REVIEW ARTICLE

Platelet-rich Plasma for Shoulder Joint

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Abstract

Introduction: Shoulder pain is a common and disabling complaint. The reported annual incidence of shoulder pain in primary care is 14.7 per 1000 patients per year with a lifetime prevalence of up to 70%. The most common causes of shoulder pain are rotator cuff tendinopathy, frozen shoulder or adhesive capsulitis and acromioclavicular (AC) joint osteoarthritis. Glenohumeral joint arthritis is uncommon.

Discussion: Platelet rich plasma (PRP) is plasma that contains higher than physiologic platelet content. It has been seen that these growth factors are markedly up-regulated following tendon injury and are active at multiple stages of the healing process. Platelet rich plasma is an autologous source of growth factors and has been found to be helpful for treatment of tendinopathies and osteoarthritis. Platelet rich plasma injections for shoulder joint pathologies can be done using either fluoroscopy or by ultrasound guidance.

Conclusion: Fluoroscopic guided PRP injection is better than ultrasound guidance as it helps to inject PRP with a single needle prick at three sites including glenohumoral joint, supraspinatous tendon and acromioclavicular joint.

Keywords: Fluoroscopy, Platelet-rich plasma, Shoulder pain.

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Introduction

The shoulder joint is a complex and the most mobile joint in the human body. However, due to this, the shoulder joint is an unstable one. This instability is compensated by the soft tissues around the joint including rotator cuff muscles and tendons, ligaments, and glenoid labrum.[1] The shoulder pain is a common and disabling complaint. The reported annual incidence of shoulder pain in the primary care is 14.7 per 1,000 patients per year with a lifetime prevalence of up to 70%.[2–6]

Anatomy

The bones of the shoulder joint complex include clavicle, scapula, and proximal end of humerus; joints include sternoclavicular, acromioclavicular, and glenohumoral joints; rotator cuff muscles include supraspinatous, infraspinatous, subscapularis, teres major, and teres minor.[7] All the three joints are synovial joints. The glenohumoral joint which is an unstable joint by its skeleton provides the stability by ligaments, capsules, and rotator cuff muscles surrounding it. Rotator cuff muscles along with the deltoid causes the movements of the glenohumoral joint.

Causes of Shoulder Pain

The common causes of shoulder pain are rotator cuff tendinopathy, frozen shoulder or adhesive capsulitis, and AC joint osteoarthritis.[8–10] About 65–70% cases of shoulder pain are due to rotator cuff problems.[9] Glenohumeral joint arthritis is uncommon (Fig. 1).

PRP

PRP is the plasma that contains higher platelet content than physiologic. PRP is concentrated autologous platelet preparation containing growth factors. Growth factors represent one of the most important of the molecular families involved in healing. Important factors among these include insulin-like growth factor-I (IGF-I), transforming growth factor beta (TGFbeta), vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and basic fibroblast growth factor (bFG).[11,2]

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These factors along with epidermal growth factor (EGF) and fibroblast growth factor (FGF) are released from alpha granules of platelets upon platelet activation and delivered to the injured site to facilitate healing.[13] It has been seen that these growth factors are markedly up-regulated following tendon injury and are active at multiple stages of the healing process.[14] PRP is an autologous source of these growth factors and has been found to be helpful for the treatment of tendinopathies and osteoarthritis (Fig. 2).[12,13]

Discussion

Rotator Cuff Tendinopathy

The pathophysiology of rotator cuff tendinopthy is characterized by progressive, degenerative changes within the tendon as a result of overuse, altered shoulder mechanics, and a limitation of the normal tendon repair system with a fibroblastic and a vascular response known as angiofibroblastic degeneration.[15] Conservative therapies do not uniformly improve clinical, functional, and radiological outcomes across severity grades of rotator cuff tendinopthy, and no therapy specifically targets the presumed degenerative pathology.[15] PRP and stem cells enhance the regenerative potentials of tendon stem cells and regeneration of torn supraspinatus in preclinical studies.[16] A single intralesional injection of PRP under ultrasound guidance resulted in a safe, significant, sustained improvement

