sample having platelet levels that are higher than the reference range. [13]

NEED OF THE STUDY:

Given the lack of clear data for treatment methods as well as new development of PRP (Platelet Rich Plasma) as a biological agent that promotes recovery, it is vital to examine its function and evaluate its performance to steroid injections.

OBJECTIVES

OBJECTIVES OF STUDY

- To find out the potency of single IA PRP injection in periarthritis shoulder based on the functional outcome with the shortened version of QuickDASH, pain by VAS and Shoulder Pain and functional outcome by SPADI at end of 2, 4, 8, 12, 24 weeks.

- To analyse the potency of single intra articular corticosteroid injection (IA-CS) in Periarthritis shoulder based on the functional outcome with the QuickDASH , pain by VAS and Shoulder Pain as well as functional outcome by SPADI at end of 2, 4, 8, 12, 24 weeks.

- To differentiate the efficacy of functional outcome of single intra-articular PRP (IA-PRP) injection and intraarticular corticosteroid injection (IA CS) in patients with periarthritis shoulder by using above parameters.

REVIEW OF LITERATURE

REVIEW OF LITERATURE:

Frozen shoulder (FS) is a painful and unpleasant illness that causes stiffness and impairment. It commonly strikes in the 5^{th} to 6^{th} decade of life, mainly influencing working-age people. The handicap caused by this disorder has a significant economic impact on individuals who are affected and society. It was earlier considered that this disease has a self-limiting nature. However, recent literature disclose that the course of disease might last as long as 10 years and up to 40% of the patients continue to suffer from it throughout their lives. Anxiety is particularly impacted by upper extremity impairment.[14]

Shoulder pathologies have been scored as highly as HTN (hypertension), depression, DM (diabetes mellitus), AMI (acute myocardial infarction), CHF (congestive heart failure) on patient's overall health.[15]

Codman, in 1934first used the term frozen shoulder. He spoke of an excruciating shoulder issue that got worse over time, followed by stiffness and sleep issues on the affected side. Both external rotation and forward flexion, which are symptoms identified by Codman, were significantly reduced.

Duplay labelled the same ailment as peri-arthritis in 1872, much before Codman. Naviesar created the phrase adhesive capsulitis in 1945. Although this more contemporary phrase is still in use, it's regrettable because, while periarthritis shoulder is linked to capsule contracture and synovitis, it's not linked to capsular adhesions.[7]

Shoulder periarthritis (PA) can be either primary (idiopathic) or secondary. Injury, rotator cuff dysfunction, rotator cuff impingement, hemiparesis, cardiovascular disease or diabetes are all causes of secondary frozen shoulder. Frozen shoulder is known to affect 10% to 36% of persons with diabetes, and it does not react as well to therapy as it does in non-diabetics.[7]

Epidemiology, types and pathophysiology:

This condition's prognosis is currently unknown.

- The aetiology of frozen shoulder is multifaceted as well as likely includes both environmental and genetic components.
- Arthroscopic and pathologic research studies of the axilla have shown an inflammatory component. Damage to the synovial lining, characterised by stiffness and adhesions, is a common consequence of the inflammation that causes it.[7]

Frozen shoulder can be:

1. Primary - The onset is usually unknown cause
2. Secondary - Occurs as a result of a proven cause, potential risk, or iatrogenic. A subsequent frozen shoulder can be caused by several adverse outcomes. For instance, after surgery, after a stroke, or after an accident. When there has been an injury, the movement pattern may shift to protect the injured tissues, which will interfere with the shoulder's motor control, hampering the ROM and eventually causing joint stiffness.[16]

- There are 3 different variations of secondary frozen shoulder.
    1. Systemic cause (Metabolic diseases like diabetes mellitus etc.)
    2. Extrinsic variables (cervical disc disease, cardiovascular disease, cerebrovascular accidents (CVA), fracture of humerus, Parkinson's disease)
    3. Intrinsic variables (biceps tendinopathy, pathologies of rotator cuff, calcific tendinopathy, arthritis of Acromioclavicular (AC) joint).[17]

PA shoulder is highly common

- In female population, roughly seventy percent of total patients presenting with a frozen shoulder are woman.
- Many of those aged 35 to 65, with a general population incidence rate of about 2-5%. It is referred to as the 50-year-old shoulder in China and Japan because of its dominance at that age. [17,18,19]
- The incidence rate in population suffering from diabetes is around 20%.[20–22]
- If a person has had a Frozen Shoulder before (5 to 34% probability of developing it in the opposite shoulder at some point). It has been shown that synchronous bilateral participation occurs in around 14% of patients.[23]
- Born in the British Isles and being of white ethnicity have both been identified as risk factors. The highest occurrence was noted at 60–64 years in the Asian ethnicity patients, whereas it was 55–59 years in the other patients. Shoulder periarthritis was more common among Asian patients, who also faced a unique risk factor.[23]

Relevant surgical anatomy and physiology:

The proximal section of the humerus and glenoid of the scapula form a dynamic, complex articulation known as the shoulder joint. The humerus head fits snugly into the glenoid cavity (or fossa) of the scapula. These two bones have distinct articular cartilage ridges on their joint surfaces. In order to compensate for the shallowness of the glenoid cavity inside the osseous shoulder joint, , a ring of fibrocartilage known as the glenoid labrum surrounds the glenoid. Biceps brachii tendon connects to glenoid labrum at the superior aspect.[24]

Because of its small glenoid fossa and relatively large humeral head, the shoulder is a very flexible joint. (4:1 surface area ratio). This is likely to get dislocated due to its greater motion.[25]

There is a fibrous membrane around the glenohumeral joint called the joint capsule. When the glenoid fossa rim wraps over the humeral neck, it forms a physical connection to the joint capsule. While the joint capsule as a whole serves to protect the articulating components, the glenohumeral ligaments may be found in the capsulolabral complexes. The glenohumeral ligaments, first identified in 1829, constrict with changing degrees of humeral rotation and abduction rather than acting as classical ligaments that convey a pure tensile force along their length.[26,27] In order to reduce wear and tear on the articular surfaces, the synovial membrane that lines the joint capsule produces synovial fluid.[28]

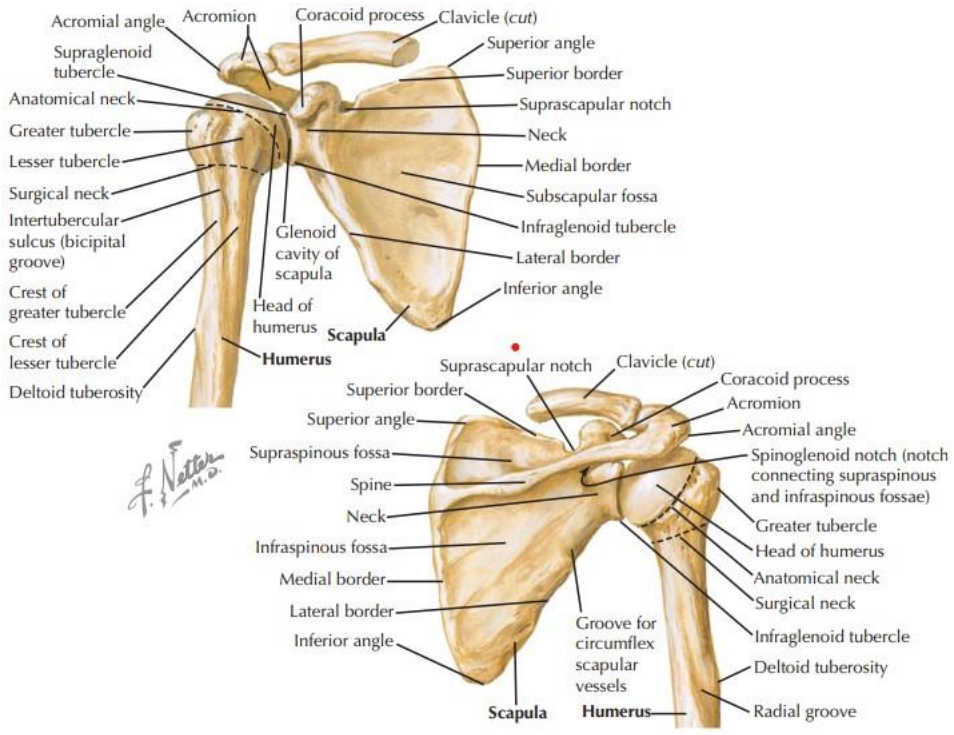

Figure-1: Anatomy of shoulder joint- anterior view and posterior view[29]

Along with the synovial fluid, there are many synovial bursae that reduce friction in the joint. Bursae serve as a physiological shield between joint components such as tendons. For diagnosis, the subscapular bursa and subacromial bursa are extremely helpful. There are various examples, which include:

- Subdeltoid/ Subacromial bursa – It may be found in the superolateral part of shoulder joint, between joint capsule along with deltoid muscle. The supraspinatus tendon lies nearby. This bursa allows for a greater range of motion by reducing friction below the deltoid muscle. With the exception of structural variations, Typically, this subacromial bursa does not attach to the glenohumeral joint. There is a sac called the subcoracoid bursa between subscapularis muscle and coracoid process.
- The subscapular bursa is a small fluid-filled sac that resides between joint capsule and tendon of the subscapularis muscle. This works by reducing opposition injury to subscapularis muscle during shoulder movement, mainly internal rotation.

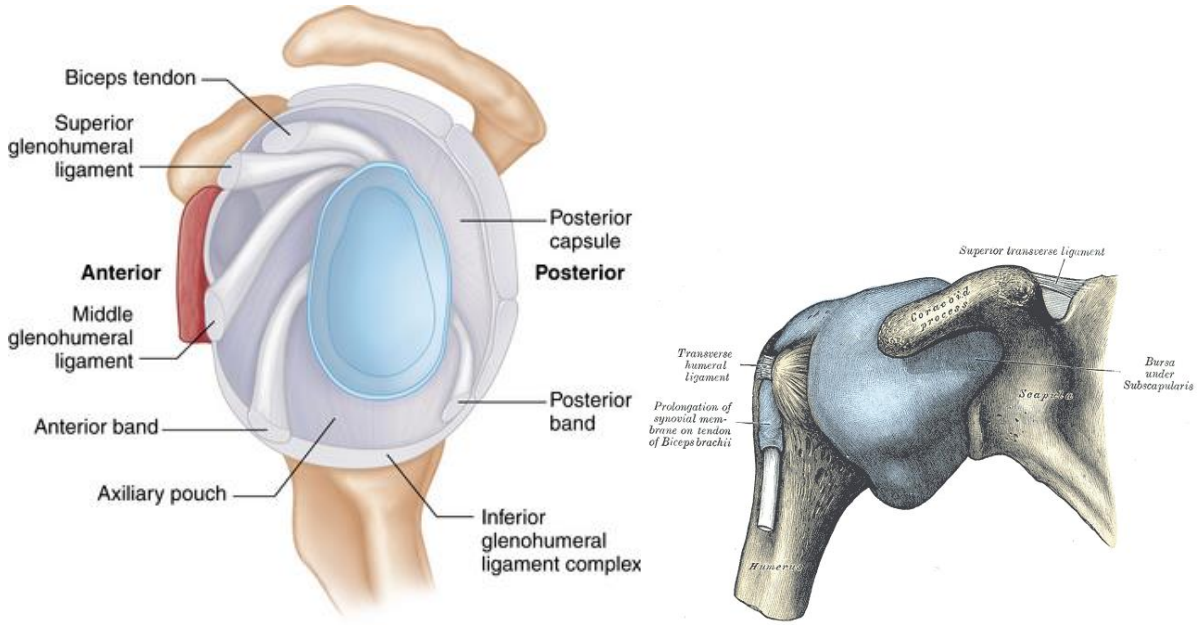

Figure-2: Static stabilizing structures- glenohumeral ligaments, glenoid labrum, and the glenohumeral joint capsule.[30]

Static stabilising structures include the joint capsule, labrum of glenoid, negative intraarticular pressure, joint capsule, glenohumeral ligaments.[31]

- Glenohumeral ligaments- The glenohumeral joint capsule, which connects the glenoid fossa to the humerus, is made up of three ligaments. These ligaments act as the main joint stabilisers and protect the shoulder joint by preventing anterior dislocation due to their positioning.
- Coracoclavicular ligament - The trapezoid and conoid ligaments form this ligament, which attaches the coracoid process to the clavicle. It helps to keep clavicle in place by working with the acromioclavicular ligament. It is possible for the acromioclavicular ligaments to be torn during an acromioclavicular joint injury due
- Coracohumeral ligament (CHL) supports the joint capsule's superior side. The CHL is wide and thin at its origin at the coracoid's base, with diameter of about 2 centimetres; however, at its proximal end in the bicipital groove, it divides laterally into 2 different bands, which wrap around the long head of the biceps tendon.

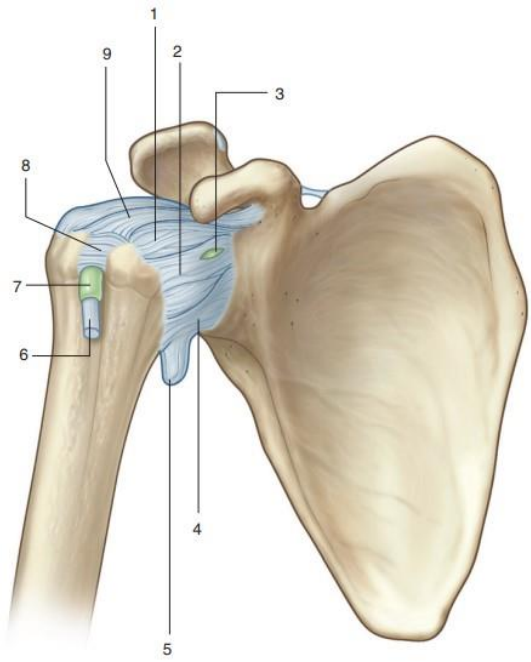

Figure-3: Ligaments around the shoulder joint [32]

1. SGHL (Superior glenohumeral ligament), 2. MGHL (Middle glenohumeral ligament), 3. Aperture for subtendinous bursa of subscapularis muscle, 4. Inferior glenohumeral ligament (IGHL), 5. Redundant capsule, 6. Tendon of long head of biceps brachii muscle, 7. Synovial sheath, 8. Transverse humeral ligament, 9. Coracohumeral ligament

There are several dynamic stabilizing systems, including long head of the biceps brachii tendon **LHBT**, rotator cuff muscles (teres minor, subscapularis, infraspinatus, supraspinatus), periscapular muscles, and rotator interval.

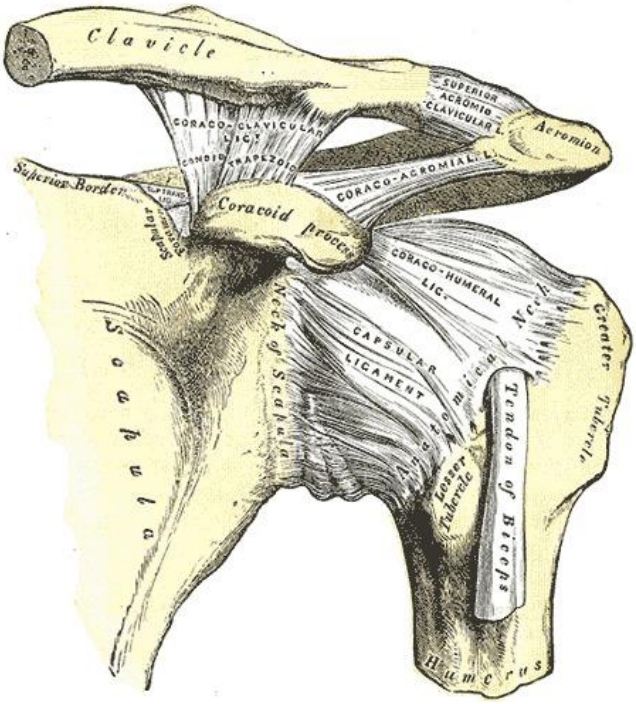

Figure-4: Ligaments around the shoulder joint of left joint.[30]

Soft tissue pulley system and LHBT [33,34]

In bicipital groove case, subscapularis muscle provides floor and ceiling via its deep and superficial fibres. They are also attached to the glenohumeral ligament and the coracohumeral ligament. Extensions of the soft tissue pulley system surround the LHBT in the bicipital groove, with the medial and proximal parts adhering closely to the smaller tuberosity. After leaving the groove, LHBT makes a bend of 30-40 degrees toward the

glenoid labrum and supraglenoid tubercle. Keeping the proximal soft tissue sections of the groove in good shape is crucial to the long-term health of the biceps complex.

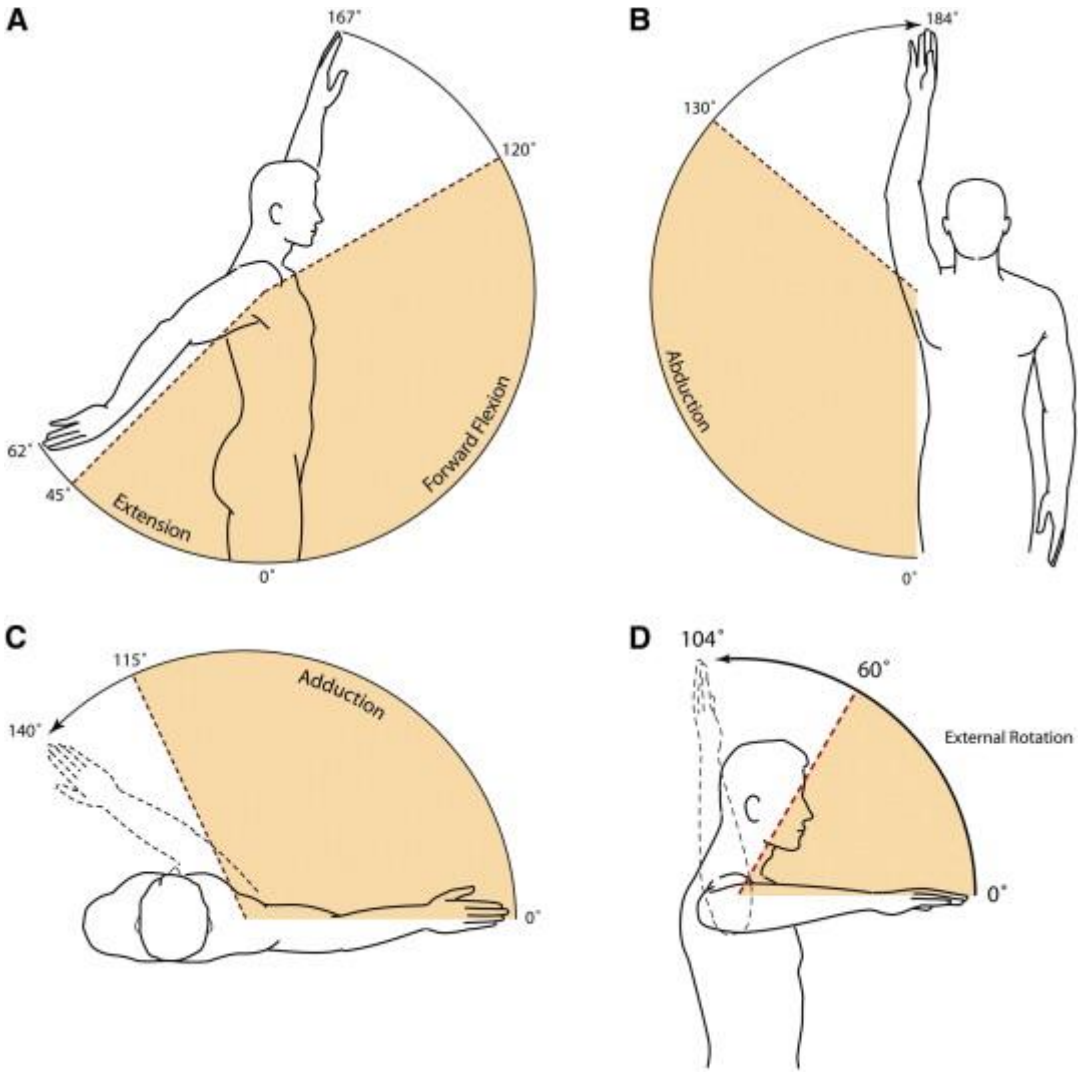

Figure-5: ROM of shoulder joint in different planes.[36]

- The shoulder joint may allow for quite extensive mobility in many different axes.[35]

- Flexion - In sagittal plane, the direction of motion for upper limbs is toward the front. The typical ROM is 180°. The anterior deltoid, pectoralis, along with coracobrachialis are the primary flexors of the shoulder. The biceps brachii also participate very little in this movement.

- Extension—Movement of the upper body occurs behind the body, in the sagittal plane. ROMs between 45 to 60^0 are considered normal. The teres major, latissimus dorsi, along with posterior deltoid fibres are the primary extensors of the shoulder.

- In this context, internal rotation refers to a turn inward along the vertical axis toward the body's midline. The average range is 70-90^0. The muscles responsible for internal rotation comprise pectoralis major, subscapularis, latissimus dorsi, teres major, anterior deltoid.

- External rotation - rotation along a vertical axis, away from the midline. 90 degrees is the usual ROM. The muscles of external rotation are teres minor and infraspinatus.

- An arm is said to be adducted when it is brought medially from coronal plane. The normal ROM is 40 to 50°. The pectoralis major, teres major, along with latissimus dorsi, are the muscles involved in shoulder adduction.

- Abduction- Abduction is lateral displacement of an upper limb in coronal plane relative to midline.[36] Common range of motion is about 150 degrees. In this motion plane, glenohumeral joint's ROM may be used for detecting several diseases, knowing how various muscles impact this movement is critical.[35]

i. supraspinatus is in charge of the initial 0-$15^0$of abduction.[37]

ii. The deltoid middle fibres are accountable for 15 to $90^0$of abduction following.

iii. Scapular rotation caused by serratus anterior and trapezius motions allows for the abduction exceeding 90^0.

