



FUNCTIONAL OUTCOME IN EARLY OSTEOARTHRITIS OF KNEE WITH TWO DOSES OF PLATELET RICH PLASMA OUR EXPERIENCE.

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ABSTRACT **Background:** Osteoarthritis (OA) is a degenerative disorder of synovial joints in which there is gradual softening and disintegration of articular cartilage accompanied by the new growth of cartilage and bone at the joint margins (Osteophytes), cyst formation and sclerosis in the subchondral bone, mild synovitis, and capsular fibrosis. It differs from simple wear and tears in that it is asymmetrically distributed, often localized to only one part of a joint i.e., weight bearing, and often associated with abnormal loading rather than frictional wear. It is a dynamic phenomenon and shows features of both destruction and repair. Cartilage softening and disintegration are accompanied from the very outset by hyperactive new bone formation, osteophyte formation and remodeling. Osteoarthritis is an age-related phenomenon, and it affects more than 80% of people greater than 55 years of age. Body mass index (BMI) plays a vital role in osteoarthritis in weight-bearing joints. People with obese or overweight were approximately 4.6 times more likely to have knee OA than normal-weight individuals. In addition people with metabolic and endocrine disorders are also more prone for osteoarthritis at an early age. **Methods:** Sixty patients suffering from grade 1 and 2 osteoarthritis knee joint who attended the outpatient department of orthopaedics, King George hospital, Visakhapatnam between November 2018 to October 2020 were included in the study. Informed and written consent was taken from the patients. General physical examination was done. Neurovascular status of both lower limbs was also examined. X-ray of both knee joints in antero-posterior and lateral views were taken in standing position. Routine pre-injection WOMAC and VAS score were recorded. Under aseptic conditions, two platelet-rich plasma (PRP) injections were injected into the knee joint at four weeks interval. Functional status of the knee was evaluated using WOMAC and VAS score at one, three and six week's interval. This study is an analytical comparative study. **Results:** There is a significant difference in the VAS score and WOMAC score before giving an injection and after giving an injection, in patients with grade 1 and grade 2 osteoarthritis. The visual analogue score showed a mean of 7.16 at pre-injection period, which decreased to 5.95 at 1st week and 4.81 at 3rd week and 4.06 at six weeks follow up. **Conclusion:** In the present study the effectiveness of two aliquots of PRP injection was evaluated. Although studies including more than 2 PRP injections and more advanced stages of osteoarthritis were compared, the time frame was fixed to 6 weeks. The functional outcome of the patient was better after 2nd dose of PRP. The present study concluded that two doses of PRP injection decreases the joint pain, alleviates the symptoms and enhances the activity of daily living and quality of life in short term duration.

KEYWORDS : Plasma A12.207.152.693 Blood Platelets A11.118.188 Cartilage A02.165

INTRODUCTION

The rationale for the use of PRP is based on their capacity to supply and release supra physiological amounts of essential growth factors and cytokines from their alpha granules to provide a regenerative stimulus that augments healing and promotes repair in tissues with low healing potential. By definition, platelet rich plasma (PRP) must contain a higher concentration of platelet than baseline. To be labelled as PRP, a platelet count of 3-5 times of the baseline should be present in the platelet concentrate. (many studies like Max et al mention the platelet count 1 million as standard value for PRP). Growth factors (VEGF, PDGF, IGF, HGF, TGF- β) in the alpha granules have been postulated to be chondro protective and capable of improving the physiology in osteoarthritic joints. In cartilage, it improves anabolism, decreases catabolism and promotes chondral remodeling. PRP causes increasing chondrocyte proliferation and production of matrix molecules. In the case of leucocyte rich PRP, monocytes and macrophages facilitate tissue repair by debriding and phagocytizing damaged tissue and debris. PRP counteracts the inflammatory cascade elicited by IL-1 beta and tumor necrosis factor-alpha (TNF- α) and inhibits IL-1 beta, COX-2 and MMP-2 gene expression. Growth factors in the platelets were shown to stimulate synovial fibroblast to synthesize hyaluronic acid.

AIM AND OBJECTIVES

Aim: 1. To evaluate the functional effectiveness of platelet rich plasma in grade 1 and grade 2 osteo arthritis of knee
2. To estimate the effects with VAS and WOMAC scores

Objectives: To compare the results with other similar studies.

MATERIAL AND METHODS

The present study included 60 patients (n=60) with grade 1 and grade 2 osteoarthritic knee joint (Kellgren-Lawrence radiological grading). We evaluated with visual analogue score (VAS) and Western Ontario and McMaster universities arthritis index (WOMAC ARTHRITIS

INDEX) for all patients before giving platelet-rich plasma injection and after giving platelet-rich plasma injection at 1st week, 3rd week, six weeks.

