



Management of post traumatic frozen shoulder using autologous Platelet Rich Plasma intra-articular injection

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ABSTRACT

Introduction- Frozen shoulder secondary to trauma occurs with either because of trauma to shoulder itself or away from shoulder joint in same limb consequencing into prolonged disuse or immobilization. Platelet-rich plasma can produce collagen and growth factors, which increases stem cells and consequently enhances the healing. To date, there is only a case report regarding the effectiveness of platelet-rich plasma in frozen shoulder either primary or secondary.

Methodology- 22 patients visiting the Orthopedics OPD fulfilling the inclusion criteria were included in the study. On follow-up evaluation was done by using DASH score.

Results- Pre-injection mean DASH score was 60.64 and post-injection mean DASH score at final follow-up was 32.4. The difference is statistically significant with p-value <0.001.

Conclusion- Results were comparable with other studies using other modalities. The results of this study support the use of PRP in post-traumatic frozen shoulder which is safe and has shown significant improvement in early phases of diseases.

KEYWORDS : Dexmedetomidine , Intranasal, Midazolam , premedication

INTRODUCTION

Frozen shoulder, also called as Periarthritis shoulder, is of importance because of its frequent occurrence, limiting effect on work capacity, frequent resistance to treatment and progression at times to a capsulitis resulting in prolonged severe disability. Frozen shoulder secondary to trauma occurs with either because of trauma to shoulder itself or away from shoulder joint in same limb consequencing into prolonged disuse or immobilization. Frozen shoulder may virtually present as complete ankylosis and then spontaneously thaw leaving a relatively normal joint.¹ Contribution of Duplay by end of 19th century represents the first effort to distinguish it from the vague, general classification of arthritis.² Most complete clinical description of the condition was that of Codman in 1934, but pathological basis of ailment was obscure to him.³ In 1969, Lundberg made a distinction between primary and secondary frozen shoulder. Primary frozen shoulder develops primarily without an underlying disease locally or systemically. In secondary frozen shoulder, such as proximal humeral fractures, soft tissue injuries, subacromial bursitis, shoulder surgery, trauma to affected limb away from shoulder joint (which resist motion at shoulder joint) and systemic diseases was described.⁴ Suggested treatment regimens include continued physical therapy, steroid injections, hydraulic distension, and manipulation under anesthesia, surgical release - open or arthroscopic.^{5,6,7,8,9,10,11}

Platelet rich plasma has been a breakthrough in the stimulation and acceleration of bone and soft tissue healing. Within PRP, the increase number of platelet delivers an increased number of growth factors to the affected area. Growth factors in PRP are: Platelet Derived Growth Factor (PDGF) as PDGF α , PDGF β , PDGF γ , Transforming Growth Factor beta (TGF- β), Vascular Endothelial Growth Factor (VEGF), and Epithelial Growth Factor (EGF). These are native growth factors in their biologically determined ratios. The growth factors in PRP acts on healing capable cells to increase their

numbers (mitogenesis) and stimulate vascular ingrowth (angiogenesis).¹² To best of our knowledge, there is only one case report has been published till date which supports use of PRP in frozen shoulder published in year 2016 by Aslani et al.¹³ There is no literature available for use of PRP in large group of patients of frozen shoulder whether primary or secondary. Hence the present study was done to find the effect of intra-articular injection of PRP in patients of post traumatic frozen shoulder. Assessment of results were done by using DASH score.¹⁴

MATERIAL AND METHODS

This prospective study was conducted in Department of Orthopaedics, Maharaja Agrasen Medical College, Agroha (Hisar). A total of 22 patients having secondary frozen shoulder visiting the Orthopedics OPD fulfilling the inclusion criteria were included in the study. Patients of age group 40 years and above with post traumatic frozen shoulder, marked loss of active and passive shoulder motion (more than 50% loss of movements in all ranges in comparison with the opposite unaffected side), and pain at extremes of all range of motions and globally limited glenohumeral translations were included in the study. Patient with platelet dysfunction syndrome, intrinsic glenohumeral pathology such as glenohumeral arthritis, unhealthy skin condition at procedure site and patient unwilling to accept risks or to participate in study were excluded from the study.

All the 22 patients of post traumatic frozen shoulder had history of ipsilateral injuries. Six patients had clavicle fracture, five patients had soft tissue injury around shoulder joint, five patients had fracture around elbow, three patients had fracture both bone forearm and three patients had fracture around wrist. All patients of clavicle fracture and soft tissue injury to shoulder joint had been treated conservatively. Three patients of fracture around elbow and all the three patients of fracture both bone forearm were treated surgically with internal fixation. Rest of patients had history of being

treated conservatively in plaster of paris.