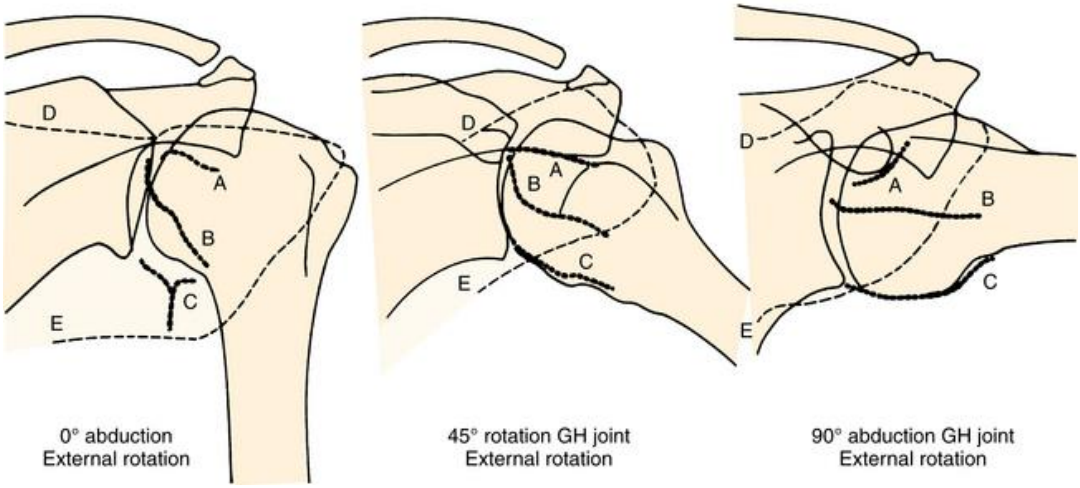

Figure-6: Anteroposterior (AP) views of the orientation of the glenohumeral (GH) ligaments in external rotation as a function of shoulder position. A, Superior glenohumeral ligament. B, Middle glenohumeral ligament. C, Inferior glenohumeral ligament. D and E, The capsule.[38]

Nerves

The axillary nerves, lateral pectoral, along with suprascapular all provide nerve endings to shoulder joint. The glenohumeral joint is innervated by brachial plexus, a nerve matrix created by the ventral rami of the lower four cervical nerves and the first thoracic nerve (T1, C8, C5, C7, C6). The axillary nerve's structure is noteworthy due to its proximity to shoulder joint. The axillary nerve begins in the posterior chord of the brachial plexus and extends down via the subscapularis muscle and into the inferior glenohumeral joint capsule. The posterior circumflex artery enters the humeral head through the deep deltoid fascia and exits by the surgical neck. [34]

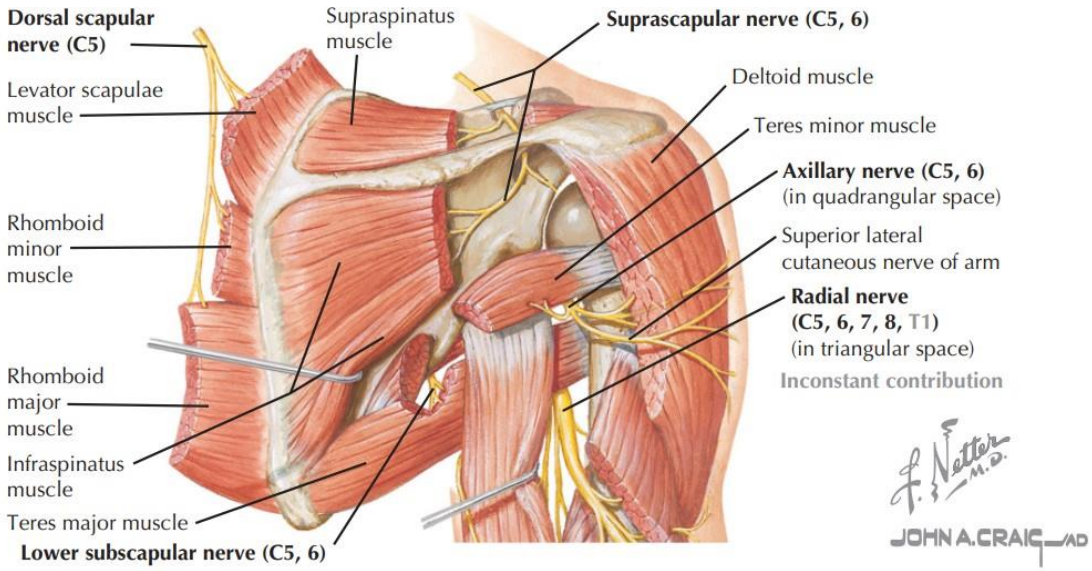

Figure-7: Nerve supply of shoulder joint[29]

Muscles

The subscapularis, infraspinatus, teres minor, along with supraspinatus muscles make comprise the rotator cuff. The rotator cuff aids in shoulder stability when the humeral head is squeezed against the glenoid. Thus, the glenohumeral joint is dynamically stabilized by the rotator cuff muscles. Along with rotator cuff, the LHBT is essential for keeping the shoulder stable. Current medical theory holds that stabilising role of LHBT in glenohumeral joint becomes crucial in the shoulder of a person with rotator cuff instability.

Approximately 15°of abduction may be attributed to the supraspinatus muscle. The teres minor as well as infraspinatus muscles help to move shoulder. Muscles between shoulder blades are innervated by the suprascapular nerve (infraspinatus as well as supraspinatus). Whereas the axillary nerve supplies the teres minor muscle, the scapular nerve supplies the subscapularis muscle.[30]

Applied anatomy

As the subject experiences contractures because of a frozen shoulder, the accessible space and volume surrounding the GH joint alter.

It is presumed that the area of the region surrounding the GH joint drops from 15 to 35 cm to 5 to 6 cm. A glenohumeral ligament enlargement and fibrosis may also result from a rotator interval enlargement and fibrosis at the top of the cuff. The tightening of the inferior glenohumeral ligament appears to be the most crucial.

The IGHL is located at the bottom of the joint and serves as the hammock for an anterior, posterior band. However, this additional ROM at the GH joint is limited by ligament contraction.

A little note on the capsule: It offers the GH joint a distraction of around 2 to 3 millimetres (mm), which is crucial. It contributes minutely to stability of the joint by itself. On the other hand, the rotator cuff tendons inserts into the capsule. As a result, the capsular tension can be affected by the rotator cuff's dynamic motion. Overall, both muscles and ligaments connect straight into the capsule, which provides supplementary support to the GH joint.

A last aspect is neurovascular, which might alter selectively owing to the inflammatory response that could be linked to the current concept of capsulitis.

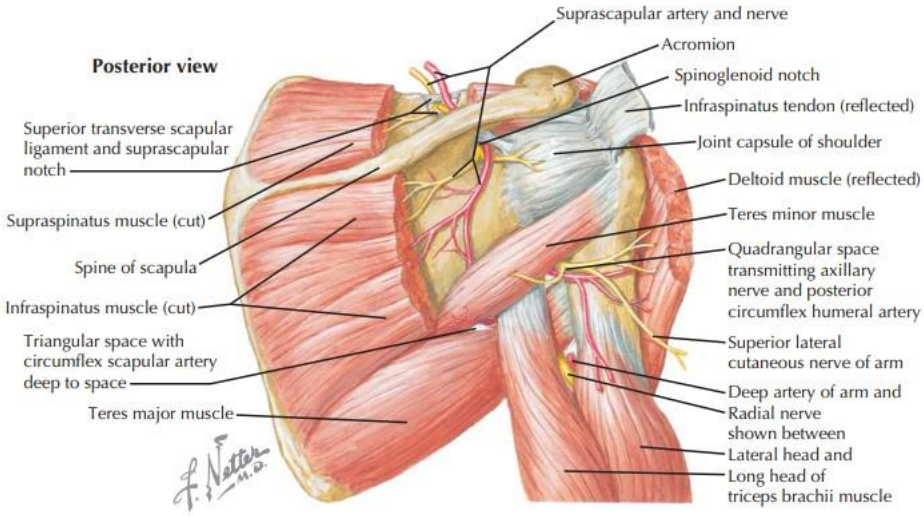

Figure-8: Anatomy of rotator muscles[29]

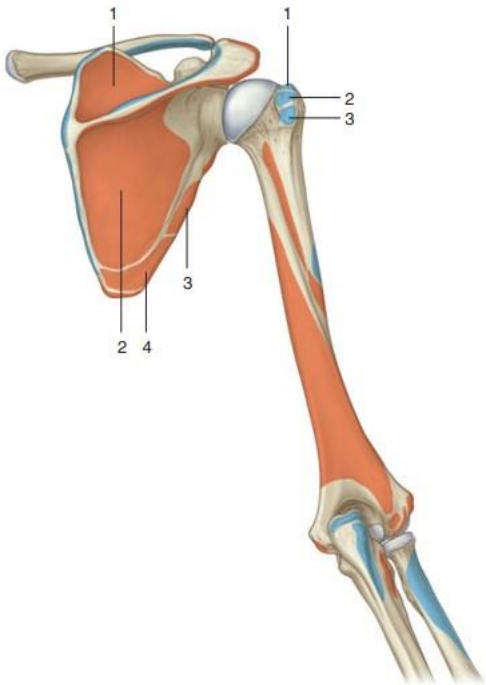

Figure-9: Origin and insertion of rotator cuff muscles 1. Supraspinatus, 2.infraspinatus, 3. Teres minor, 4. Subscapularis[32]

Pathophysiology.[39]

Axillary recess, coracohumeral ligament, and the anterosuperior joint capsule are all impacted by the disease process.

- Small joints, a lack of axillary folds, a constricted anterior capsule, synovitis ranging from moderate to severe, and the absence of genuine adhesions are common symptoms.
- Patients with frozen shoulders also tend to have stiff rotator cuffs, which likely contributes to their restricted range of motion.
- Whether this disease is a fibrotic ailment, an inflammatory disorder, or an algoneurodystrophic process is still open for dispute.
- According to evidence, tissue contraction is preceded by synovial inflammation, which is followed by capsule fibrosis in which type I and III collagen are laid down.
- Serum cytokine levels have been shown to be elevated, which helps with tissue remodelling and repair during inflammatory processes.
- Chronic inflammation and fibrosis are features of frozen shoulder, and studies have shown cytokines as a key player in this process for both primary and secondary forms of the disorder.
- One idea suggests that capsule structures and stiffening of ligamentous may result from a combination of excessive fibrosis and an abnormal absence of collagenous remodelling.

Clinical manifestations and Usual natural course of peri arthritis shoulder:

Traditionally, a subject suffering from adhesive capsulitis often experiences three phases.[40]

In doing a joint examination, remember the dictum of the Alan Apley, a prominent orthopaedic speaker and teacher: Look, Feel, Move.

Look: In adduction and internal rotation, it is held by the side. Mild atrophic changes of deltoid as well as supraspinatus might be observed.

Feel: On palpation reveals widespread soreness throughout glenohumeral joint, which spreads to areas of interscapular and trapezius due to unsuccessful splinting of the troublesome shoulder.

Move: A fully blown capsulitis eliminates outward rotation. The classic sign of a frozen shoulder is this. It is crucial to demonstrate that neither active nor passive motions may allow for external rotation (ER). For instance, if external rotation could be completed without difficulty with a doctor's assistance, we would assume a serious rotator cuff damage that would necessitate a whole different type of treatment. All other joint motions are limited in frozen shoulder, and any movement that does occur often originates from the thoracoscapular joint.

Three stages of clinical manifestation.[7]

Painful freezing stage

This stage duration is about 10 to 36 weeks. Stiffness and pain in the shoulder area, with no known injury history. The nagging persistent ache gets worse at night, and nonsteroidal anti-inflammatory medicines have no effect.

Adhesive phase/Frozen stage

Occurs between 4 and 12 months. Even when the discomfort ultimately goes away, the stiffness stays. Only the most severe movements cause pain. Shoulder motions are drastically reduced, with external rotation nearly obliterated.

Resolution phase/Thawing stage

It takes between 12 and 42 months. Following the frozen phase, a natural loosening of restrictions occurs during the thawing phase. More than 30 months down the line on average, from the onset of a frozen shoulder to the point of maximal remission.

Diagnosis

Patient history, a physical exam, and imaging tests all contribute to a definitive diagnosis of frozen shoulder (ruling out the other conditions rather than confirming the diagnosis of PA). The AC diagnosis cannot be verified by a single laboratory or imaging test. Since the results of the presently available modalities (like ultrasonography, radiography, computed tomography and plain magnetic resonance imaging) are sometimes unsatisfactory, and diagnostic imaging of PA may be challenging. Therefore, it is not possible to diagnose rotator cuff tendon tears or glenohumeral osteoarthritis using radiography alone.[41]

Treatment modalities:

Up to 90% of frozen shoulder patients benefit greatly from conservative treatment. The method used to treat frozen shoulder in clinical procedure frequently relies on clinicopathological stage. Common conservative management includes oral medications like NSAIDs, calcitonin, physical therapy, corticosteroid, exercise, steroid injection as well as hydrodilation. Treatment involves the use of oral drugs that temporarily relieve pain during

the uncomfortable freezing period but cannot be utilized long-term or to increase range of motion. However, manipulation under anesthesia (MUA) or arthroscopic capsular release may be necessary for a select few individuals who continue to decline after ACR (arthroscopic capsular release).[42]

NSAIDs remain a common choice among medical professionals treating frozen shoulder. Generally, short course is most commonly advised for relieve of pain in freezing phase but can't be used for long term use. Steroids are the second line of drugs used in the medical management. Both oral as well as local steroid are used in the management. It can be used only in the early stages of PA and won't be effective in later stages once fibrosis has been established. Improvement of symptoms is noted with oral steroids till 6 weeks.[43]

Local steroid injection is the common method used to provide pain relief in the freezing stage of PA. However, few complications have been noted with use of steroid, like fascial flushing, chest and shoulder pain, nausea, hyperglycemia, vasovagal reactions during injections.[43,44]

Physiotherapy (PT) always remains as cornerstone in the management of PA. It is always recommended along with the oral NSAIDs, steroids or local steroids. Various modalities are used in PT for pain relief like SWD (short wave diathermy), hot packs and ultrasound. acupuncture, extracorporeal shock wave therapy (ECSWT) and suprascapular nerve block has also been used as conservative management in the treatment of PA.[43]

Surgical intervention is planned in patients in whom extended conservative treatment failed. Most commonly used techniques are MUA and ACR. MUA is performed mostly in second stage of PA and secondary PA. Rotator cuff tear, humeral shaft fractures, labral tear, complex regional pain syndrome and nerve injury are some of the complications noted.[43]

Now that arthroscopic techniques have advanced to the point that fibrosis of the capsule-ligament complex may be released under direct visualization, arthroscopic capsular release has supplanted MUA as the gold standard surgical treatment for refractory PA. Postoperatively, the MUA group exhibited more external rotation than the ACR group. [45]

1. **Platelet-rich plasma**

Autologous PRP (platelet-rich plasma) is produced by centrifuging the patient's own blood to concentrate the platelets. Centrifugation of platelets concentrates the growth factors and cytokines— IGF-1, EGF, VEGF, PDGF, and TGF-1—found in their alpha granules, allowing them to be released at supraphysiologic quantities at the injury site to aid the body's healing processes.[46,47] Human platelet counts typically range from 1.5to 3.5lac/L. Up to 1,000,000/L of concentrated platelets have been demonstrated for promoting bone and soft tissue regeneration by tripling the amount of growth factors present.[48]

History

PRP is a specific kind of plasma that contains platelets. It is also called platelet-rich growth factors (GFs), PRF (platelet-rich fibrin) matrix, platelet-rich fibrin, and platelet concentrate. PRP term was initially used in the field of haematology.[49] As a transfusion product for the treatment of thrombocytopenia, the term was coined in the 1970s by haematologists to denote plasma with a platelet count greater than that of peripheral blood. After another decade, 50 PRP was first used in maxillofacial surgery.[51]

PRP's anti-inflammatory properties prompted cell growth, whereas fibrin's adhesion and homeostatic abilities were useful.[52] As a result, PRP has mostly been employed in the musculoskeletal sector in treat Injuries occurring during sports. Its use in pro athletes has

garnered substantial media interest and has been widely employed in this sector.[53] Additionally, PRP is utilized in ophthalmology, urology, paediatric surgery, cardiac surgery, obstetrics, and plastic surgery.[50]

In dermatology, use of PRP, particularly for its advantages in alopecia, skin rejuvenation, scar revision, wound healing, and regeneration of tissue has recently attracted more attention.[54,55,56,57,58]

Platelet Biology:

The common pluripotent stem cell from which all blood cells are derived can give rise to several cell lineages. For every kind of cell, there are progenitors that can further divide and mature.

The production of platelets, also known as thrombocytes, occurs in the bone marrow. Platelets, which are nucleated annular cellular components of variable diameters and the least dense of all blood cells at roughly 2 m in diameter, play an important role in clotting. Between 1.5 to 4.0 million platelets per micro liter of blood are considered normal.[50]

Platelets include a variety of secretory granules which are necessary for functioning of platelets. Granules are classified into three types: lysosomes, dense granules, along with α - granules. The highest quantity of these granules is found in each platelet, which constitute 50–80 of them.

The aggregation process is largely controlled by platelets. The primary role is to help maintain homeostasis through three stages: aggregation, activation, and adhesion. Platelets get activated in response to vascular damage, and their granules then secrete chemicals that aid in coagulation.[59]

Platelets have been formerly assumed to have exclusively hemostatic action, but scientific study and technology have offered a fresh viewpoint on platelets and their roles in recent years. Studies have shown that platelets are rich in cytokines and GFs, which may affect processes including cell proliferation, stem cell migration, angiogenesis, and inflammation.

The pericellular milieu is altered by GFs (growth factors) and cytokines released by platelets in PRP upon activation. There are signaling molecules in PRP since it comes from the body itself. Platelets in PRP release a number of growth factors (GFs), including interleukin 8, metalloproteinases 2, 9, insulin-like GF 1, 2 (IGF-1, IGF-2), hepatocyte GF, epidermal GF, platelet-derived GF, FGF, VEGF. [49,60]

Indications in relation to shoulder disease

The non-surgical treatment in various shoulder pathologies has shown promising results with usage of PRP. PRP is being utilized more often to cure rotator cuff, and there is growing evidence to support this practice; however, there is a lot of variation in PRP preparations and delivery techniques, which limits the general result of these studies.[61,62] In certain cases, rotator cuff injuries may be treated without surgery by using physical therapy, NSAIDs, as well as corticosteroid injections to alleviate clinical symptoms along with functional limitations.[63] If PRP is utilized for treating rotator cuff injuries non-surgically, it may reduce inflammation and discomfort while speeding recovery, delaying the need for surgery. Research has focused on PRP's potential as an alternative to corticosteroid injection.

Contraindications of PRP for shoulder disease

Absolute contraindications

- Subjects on chronic antiplatelet therapy[64]
- Infection at the procedure site
- Septicemia
- Hemodynamic instability
- Critical thrombocytopenia
- Platelet dysfunction disorder

Relative Contraindications:

- Consistent use of NSAIDs during the first 48 hours after surgery
- Injection of corticosteroids at the location of therapy within a month
- Administration of corticosteroids through mouth for the previous two weeks
- Recent fever or illness
- Usage of Tobacco
- Cancer- mainly hematopoietic or bone
- Chronic liver disease
- Hypofibrinogenaemia
- Hemoglobin less than 10 grams/deciliter
- Count of platelets < 105/ul

Forms of PRP

PRP can be inactive or activated, and it either be leukocyte-poor or leukocyte-rich. A PRP categorization system (Table 1) has been developed based on these four variants.[65] PRP is

activated when it is produced with CaCl2 accompanied or absence of serine protease.[66] The stimulation induces platelet granules to release cytokines, ensuring that they are abundant following injection of the preparation. Platelet interaction with intrinsic collagen and thromboplastin, instead, activates platelets inside connective tissue in the non-activated state.[67]

Table 1: Types of platelet-rich plasma. [65]

	WBC (White blood cells)	Activation	Platelets Concentration
Type-1	Elevated	Nil	A,>5× B,<5×
Type-2	Elevated	Enabled	A,>5× B,<5×
Type-3	Less or normal	nil	A,>5× B,<5×
Type-4	Less or normal	Enabled	A,>5× B,<5×

Type-1 PRP is not triggered by external activator-like calcium or thrombin and has a higher quantity of white blood cells and platelets than baseline. Increased platelets, as well as white blood cells, are seen in type 2, which is triggered by an external activator like thrombin or calcium. The term platelet-leukocyte gel is another name for this form of PRP (type-2). Type-3 PRP contains a higher concentration of platelets and does not need activation before usage, therefore, it does not include any white blood cells. Platelet-rich plasma (PRP) is another name for this PRP kind. Type 4 involves an increased platelet concentration and is induced by extrinsic activators such as thrombin and/or calcium. Type 4 PRP is often referred to in the literature as platelet gel. Platelet counts in subtype-A patients are at least five times higher than average. Subtype-B has a platelet count that is larger than the norm but is still below five times the norm. If the concentration is not specified, no subtype is assigned.[65]

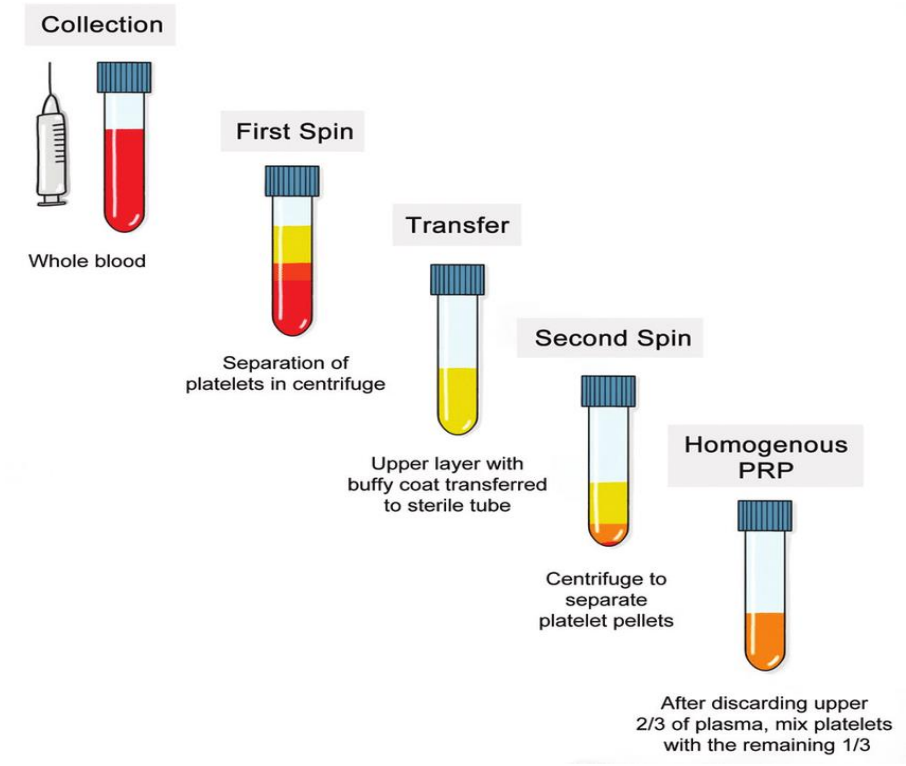

Figure 10: Centrifugation method for PRP preparation.[65]

Blood is drawn from the participants, and then it is subjected to first spin for 12 minutes at a 200G rate. The second spin lasts eight minutes at a pace of 1600G, and there is no intervention between the first and second spins. Finally, the poor platelet plasma (PPP) and PRP are aspirated with the use of a 20G long needle inserted with the aid of an 18G guide needle.[68]

As was mentioned before, PRP may be either leukocyte-poor (LP PRP) or leukocyte-rich (LR PRP). Although precise role of leukocytes in PRP has yet to be determined, it is assumed that leukocytes have a role in preventing the spread of certain pathogens and aiding in healing of infected soft tissue. However, interleukin (IL)-1, IL-6, IL-8, and TNF-alpha (tumour necrosis factor alpha) synthesis activation by leukocytes has been linked to an exaggerated

inflammatory response. Moreover, leukocytes are hypothesized to promote the generation of reactive oxygen species, which might result in further muscle injury and inflammation.[67]

Functional outcome with various scales – Quick DASH, VAS, SPADI

Clinical effectiveness should ideally be estimated using patient-rated performance metrics in research and clinical settings.[69] For the upper limbs and shoulder, there are a number of patient-reported outcome indicators which are unique to those areas. The most common methods for evaluating the success of treatment for musculoskeletal shoulder pain are the SPADI, DASH and QuickDASH.[70,71,72]

SPADI is a joint-specific test designed to evaluate pain and disability in the shoulder. The QuickDASH and DASH are patient-rated upper limb outcome assessments that encompass factors like social functioning, leisure, and job. The DASH and QuickDASH have been found to have a high association.[73,74] To decrease patient burden, the shorter version QuickDASH protocol has been proposed over the DASH protocol. With diverse content, SPADI and DASH/QuickDASH are expected to cover a wide range of functioning from a biopsychosocial point of view. The level to which SPADI and QuickDASH are connected, however, hasn't been established.[69]

Shoulder Pain and Disability Index (SPADI)

The SPADI is 13-item patient questionnaire utilized for evaluating both pain as well as functional limitations related to ADLs involving the upper limbs. There are five items on the pain scale and eight on the disability scale.