Procedure For Preparation Of Platelet-rich Plasma

Under aseptic conditions, patient blood of 34ml is collected from the antecubital vein. This blood is taken into two different test tubes containing 17 ml each. 3ml of anticoagulant (acid citrate dextrose solution) is added to each test tube. This test tube is subjected to centrifugation at 1500 rpm for 15 minutes (soft spin). This initial centrifugation separates red blood cells, buffy coat, and plasma. 20 ml of plasma (10 ml in each test tube) is separated and again subjected to centrifugation at 3500 rpm for 7 minutes. The supernatant platelet-poor plasma of 17ml is discarded, and the bottom 3 ml of platelet-rich plasma is collected.

Procedure For The Administration Of Platelet-rich Plasma

The patient position was sitting position with the knee flexed to ninety degrees. Under aseptic conditions, the injection site was cleaned and draped. 3ml of platelet-rich plasma injected into the patient knee joint (medial or lateral parapatellar ligament site) Sterile plaster was then applied. On the same day, the patient was allowed to go home, and an antibiotic (Amoxyclav 625mg BD) for five days was prescribed. No analgesics were prescribed except for paracetamol 500mg for emergency usage for unbearable pain.

Follow Up:

The knee's functional status was evaluated using WOMAC and VAS score at 1st, 3rd, six weeks interval.

The WOMAC (Western Ontario and McMaster Universities) index is used to assess patients with osteoarthritis of the hip or knee using 24 parameters. It can be used to monitor the course of the disease or to determine the effectiveness of Therapy. The difficulty level was graded into five grades from 0 to 4 in five categories of pain occurring in

various types of loading. Stiffness was graded in the same way in two categories. Physical function was also graded into five grades from 0 to 4 in seventeen daily activities.

Scale of difficulty: 0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely Pain while : 1. Walking 2. Stair Climbing 3. Nocturnal 4. Rest 5. Weight-bearing

Stiffness 1. Morning stiffness 2. Stiffness occurring later in the day.

Physical Function 1. Descending stairs 2. Ascending stairs 3. Rising from sitting 4. Standing 5. Bending to floor 6. Walking on a flat surface 7. Getting in/ out of car 8. Going shopping 9. Putting on socks 10. Lying in bed 11. Taking off socks 12. Rising from bed 13. Getting in/out of bath 14. Sitting 15. Getting on/off toilet 16. Heavy domestic duties 17. Light domestic duties 0 1 2 3 4.

Total Score: _____ /96 = _____ %

The higher the score worse is the functional status of that knee joint.

Visual Analog Scale For Pain

Visual Analog Scale for pain is a patient marked indicator of pain intensity. It is marked on a continuous 100 long line. On the left with 0 as no pain to the right extreme pain at 100 mm. this tool is totally patient indicated.

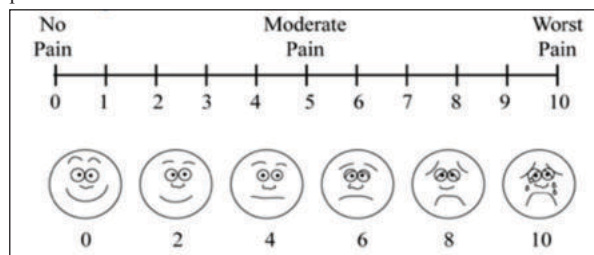


Fig-1 VAS score

KELLOGREN-LAWRENCE RADIOLOGICAL GRADING SYSTEM FOR OSTEOARTHRITIS KNEE JOINT **GRADE-1** Doubtful narrowing of joint space, possible osteophytic lipping. **GRADE-2** Definite osteophytes, possible narrowing of joint space. **GRADE-3** Moderate multiple osteophytes, definite joint space narrowing, some sclerosis, possible deformity of bony ends. **GRADE-4** Large osteophytes, marked joint space narrowing, severe sclerosis, and definite bony end deformity. (Fig -2)

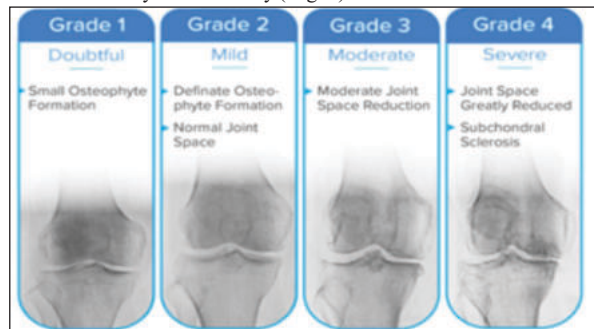


Fig -2 : KL Grading System Of Osteo Arthritis Of Knee

The results were tabulated, analyzed for mean and standard deviation and compared with similar studies

Inclusion Criteria

- 1. Age more than 45 years and less than 65years
- 2. Osteoarthritis grade 1 & 2

Exclusion criteria

- 1. Age less than 45 years and more than 65years
- 2. Patients with Diabetes mellitus
- 3. Patients with local infection
- 4. Osteoarthritis grade 3 & 4
- 5. Immuno-compromised patients

RESULTS

A total of 60 cases (n=60) presented with grade1 and grade 2

osteoarthritis knee joint were included in the study. The participants in this study were in the age group of 45-65 years. Female preponderance was observed with this study with 58.4% females to 41.6% male patients. In other words, gender distribution has no effect on pain relief. Both men and women responded similarly. Out of 60 patients 40 were grade1 and 20 were grade 2 osteo arthritis according to Kellgren Lawrence grade. There was a significant difference in the VAS score and WOMAC score before giving an injection and after giving an injection, in patients with grade 1 and grade 2 osteoarthritis. The visual analogue score showed a mean of 7.16 at pre-injection period, which decreased to 5.95 at 1st week and 4.81 at 3rd week and 4.06 at six weeks follow up (Table-1).