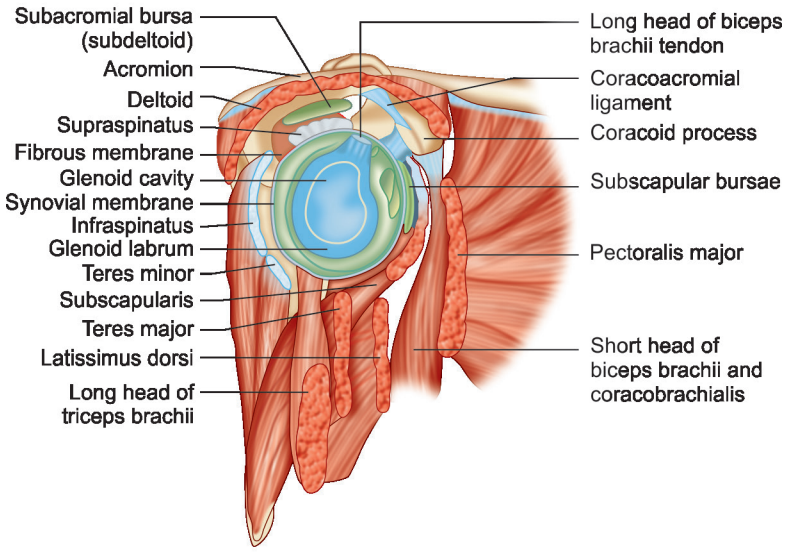

Fig. 1: Lateral view of the right glenohumeral joint and surrounding muscles with the proximal end of humerus removed

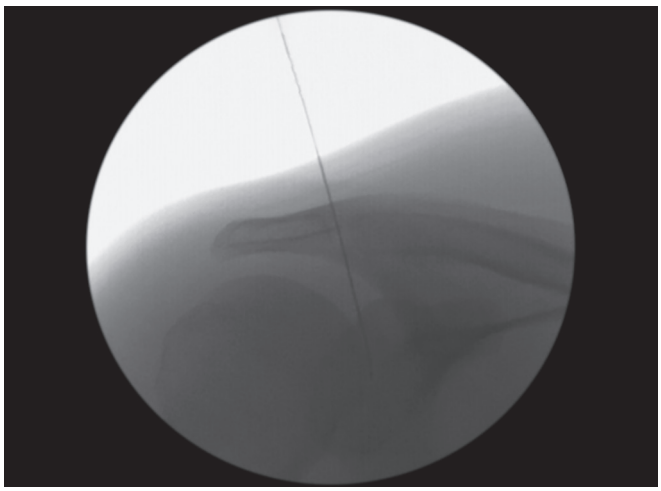

Fig. 2: Fluoroscopic-guided 3-in-one shoulder joint injection

in pain, function, and MRI outcomes in patients with refractory rotator cuff tendinopthy.[15] Several clinical studies have described PRP-augmented rotator cuff repairs in patients with rotator cuff tears.[16] Kim found that bone marrow aspirate concentrate-platelet rich plasma (BMAC-PRP) improved pain and shoulder function in patients with partial tear of the rotator cuff tendon.[16] Also Kothari et al. found single injection of PRP resulting in significant improvement in range of shoulder motion, pain, and function than steroid or ultrasonic therapy in patients with periarthritis shoulder.[17] Shams et al. found subacromial injection, for rotator cuff tear, of autologus PRP that had improved visual analog scale (VAS), American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), Constant-Murley score (CMS), and simple shoulder test (SST) at 12 weeks compared to corticosteroid injection.[18] However, for massive or large rotator cuff tear, PRP injection has shown no benefit with respect to the quality of tendon healing.[19] A meta-analysis done by Fitzpatrick et al. concluded that PRP injections improved outcomes in patients with rotator cuff tendinopathy.[20]

Adhesive Capsulitis/Frozen Shoulder

As almost 40% of frozen shoulder have permanent disability, a ray of hope with PRP treatment has been given by a case report by Haidreza et al.[21] He has shown that intra-articular and subacromial injections of PRP have more than 3-fold improvement in range of motion and 70% improvement of function in a patient with no side effects when compared to less proven beneficial physiotherapy and corticosteroid with potential direct or apparent side effects.