The 1991 published edition assesses objects using VAS (Visual Analogue Scale), but the 2016 edition rates things using NRS (Numerical Rating Scale).[75]

SPADI can be utilized in the following research subjects:[76]

- Shoulder pain
- Rotator cuff disease
- Osteoarthritis of shoulder
- Rheumatoid arthritis involving shoulder
- Frozen Shoulder
- Shoulder arthroplasty

Techniques of application

The patients are asked to select the number that best depicts their amount of pain and discomfort utilising the affected shoulder. While the disability scale adds up to 80, the pain scale adds up to 50.

Zero is considered as best score, while hundred is considered as worst score. A higher score indicates greater impairment.

All unanswered questions should be subtracted from the final score of each subscale when scoring SPADI. In other words, if one question in the pain portion is skipped, the score is divided by 40.

Reliability

The intraclass correlation coefficient (ICC) for SPADI has been determined to be 0.89 across a number of patient subgroups. Cronbach's alpha often exceeds 0.90, indicating strong internal consistency.[72]

Validity

The construct validity of the SPADI is good, and it correlates well with other local shoulder surveys.[77,78] It was shown to be responsive to changes in context and time and to differentiate between patients whose illnesses are improving and those whose diseases are worsening across a range of patient populations.[79,72]

Responsiveness

The lowest measurable variation that is meaningful to the subject has been documented to be 8 points.[78] The smallest discernible change after applying SPADI on the same subject multiple times is 18 points.[80,25]

Note: SPADI has been interpreted into a number of languages, including Greek, Spanish, Dutch, Hindi, Thai, and Italian, each having their validity and dependability.

QuickDASH

A condensed type of the original DASH outcome metric is QuickDASH result. There are 30 components in the original DASH outcome compute; however, Quick DASH only has 11. This is a survey designed to evaluate a person's functional capacity, stress tolerance, and level of dissatisfaction.[81] For the QuickDASH tool, the patient selects a rating on a 5-point Likert scale for indicating the degree of their symptoms.[82]

- Everyone who suffers from one or more musculoskeletal disorders of the upper extremities is addressed by the DASH.[83]
- QuickDASH outcome result is designed for use on people who have one or more arm, shoulder, or hand problems.[82] Several instances of DASH inquiries

How would you evaluate your capacity to complete the specific steps on a scale of one to five (One is no problem, five is immensely difficult):

Put an item on the shelf over your head.

Food should be chopped with a knife.

To clean your back

The questionnaire's last section employs a comparable scale to score your complaints and their effect on profession and sport.

Scoring

QuickDASH and DASH Scoring Formula = ([(sum of n responses)/n] -1)(25),

here n defines the number of items completed.

- If more than three data points are missing, DASH will not be able to be computed.
- If more than one thing is missing, it will be unable to do a Quick DASH.

Level of Disability

Higher scores on QuickDASH along with DASH indicate a greater degree of severity and impairment, while lower values imply a lesser degree of disability.[81] Between zero (no impairment) to one hundred (full disability), the results on both tests range.[70]

Extra optional modules

There are two optional 4-item extra modules for DASH and QuickDASH. The two possible extra modules are as follows:

- Work - For individuals receiving workers' compensation benefits or whose disability restricts their working ability.

- Sports/Performing Arts - For musicians and sports person.

If a response is absent, optional modules can't be scored.[74]

Table 2: Difference between DASH and Quick DASH

Psychometric Property	DASH	QuickDASH
Reliability	ICC(2,1) = 0.96 [83]	ICC(2,1) = 0.90 [84]
Validity	Pearson r > 0.70 [83]	Pearson r > 0.70[74]
Minimal Detectable Change (MDC)	12.75% - 17.23%[81]	11.2%[84]
Minimal Clinical Important Difference (MCID)[85]	10.83-15	15.91-20
Responsiveness	Good responsiveness to self-rated changes before and after most arm, shoulder, and hand diagnoses and surgeries[81] Comparable responsiveness compared to other joint and disease-specific measures[83]	Slightly more responsive to the original DASH outcome measure and, clinically, may be preferable due to shorter length
"Miscellaneous"	Available in 27 different languages. Many of these versions have had or are in the process of being tested for their psychometric properties.[81]	QuickDASH measure has more relative efficiency compared with the DASH[70] "Recent studies have also analyzed the reliability of a modified QuickDASH outcome measure, from a questionnaire into a visual analog version[82]

(MDC)– minimum degree of deviation required to classify a change as deviation rather than error.[81]

(MCID) – the required minimum improvement in the score before it may be considered clinically significant.[84]

Comparison of Effectiveness of intraarticular PRP (IA PRP) vs single intraarticular corticosteroid injection (IA CS) in shoulder diseases based on the functional outcome with the Quick DASH, pain by VAS, SPADI and other parameters

A prospective randomized controlled study conducted in 2016 with 40 symptomatic patients with partial rotator cuff injuries to compare sub-acromial platelet rich plasma injections vs corticosteroid injections at 6, 12 and 24 weeks' time periods. Clinical outcomes improved statistically significantly in both injection groups when compared to before injection. After 12 weeks, the platelet rich plasma group had statistically significant improvements on the ASES, SST, CMS, and VAS for pain. By the end of the 24-week period, neither group receiving injections nor the control group had a statistically significant advantage. The results of the research demonstrated that PRP injection is an effective and safe alternative to corticosteroid administration for patients with partial rotator cuff injury.[63]

A double-blind RCT was performed in 2013 with 40 patients suffering from partial tears or rotator cuff tendinopathy. Rehabilitation was provided for patients whether they had had PRP or a placebo (saline solution) injection. At baseline, 3, 6, 12, and 24 weeks, and after 1 year of injection, shoulder ROM and SPADI had all been measured in each group of 20 patients. WORC (Western Ontario Rotator Cuff Index) and VAS of shoulder pain were also calculated using the Neer test. They found no significant variation in painfulness between the two groups.[86]

A RCT was conducted in 2015 to assess the efficacy of corticosteroid injection compared to NSAIDs. 74 patients with primary AC were randomized into 3 categories to receive IA

injections with oral NSAIDs or betamethasone. Using VAS, ASES shoulder score, and QuickDASH score, the clinical result was evaluated at 2, 4, 8, and 12 weeks post-operatively. Early injection of corticosteroid can be used for pain relief in cases of pain persisting despite non-invasive and conservative treatments.[87]

In 2017, a randomized controlled experiment compared PRP injection, corticosteroid injection, and ultrasonic therapy for the treatment of FS. The test arm received 2ml of PRP. A total of 195 subjects were randomized either to test arm or control arm. At 12 weeks, When compared to corticosteroid and ultrasonic therapy, PRP treatment dramatically increased passive and active ROM of the shoulder, as well as QuickDASH and VAS scores. At six weeks, QuickDASH and VAS scores for PRP treatment were statistically significantly higher than for ultrasonic therapy. No major complications were seen. This randomized controlled research found that a single PRP injection was more effective than either ultrasonic therapy or corticosteroid injection in treating FS shoulder.[2]

In 2018, researchers performed a randomized controlled trial to assess the usefulness of corticosteroid injection for the treatment of early FS. Overall 77 patients have been involved in the trail and randomized into 3 different groups based on the injection site; rotator interval (RI) group consists of 27, IA injection group consists of 24 and 26 patients in subacromial space (SA) group. Clinical assessment was done using VAS, ROM, DASH score and constant score at the end of 4^{th}, 8^{th} and 12 weeks following procedure. Improvement in pain VAS, ROM, DASH and constant score were faster as well as more notable in RI group from 4^{th} week following the injection.[88]

A retrospective longitudinal study was conducted in 2018 to assess the optimal timing for intra-articular corticosteroid in adhesive capsulitis of shoulder. Overall 339 patients were taken into the study who were unresponsive to conservative management for 1 month and

who had taken ultrasound guided IA-CS injection. Patients were assessed using VAS, SPADI scores and passive ROMs at end of 1st and 12th month. Author's stat that there is improvement in VAS, SPADI scores both long term and short term, significant improvement in internal rotation when analyzed at 1st month and 12th month.[89]

An observational study was conducted in 2018 on assessment of role of IA-steroid injection in frozen Shoulder (FS). The research involved 32 patients in total. Study population were evaluated using Constant Shoulder Score (CSS) and VAS score at 2nd, 6th and 12th weeks following procedure. There is significant improvement in CSS and VAS scores throughout the follow-up intervals.[90]

A prospective comparative study conducted in 2019 for assessing the effectiveness of single intraarticular PRP and CS injection in subjects with frozen shoulder. The study population included subjects with control and test group. Test group was IA-PRP, and control was IA-ICS. After a 12-week follow-up, this study found single dose of IA-PRP to be significantly productive in reducing pain and showed improved shoulder movements and disability in frozen shoulders compared to IA-ICS.[92]

A comparative study was conducted in 2019 on effectiveness of injection methyl prednisolone versus autologous PRP in 60 patients with PA. Clinical assessment was done using VAS and QUICKDASH -9 at the end of 1st, 2nd and 6 months post-procedure. At the conclusion of the second and sixth month following the procedure, there was a notable improvement in VAS and QUICKDASH- 9 in PRP group.[93]

An interventional case series was conducted in 2019 on the effects of PRP injection in adhesive capsulitis. There was a total of 9 participants who were calculated at baseline, 2, 6, and 12 weeks after the operation using ROM, VAS, and SPADI scores. Active and passive

ranges of motion, visual analogue scale, and SPADI score were significantly improved at the end of the 2, 6, and 12 weeks after surgery.[94]

A randomized controlled trial comparing PPR to corticosteroid treatment for adhesive capsulitis in 120 patients is scheduled to begin in 2020. Researchers will use SPADI ratings at 1, 3, and 6 months to measure the severity of pain and impairment. After three and six months of treatment with corticosteroids, patients in the steroid group demonstrated a greater reduction in pain and disability compared to the placebo group. Throughout the follow-up period, patients in PRP group reported statistically significant increases in SPADI scores, mean disability scale and pain scale.[95]

In 2020, researchers will conduct a randomized clinical trial comparing the effectiveness of ultrasound-guided PRP injection with conventional physical therapy (CPT), assessing their progress at 1, 3, and 6 weeks after the injection and physical therapy, respectively, using visual analogue scale, shoulder, and hand scores. There was no discernible difference in results between the two groups, according to our analyses. However, IA-PRP injection group consumed less acetaminophen than the group following CPT.[96]

A randomized control trail was conducted in 2021 to assess the comparison of functional outcome between IA-CS versus IA-PRP injections in frozen shoulder patients using VAS, UCLA (University of California at Los Angeles Shoulder score) and ROM at post-therapy and after 12 weeks of therapy. 202 patients participated in the study; group-a a (PRP) consisted of 102 cases, and 100 cases in group-B (CS). After 12 weeks of therapy, the PRP group's VAS, UCLA scores, and ROM were significantly improved.[97]

A controlled laboratory and cohort study in 2021 assessed the pain and functional outcome between the ultrasound guided IA-PRP versus corticosteroid control group using VAS,

SPADI scores and ROM at 1st week, 1st, 3rd and 6 months after the procedure. 15 patients were included in PRP group, with corticosteroid group being as control group. It is significant to improvise in VAS, SPADI scores, ROM, muscle strength till 3 months in CS group, but it was significantly improved in PRP group in the 6th-month post-procedure.[98]

A triple-blinded RCT trial conducted in 2021 for assessing IA-PRP's efficacy in management of frozen shoulders. 32 subjects with frozen shoulder were included. By the third month, PRP group had pain relief and movement in all directions compared to the control group. Hence these results suggested PRP intraarticular injections in managing frozen shoulders.[99]

A prospective study in 2022 assessed the efficacy of PRP or CS under ultrasound guidance in the treatment of adhesive capsulitis. A total of 40 subjects with adhesive capsulitis were included. At the end of six weeks, the SPADI and numeric pain scale (NRS) scores were improved significantly for PRP group.[100]

According to a systematic evaluation of PRP's use in FS published in 2022, PRP is an effective novel technique for treating adhesive capsulitis.[101]

A prospective cohort research conducted in 2022 assessed the potency of PRP in adhesive capsulitis. There were 305 participants who all had adhesive capsulitis. Subjects had repeatedly received PRP weekly for four weeks. VAS scores were performed before and after the surgery, and The VAS scores significantly increased 6 weeks following therapy.[102]

In 2022, researchers randomized patients to receive either PRP or a local corticosteroid injection for shoulder periarthritis. There were a total of 60 patients in the trial, 30 in each of two groups (PRP &CS group). VAS and DASH ratings were used to evaluate pain and function at weeks 4, 12, and 24. According to the findings, significant improvements in VAS scores have been seen at the end of the 4th and 12th weeks in CS group, and the end of 24th

week in PRP group. After 24 weeks, the PRP group had significantly higher SPADI scores than the control group.[103]

A prospective study was conducted in 2022 for the assessment of role of PRP in periarthritis Shoulder. 50 patients diagnosed with periarthritis shoulder have been included in the study. The DASH and VAS scale scores have been used to assess pain and functional results at the end of the 3rd, 6th, and 12 weeks. SPADI VAS and scores increased significantly at the three, six, and twelve-week marks.[104]

LACUNAE IN LITERATURE:

PRP is increasingly being used in orthopedic surgery, with an emphasis on the shoulder on both surgical and non-surgical ground. Platelet-rich plasma is expected to improve recovery and accelerate development by producing growth factors from activated platelets at high levels, as per basic science and animal research. Despite this significant potential, there is no consensus on the therapy recommendations or usage of PRP because human subject research has not consistently supported its use in surgical or non-surgical shoulder problems, notably frozen shoulder. The absence of formulation, uniform dose and platelet concentrate and GFs that constitute PRP is one drawback. Furthermore, the advantage of adding leukocytes in PRP preparations is debatable. Because there is no defined procedure for giving PRP, the administration might differ amongst doctors. Because of these differences, cross-study comparisons are difficult to understand.

MATERIAL & METHODS

MATERIALS AND METHOD:

STUDY DESIGN: A parallel group randomized control trial.

STUDY PERIOD: December 2020 to July 2022

SOURCE OF DATA: Periarthritis shoulder patients reporting to the outpatient department (OPD) and admitted patients in department of orthopaedics in R L Jalappa Hospital and Research Centre (RLJH&RC), which is affiliated with Sri Devaraj urs Medical College, Tamaka, Kolar will be included for the study.

INCLUSION CRITERIA:

1. Patients aged 18-75 years with clinical diagnosis of Periarthritis shoulder, with less than 6 months duration.
2. Patients belonging to either gender.
3. Patients more than 3 months after failed conservative treatment.
4. Antero-posterior radiographs (AP) of shoulder joint.

EXCLUSION CRITERIA:

1. Past History of shoulder trauma/surgery.
2. Patients with hematological disorders.
3. Patient who is on antiplatelet or anticoagulant therapy
4. Patients with uncontrolled diabetes.

5. Shoulder instability.

6. Neurological disorders affecting shoulder.

7. Local skin infections.

8. History of infection of shoulder joint.

METHOD OF COLLECTION OF DATA

SAMPLE SIZE: In his research, Barman G. calculated an adequate sample size based on the percentage point change in VAS scores between the pre-study and post-study assessments taken 12 weeks apart.[92] 15.9 (8.0) and 22.8 (11.0) were the mean (SD) VAS scores at 12 weeks in IA-PRP and IA-CS groups, respectively. The sample size for the study is an estimation based on 80% power and alpha error of 5%. Estimated sample size per group was 31 in each group (31 in Intervention A and 31 in Intervention B), with a total sample size of 62. The formula was used to determine the appropriate size of the sample.

$$n = \frac{2s_p^2\left[z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right]^2}{\mu_d^2} \qquad s_p^2 = \frac{s_1^2 + s_2^2}{2}$$

Where,

- S_1^2 is defined as the Standard deviation in the first group
- S_2^2 is defined as the Standard deviation in the second group
- M^2_d is defined as the Mean difference between the samples
- α is defined as a Significance level of 95%
- 1-β- Power of 80%

Since loss-to-follow-up in our setting is around 10%, the final sample size was inflated to 34 in group-1 and 34 in group-2, leading to a total sample size of 68.

SAMPLING TECHNIQUE:

All consecutive patients who met the inclusion criteria were approached for Informed consent and then randomized into one of the two intervention groups.

Methodology:

All patients were evaluated by detailed history, clinical examination & radiographic findings. 68 patients were recruited based on inclusion criteria. Two groups were randomly divided using a computer-generated randomized table. Group A had received 4ml PRP, and Group B had received 2ml (80mg) of methylprednisolone acetate mixed with 2ml normal saline (total 4ml) to prepare CS injection into the shoulder's intraarticular area. With a posterior approach, the needle was inserted 2 centimeters below the acromion's angle and 2 centimeters medial to the acromion, with the coracoid process 2 to 3 centimeters below the needle's tip. A single centrifugation technique was used in PRP preparation. 24ml of intravenous blood was taken from the study population from the uninvolved side (cubital vein) with help of phlebotomist. A 2.0 ml dose of the anticoagulant ethylenediaminetetraacetate (EDTA) was added to the blood sample in two equal portions of 12 ml each in order to prevent a coagulation cascade. At initial blood draw time, a peripheral complete blood count has been acquired from the residual sample using an automated cell counter (Sysmex XN-550). Two to four times PRP containing tubes were moved front and back for thorough mixing of blood with anticoagulant. Following a 14-minute centrifugation at 1800 RPM to separate the RBCs and WBCs, the tubes were combined to yield roughly 5ml (2.5ml of PRP from every tube). Out of 5 ml, 4 ml of PRP were aspirated under aseptic conditions from two tubes using a spinal needle in a class IIA biosafety to inject the patient without adding buffering or an activator agent.[92] Patients were followed up for 24 weeks. Patients were accepted to take oral

Paracetamol 650 mg up to a max 3 times a day as rescue medication if any patients have pain post-injection or during follow-up, with a VAS score of more than 4.

FOLLOW-UP VISITS:

Functional outcome was evaluated using Quick Dash, VAS and SPADI for periarthritis shoulder follow-up period of 2, 4, 6, 8, and 12 weeks.

STATISTICAL ANALYSIS

VAS, Quick dash and SPADI were regarded as the main determinant of the result. Study Group (Group 1 (IA-PRP) vs. Group 2 (IA-CS)) was regarded as the Primary explanatory variable. Age, Gender, Platelet count (L), and RBS (mg/dl), etc., were all deemed to be pertinent research factors.

For quantitative variables, the relevant statistics (mean+/- SD) were presented in the descriptive analysis, while frequency and percentage were used for categorical variables. The necessary graphics, such as bar graphs and pie charts, were also used to illustrate the data.

By visually inspecting histograms and normality Q-Q plots, all continuous measurements were examined to define the distribution as normal of each group of study. Additionally, Shapiro-Wilk test was utilized to evaluate statistically. When the test's p-value was >0.05, the distribution was regarded as normal. The mean values of quantitative parameters that were normally distributed among study groups were determined utilizing an Independent sample t-test. Quantitative parameters, medians, and IQR that did not follow a normal distribution were compared across groups using the Mann Whitney u test.

Chi-square test reported the comparison of categorical outcomes between research clusters. In statistical terms, If the probability ratio (or p-value) is less than 0.05, the result is significant. The statistics were run using IBM SPSS version 24.[105]

RESULTS

RESULTS:

The final analysis included 68 participants in total.