Table 1: Visual Analogue Score

VAS	Pre injection	1 st week	3 rd week	6 th week
N	60	60	60	60
Mean	7.16	5.95	4.81	4.06
SD +/-	0.99	1.15	1.25	1.44

The WOMAC score showed a mean of 71.6 at pre-injection period. The mean WOMAC score at 1st-week post-injection was 61.8. The mean WOMAC score at 3rd week was 53.8 and the mean WOMAC score at six weeks was 48.7. The present study showed a significant decrease in mean WOMAC score at 6 weeks when compared with pre-injection mean WOMAC score with a mean p value of less than 0.0001 which was significant (<0.05) (Table -2).

Table 2: WOMAC Score

WOMAC	Pre injection	1 st week	3 rd week	6 th week
N	60	60	60	60
Mean	71.6	61.8	53.8	48.7
SD +/-	10.25	10.45	12.47	14.20

It was observed that platelet-rich plasma is more effective in providing pain relief and improving physical function in patients with grade 1 and grade 2 osteoarthritis of knee joint. There were no significant complications or incidence of infection in the patients who has received PRP injection.

DISCUSSION

Amir khosbhin et al reported a mean age of 56.1 years in their systematic review [1]. Brian j cole et al reported a mean age of 55.8 years in their randomized control trial of single stage procedure of cell based repairs of cartilage defects [2]. In the present study, the average age of the patient is 54.6 years comparable to other studies. In the present study, thirty-five patients (58.4%) were females, and twenty-five patients (41.6%) were males. This present study shows female preponderance when compared with Amir khosbhin et al, Brian j cole et al studies [1,2]. Longxiang shen, Ting yuan, Shengbao CHEN conducted a study on platelet-rich plasma on pain and physical function in the treatment of osteoarthritis knee joint. It concluded that intra-articular platelet-rich plasma injections are more effective in the treatment of knee osteoarthritis in terms of relief of pain and self-reported function improvement at 3,6 and 12 months follow up. The present study is very much in agreement with that conclusion as far as pain relief in osteoarthritis knee joint afforded by PRP is concerned [3]. Age and physical activity can also influence the outcome of intra-articular injection platelet-rich plasma in knee osteoarthritis. Age is the most important factor studied and older age group individuals have poorer prognosis [4]. O'Donnel et al., in their study, showed that the stimulation of chondrocytes by Platelet-rich plasma from elderly osteoarthritis patients induced a catabolic cellular phenotype [5]. Chen et al in their study compared the efficacy of platelet-rich plasma versus hyaluronic acid in the treatment of osteoarthritis knee joint and concluded that platelet-rich plasma is more effective and providing relief of pain in patients with osteoarthritis knee joint. They also concluded that PRP group was superior to the HA group in terms of VAS and WOMAC score. In the present study, we did not compare PRP with HA. Still, VAS and WOMAC score significantly reduced after giving PRP injection [6] (Table -3&1).

Table 3: Comparing Vas Score With Various Studies

STUDY	VAS score
Amir Khosbhin et al	4.09
Brian J Cole et al	3.96
Present study	4.06

According to Guler et al hyaluronic acid can only increase the elasticity and viscosity of the joint fluid and thus helps in pain relief by

lubrication. So after giving hyaluronic acid injection as time progress, lubricating effect decreases and pain again reappears [7]. Görmeli et al. conducted a randomized controlled trial on the effects of multiple PRP injections. They suggested that multiple PRP injections have better clinical outcome than single PRP or HA injections. This indicates that multiple injections also play an essential role in the intervention outcome [8]. Mario Simental-Mendía et al in their pilot study compared the efficacy of single vs multiple PRP injections in the treatment of osteoarthritis knee joint and concluded that within a 6-month interval, a single injection was as effective as multiple PRP injections in terms of pain improvement which was assessed by VISUAL ANALOGUE SCALE (VAS) and that multiple injections were more effective than a single injection in functionality improvement [9]. In the present study, we opted for two PRP injections and there was a significant improvement in both pain relief and functional improvement for a short period of time.

Limitations

The present study is a short term study. Long term follow up is required with diagnostic arthroscopy or MRI to assess the articular cartilage regeneration.

CONCLUSION

In the present study the effectiveness of two aliquots of PRP injection was evaluated. Although studies including more than 2 PRP injections and more advanced stages of osteoarthritis were compared, the time frame was fixed to 6 weeks. The functional outcome of the patient was better after 2nd dose of PRP. The present study concluded that two doses of PRP injection decreases the joint pain, alleviates the symptoms and enhances the activity of daily living and quality of life in short term duration.

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