Platelet rich plasma was prepared on the day of application from the patient's own blood in department of blood transfusion using the standard preparation technique in a sterile environment (by using a standard centrifuge-fig.1). A total of 50 ml of patient's venous blood was drawn and Citrate Phosphate Dextrose Agar (CPDA) added as anticoagulant in a ratio of 1:9 (CPDA: blood). After 10 minutes centrifugation at 2200 revolution per minute (rpm) the blood was layered in 3 basic components; red blood cells, buffy coat (rich in platelet) and platelet poor plasma (fig.2). The red blood cells layer drawn from the tube and remainder was agitated for several seconds and underwent a second centrifugation at 2000 rpm for 10 minutes. After this three quarters of supernatant was discarded and the remaining taken as PRP (fig.3). In operation theatre (OT), just prior to application calcium chloride added into the vacutainer in a ratio of 1:6 (10% calcium chloride: PRP) to activate PRP (fig.4). In our study both anterior and posterior approaches for intra-articular injections of PRP were used. Patients were sent home with instructions to limit the use of arm for 24 hours to reduce inflammatory changes post injection injury. Post PRP injection regular follow up done at 2 weeks, 4 weeks and 3 months. All patients were put on physiotherapy. If at 2 weeks no significant improvement in DASH score was found second PRP injection was repeated.



Fig-1. Centrifuge Machine



Fig-2. Blood after Centrifugation

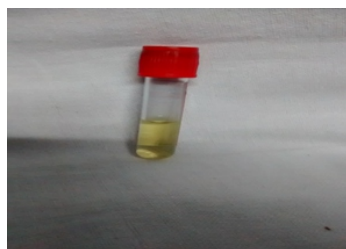


Fig-3. PRP.



Fig-4. PRP mix with calcium.

RESULTS

In our study average age of patients was 55 years, female outnumbered male (female 14, male 8) and right side was more

involved than left (right 15, left 7). Average duration of presentation after trauma was 5 month and 16 days. Seven patients had overlapping comorbidities as 4 patients having diabetes mellitus, 4 patients having hypertension, 1 patient having coronary artery disease, 4 patients having COPD and 2 patients having hypothyroidism. Tenderness was present in all cases over anterior joint line. Atrophy of muscles around the shoulder was present in around one-third of the patients (7 out of 22). All ranges of motions of the shoulder were reduced in all patients at presentation. The average ranges were flexion 94°, extension 30°, abduction 82°, adduction 31°, internal rotation 30° and external rotation 38° respectively and at final follow-up average ranges were flexion 143°, extension 54°, abduction 138°, adduction 50°, internal rotation 52° and external rotation 60° respectively. No major procedure related complication occurred. None of the patients deteriorated. On follow-up at 2 weeks 5 out of 22 patients show negligible improvement in DASH score so second PRP injection was given. Transient pain at injection site was experienced by 18 patients. All were relieved within 24-48 hours with or without analgesics. Pre-injection mean DASH score was 60.64 and post-injection mean DASH score at final follow-up was 32.4. The difference is statistically significant with p-value <0.001.

DISCUSSION

The treatment of frozen shoulder is confusing; it is no surprise that there is no unanimous opinion regarding the ideal and appropriate method of treatment. Conservative and non-operative treatment is still the treatment of choice. It is followed by local injection, manipulation and physiotherapy. Beyond this, controversies start and there are no uniform recommendations. Many treatment protocols have been proposed i.e. nerve blockage, hydrodilatation, manipulation under GA, open release, arthroscopic release and combination of various modalities have been tried.

PRP as modality of treatment is not new in the field of medicine but is new as far as frozen shoulder is concerned. The purpose of this prospective study was to evaluate how PRP affects healing in patients of post traumatic frozen shoulder. As there is no large study available on use of PRP in frozen shoulder, the results of present study are compared with relevant studies.

Mean age in our study was 55 years, which shows patients of elderly age groups are more prone to develop frozen shoulder after trauma (upper limb) as they restrict movements at shoulder joint. There were 14 females out of 22 patients in the present study. This shows females are more prone to develop frozen shoulder after trauma because of lack of physical activity and hormonal imbalances after menopause. Those patients who had disease of longer duration were recovered very slowly because of more stiffness. In the present study it was observed that 7 patients out of 22 having atrophy of muscles around shoulder joint. This might be because of disuse of shoulder joint.

Range of Motion (ROM) at presentation and at final follow-up after PRP injection of present study was compared with study on manipulation under anesthesia with hydrodilatation by Quraishi et al,¹⁵ comparison shown in the tables given below:

Table-1: Comparison of Range of Motions

| Study | Pre-injection | | | | | Post-injection | | | | | | |
|------------------------------|---------------|------|------|------|----|----------------|-------|------|------|------|----|----|
| | Flex. | Ext. | Abd. | Add. | IR | ER | Flex. | Ext. | Abd. | Add. | IR | ER |
| Quraishi et al ¹⁵ | 93 | - | 78 | - | 39 | 23 | 134 | - | 129 | - | 53 | 45 |
| Present study | 94 | 30 | 82 | 31 | 30 | 38 | 143 | 54 | 138 | 50 | 52 | 60 |

Flex.- flexion, Ext.- extension, Abd.- abduction, Add.- Adduction, IR- internal rotation, ER- external rotation.