Table 3: Descriptive analysis of the study population (n=68)

Study Group	Frequency
Group 1 (IA-PRP)	34
Group 2 (IA-CS)	34

Among the study population, 34 participants were included in intraarticular platelet-rich plasma, and the remaining 34 were included in intraarticular- corticosteroid group. (Figure 11 & table 3)

Figure 11: Pie chart of IA-PRP and IA-CS (N=68)

The study population was equally distributed among the two study groups

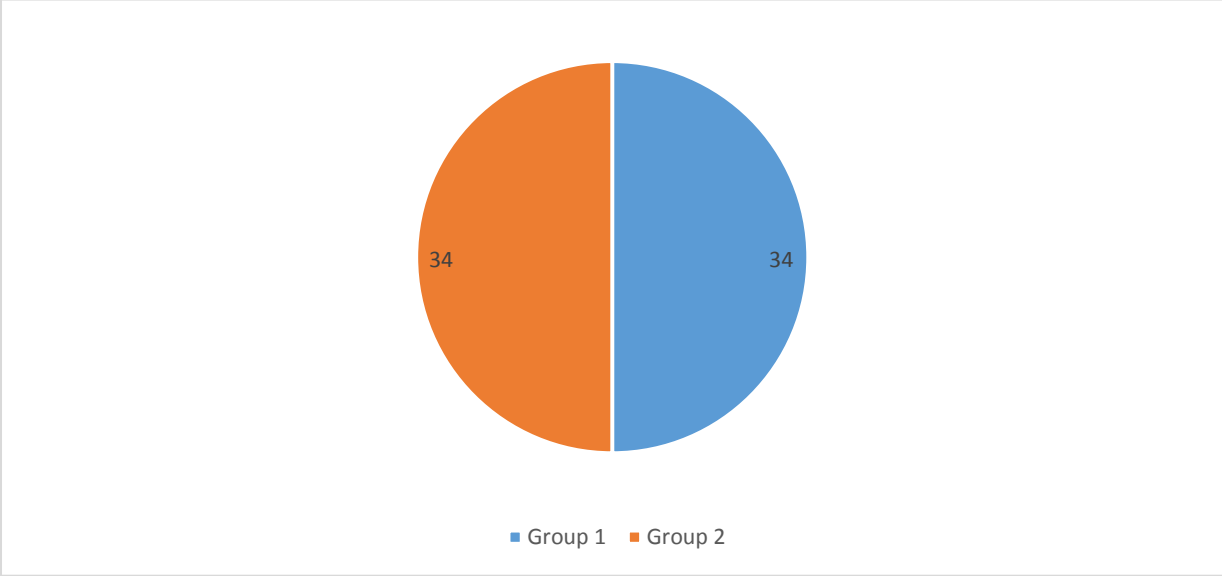

Table 4: Distribution of age (years) in each group of the study (N=68)

Parameter	Study Group (Mean ± SD)		P Value
	Group-1 (N=34)	Group-2 (N=34)	
Age (years)	58.38 ± 8.11	58.53 ± 7.77	0.9394

The mean age (years) in group 1 was 58.38 ± 8.11 and 58.53 ± 7.77 in group 2. With 0.9394 P value, mean age difference (years) in the study group was statistically insignificant. (Table 4 & Figure 12)

Figure 12: Error bars age (years) distribution in each group (N=68)

The most common age group of the study population was distributed between the 5th and 6th decade, with the mean age being 58 years

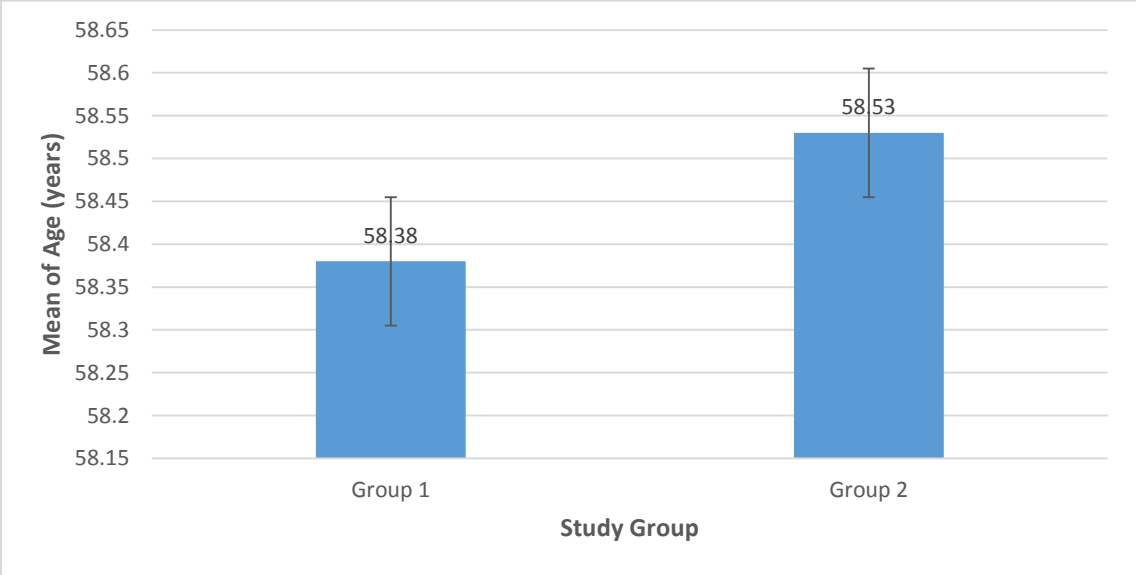

Table 5: Comparison of gender in the study clusters (N=68)

Gender	Study Group		Chi square value	P value
	Group 1 (N=34)	Group 2 (N=34)		
Male	15 (44.12%)	20 (58.82%)	1.47	0.2251
Female	19 (55.88%)	14 (41.18%)		

In group 1, 15 (44.12%) participants were male, and 19 (55.88%) were female. In group 2, 20 (58.82%) were male, and 14 (41.18%) were female. With a P-value of 0.2251, the gender-proportional difference between the study groups was statistically insignificant. (Table 5 & Figure 13)

Figure 13: Study clusters indicating gender distribution (N=68)

Males were more commonly affected than females in the study population, with a sex ratio of 1.06:1

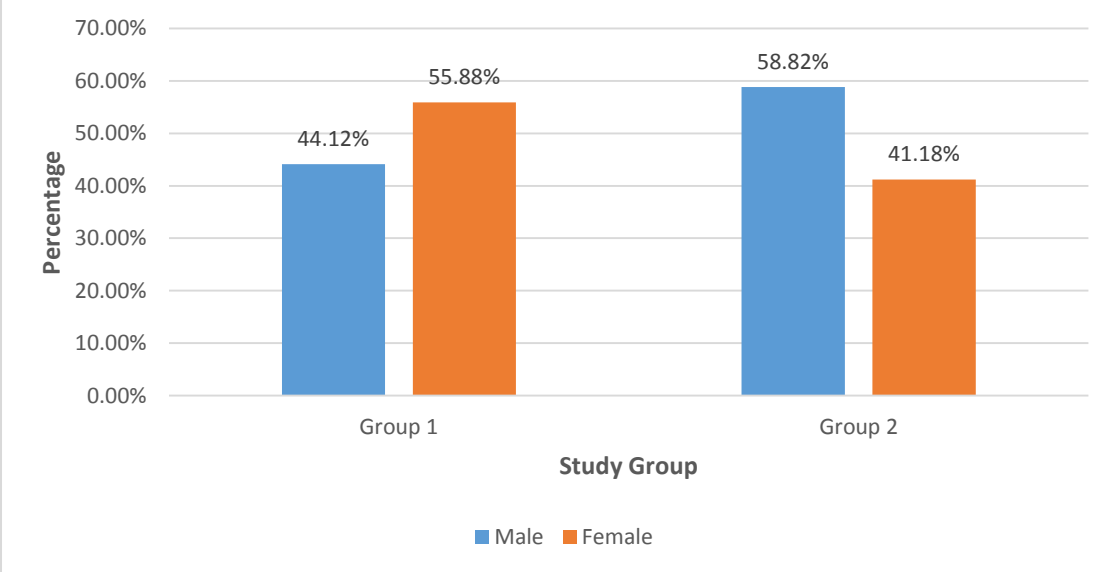

Table 6: Comparison of sides in the study groups (N=68)

Side	Study Group		Chi square value	P value
	Group 1 (N=34)	Group 2 (N=34)		
Right Side	18 (52.94%)	23 (67.65%)	1.54	0.2153
Left Side	16 (47.06%)	11 (32.35%)		

In group 1, 16 (47.06%) participants had left side involvement, while 18 (52.94%) had right-side involvement. In group 2, 23 (67.65%) participants had affected right side, and 11 (32.35%) had affected left side. With a P-value of 0.2153, the variation in side proportion across the study groups was found to be statistically insignificant. (Figure 4 & Table 6)

Figure 14: Cluster bar chart of side with study groups (N=68)

The research population showed a strong preference for the damaged dominant limb.

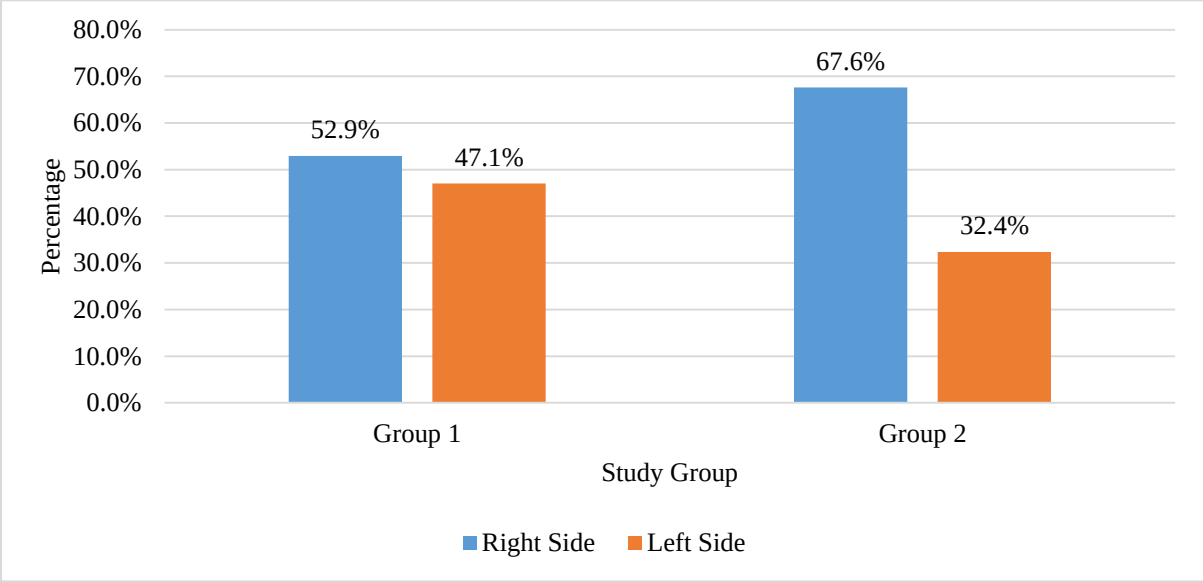

Table 7: Comparison of duration of symptoms (months) between study groups (N=68)

Duration (Months)	Study Group		Chi square	P value
	Group 1 (N=34)	Group 2 (N=34)		
<=6 Months	12 (35.29%)	7 (20.59%)	7.649	0.105
6-12 Months	10 (29.41%)	14 (41.18%)		
12-18 Months	10 (29.41%)	5 (14.71%)		
18-24 Months	2 (5.88%)	6 (17.65%)		
>24 Months	0 (0%)	2 (5.88%)		

In group 1, 12 (35.29%) participants were <=6 months in duration, 10 (29.41%) were duration between 6 to 12 months, 10 (29.41%) were duration between 12 to 18 months, and 2 (5.88%) were duration between 18 to 24 months. In group 2, 7 (20.59%) participants were <=6 months duration, 14 (41.18%) were duration between 6 to 12 months, 5 (14.71%) were duration between 12 to 18 months, 6 (17.65%) were duration between 18 to 24 months and 2 (5.88%) were duration between >24 months. P = 0.105 indicates no statistically significant difference was found in the percentage of duration (months). (Table 7 & Figure 15)

Figure 15: Cluster bar chart of duration (months) between study groups (N=68)

Most of the study population had symptoms between 6-12 months of onset, followed by less than 6 months and 12-18 months indicating most of the patients presented in the freezing stage and frozen stage.

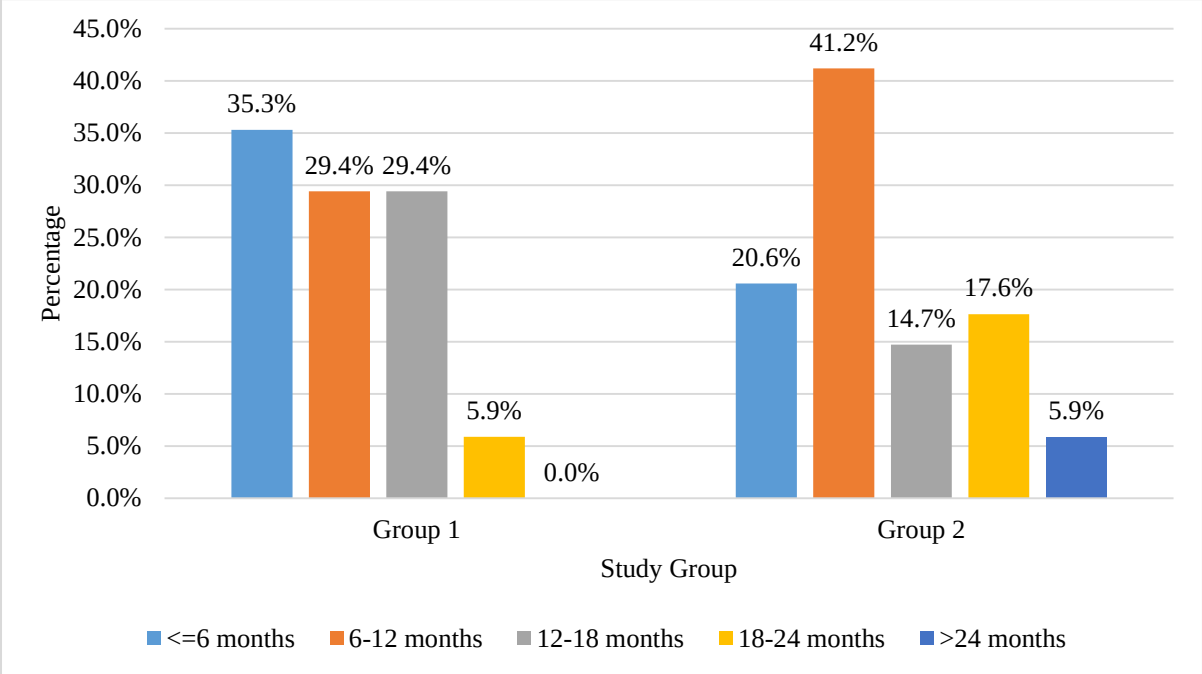

Table 8: Comparison of comorbidities in the study population (N=68)

Comorbidities	Study Group		Chi square value	P value
	Group 1 (N=34)	Group 2 (N=34)		
Diabetes Mellitus				
Yes	12 (35.29%)	14 (41.18%)	0.25	0.6177
No	22 (64.71%)	20 (58.82%)		
Hypertension				
Yes	8 (23.53%)	2 (5.88%)	4.22	0.0832
No	26 (76.47%)	32 (94.12%)		

No Test is Applicable due to the nature of the data

In group 1, 12 (35.29%) participants had diabetes mellitus, and 14 (41.18%) had diabetes mellitus in group 2. With a P-value of 0.6177, no statistically significant difference was found in prevalence of diabetes mellitus across study groups. In group 1, 8 (23.53%) participants had hypertension and 2 (5.88%) had hypertension in group 2. The prevalence of hypertension was not significantly different between control group and study group (P = 0.0832). (Table 8 & Figure 16)

Figure 16: Cluster bar graph of comorbidities with group 1 and group 2 (N=68)

The most common comorbidity condition noted in the study population was diabetes mellitus (38%), followed by hypertension (15%).

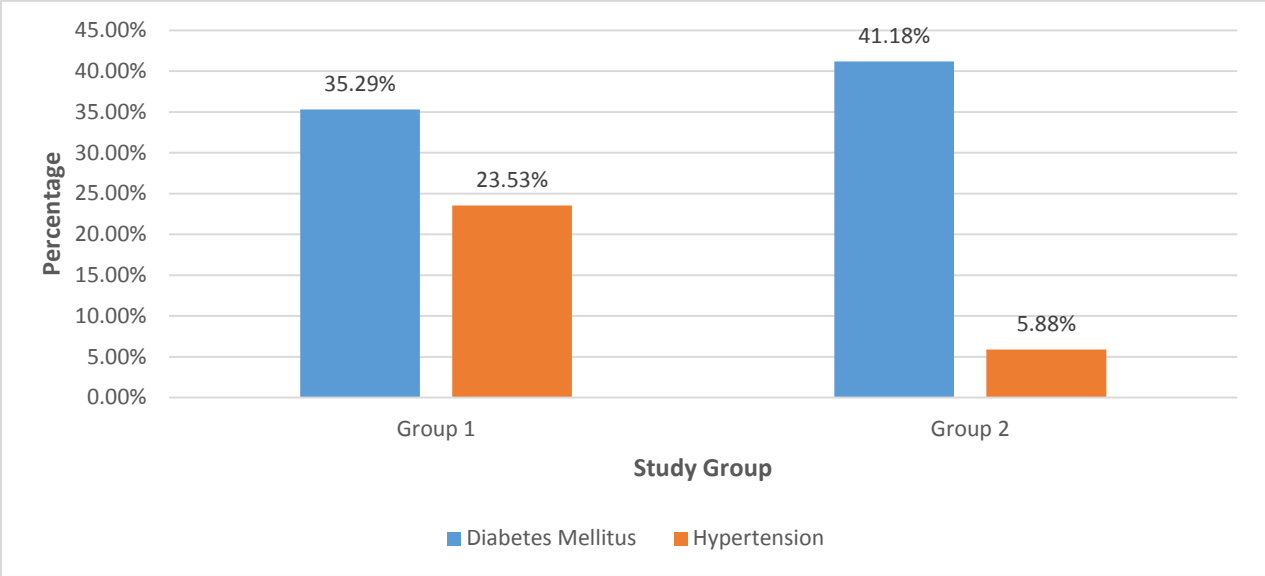

Table 9: Summary of platelet count (L) in group 1 (N=34)

	Mean ± S. D	Median	Minimum	Maximum	95% CI	
					Lower CI	Upper CI
Baseline platelet count (L)	3.26 ± 0.94	3.28	1.45	4.87	2.93	3.59
Post centrifugation platelet count (L)	11.61 ± 2.83	11.71	6.60	16.97	10.62	12.60

The mean baseline platelet count (L) was 3.26 ± 0.94 in group 1, the minimum level was 1.45, and the maximum level was 4.87 (95% CI 2.93 to 3.59). The mean post platelet count (L) was 11.61 ± 2.83, the minimum level was 6.60, and the maximum level was 16.97 (95% CI 10.62 to 12.60). Platelet count has been increased to almost 3-4 times of base platelet count, satisfying the definition of platelet-rich plasma.

Table 10: Comparison of RBS (mg/dl) with study groups (N=68)

Parameter	Study Group (Mean ± SD)		P Value
	Group 1 (N=34)	Group 2 (N=34)	
RBS (mg/dl)	169.50 ± 29.23	173.00 ± 23.58	0.7427

The mean RBS (mg/dl) in group 1 was 169.50 ± 29.23, and 173.00 ± 23.58 in group 2. With 0.7427 P value, mean RBS difference (in mg/dl) in the study group was statistically insignificant. (Table 10)

Table 11: Comparison of VAS score between the two study groups at variable time points (N=68)

Parameter	Study Group (Median (IQR))		Mann Whitney U Test (P Value)
	Group 1 (N=34)	Group 2 (N=34)	
Pre-injection (VAS score)	8.50(8.0 to 9.0)	8.00(7.0 to 9.0)	0.1439
Post-injection (VAS score)	7.00(7.0 to 8.0)	6.00(5.25 to 7.0)	<0.001
VAS at 2 weeks	6.00(6.0 to 7.0)	5.00(4.25 to 6.0)	<0.001
VAS at 4 weeks	5.00(5.0 to 6.0)	5.00(4.0 to 5.0)	0.0021
VAS at 8 weeks	4.00(3.0 to 4.0)	4.00(3.0 to 4.0)	0.4766
VAS at 12 weeks	2.00(2.0 to 3.0)	3.00(2.0 to 3.0)	0.0011
VAS at 24 weeks	1.00(1.0 to 1.0)	2.00(2.0 to 2.0)	<0.001

The median difference in VAS between study groups (groups 1 & 2) at various time points, such as pre-injection and 8 weeks, was found to be statistically insignificant (P value>0.05), whereas a significant difference has been found in VAS at various time points, such as post-injection, 2, 4, 12, and 24 weeks. In comparison to group 2, the median VAS pre-injection was a bit higher in group 1, but the median VAS at 12 weeks was higher in group 2 than in group 1. (Table 11)

Figure 17: Boxplot of VAS at pre-injection within the study groups (N=68)

VAS scores pre-injection in the study population were distributed with 8.5 and 8 as the central tendency in group-1 and 8.0 in group-2.

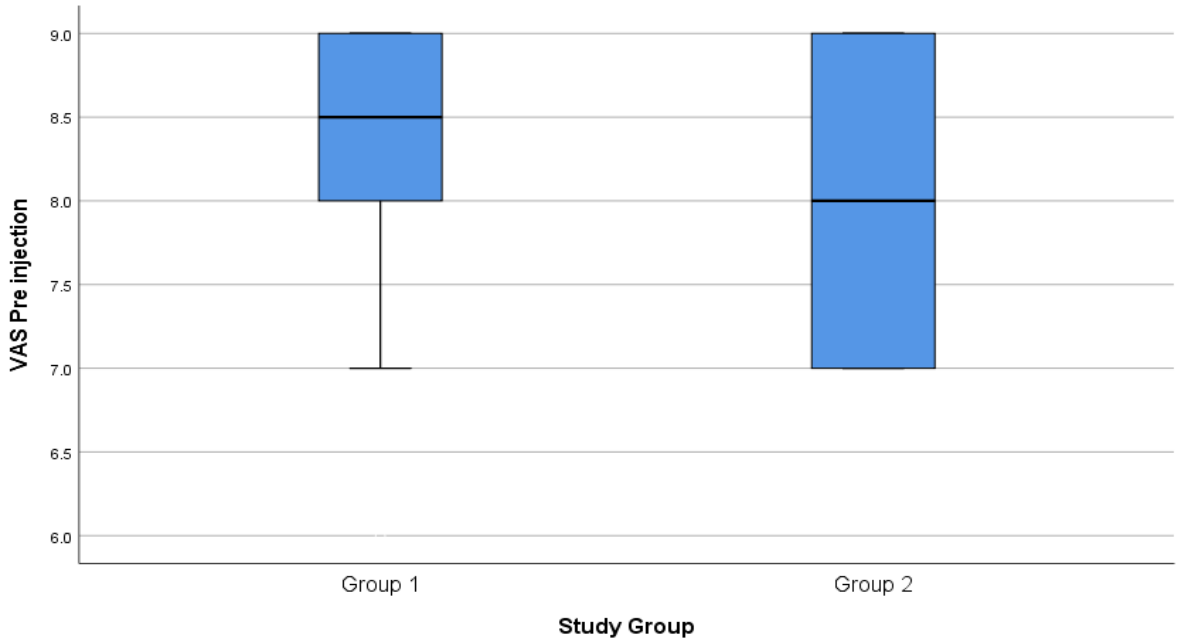

Figure 18: Boxplot graphs of VAS at post-injection in the study groups (N=68)

Both study groups had a reduction in VAS scores post-injection compared to pre-injection, however, group 2 had a significant reduction, with a median score of 6.

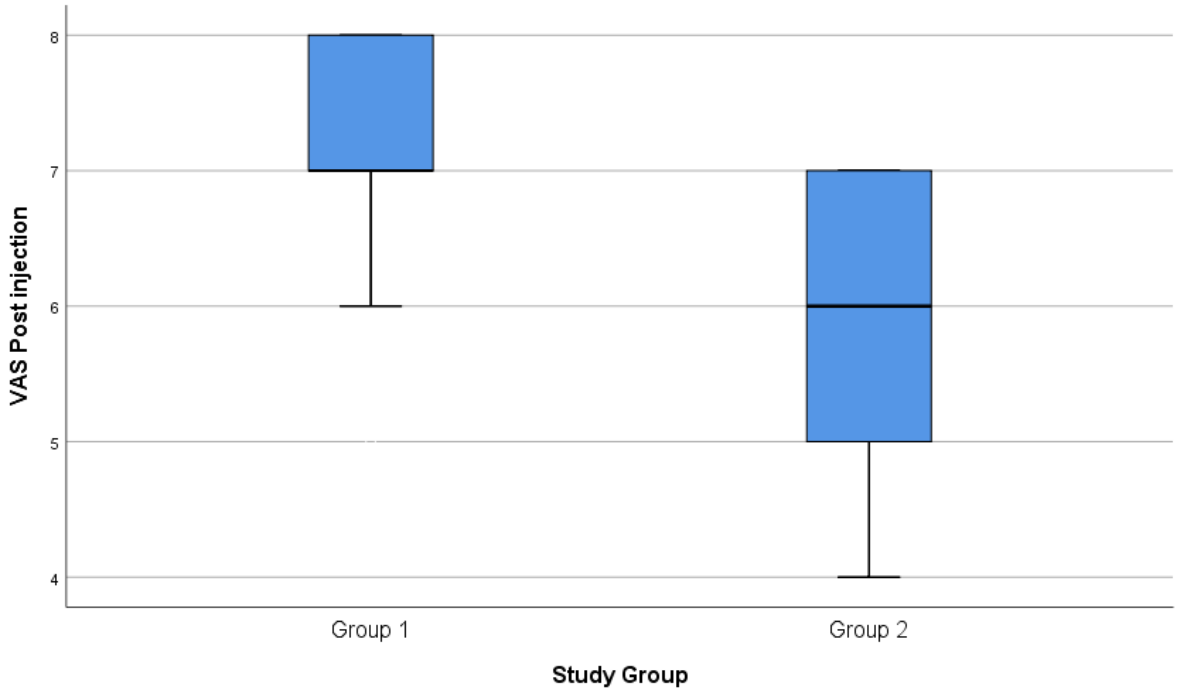

Figure 19: Boxplot graphs of VAS at 2 weeks within the study groups (N=68)

There was a decline in VAS scores in both study groups, with a significant decrease of 1 point in each group from the post-injection score.