Lin compared PRP with procaine for the treatment of frozen shoulder and he too found shoulder function and VAS improvement at 1 week, 1 month, and 3 months following PRP injection compared to procaine injection.[22] Also, 12 weeks after a single dose of intra-articular PRP injection, a significant benefit was observed by Barman and colleagues in terms of improvement of pain, disability, and shoulder range of motion in patients with adhesive capsulitis of the shoulder compared to an intra-articular corticosteroid injection.[23]

Subacromial Bursitis

Doctors of Czech Republic had done a study where a series of three PRP injections, each 1 week apart, were given into the subacromial space in patients with the shoulder impingement syndrome. This was compared with similar injections of cortisone. After treatment, patients were followed at 6 weeks, 3 months, and 6 months. Based on the follow-up, the researchers concluded that PRP administered through a series of three injections applied in the subacromial space in patients with the shoulder impingement syndrome has positive effects on the daily activities superior to cortisone.[24] In a study comparing a single-dose injection of PRP and steroid for the subacromial impingement syndrome, the patients in the steroid group had better improvement in terms of the Constant score and VAS for pain.[25]

Glenohumoral Arthritis

Serial four injections of PRP 1 week apart have been found to be superior to hyaluronic acid injection or gonarthrosis.[26] In a comparative study by Salah et al. between PRP and steroid injection in mild to moderate shoulder osteoarthritis, it was seen that the

PRP group had superior improvement in the Western Ontario Osteoarthritis Shoulder index and the Visual Analog Scale.[27] A single injection of PRP (2 mL) resulted in significant improvement in patients with the periarthritis shoulder compared to corticosteroid injection or ultrasonic therapy.[28] In a systematic review, PRP injection has been found to provide significant relief in patients with the osteoarthritis hip and the knee.[29]

Acromioclavicular Joint Arthritis

A prospective and randomized study by Sabeti-Aschraf et al. showed a significant clinical improvement in pain and function up to 1 week postinjection with local anesthetic and corticosteroid, with ultrasound guidance.[30] However, there are not many studies that have been conducted for PRP injection in this condition.

Technique for Fluoroscopic-guided 3-in-1 Block

- Patient is asked to lie on a cushioned X-ray compatible table in the supine position with arms in the neutral position.
- The fluoroscope should be placed in the A–P direction with little cranial tilt.
- All aseptic precautions should be followed.
- Needle entry point should be at the AC joint and preliminary scan is done to locate the exact point to be injected.
- After injecting local anesthetic (lignocaine 1%) at needle entry point at the marked AC joint, 22 G quincke needle is inserted.
- The needle is placed through the AC joint toward the glenohumerol joint under fluoroscopic guidance and 1–2 mL of PRP should be injected at the glenohumoral joint.
- Needle is then withdrawn and another 1–2 mL of PRP should be injected in and around the supraspinatus tendon.
- Needle is then further withdrawn gradually under fluoroscopic images such a way that the needle tip should lie at the acromioclavicular joint and 0.5–1 mL of PRP is injected.

Technique for Ultrasound-guided Injections

Patient is asked to be in a seated position with upper limb neutral, extended or scarf position depending on the pathology. After accurate disinfection of both the skin and the probe, an ultrasound scan is done to visualize the target area. Local anesthetic (lignocaine 1%) is injected along the needle track. Using either the in-plane or the out-of-plane technique, the target area is reached and 2–6 mL of PRP is injected. After the procedure, the needle is removed and a plaster is applied at the puncture site.

Conclusion

Considering the current understanding of the mechanism of action of PRP, it shall be considered an attractive option for the treatment of rotator cuff tendinopathies. Though the evidences for or against the use of PRP for glenohumoral arthritis are scanty, the data from the evidences supporting the use of PRP for other joints such as osteoarthritis of knee joint can be extrapolated for the glenohumoral joint. PRP should be a good alternative to surgeries considering the safety, cost-effectiveness, and relatively noninvasive nature of the intervention. We propose the use of fluoroscopic-guided PRP injection than ultrasound guidance as it helps to inject PRP with a single-needle prick at three sites including glenohumoral joint, supraspinatous tendon, and acromioclavicular joint. So we consider it less troublesome to the patient than pricking the needle repeatedly for injecting PRP at various sites.

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