In the present study there is significant improvement in the ROM after intra-articular PRP injection as compare to ROM status prior to

injection. The improvement in ROM in our study is comparable with other study. PRP injection was repeated in 5 patients at 2 weeks who showed more improvement after second injection as compare to first.

Mean DASH scores at presentation and at final follow-up after PRP injection of present study was compared with study on arthroscopic release by Ebrahimzadeh et al,¹⁶ comparison shown in the tables given below.

Table-2: DASH Comparison

| | No. of patients | Follow-up | DASH score pre-intervention | DASH score post-intervention | P value |
|----------------------------------|-----------------|-----------|-----------------------------|------------------------------|---------|
| Ebrahimzadeh et al ¹⁶ | 49 | 48 months | 56.6±19.7 | 21±23.9 | <0.001 |
| Our study | 22 | 3 months | 60.64±8.6 | 32.4±12.8 | <0.001 |

In the present study there is significant improvement in the DASH score after intra-articular PRP injection as compare to DASH score prior to injection. The improvement in DASH score in our study is comparable with other study. No complications and side effects were observed.

CONCLUSION

In this study, autologous PRP intra-articular injection has been found to be useful in decreasing pain and increasing range of movements in all patients of post traumatic frozen shoulder. The cause of initiation of frozen shoulder was disuse of involved limb after trauma. The procedure did not have any major complications like infection or deterioration from pre-existing status. The average mean pre-injection DASH score improved significantly when compared with post-injection mean DASH score. The results of this study support the use of PRP in post-traumatic frozen shoulder which is safe and has shown significant improvement in early phases of diseases. It also probably prevents the progression of mild to moderate disease into much severe form of frozen shoulder.

REFERENCES

1. Wright V, Haq AMMM. Periarthritis of the shoulder: Aetiological considerations with particular reference of factor. *Ann Rheum Dis* 1976;35:213-9.
2. Duplay S. De La peri-arthritis scapulo-humerale et des raideurs de lepaule qui en sont la consequence. [What is the outcome of scapulohumeral periarthritis and stiffness of the shoulder]. *Arch Gen Med* 1872;20:513-4.
3. Codman EA. The Shoulder: Rupture of the supraspinatus tendon and other lesion in or about the subacromial bursa. Boston, USA: Thomas Todd; 1934.
4. Lundberg BJ. The Frozen Shoulder, *Acta Orthop Scand* 1969;119:1-59.
5. Hannafin JA, Chiaia TA. Adhesive capsulitis: a treatment approach. *Clin Orthop* 2000; 372:95-109.
6. Diercks RL, Stevens M. Gentle thawing of the frozen shoulder: a prospective study of supervised neglect versus intensive physical therapy in seventy seven patients with frozen shoulder syndrome followed upto two years. *J Shoulder Elbow Surg* 2004;13:499-502.
7. Shaha MS, Kulkarni PN, Patil NS, Desai NR, Patel NS, Kulkarni HG. Study to Evaluate the Additional Benefit of the Hydraulic Capsular Distention Using Normal Saline and Steroid in the Management of the Frozen Shoulders Treated With Conventional Physiotherapy. *J Evidence Based Med Healthcare* 2015;2:1168-79.
8. Bell S, Coghlan J, Richardson M. Hydrodilatation in the management of shoulder capsulitis. *Australas Radiol* 2003;47:247-51.
9. Dodenhoff RM, Levy O, Wilson A, Copeland SA. Manipulation under anesthesia for primary frozen shoulder: effect on early recovery and return to activity. *J Shoulder Elbow Surg* 2000;9:23-6.
10. Omari A, Bunker TD. Open surgical release for frozen shoulder: surgical findings and results of release. *J Shoulder Elbow Surg* 2001;10:353-7.
11. Berghs BM, Molins XS, Bunker TD. Arthroscopic release of adhesive capsulitis. *J Shoulder Elbow Surg* 2004;13:180-5.
12. Marx RE. Platelet-rich plasma: evidence to support its use. *J Oral Maxillofac Surg* 2004; 62:489-96.
13. Aslani H, Nourbakhsh ST, Zafarani Z, Bani MA, Ananloo MES, Beigy M et al. Platelet Rich Plasma for frozen shoulder: A case report. *Arch Bone Jt Surg* 2016;4:90-3.
14. Hudak P, Amadio PC, Bombardier C, and the Upper Extremity collaborative group. Development of an Upper Extremity outcome measure: The Disability of Arm, Shoulder and Hand. *Am J Ind Med* 1996;29:602-8.
15. Quraishi NA, Johnston P, Bayer J, Crowe M, Chakrabarti AJ. Thawing the frozen shoulder. A randomized trial comparing manipulation under anesthesia with hydrodilatation. *J Bone Joint Surg Br* 2007;89:1197-200.
16. Ebrahimzadeh MH, Moradi A, Pour MK, Moghadam MH, Kachooei AR. Clinical Outcomes after Arthroscopic Release for Recalcitrant Frozen Shoulder. *Arch Bone Jt Surg* 2014;2:220-4.