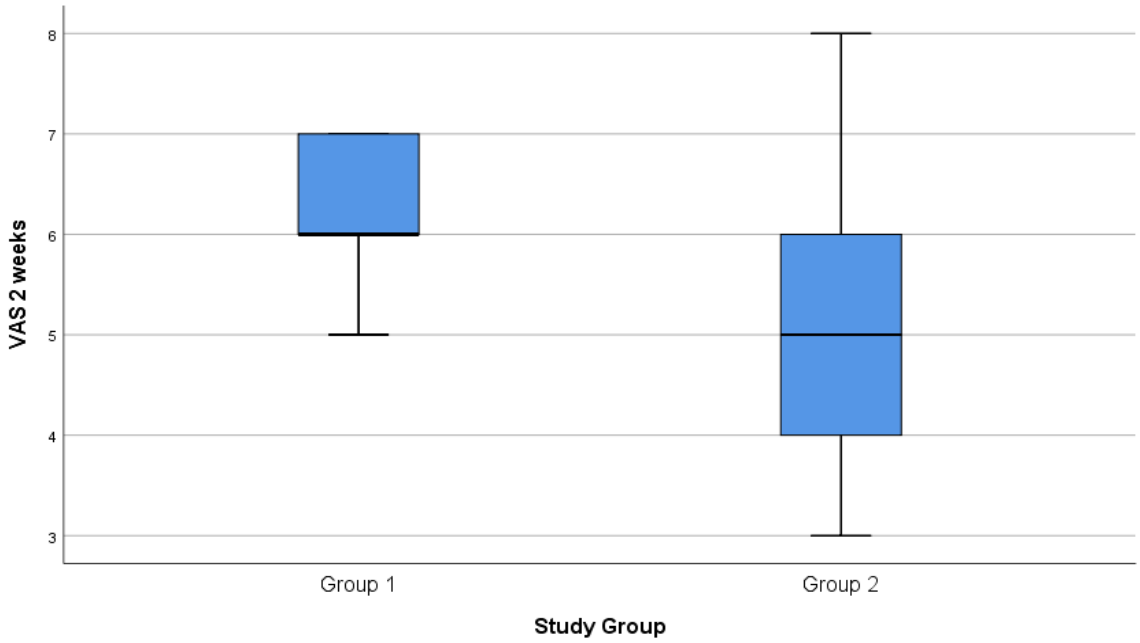

Figure 20: Boxplot of VAS at 4 weeks with study groups (N=68)

Group 1's VAS score significantly decreased from its high of 5 in the 2nd week to its final value at 4 weeks.

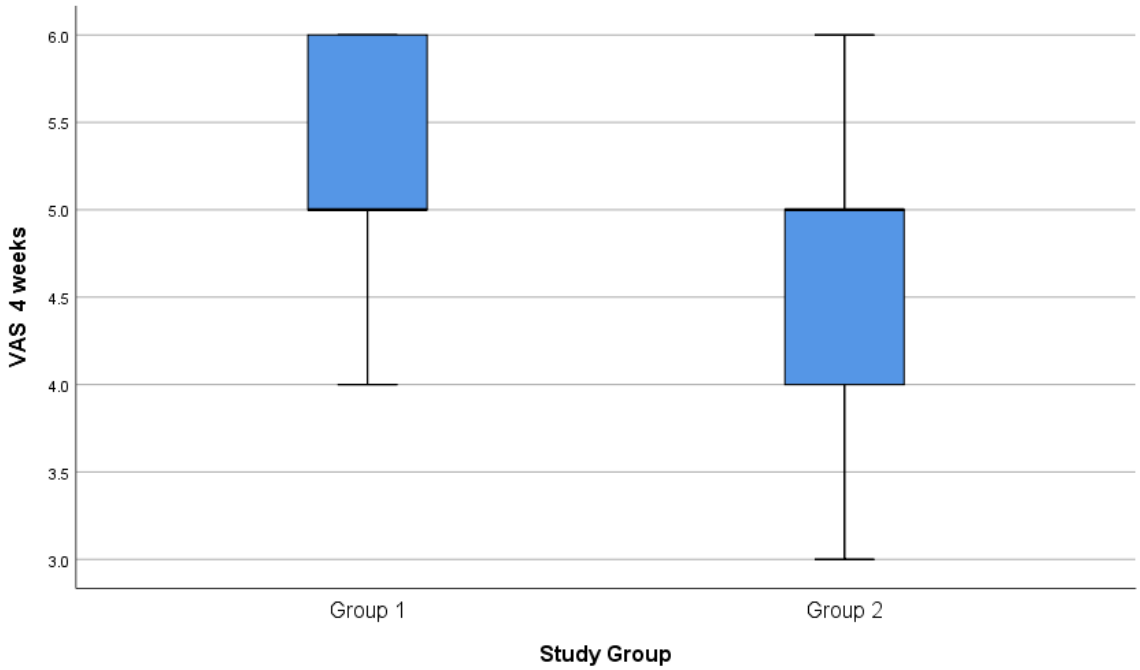

Table 12: Comparison of QuickDASH scores between the two study groups at variable time points (N=68)

Parameter	Study Group (Mean ± SD)		P Value
	Group 1 (N=34)	Group 2 (N=34)	
Pre-injection (Quick DASH score)	68.51 ± 4.52	67.91 ± 3.39	0.5408
Post-injection (Quick DASH score)	63.39 ± 5.23	64.29 ± 3.54	0.4091
QuickDASH at 2 weeks	58.53 ± 6.14	60.51 ± 3.83	0.1164
QuickDASH at 4 weeks	54.37 ± 6.48	56.93 ± 3.95	0.0533
QuickDASH at 8 weeks	50.05 ± 6.63	54.02 ± 4.04	0.0040
QuickDASH at 12 weeks	45.74 ± 6.38	51.50 ± 4.24	<0.001
QuickDASH at 24 weeks	41.83 ± 6.33	48.76 ± 5.08	<0.001

The mean difference in QuickDASH at different periods like pre-injection, post-injection, 2 weeks and 4 weeks between study groups (group 1 & group 2) has been found statistically not significant (P-value>0.05). However, QuickDASH showed a statistically significant difference after 8, 12, and 24 weeks of treatment. QuickDASH was greater in group 2 after injection compared to group 1, whereas the mean QuickDASH was higher in group 1 before administration. (Table 12 & Figure 21)

Figure 21: Line chart of QuickDASH score between the two study groups at variable time points (N=68)

Both study groups experienced a progressive decline in QuickDASH scores, while group 1 experienced a considerable decline at 8, 12, and 24 weeks.

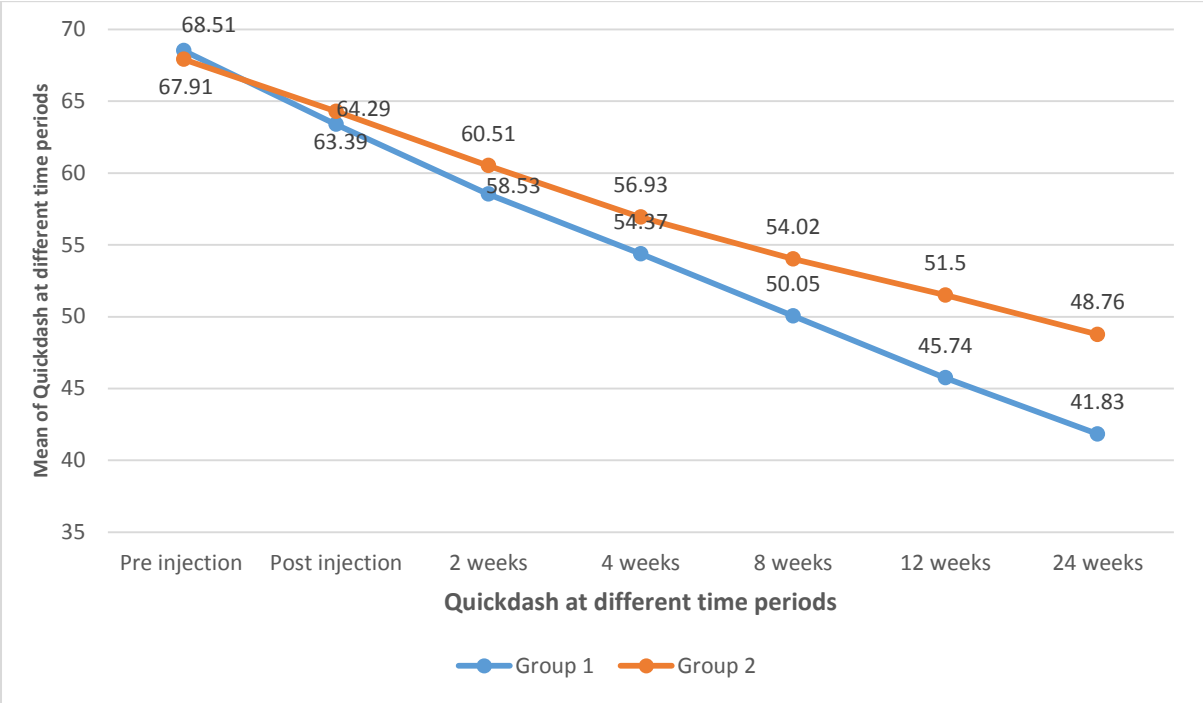

Table 13: Comparison of SPADI score between the two study groups at variable time points (N=68)

Parameter	Study Group (Mean ± SD)		P Value (IST)
	Group 1 (N=34)	Group 2 (N=34)	
Pre-injection (SPADI score)	94.91 ± 9.32	95.53 ± 7.37	0.7628
Post-injection (SPADI score)	83.94 ± 6.88	86.47 ± 6.00	0.1108
SPADI at 2 weeks	77.35 ± 6.86	80.09 ± 5.71	0.0785
SPADI at 4 weeks	70.91 ± 7.46	74.09 ± 5.73	0.0532
SPADI at 8 weeks	64.62 ± 7.79	68.24 ± 6.38	0.0399
SPADI at 12 weeks	58.79 ± 7.43	63.47 ± 6.30	0.0067
SPADI at 24 weeks	53.32 ± 7.49	59.24 ± 5.80	<0.001

The mean difference in SPADI between study groups (groups 1 and 2) at various time points, such as pre-injection, post-injection, 2 weeks, and 4 weeks, has been statistically insignificant (P value > 0.05), whereas a significant difference has been discovered in SPADI at various time points, such as 8 weeks, 12 weeks, and 24 weeks. Comparing group 2 to group 1, the mean of SPADI across all periods was higher in group 2. (Table 13 & Figure 22)

Figure 22: Line chart of SPADI scores between the two study groups at variable time points (N=68)

In both study groups, the SPADI score was on the decline, but after 8, 12, and 24 weeks, it was significantly lower in group 1.

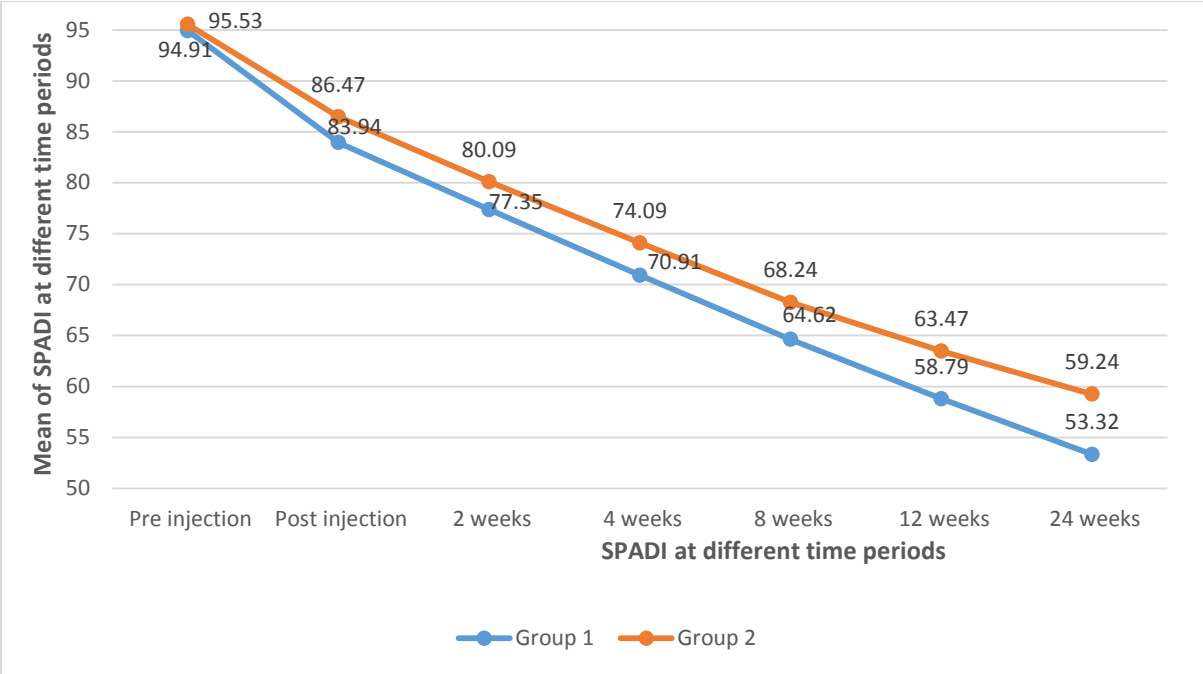

Table 14: Description of complications in study groups (N=68)

Complications	Study Group		Chi square value	P value
	Group 1 (N=34)	Group 2 (N=34)		
Yes	2 (5.88%)	1 (2.94%)	0.35	1.0000
No	32 (94.12%)	33 (97.06%)		

One participant (2.94%) in group 2 and two participants (5.88%) in group 1 encountered complications. With a P-value of 1.0000, the variation in complications across the study groups was statistically insignificant. (Table 14 & Figure 23)

Figure 23: Cluster bar chart of complications in study groups (N=68)

Three patients out of the total study population had reported having complications like pain post-injection and skin irritation, which was more in group-1.

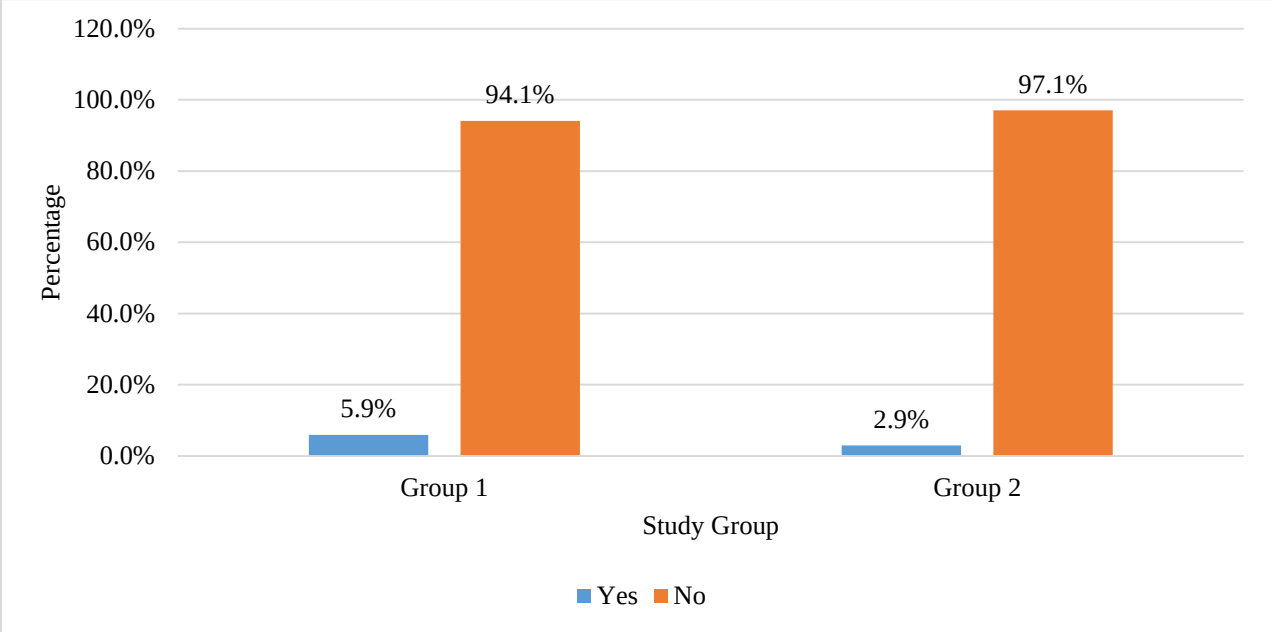

Table 15: Distribution of loss of follow-up in study groups (N=68)

Loss of follow up	Study Group	
	Group 1 (N=34)	**Group 2 (N=34)**
No	34 (100.00%)	34 (100.00%)

No Test is Applicable due to the nature of the data

All participants in both groups -68 (34 in group-1 & 34 in group-2) had complete follow-up. (Table 15)

DISCUSSION

DISCUSSION

AC is a common ailment that can be painful and incapacitating but is self-limiting. Its cause is poorly known, and although it has various treatment options, the best course of action is still up for dispute.[7,106] Although steroid injections are the most popular form of therapy, they only provide temporary pain relief and ROM improvement and are also linked to problems. Recently, PRP has become a popular alternative to steroids for treating adhesive capsulitis, especially when the patient has rejected or is prohibited from taking steroids. Despite the lack of information on PRP's usage in AC, there is preliminary evidence suggesting PRP injections were linked to a better functional result.[95]

The major goal of this randomized experiment was to evaluate whether PRP injections or steroid injections were more effective in the treatment of PA. Authors argued that peppering permits growth factors or corticosteroids to be distributed across a broader surface area, although injection is still the preferable way to administer PRP to the targeted spot.[107] Additionally, peppering-induced soft tissue damage causes bleeding and creates holes in the hypo-vascular degenerative tissue, which promotes a better healing response.[107]

Clinical characteristics

The current randomized comparative study included 68 subjects, where 34 received intra-articular-platelet-rich plasma (group 1) and the remaining 34 received intra articular-corticosteroid (group 2). The mean age between the 2 groups was found to be similar (58.38 ± 8.11 VS 58.53 ± 7.77, P value 0.9394). The proportion of gender distribution between the 2 groups was insignificant (M/F: 44.12% / 55.88% VS 58.82% / 41.18%, P-value 0.2251). However, males were most frequently affected by frozen shoulder compared to females among the study population (ratio 1.06:1).

The proportion of sides affected, either right or left, was found to be similar, but it was evident that dominant limb was more affected compared to the non- dominant side in our research population. In contrast to our study findings Chansoria, M et al.[95] found female predominance and involvement of non- dominant side compared to dominant side. Kothari S et al.[2] included study population age ranged between 29-75yrs (mean age 51.9±10.1yrs), similar to our study, but found female dominance, and majority of them had dominant side involvement (58.9%). Despite the bulk of the existing studies indicating a higher incidence of non -dominant side involvement, our study found greater dominant side involvement.[2,95,108,109] Frozen shoulder could be brought on by trauma, even frequent mild trauma.[109] If this theory is accurate, dominant shoulder problems are more common, supporting our study findings.

Duration of frozen shoulder

The duration of frozen shoulder among PRP group was as follows: ≤ 6 months in 35.29%, 6-12 months in 29.41%, 12-18 months in 29.41% and 18-24months in 5.88%. In the corticosteroid group: ≤ 6 months in 20.59%, 6-12 months in 41.18%, 12-18 months in 14.71%, and 18-24months in 17.65% and >24 months in 5.88%. The difference in the proportion of duration of the condition (months) was insignificant between the groups (P-value 0.105). However, majority of the study population had symptoms between 6-12 months of onset followed by less than 6 months and 12-18 months indicating most of the patients presented in freezing stage and frozen stage. A randomized trial by Gupta GK et al.[103] found the mean duration in PRP group to be 3.567 ± 1.015 months and in Triamcinolone group to be 3.217 ± 0.887 months with insignificant difference.

Comorbid conditions

The proportion of comorbidities such as diabetes and hypertension present between the groups was insignificant (diabetes mellitus - 35.29% VS 41.18%; hypertension- 23.53% VS 5.88% P-value 0.0832). Hence the most comorbidity condition noted in the study population is diabetes mellitus (38%), followed by hypertension (15%). Gupta GK et al.[103] found diabetes mellitus predominantly in their study population.

Biochemical parameters

The mean baseline platelet count (L) was 3.26 ± 0.94 in group 1, minimum level was 1.45, and maximum level was 4.87 (95% CI 2.93 to 3.59). The mean post platelet count (L) was 11.61 ± 2.83, minimum level was 6.60, and maximum level was 16.97 (95% CI 10.62 to 12.60). Platelet count has been increased to almost 3-4 times of base platelet count, satisfying the definition of PRP. In PRP preparation, the mean total platelet number was 6.1±1.6 times higher than whole blood values, as was revealed in the research by Kothari, S et al.[2] The mean difference in the RBS (mg/dl) between groups was insignificant (169.50 ± 29.23 VS 173.00 ± 23.58, P value 0.7427).

Outcome parameters

VAS score

The median difference in VAS between study groups (group 1 & 2) at various time points, such as pre-injection and 8 weeks, has been found statistically insignificant (P-value>0.05), whereas significant differences have been discovered in VAS at various points, such as post-injection, 2, 4, 12, and 24 weeks. Median VAS has been found greater in PRP group before injection than in the corticosteroid group, but after 12 weeks, VAS in corticosteroid group was found to be higher than in PRP group. Study participants' pre-injection VAS ratings

varied between 7 and 9, with an average of 8.5 in PRP group along with 8.0 in corticosteroid group. There was a decline in the VAS scores in both the study groups, but VAS was significantly reduced in corticosteroid group, ranging from 5 to 7.

Chansoria M et al.[95] study found that when compared to baseline characteristics, the participants in the steroid groups had notable improvements in their levels of pain, disability, and overall SPADI score. Long-term, nonetheless, these impacts were short-lived. According to Chansoria M et al.[95] study, this impact typically lasted for a maximum of twelve weeks until the scores rose at the last follow-up appointment to a higher level. Similarly, in our study, we found VAS scores rose at 12 weeks of follow-up post-injection I the corticosteroid group. Further, these results were consistent with meta-analyses by Buchbinder et al.[10] and Wang et al.[110] which found that steroid injections for AC could be helpful even if their effects might only be transient and not long-lasting. Its anti-inflammatory actions, which may result in pain alleviation and mechanical improvement, may be one explanation for these results. Additionally, Yoon et al. demonstrated that there were no appreciable changes in the effectiveness of corticosteroids at various levels, showing the preference for using a low dose initially.[111]

QuickDASH

The mean QuickDASH difference between the study groups has not been statistically significant (P-value>0.05) before, after, at 2, and 4 weeks after injection; however, it was found significant at 8, 12, as well as 24 weeks after injection. QuickDASH was greater in the corticosteroid group after injection, although mean QuickDASH score was higher in the PRP group before injection. QuickDASH scores reduced in both trial groups, although the PRP group showed more marked improvement at 8, 12, as well as 24 weeks. After 12 weeks of follow-up, PRP group fared much better on the QuickDASH than the corticosteroid and

ultrasonic groups, according to study by Kothari et al.[2]. According to Aslani H et al.[112], a 45-year-old man with frozen shoulder had two consecutives intraarticular PRP injections seven and eight months after the onset of symptoms. Indicators of shoulder pain, including VAS, shoulder mobility, DASH score, the absence of nighttime discomfort, and overall patient satisfaction, all improved.

SPADI

In SPADI, the mean difference between the study groups (group-1 & group-2) at various time points, such as pre-injection, post-injection, 2 weeks, and 4 weeks, has been statistically insignificant (p value>0.05), whereas a significant difference has been discovered in SPADI at various time points, such as 8, 12, and 24 weeks. The mean of SPADI at all time periods was high in corticosteroid group compared to PRP group.

At 8, 12, and 24 weeks, the SPADI score was on the decline in both groups, but it was significantly lower in PRP group.

Thirty-two FS patients were allocated randomly to these groups for study by Unlu et al.[99]. PRP injections were administered to one group three times every two weeks, whereas saline injections of the same amount and frequency were given to control group. The SPADI and motion range scores of the PRP group increased, whereas the VAS score declined. According to the study, those with frozen shoulder could have pain relief and improved shoulder joint mobility after receiving a PRP injection.

Chansoria, M et al.[95] reported that at 24 weeks, SPADI scores improved significantly more with PRP injection than with steroid injection. In PRP group, relieve of pain, disability, and the overall SPADI score were essentially linear. These findings concur with those of Kothari et al.[2], Aslani et al.[112]

PRP injection found to be more efficient and had longer-lasting effectiveness, According to Lin and Barman. The anti-inflammatory and analgesic actions, according to the scientists, may be responsible. It also encourages revascularization of soft tissues and raises growth factor concentration locally, both of which aid in the healing process.[27,28]

PRP also has chemotactic and mitogenic characteristics and functions as a growth factor agonist. The degenerative process may be stopped when such growth factors are combined with a high concentration of activated anti-inflammatory and platelets substances.[95,11,30] Since then, SPADI score has consistently decreased in this research.

PRP was administered in two phases to 44 frozen-shoulder patients in research conducted by Aslani MA et al.[112.] The intra-articular and subacromial bursa was administered initially with PRP injection. After four weeks, the patient returned for more PRP injections at the initial location; however, in this second stage, PRP was utilized to treat just the shoulder. At the 25-week follow-up, the results demonstrated a substantial decrease in pain (p 0.001), as well as improvements in shoulder ROM and function. Therefore, after a 24-week follow-up period, the current study indicated that PRP administered as a single injection was successful in lowering pain and improving SPADI and DASH scores.

Complications

In group 1, two (5.88%) participants had a complication, and one (2.94%) had a complication in group 2. With a P-value of 1.0000, the variation in complications across the study groups was statistically insignificant. Among the total population, very few subjects observed pain post-injection and in them, most of them belonged to the PRP group. Similarly, research by Kothari et al.[2], Barman et al.[92] and Chansoria M et al.[95] noticed the least complications among the two groups.

CONCLUSION

CONCLUSION

- The current randomized comparative study included 68 subjects, where 34 subjects each received intra-articular-platelet-rich plasma (group 1), and the remaining 34 received intra articular- corticosteroid (group 2). The mean age and gender distribution between the 2 groups found to be similar was insignificant.
- The dominant limb was more affected when compared with non-dominant side in the study population.
- The difference in the proportion of duration of the condition (months) was insignificant between the groups (P-value 0.105). But, majority of the study population had symptoms between 6-12 months of onset followed by less than 6 months and 12-18 months indicating most of the patients presented in freezing stage and frozen stage.
- The most comorbidity condition noted in the study population is diabetes mellitus (38%), followed by hypertension (15%).
- The mean baseline platelet count (L) was 3.26 ± 0.94 in the group 1, minimum level was 1.45, and maximum level was 4.87 (95% CI 2.93 to 3.59). The mean post platelet count (L) was 11.61 ± 2.83, minimum level was 6.60, and maximum level was 16.97 (95% CI 10.62 to 12.60). Platelet count has been increased to almost 3-4 times of base platelet count, satisfying the definition of PRP.

- In the RBS, the mean difference (mg/dl) between groups was insignificant (169.50 ± 29.23 VS 173.00 ± 23.58, P value 0.7427).

- The median difference in VAS between study groups (group 1 & 2) at various time points, such as pre-injection and 8 weeks, has been statistically insignificant (P-value>0.05), whereas significant differences have been found in VAS at various time

points, such as post-injection, 2, 4, 12, and 24 weeks. The median of VAS pre-injection was slightly higher in PRP group. However, corticosteroid group VAS at 12 weeks was higher than the PRP group.

- VAS scores pre-injection in the study population ranging from 7 to 9, with an average of 8.5 in PRP group and 8.0 in corticosteroid group.

- There was a decline in the VAS scores in both the study groups but VAS significantly was reduced in corticosteroid group-2, ranging from 5 to 7.

- The mean difference in QuickDASH between study groups (groups 1 and 2) at various time points, such as pre-injection, post-injection, 2 weeks, and 4 weeks, was statistically insignificant (P value>0.05), whereas a significant difference has been discovered in QuickDASH at various time points, such as 8 weeks, 12 weeks, and 24 weeks. QuickDASH was more in corticosteroid group after injection, even though mean QuickDASH score has been higher in the PRP group before injection. Both groups' Quick dash scores decreased throughout research, but PRP group had more decline at 8, 12, and 24 weeks.

- The mean difference in SPADI between study groups (groups 1 and 2) at various time points, such as pre-injection, post-injection, 2 weeks, and 4 weeks, was statistically insignificant (P-value>0.05), whereas significant difference has been discovered in SPADI at various time points, such as 8, 12, and 24 weeks. The mean of SPADI at all time periods was high in corticosteroid group compared to PRP group.

- There is decline trend of SPADI score in both study groups but it is significantly reduced in PRP group at 8, 12, and 24 weeks.

- In group 1, 2 (5.88%) participants had a complication and 1 (2.94%) had a complication in group 2. With a P-value of 1.0000, the variation in complications across the study groups was statistically insignificant.
- Complications like pain post injection, skin itching noted among the overall population, found to more in PRP group.

This study emphasize the developing significance of PRP in treating chronic musculoskeletal disorders like periarthritis shoulder, particularly in situations when the patient refuses or is contraindicated to receiving steroids. In our study, individuals with PA shoulder responded much better to a single PRP injection than to steroid in terms of QuickDASH score, SPADI scores with least complications. Although the VAS score improved more in the corticosteroid group, pain ratings decreased in both groups with time.

LIMITATION

LIMITATIONS AND RECOMMENDATIONS

The following significant limitations of current analysis restrict the generalizability of the study's findings:

- An investigation conducted in a single location with a relatively small sample size
- Since no efforts were made to examine the repair by imaging like MRI (magnetic resonance imaging) or evaluation by histology, the prospective randomized trial is completely subjective (SPADI score).
- Long-term researches (near about 52 weeks or more) are required to accurately determine how intervention modifies the natural history of PA shoulder since its course is poorly known. Because our research was only allowed to last 24 weeks, its long-term effectiveness is unknown. Future research may look at the role of ultrasound guided (USG) injections in the musculoskeletal system.

SUMMARY

SUMMARY

A randomized prospective control study has been performed on 68 patients suffering from periarthritis shoulder after meeting inclusion and exclusion criteria in two groups with 34 in every group. Group-1 (IA PRP) received 4ml PRP and Group-2 (IA CS) received 2ml (80mg) of methylprednisolone acetate mixed with 2ml normal saline (total 4ml) to prepare CS injection into the intraarticular area of shoulder. Using VAS, QuickDASH and SPADI scores patients were regularly assessed at the end of 2^{nd}, 4^{th}, 8^{th}, 12^{th}, and 24 weeks.

The gender distribution and mean age between these two groups found to be similar was insignificant. Within the population under investigation, the dominant limb has often been impacted than the non-dominant one. The difference in the proportion of duration of the condition (months) was insignificant between the groups (P-value 0.105). The most comorbidity condition noted in the study population is diabetes mellitus (38%), followed by hypertension (15%).

There is a gradual decrease in VAS scores in both groups but significantly reduced at 2, 4,12 and 24 weeks in PRP group. Both study groups experienced a progressive decline in QuickDASH and SPADI scores, while the PRP group experienced a significant decline at 8, 12, and 24 weeks.

With a P-value of 1.0000, the variation in complications across the study groups was statistically insignificant. The complications like pain post-injection noted among the overall population were found to be more in PRP group.

According to our study, the IA-PRP injection group outperformed the IA-CS injection group in terms of functional outcomes and pain reduction. Injections of IA-PRP may be employed as a modality of intervention for the therapy of shoulder periarthritis.

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ANNEXURES

ANNEXURE-1

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101.

PATIENT INFORMATION SHEET

STUDY TITLE: "A PROSPECTIVE COMPARATIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME OF INTRAARTICULAR INJECTION THERAPY WITH PLATELET RICH PLASMA VERSUS CORTICOSTEROID FOR PERIARTHRITIS SHOULDER"

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

Details- Patients diagnosed with periarthritis shoulder who present to orthopedics OPD of R.L.J. HOSPITAL AND RESEARCH CENTRE, attached to Sri Devaraj Urs Medical College, Tamaka, Kolar.

Patients who full fill the inclusion criteria will be included in this study in one of the two groups. Group A will receive 4ml of PRP and Group B will receive 4 ml of corticosteroid injections into intraarticular surface of shoulder under strict aseptic precautions. Corticosteroid injections is cost effective but has adverse effects such as hypoglycemia, damaging effects on articular cartilage, increased probability of tendon rupture and depigmentation of local skin. Platelet Rich Plasma has better regenerative properties and adverse effects are less. The participant will have benefits of improvements in his symptoms and functions in both groups.

Patients in this study will have to undergo Blood Investigations: -Complete blood picture, Random blood sugars, and Serum Urea and Creatinine. Radiological investigation: Plain x-ray of involved shoulder joint-AP & lateral views. The principal investigator is bearing the cost of all investigations.

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

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

CONFIDENTIALITY

Your medical information will be kept confidential by the investigator/treating doctor and will not be made publicly available. Your original records may be reviewed by your doctor or ethics review board. For further information/ clarification please contact

Dr. SOMISETTY VENKATA SAI TARUN KUMAR (Post Graduate),

Department Of ORTHOPAEDICS,

SDUMC, Kolar

Mobile No: 7981306013

ANNEXURE-2

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101

INFORMED CONSENT FORM

Name of the patient:

Age:

Sex:

Address:

Contact no:

Date:

Case no:

Op/Ip UHID no:

TITLE:

"A PROSPECTIVE COMPARATIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME OF INTRAARTICULAR INJECTION THERAPY WITH PLATELET RICH PLASMA VERSUS CORTICOSTEROID FOR PERIARTHRITIS SHOULDER"

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 the advised procedure. The nature and risks involved in the procedure have been explained to me to my satisfaction.

I have been explained in detail about the Clinical Research on "A Prospective Comparative study to Assess the Functional Outcome of Intraarticular Injection Therapy with Platelet Rich Plasma versus Corticosteroid for Periarthritis Shoulder" being conducted. I have read the patient information sheet and I have had the opportunity to ask any questions. 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 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. All the data may be published or used for any academic purpose. I will not hold the treating doctors / nurses/institute etc. responsible for any untoward consequences during the procedure / study.

Signature/Thumb impression & Name of patient Signature & Name of Pt. Attender

Relation with patient:

Witness:

Signature & Name of Research person /doctor:

ANNEXURE-3
KANNADA CONSENT
ಮಾಹಿತಿದಾರರ ಸಮ್ಮತಿ ನಮೂನೆ

ರೋಗಿಯ ಹೆಸರು:

ವಯಸ್ಸು:

ಲಿಂಗ :

ವಿಳಾಸ:

ಸಂಪರ್ಕ ಸಂಖ್ಯೆ:

ದಿನಾಂಕ:

ಪ್ರಕರಣ ಸಂಖ್ಯೆ: ಆಪ್ / ಐಪಿ ಯುಹೆಚ್ಐಡಿ ಸಂಖ್ಯೆ:

ಶೀರ್ಷಿಕೆ: "ಶೌಲ್ಡರ್ನ ಪೆರಿಯರ್ಥ್ರೈಟಿಸ್ಗಾಗಿ ಪ್ಲೇಟ್ಲೆಟ್ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ವರ್ಸಸ್ ಕಾರ್ಟಿಕೊಸ್ಟೆರಾಯ್ಡ್ನೊಂದಿಗೆ ಆಂತರಿಕ ಇಂಜೆಕ್ಷನ್ ಥೆರಪಿಯ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶವನ್ನು ಪಡೆಯಲು ಒಂದು ಪ್ರಾಯೋಗಿಕ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ"

ನಾನು, _____ ವಯಸ್ಸಿನ _____, ಅಧ್ಯಯನದ ಉದ್ದೇಶ ಮತ್ತು ಕಾರ್ಯವಿಧಾನದ ಅಪಾಯಗಳು ಮತ್ತು ತೊಡಕುಗಳ ಬಗ್ಗೆ ನನ್ನ ಸ್ವಂತ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಿದ ನಂತರ, ಸಲಹೆ ನೀಡುವ ಕಾರ್ಯವಿಧಾನಕ್ಕೆ ಯಾವುದೇ ಬಲ ಅಥವಾ ಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೆ ನನ್ನ ಮಾನ್ಯ ಲಿಖಿತ ತಿಳುವಳಿಕೆಯ ಒಪ್ಪಿಗೆಯನ್ನು ಈ ಮೂಲಕ ನೀಡುತ್ತೇನೆ. ಕಾರ್ಯವಿಧಾನದಲ್ಲಿ ಒಳಗೊಂಡಿರುವ ಸ್ವರೂಪ ಮತ್ತು ಅಪಾಯಗಳನ್ನು ನನ್ನ ತೃಪ್ತಿಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಕ್ಲಿನಿಕಲ್ ರಿಸರ್ಚ್ ಬಗ್ಗೆ ನನಗೆ ವಿವರವಾಗಿ ವಿವರಿಸಲಾಗಿದೆ "ಪ್ಲೇಟ್ಲೆಟ್ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ವರ್ಸಸ್ ಕಾರ್ಟಿಕೊಸ್ಟೆರಾಯ್ಡ್ ಫಾರ್ ಪೆರಿಯಾರ್ಥ್ರೈಟಿಸ್ ಭುಜದೊಂದಿಗಿನ ಇಂಟ್ರಾಟಾರ್ಟ್ಯುಲರ್ ಇಂಜೆಕ್ಷನ್ ಚಿಕಿತ್ಸೆಯ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶವನ್ನು ನಿರ್ಣಯಿಸಲು ಒಂದು ನಿರೀಕ್ಷಿತ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ". ನಾನು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಓದಿದ್ದೇನೆ ಮತ್ತು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳುವ ಅವಕಾಶ ನನಗೆ ಸಿಕ್ಕಿದೆ. ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ ನನ್ನ ತೃಪ್ತಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ. ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪುತ್ತೇನೆ. ನನ್ನ ಇತಿಹಾಸವನ್ನು ಒದಗಿಸಲು, ದೈಹಿಕ ಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಲು, ಕಾರ್ಯವಿಧಾನಕ್ಕೆ ಒಳಗಾಗಲು, ತನಿಖೆಗೆ ಒಳಗಾಗಲು ಮತ್ತು ಅದರ ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳನ್ನು ವೈದ್ಯರಿಗೆ / ಸಂಸ್ಥೆಗೆ ಒದಗಿಸಲು ನಾನು ಈ ಮೂಲಕ ಒಪ್ಪಿಗೆ ನೀಡುತ್ತೇನೆ.

ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಕಾರ್ಯಾಚರಣೆ / ಕಾರ್ಯವಿಧಾನ ಇತ್ಯಾದಿಗಳನ್ನು ವೀಡಿಯೊ ಗ್ರಾಫ್ ಮಾಡಬಹುದು ಅಥವಾ **bÁ**ಯಾಚಿತ್ರ ಮಾಡಬಹುದು. ಎಲ್ಲಾ ಡೇಟಾವನ್ನು ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಪ್ರಕಟಿಸಬಹುದು ಅಥವಾ ಬಳಸಬಹುದು. ಕಾರ್ಯವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ಅಹಿತಕರ ಪರಿಣಾಮಗಳಿಗೆ ಚಿಕಿತ್ಸೆ ನೀಡುವ ವೈದ್ಯರು / ದಾದಿಯರು / ಸಂಸ್ಥೆ ಇತ್ಯಾದಿಗಳನ್ನು ನಾನು ಜವಾಬ್ದಾರನಾಗಿರುವುದಿಲ್ಲ.

ಸಹಿ / ಹೆಬ್ಬೆರಳು ಅನಿಸಿಕೆ ಮತ್ತು ರೋಗಿಯ ಹೆಸರು ಸಹಿ ಮತ್ತು ಪಂ. ಅಟೆಂಡರ್

ರೋಗಿಯೊಂದಿಗಿನ ಸಂಬಂಧ:

ಸಾಕ್ಷಿ:

ಸಹಿ ಮತ್ತು ಸಂಶೋಧನಾ ವ್ಯಕ್ತಿ / ವೈದ್ಯರ ಹೆಸರು:

ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆ

ಶೀರ್ಷಿಕೆ: "ಶೌಲ್ಡರ್ನ ಪೆರಿಯಥ್ರ್ಯೆಟಿಸ್ಗಾಗಿ ಪ್ಲೇಟ್ಲೆಟ್ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ವರ್ಸಸ್ ಕಾರ್ಟಿಕೊಸ್ಟೆರಾಯ್ಡ್ನೊಂದಿಗೆ ಆಂತರಿಕ ಇಂಜೆಕ್ಷನ್ ಥೆರಪಿಯ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶವನ್ನು ಪಡೆಯಲು ಒಂದು ಪ್ರಾಯೋಗಿಕ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ"

ಅಧ್ಯಯನ ಸ್ಥಳ:ಆರ್ ಎಲ್ ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ ಲಗತ್ತಿಸಲಾದ ಶ್ರೀ ದೇವರಾಜ್ ಅರಸು ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಟಮಕ, ಕೋಲಾರ.

ವಿವರಗಳು- ಪೆರಿಯಾರ್ಥ್ರೈಟಿಸ್ ಭುಜದ ರೋಗನಿರ್ಣಯದ ರೋಗಿಗಳು ಮೂಳೆಚಿಕಿತ್ಸೆಯ ಒಪಿಡಿಗೆ ಬಂದರು ಆರ್.ಎಲ್.ಜೆ. ಹಾಸ್ಪಿಟಲ್ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ಲಗತ್ತಿಸಲಾದ ಶ್ರೀ ದೇವರಾಜ ಅರಸು ವೈದ್ಯಕೀಯ ಕಾಲೇಜು, ಟಮಕ , ಕೋಲಾರ

ಈ ಅಧ್ಯಯನದ ರೋಗಿಗಳು ರಕ್ತ ತನಿಖೆಗೆ ಒಳಗಾಗಬೇಕಾಗುತ್ತದೆ: -ಸಿಬಿಸಿ, ಆರ್ಬಿಎಸ್, ಮತ್ತು ಸೀರಮ್ ಯೂರಿಯಾ ಮತ್ತು ಕ್ರಿಯೇಟೈನ್. ರೋಗಶಾಸ್ತ್ರೀಯ ತನಿಖೆ: ಭುಜದ ಜಂಟಿ-ಎಪಿ ಮತ್ತು ಪಾರ್ಶ್ವ ವೀಕ್ಷಣೆಗಳ ಸರಳ ಎಕ್ಸರೆ.

ಸೇರ್ಪಡೆ ಮಾನದಂಡಗಳನ್ನು ಪೂರ್ಣವಾಗಿ ತುಂಬುವ ರೋಗಿಗಳನ್ನು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಎರಡು ಗುಂಪುಗಳಲ್ಲಿ ಸೇರಿಸಲಾಗುವುದು. ಗ್ರೂಪ್ ಎ 4 ಎಂಎಲ್ಎ ಇಂಟ್ರಾ-ಆರ್ಟಿಕಲ್ ಕಾರ್ಟಿಕೊಸ್ಟೆರಾಯ್ಡ್ ಇಂಜೆಕ್ಷನ್ ಅನ್ನು ಪಡೆಯುತ್ತದೆ ಮತ್ತು ಗ್ರೂಪ್ ಬಿ ಕಟ್ಟುನಿಟ್ಟಾದ ಅಸೆಪ್ಟಿಕ್ ಮುನ್ನೆಚ್ಚರಿಕೆಗಳ ಅಡಿಯಲ್ಲಿ 4 ಮಿಲಿ ಇಂಟ್ರಾ-ಆರ್ಟಿಕಲ್ ಪ್ಲಾಮಾ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ಚುಚ್ಚುಮದ್ದನ್ನು ಸ್ವೀಕರಿಸುತ್ತದೆ. ಕಾರ್ಟಿಕೊಸ್ಟೆರಾಯ್ಡ್ ಚುಚ್ಚುಮದ್ದು ವೆಚ್ಚದಾಯಕವಾಗಿದೆ ಆದರೆ ಹೈಪೊಗ್ಲಿಸಿಮಿಯಾ, ಕೀಲಿನ ಕಾರ್ಟಿಲೆಜ್ ಮೇಲೆ ಹಾನಿಕಾರಕ ಪರಿಣಾಮಗಳು, ಸ್ನಾಯುರಜ್ಜು ಛಿದ್ರವಾಗುವ ಸಂಭವನೀಯತೆ ಮತ್ತು ಸ್ಥಳೀಯ ಚರ್ಮದ ಕ್ಷೀಣತೆ. ಪ್ಲೇಟ್ಲೆಟ್ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ಉತ್ತಮ ಪುನರುತ್ಪಾದಕ ಗುಣಗಳನ್ನು ಹೊಂದಿದೆ ಮತ್ತು ಪ್ರತಿಕೂಲ ಪರಿಣಾಮಗಳು ಕಡಿಮೆ. ಭಾಗವಹಿಸುವವರು ತಮ್ಮ ರೋಗಲಕ್ಷಣಗಳು ಮತ್ತು ಎರಡೂ ಗುಂಪುಗಳಲ್ಲಿನ ಕಾರ್ಯಗಳ ಸುಧಾರಣೆಯ ಪ್ರಯೋಜನಗಳನ್ನು ಹೊಂದಿರುತ್ತಾರೆ.

ದಯವಿಟ್ಟು ಈ ಕೆಳಗಿನ ಮಾಹಿತಿಯನ್ನು ಓದಿ ಮತ್ತು ನಿಮ್ಮ ಕುಟುಂಬ ಸದಸ್ಯರೊಂದಿಗೆ ಚರ್ಚಿಸಿ. ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಬಹುದು. ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಒಪ್ಪಿದರೆ ನಾವು ನಿಮ್ಮಿಂದ ಅಥವಾ ನಿಮ್ಮಿಂದ ಅಥವಾ ಇಬ್ಬರಿಗೂ ಜವಾಬ್ದಾರರಾಗಿರುವ ವ್ಯಕ್ತಿಯಿಂದ ಮಾಹಿತಿಯನ್ನು (ಪ್ರೊಫಾರ್ಮಾದ ಪ್ರಕಾರ) ಸಂಗ್ರಹಿಸುತ್ತೇವೆ. ಸಂಬಂಧಿತ ಇತಿಹಾಸವನ್ನು ತೆಗೆದುಕೊಳ್ಳಲಾಗುವುದು. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಪ್ರಬಂಧ ಮತ್ತು ಪ್ರಕಟಣೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ. ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ ಎಲ್ಲಾ ತನಿಖೆಗಳ ವೆಚ್ಚವನ್ನು ಭರಿಸುತ್ತಿದ್ದಾರೆ.

ನಿಮ್ಮಿಂದ ಸಂಗ್ರಹಿಸಲಾದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಗೌಪ್ಯವಾಗಿಡಲಾಗುತ್ತದೆ ಮತ್ತು ಯಾವುದೇ ಹೊರಗಿನವರಿಗೆ ಬಹಿರಂಗಪಡಿಸುವುದಿಲ್ಲ. ನಿಮ್ಮ ಗುರುತು ಬಹಿರಂಗಗೊಳ್ಳುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನವನ್ನು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯು ಪರಿಶೀಲಿಸಿದೆ ಮತ್ತು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯ ಸದಸ್ಯರನ್ನು ಸಂಪರ್ಕಿಸಲು ನೀವು ಮುಕ್ತರಾಗಿದ್ದೀರಿ. ಈ ಅಧ್ಯಯನವನ್ನು ಒಪ್ಪಿಕೊಳ್ಳಲು ಯಾವುದೇ ಬಲವಂತವಿಲ್ಲ. ನೀವು ಭಾಗವಹಿಸಲು ಬಯಸದಿದ್ದರೆ ನೀವು ಪಡೆಯುವ ಕಾಳಜಿ ಬದಲಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪಿಕೊಂಡರೆ ಮಾತ್ರ ನೀವು ಸಹಿ / ಹೆಬ್ಬೆರಳು ಅನಿಸಿಕೆಗೆ ಒದಗಿಸುವ ಅಗತ್ಯವಿದೆ.

ಗೌಪ್ಯತೆ

ನಿಮ್ಮ ವೈದ್ಯಕೀಯ ಮಾಹಿತಿಯನ್ನು ಅಧ್ಯಯನ ವೈದ್ಯರು ಮತ್ತು ಸಿಬ್ಬಂದಿ ಗೌಪ್ಯವಾಗಿಡುತ್ತಾರೆ ಮತ್ತು ಸಾರ್ವಜನಿಕವಾಗಿ ಲಭ್ಯವಾಗುವುದಿಲ್ಲ. ನಿಮ್ಮ ಮೂಲ ದಾಖಲೆಗಳನ್ನು ನಿಮ್ಮ ವೈದ್ಯರು ಅಥವಾ ನೈತಿಕ ಪರಿಶೀಲನಾ ಮಂಡಳಿಯು ಪರಿಶೀಲಿಸಬಹುದು. ಹೆಚ್ಚಿನ ಮಾಹಿತಿಗಾಗಿ / ಸ್ಪಷ್ಟೀಕರಣಕ್ಕಾಗಿ ದಯವಿಟ್ಟು ಸಂಪರ್ಕಿಸಿ

ಡಾ. ಸೋಮಿಸೆಟ್ಟಿ ವೆಂಕಟ ಸಾಯಿ ತರುಣ್ ಕುಮಾರ್
ಮೂಳೆ ಚಿಕಿತ್ಸೆಯಲ್ಲಿ, ಸ್ನಾತಕೋತ್ತರ ಪದವಿ
ಶ್ರೀ ದೇವರಾಜ್ ಅರಸ್ ವೈದ್ಯಕೀಯ ಕಾಲೇಜು , ಟಮಕ ,ಕೋಲಾರ.

ANNEXURE-4

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101.

PROFORMA

Case no:

IP no:

TITLE:

"A PROSPECTIVE COMPARATIVE STUDY TO ASSESS THE FUNCTIONAL OUTCOME OF INTRAARTICULAR INJECTION THERAPY WITH PLATELET RICH PLASMA VERSUS CORTICOSTEROID FOR PERIARTHRITIS SHOULDER"

1. BASIC DATA

Name Age/Sex

Address

Mobile No.

Date of Procedure/Intervention:

Date of Admission/OP

Date of Discharge

History:

General physical examination:

Vitals: Pulse- B.P-

RR- Temp-

Systemic examination:

CVS-

RS-

PS-

CNS-

Pre-existing systemic illness:

Diabetes/Thyroid disorder/ Cervical Spine/ CVS/RS/ CNS/loco-motor/TB/ anemia/

Hypertension/ malnutrition/others

Local examination: right / left shoulder

Swelling

Tenderness

ROM	Right	Left
Active Flexion		
Passive Flexion		
Active Extension		
Passive Extension		
Active Abduction		
Passive Abduction		
Active Adduction		
Passive adduction		
Active Internal rotation		
Passive Internal rotation		
Active External rotation		
Passive external rotation		

Active wrist and finger movements:

Distal sensation intact (yes/no)

Distal pulsations palpable (yes/no)

2. DIAGNOSIS:

3. INVESTIGATIONS:

- Blood Investigations:

  -CBC

  -RBS

  -Serum Urea and Creatinine

- Radiological investigation:

- -Plain x-ray of involved shoulder joint- AP & lateral

4. PROCEDURE:

Results:

Visual Analogue Scale (VAS)

Shoulder Pain and Disability Index (SPADI)

Please place a mark on the line that best represents your experience during the last week attributable to your shoulder problem.

Pain scale

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

At its worst?	0	1	2	3	4	5	6	7	8	9	10
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 kilograms)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

*Quick*DASH-9

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, by circling the appropriate number. If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* of 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.

Rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	0	1	2	3	4
2. Do heavy household chores (e.g., wash walls, floors).	0	1	2	3	4
3. Carry a shopping bag or briefcase.	0	1	2	3	4
4. Wash your back.	0	1	2	3	4
5. Use a knife to cut food.	0	1	2	3	4
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	0	1	2	3	4

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
7. 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?	0	1	2	3	4

	NOT AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
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?	0	1	2	3	

	NONE	MILD	MODERATE	SEVERE	EXTREME
9. Arm, shoulder or hand pain.	0	1	2	3	4

A *Quick*DASH-9 score may not be calculated if there is greater than 1 missing item.

***Quick*DASH-9 SCORE = [(sum) x 1.1] x 5/2, a missing response is added as the average of the remaining.**

FOLLOW UP:

	VAS	**QUICK DASH**	**SPADI**
PRE INJECTION			
POST INJECTION			
2 WEEKS			
4 WEEKS			
8 WEEKS			
12 WEEKS			
24 WEEKS			

Complications If any:

ANNEXURE-5

IMAGES

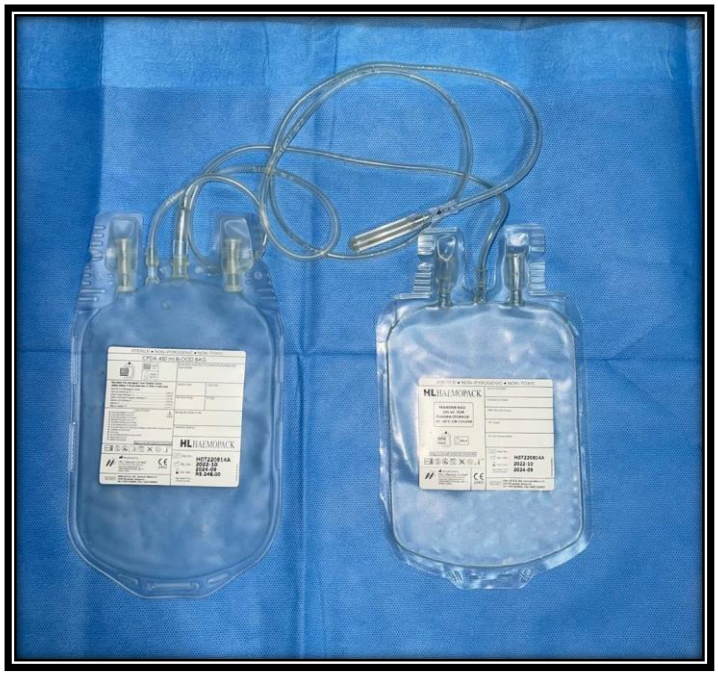

Figure 24: Double blood bag- used for collection of blood sample for PRP preparation

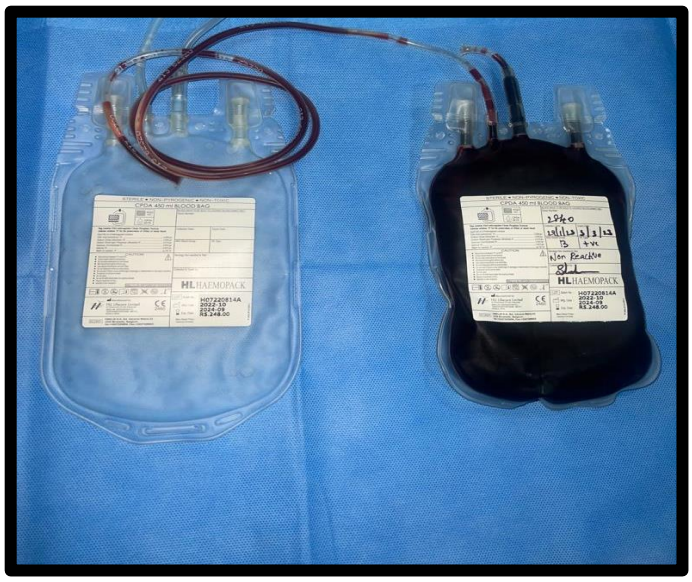

Figure 25: Blood separation- blood bag is kept for 1 hour at temperature of 20-24 degree Celsius till separation

Figure 26: Blood bag centrifugation machine

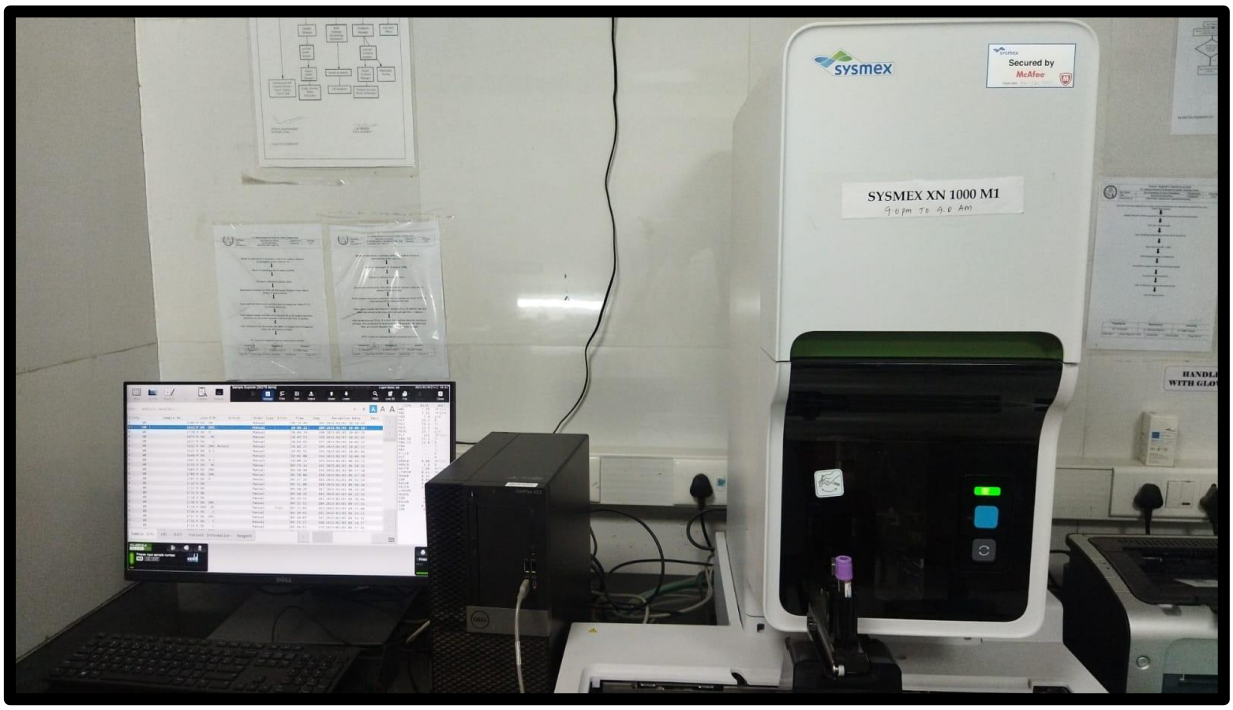

Figure 27: platelet counting machine

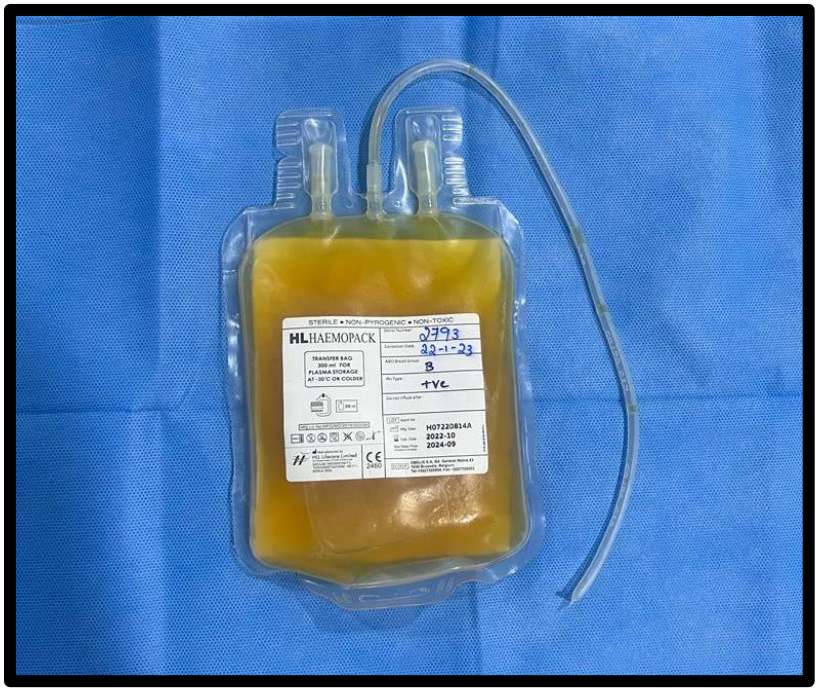

Figure 28: Platelet rich plasma

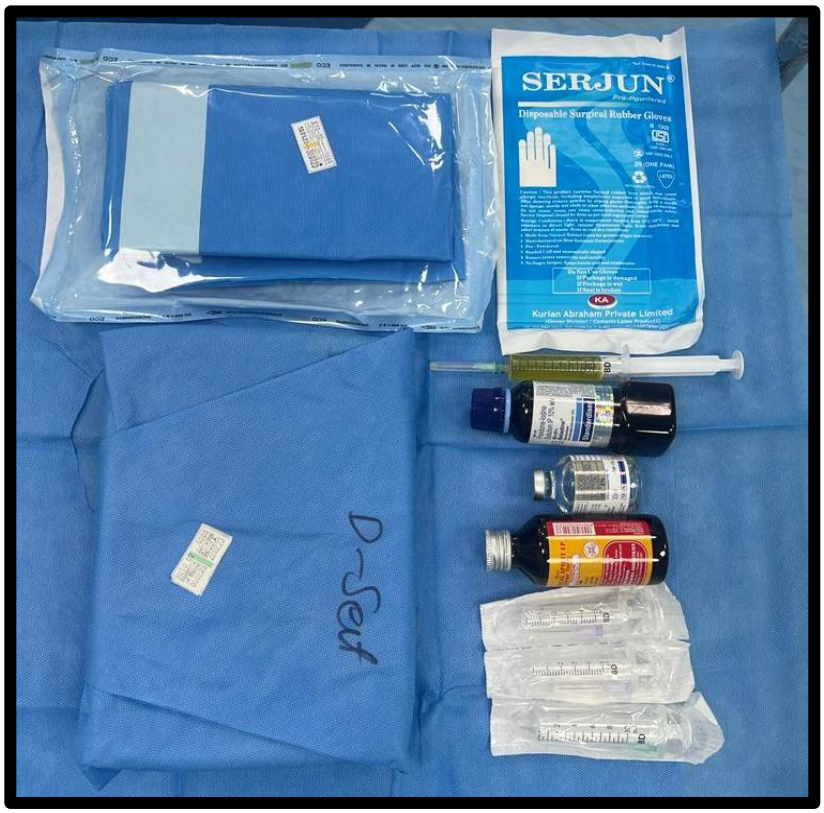

Figure 29: Equipment's for IA PRP injection

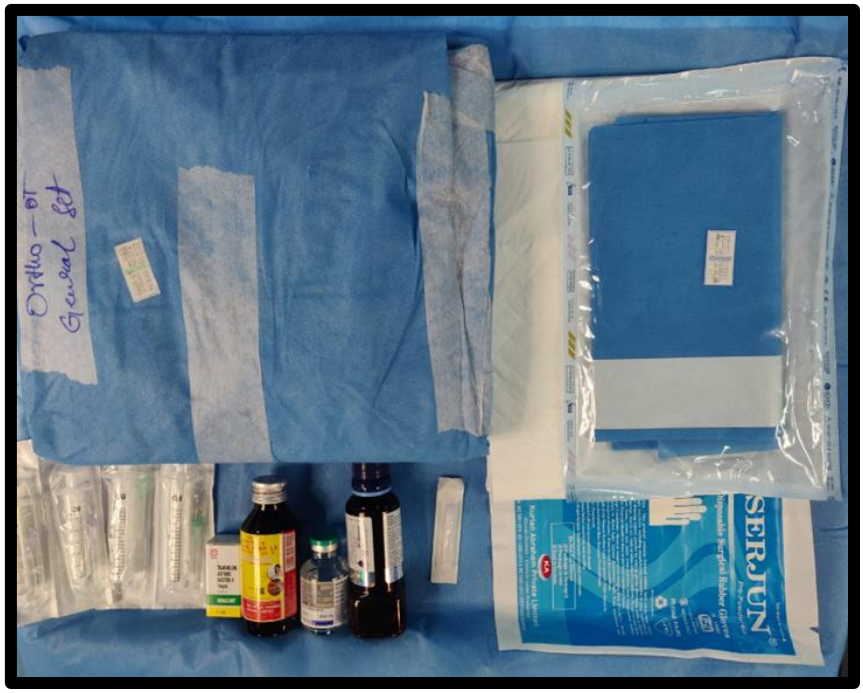

Figure 30: Equipment's for IA CS injection

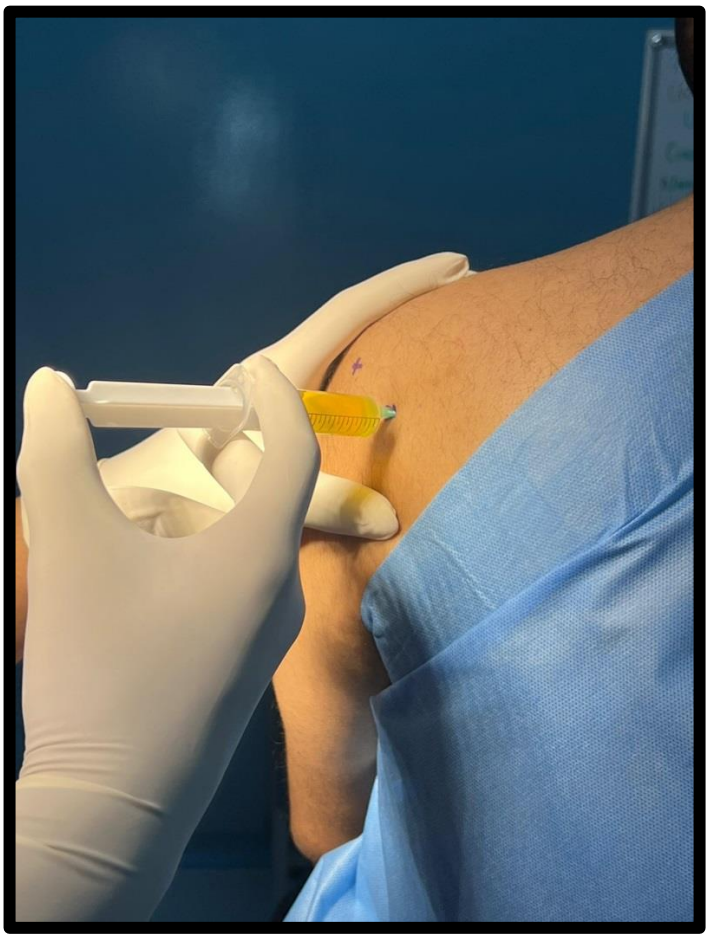

Figure 31: Administration of IA PRP injection to left shoulder joint

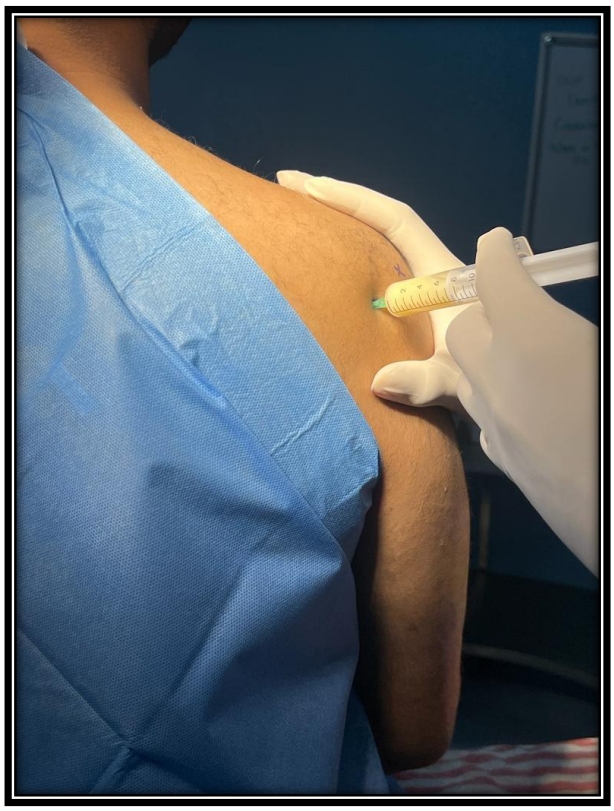

Figure 32: Administration of IA CS injection to right shoulder joint

MASTER CHART

ANNEXURE-6

KEY TO MASTER CHART

M	Male
F	Female
UHID NO.	Unique Hospital Identification
S.NO	Serial number
IA-PRP	Intraarticular Platelet rich plasma
IA-CS	Intraarticular Corticosteroid
VAS	Visual Analog Scale
SPADI	Shoulder Pain And Disability Index
QuickDASH	Shortened version of Disabilities of Arm, Shoulder and Hand

				Side				Procedure			Comorbidities								VAS							Quick dash							SPADI								
Sl. No.	Patient name	Age	Gender	Right	Left	Chief complaints		IA-PRP (Group 1)	IA-CS	Date of procedure	Diabetes Mellitus	Hypertension	Tuberculosis	Bronchial asthma	Epilepsy	Complications after procedure	Pre platelet count	Post platelet count	RBS	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Complications	Loss of follow up
1	venkatlakshmamma	66	Female	Yes		shoulder painx 1 yr		Yes		02-01-2021						No	2.3L	10.20L		8	7	6	4	3	2	2	76.7	68.9	63.25	60.98	57.8	55.6	49.8	108	90	82	77	65	56	45	no	no
2	mahesh	56	Male	Yes		shoulder painx8 months			Yes	24-01-2021	Yes					No			22O mg/dl	**9**	**6**	**5**	**5**	**3**	**2**	**2**	**75.8**	**71.2**	**67.8**	**65.8**	**60.9**	**57.8**	**56.7**	**98**	**88**	**78**	**68**	**56**	**52**	**48**	no	no
3	narayanappa	67	Male	Yes		restriction of shoulder movements x8 months		Yes		25-01-2021		Yes				No	3.8L	10.86L		9	8	7	6	4	3	1	77.8	70.5	65.9	62.7	60.7	57.9	56.5	100	80	70	58	45	42	35	no	no
4	ramappa	45	Male		Yes	shoulder pain and restriction of movements x1 1 months			Yes	28-01-2021						No				**8**	**7**	**6**	**5**	**4**	**3**	**1**	**68.9**	**68**	**67.8**	**60.4**	**58.9**	**56.7**	**55.9**	**92**	**80**	**74**	**65**	**60**	**56**	**52**	no	no
5	subbamma	66	Female	Yes		shoulder pain x 5 months		Yes		04-02-2021						No	2.56L	9.67L		8	7	7	6	4	3	2	73.6	71	67.8	63.6	60.2	56.5	55.1	98	82	76	68	56	45	40	no	no
6	venkatlakshmamma	69	Female		Yes	restriction of shoulder movements x 2 years			Yes	12-02-2021	Yes					No			190	**9**	**7**	**5**	**5**	**4**	**3**	**2**	**74.5**	**72**	**69.4**	**66.7**	**62.5**	**60.3**	**57.8**	**96**	**82**	**78**	**67**	**60**	**50**	**48**	no	no
7	ramanarayana	71	Male	Yes		shoulder pain x 6 months		Yes		14-02-2021		Yes				No	3.69L	12.43L		9	8	7	5	4	3	1	63.25	55	42.5	38.5	36	34.5	32.5	94	80	72	68	60	52	45	no	no
8	subhalakshmi	53	Female	Yes	Yes	shoulder ROM restrictions x 4 months			Yes	19-02-2021						No				**7**	**4**	**4**	**4**	**2**	**2**	**2**	**70.9**	**62.8**	**53.6**	**50.8**	**44.5**	**42.3**	**40.2**	**98**	**90**	**82**	**78**	**67**	**65**	**59**	no	no
9	vani	58	Female			shoulder pain and rom restriction x 3 months		Yes		28-02-2021	Yes					No	3.8L	12.00L	145	9	8	6	5	3	2	2	73.3	70.7	66.8	65.8	60.5	50.6	43.7	94	88	80	76	65	60	58	no	no
10	somanna	59	Male	Yes		shoulder pain x 2 years			Yes	20-03-2021						No				**9**	**6**	**5**	**5**	**4**	**3**	**2**	**65.8**	**63.8**	**60.1**	**54.9**	**51.8**	**47.8**	**42.3**	**95**	**89**	**80**	**70**	**62**	**56**	**52**	no	no
11	ramana	65	Male		Yes	shoulder ROM restrictions x 2 months		Yes		26-03-2021		Yes				No	2.65L	9.00L		8	7	6	6	5	4	1	68.7	64.5	58.6	54.7	51.2	49.3	44.6	98	80	80	76	72	68	50	no	no
12	naveen kumar	49	Male	Yes		shoulder pain x 15 months			Yes	15-04-2021	Yes					No				**9**	**7**	**6**	**5**	**4**	**3**	**2**	**66.7**	**62.7**	**57.8**	**54.2**	**50.5**	**47.3**	**45.4**	**99**	**82**	**76**	**68**	**62**	**58**	**55**	no	no
13	manjulamma	47	Female		Yes	shoulder rom restiction x 14 months		Yes		21-04-2021						No	4.32L	13.98L	210	9	8	7	6	5	3	1	74.5	72	69.4	66.7	62.5	60.3	57.8	88	80	72	68	60	55	50	no	no
14	chalapthi	51	Male	Yes		restriction of movements of shoulder x 3 months			Yes	28-04-2021	Yes					No				**8**	**6**	**5**	**5**	**4**	**3**	**2**	**70.5**	**66.6**	**60.2**	**56.7**	**52.8**	**47.6**	**42.7**	**86**	**80**	**70**	**65**	**56**	**55**	**46**	no	no
15	narayanasawamy	63	Male	Yes		shoulder pain and restriction of movements x 13 months		Yes		13-05-2021						No	2.87L	10.00L	176	7	6	5	5	4	3	1	68.7	66.5	60.9	54.8	44.8	40.1	37.8	91	84	80	72	68	62	58	no	no
16	lakshmamm	70	Female	Yes		shoulder pain x 17 months			Yes	18-05-2021						No				**8**	**7**	**6**	**4**	**5**	**3**	**1**	**65.8**	**63.8**	**60.1**	**54.9**	**51.8**	**47.8**	**42.3**	**92**	**86**	**80**	**71**	**65**	**59**	**55**	no	no
17	vishnu	54	Male		Yes	rom restriction of shoulder x 18 months		Yes		22-05-2021	Yes	Yes				No	1.54L	7.00L	156	9	8	7	6	5	2	1	66.3	60.2	55.6	51.7	46.6	43.7	39.2	98	88	80	70	62	58	50	no	no
18	kumaraswamy	55	Male	Yes		pain and rom restriction of shoulder x 11 months			Yes	28-05-2021						No				**7**	**5**	**4**	**3**	**2**	**2**	**1**	**65.8**	**61.6**	**58.7**	**53.5**	**49.8**	**46.7**	**40.2**	**86**	**84**	**80**	**72**	**68**	**62**	**58**	no	no
19	lakshmipathi	57	Male		Yes	shoulder pain x 15 months		Yes		11-06-2021	Yes					No	3.34L	10.87L	222	9	8	7	5	4	2	1	71.2	67.5	63.4	57.7	54.2	49.6	45.5	98	88	80	70	62	52	48	no	no
20	pushpalatha	66	Female	Yes		shoulder pain x 26 months			Yes	19-06-2021						No				**9**	**6**	**5**	**3**	**3**	**2**	**1**	**70.3**	**67.8**	**58.9**	**55.6**	**50.3**	**46.7**	**43.7**	**99**	**89**	**80**	**78**	**72**	**68**	**60**	no	no
21	ravanappa	65	Male	Yes		restriction of rom and shoulder pain x 12 months		Yes		22-06-2021		Yes				No	4.87L	13.87L		8	7	6	5	3	2	1	67.8	56.7	50.4	48.3	46.7	45.9	43.2	104	94	82	71	68	56	50	no	no
22	ramesh	64	Male		Yes	restriction of rom and shoulder pain x 14 months			Yes	09-07-2021	Yes					No			187	**7**	**5**	**3**	**3**	**2**	**2**	**2**	**69.1**	**63.4**	**60.5**	**54.6**	**53.8**	**51.8**	**47.1**	**106**	**89**	**80**	**72**	**66**	**60**	**57**	no	no
23	sarojamma	54	Female	Yes		shoulder pain x 14 months		Yes		11-07-2021						No	3.12L	10.76L		7	6	5	5	4	2	1	65.7	60.9	57.2	55.7	44.8	40.3	36.7	99	88	76	65	56	50	48	no	no
24	lavnaya	56	Female	Yes		shoulder pain and restriction of movements x 16 months			Yes	21-07-2021						No				**9**	**6**	**5**	**5**	**4**	**4**	**3**	**64.7**	**60.4**	**58.9**	**55.6**	**53.6**	**50.9**	**47.8**	**98**	**90**	**82**	**76**	**70**	**61**	**60**	no	no
25	kavya	58	Female	Yes		shoulder pain and restriction of movements x1 1 months		Yes		23-07-2021	Yes					No	3.76L	11.56L	167	8	7	6	5	3	2	1	67.4	61.2	57.6	52.3	47.8	43.9	39.6	70	62	54	45	43	42	41	no	no
26	suhas	67	Male	Yes		restriction of shoulder movements x 28 months			Yes	30-07-2021						No				**8**	**6**	**6**	**5**	**5**	**4**	**3**	**70.5**	**67.8**	**66.4**	**60.6**	**56.4**	**52.7**	**48.7**	**88**	**80**	**76**	**72**	**66**	**62**	**60**	no	no
27	likitha	54	Female		Yes	restriction of shoulder ROM x 6 months		Yes		02-08-2021	Yes					No	3.12L	12.67L	124	9	8	7	5	4	3	2	67.3	62.7	58.6	55.3	51.6	46.3	40.1	86	80	71	62	57	55	49	no	no
28	pruthvi	63	Male		Yes	restriction of shoulder and pain x 7 months			Yes	14-08-2021						No				**9**	**7**	**6**	**5**	**4**	**5**	**4**	**68.9**	**65.3**	**60.6**	**54.7**	**51.4**	**47.3**	**46.3**	**84**	**78**	**70**	**66**	**62**	**60**	**56**	no	yes
29	balaji	52	Male	Yes		shoulder pain and restriction of movements x1 1 months		Yes		17-08-2021	Yes					No	3.87L	11.87L	142	8	7	7	5	3	2	1	72.3	65.7	60.9	54.6	49.2	45.6	41.3	82	71	66	62	58	52	49	no	no
30	rakesh	56	Female	Yes		shoulder pain x 15 months			Yes	27-08-2021						No				**7**	**6**	**5**	**5**	**4**	**4**	**2**	**65.6**	**62.3**	**60.1**	**54.6**	**53.9**	**50.1**	**46.8**	**98**	**90**	**82**	**71**	**63**	**60**	**55**	no	no

				Side				Procedure			Comorbidities								VAS							Quick dash							SPADI								
Sl. No.	Patient name	Age	Gender	Right	Left	Chief complaints		IA-PRP (Group 1)	IA-CS	Date of procedure	Diabetes Mellitus	Hypertension	Tuberculosis	Bronchial asthma	Epilepsy	Complications after procedure	Pre platelet count	Post platelet count	RBS	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Complications	Loss of follow up
31	lalitha	50	Female	Yes		shoulder pain and restriction of movements x 14 months		Yes		29-08-2021	Yes					No	1.98L	8.76L	167	9	8	6	4	3	2	1	56.4	47.8	40.9	36.5	32.7	30.7	27.8	94	82	74	70	66	62	54	no	no
32	subramani	46	Male		Yes	shoulder pain and restriction of movements 21 months			Yes	01-09-2021						No				**8**	**6**	**6**	**5**	**5**	**4**	**2**	**62.6**	**57.8**	**54.5**	**50.9**	**47.8**	**46.4**	**43.8**	**89**	**80**	**72**	**70**	**66**	**60**	**58**	no	no
33	chennnabasappa	44	Female		Yes	shoulder pain and restriction of movements x 15 months		Yes		10-09-2021		Yes				No	1.54L	6.6L		9	8	7	5	4	3	1	69.4	62.3	57.4	51.4	47.8	44.6	39.8	80	72	67	62	59	50	43	no	yes
34	manjula	76	Female	Yes		shoulder pain and restriction of movements x 12 months			Yes	17-09-2021						No				**7**	**5**	**4**	**4**	**4**	**3**	**2**	**71.2**	**65.3**	**60.6**	**56.7**	**52.3**	**50.6**	**44.6**	**99**	**90**	**82**	**76**	**70**	**62**	**59**	no	no
35	ankappa	56	Female		Yes	shoulder pain and restriction of movements x 10 months		Yes		24-09-2021	Yes					No	1.45L	6.8L	187	6	5	5	4	3	2	1	65.7	60.1	54.3	53.7	50.6	44.7	43.1	89	80	72	68	62	58	52	no	no
36	sashikala	65	Female	Yes		shoulder pain and restriction of movements x 9 months			Yes	10-10-2021	Yes					No			194	**8**	**6**	**5**	**5**	**3**	**2**	**2**	**67.8**	**63.4**	**60.1**	**56.7**	**55.4**	**52.6**	**49.8**	**93**	**88**	**84**	**79**	**72**	**69**	**66**	no	no
37	gangadhar	76	Male	Yes		shoulder pain and restriction of movements x 8 months		Yes		16-10-2021						No	4.65L	13.76L		9	8	7	6	5	3	1	65.7	60.8	56.7	50.2	45.7	42.7	40.1	92	86	80	77	70	62	57	no	yes
38	srinivas	62	Male	Yes		shoulder pain and restriction of movements x 6 months			Yes	18-10-2021		Yes				No				**8**	**6**	**5**	**5**	**4**	**3**	**2**	**70.9**	**65.4**	**61.2**	**57.3**	**54.2**	**50.1**	**47.2**	**94**	**87**	**82**	**78**	**74**	**68**	**65**	no	no
39	sindhu	45	Female		Yes	shoulder pain and restriction of movements x 7 months		Yes		27-10-2021						No	2.98L	10.87L		9	8	7	6	4	2	1	66.1	60.3	54.6	52.3	49.6	44.3	39.4	89	79	75	70	66	63	56	no	no
40	yashwanth	51	Male		Yes	shoulder pain and restriction of movements x 4 months			Yes	14-11-2021	Yes					No			165	**7**	**5**	**4**	**4**	**3**	**2**	**1**	**67.4**	**62.6**	**60.1**	**57.3**	**52.3**	**50.1**	**47.3**	**88**	**80**	**76**	**72**	**67**	**62**	**59**	yes	no
41	chowdappa	54	Male		Yes	shoulder pain and restriction of movements x1 1 months		Yes		19-11-2021						No	1.65L	7.8L		9	8	6	4	3	2	1	69.8	66.3	60.2	57.3	55.3	50.3	46.7	86	79	72	66	60	58	52	no	no
42	nagaveni	59	Female	Yes		shoulder pain and restriction of movements x 22 months			Yes	27-11-2021						No				**8**	**6**	**5**	**5**	**4**	**3**	**1**	**72.3**	**68.9**	**64.3**	**61.2**	**58.4**	**54.6**	**50.3**	**90**	**83**	**78**	**75**	**70**	**66**	**60**	no	no
43	yerrappa	60	Male	Yes		shoulder pain and restriction of movements x 20 months		Yes		01-12-2021						No	2.65L	7.9L		9	7	6	5	3	2	1	74.5	70.3	65.6	61.2	54.3	50.9	44.3	105	91	83	75	70	66	60	no	no
44	rakesh	48	Male	Yes		shoulder pain and restriction of movements x 19 months			Yes	13-12-2021	Yes					No			156	**9**	**7**	**6**	**5**	**4**	**3**	**2**	**70.1**	**65.3**	**61.2**	**57.4**	**54.3**	**50.3**	**50.1**	**110**	**94**	**88**	**79**	**72**	**66**	**62**	no	yes
45	pratyusha	66	Female		Yes	shoulder pain and restriction of movements x 14 months		Yes		19-12-2021						No	2.67L	8.9L		7	6	5	4	3	2	1	68.3	63.4	60.1	54.3	50.1	44.8	41.2	98	89	82	78	76	65	56	yes	no
46	krishna	61	Female	Yes		shoulder pain and restriction of movements x 9 months			Yes	05-01-2022						No				**7**	**5**	**4**	**4**	**3**	**3**	**2**	**63.2**	**58.7**	**54.6**	**50.2**	**48.9**	**47.3**	**46.5**	**99**	**90**	**86**	**80**	**76**	**72**	**69**	no	no
47	chinakka	63	Female		Yes	shoulder pain and restriction of movements x 2 months		Yes		10-01-2022						No	4.15L	13.98L		9	8	7	6	5	3	1	70.2	67.4	62.3	56.7	51.2	45.3	40.3	96	87	83	75	70	63	59	no	no
48	balakrishna	69	Male	Yes		shoulder pain and restriction of movements x24 months			Yes	25-01-2022	Yes					No			176	**7**	**5**	**4**	**4**	**3**	**3**	**2**	**67.3**	**63.4**	**60.9**	**59.8**	**57.6**	**55.4**	**54.3**	**95**	**90**	**82**	**80**	**77**	**73**	**68**	no	no
49	kalavathi	71	Female	Yes		shoulder pain and restriction of movements x3 months		Yes		31-05-2022						No	3.76L	14.5L		8	7	6	4	3	2	1	58.9	55.4	53.2	43.7	40.1	34.6	32.4	110	90	83	76	70	64	62	no	no
50	vinod	57	Male	Yes		shoulder pain and restriction of movements x 9 months			Yes	10-02-2022		Yes				No				**8**	**6**	**5**	**5**	**4**	**3**	**2**	**65.3**	**63.7**	**60.1**	**57.8**	**54.7**	**53.2**	**50.3**	**98**	**90**	**82**	**78**	**70**	**66**	**63**	no	no
51	arun kumar	52	Male		Yes	shoulder pain and restriction of movements x 4 months		Yes		18-02-2022						No	4.87L	15.8L		9	8	7	6	4	2	1	68.4	62.3	60.2	56.7	52.1	45.7	41.2	108	92	84	79	72	64	61	yes	no
52	sagar krishna	60	Male		Yes	shoulder pain and restriction of movements x1 1 months			Yes	26-02-2022	Yes					No			159	**9**	**6**	**5**	**4**	**4**	**3**	**2**	**64.3**	**60.2**	**54.3**	**53.3**	**51.2**	**50.1**	**49.3**	**112**	**93**	**85**	**79**	**76**	**69**	**63**	no	no

				Side				Procedure			Comorbidities									VAS							Quick dash							SPADI								
Sl. No.	Patient name	Age	Gender	Right	Left	Chief complaints		IA-PRP (Group 1)	IA-CS	Date of procedure	Diabetes Mellitus	Hypertension	Tuberculosis	Bronchial asthma	Epilepsy	Complications after procedure	Pre platelet count	Post platelet count	RBS	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Pre injection	Post injection	2 weeks	4 weeks	8 weeks	12 weeks	24 weeks	Complications	Loss of follow up
53	krishnamurthy	61	Female		Yes	shoulder pain and restriction of movements x 2 months		Yes		10-03-2022	Yes					No	3.23L	9.56L	199	7	6	5	6	4	3	1	66.3	63.2	60.1	54.5	50.5	43.7	41.2	96	88	82	76	72	69	61	no	no
54	hariharan	68	Male	Yes		shoulder pain and restriction of movements x 11 months			Yes	18-03-2022						No				**9**	**7**	**6**	**5**	**5**	**4**	**2**	**72.3**	**70.1**	**66.5**	**62.3**	**60.1**	**58.7**	**54.9**	**98**	**88**	**80**	**78**	**76**	**72**	**68**	no	no
55	harsha kumar	69	Male		Yes	shoulder pain and restriction of movements x 18 months		Yes		21-03-2022	Yes					No	3.64L	12.87L	129	8	7	6	4	3	2	1	65.6	61.2	54.3	51.2	47.3	42.1	38.7	114	90	86	82	77	72	68	no	no
56	harshith	61	Male	Yes		shoulder pain and restriction of movements x 2 months			Yes	03-04-2022						No				**9**	**7**	**8**	**6**	**5**	**4**	**2**	**64.2**	**61.2**	**57.3**	**53.4**	**52.8**	**51.7**	**50.2**	**94**	**88**	**85**	**76**	**68**	**65**	**62**	no	no
57	ravanamma	54	Female	Yes		shoulder pain and restriction of movements x 22 months		Yes		17-04-2022		Yes				No	3.65L	14.76L		8	7	5	5	3	2	1	63.25	58.91	54.2	50.1	43.4	40.1	35.6	92	87	79	72	66	61	58	no	no
58	shubhalakshmi	58	Female		Yes	shoulder pain and restriction of movements x 12 months			Yes	21-04-2022	Yes					No			135	**8**	**6**	**5**	**4**	**3**	**2**	**1**	**68.4**	**66.2**	**60.1**	**58.9**	**56.3**	**55.4**	**55.1**	**90**	**82**	**78**	**72**	**66**	**62**	**60**	no	no
59	sravanthi	52	Female	Yes		shoulder pain and restriction of movements x 15 months		Yes		01-05-2022	Yes					No	3.21L	13.76L	165	9	8	6	4	3	2	1	71.2	66.3	61.2	57.8	55.4	50.1	45.3	84	78	75	71	63	59	56	no	no
60	parvathi	59	Female	Yes		shoulder pain and restriction of movements x1 1 months			Yes	10-05-2022						No				**7**	**5**	**4**	**4**	**3**	**2**	**2**	**62.76**	**60.1**	**58.2**	**54.5**	**53.2**	**52.1**	**51.6**	**88**	**79**	**74**	**69**	**66**	**62**	**59**	no	no
61	lakshmi	58	Female	Yes		shoulder pain and restriction of movements x 2 months		Yes		14-05-2022						No	4.24L	16.87L		8	7	6	6	5	3	1	70.1	65.4	60.3	54.3	50.1	44.3	37.6	86	80	77	71	65	62	60	no	no
62	ramani	63	Female		Yes	shoulder pain and restriction of movements x 5 months			Yes	21-05-2022	Yes					No			183	**9**	**7**	**6**	**5**	**4**	**3**	**2**	**66.3**	**62.1**	**58.7**	**56.3**	**52.1**	**50.9**	**44.3**	**116**	**109**	**101**	**93**	**87**	**81**	**70**	no	no
63	raghavarao	61	Male		Yes	shoulder pain and restriction of movements x 1 month		Yes		23-05-2022						No	2.99L	13.87L		9	8	7	6	4	3	2	65.4	60.1	54.3	51.2	45.3	41.2	37.6	102	90	84	75	70	66	61	no	no
64	raghupathi	48	Male		Yes	shoulder pain and restriction of movements x 4 months			Yes	06-06-2022	Yes					No			144	**7**	**5**	**4**	**4**	**3**	**2**	**2**	**70.3**	**68.3**	**64.2**	**63.2**	**62.2**	**60.1**	**59.4**	**88**	**80**	**76**	**72**	**69**	**66**	**59**	no	no
65	manjuladevi	46	Female	Yes		shoulder pain and restriction of movements x 7 months		Yes		19-06-2022		Yes				No	3.65L	13.87L		8	7	6	5	3	2	1	71.2	66.3	61.2	57.8	55.4	50.1	45.3	104	92	88	84	76	67	62	no	no
66	akkamma	49	Female		Yes	shoulder pain and restriction of movements x1 1 months			Yes	21-06-2022	Yes					No			167	**9**	**7**	**5**	**4**	**3**	**3**	**2**	**63.2**	**59.3**	**58.2**	**54.5**	**53.2**	**52.1**	**51.6**	**93**	**84**	**79**	**74**	**70**	**66**	**60**	no	no
67	harshaveni	50	Male	Yes		shoulder pain and restriction of movements x 1 month		Yes		24-06-2022	Yes					No	4.21L	16.76L	184	8	7	6	6	5	2	1	68.3	63.4	60.1	54.3	50.1	44.8	41.2	94	87	83	76	70	63	59	no	no
68	harish	51	Male	Yes		shoulder pain and restriction of movements x 8 months			Yes	11-06-2022						No				**9**	**7**	**6**	**6**	**5**	**4**	**2**	**65.4**	**64.3**	**61.2**	**60.4**	**56.7**	**55.4**	**53.2**	**99**	**88**	**85**	**80**	**73**	**67**	**63**	no	no