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Original Research Article

Injection of platelet rich plasma for low backpain caused by lumbar disc degeneration: a prospective study

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ABSTRACT

Background: Though the etiologies of chronic low back pain can be diverse, lumbar disc degeneration is one of the important causes of low backpain. In intractable cases of low back pain surgical interventions may be warranted. Intradiscal injection of platelet rich plasma is emerging as a novel treatment modality for chronic backpain and has been reported to have good results in terms of reduction of pain and improvement in functional abilities.
Methods: This was a prospective study in which 30 patients with chronic low back pain were included. Platelet rich plasma was injected in nucleus pulposus of the affected part of lumbar spine under fluoroscopic control. Patients were followed up for 3 months. Reduction in severity of pain and functional improvement was assessed by Visual Analogue Scores (VAS) and Roland-Morris Low Back Pain and Disability Questionnaire (RDQ) scores.
Results: The Mean age of the male patients was found to be 50.05±9.04 while the mean age of females was found to be 48.50±10.19. 18 (60%) patients were either overweight or obese. Remaining 12 (40%) patients had a normal BMI. The difference between mean VAS scores and RDQ scores at presentation and 3 months after PRP injection was found to be statistically highly significant ($p<0.0001$).
Conclusions: The intradiscal injection of platelet rich plasma in patients with low back pain secondary to lumbar disc degeneration is effective in reducing back pain and causing significant functional improvement.

Keywords: Functional disability, Lumbar disc degeneration, Platelet rich plasma injection, VAS scores

INTRODUCTION

Back pain is one of the important causes of morbidity in adults and remains one of the important causes for which orthopedic consultations are sought.[1] It is reported that more than 75% of patients will experience some or the other degree of back pain in their lifetime. However, in majority of the cases this low back pain resolves on its own with 3-4 weeks. The list of etiologies which may be responsible for back pain is extensive and may consist of pathologies such as infections (paraspinal or epidural abscess), degenerative changes in intervertebral discs, inflammatory and neoplastic conditions, spondylolisthesis, metastatic deposits and autoimmune conditions (ankylosing spondylitis etc.).[2]

Back ache caused by degeneration of intervertebral discs is by far one of the common causes of back pain particularly in elderly individuals.[3] Disc degeneration results in loss of elasticity of the intervertebral discs. This loss of elasticity then progresses to structural degeneration making the disc friable and prone for

annular tear. All these changes cause low back pain.[4] Since the etiology is degenerative disc changes it is termed as discogenic back pain. The diagnosis of discogenic back pain is usually confirmed on the basis of MRI imaging. MRI T2 weighted images are very helpful in the diagnosis of degenerative diseases involving spinal cord. It may show altered signal intensity (usually hypointense disc is suggestive of desiccation or degenerative changes). IN addition to degenerative changes MRI may also show annular tear, disc bulging or disc prolapse.[5]

The management of discogenic backpain may consist of conservative measures such as restriction of activities, analgesics, physiotherapy and injection of corticosteroids.[6] However, in many cases these measures do not produce significant relief and considerable pain remains despite all these conservative measures. In these cases, some or the other form of surgeries such as lumbar fusion surgery or disc replacement is usually advised.[7] Because of its indolent nature many patients learn to live with back pain and are reluctant to surgical treatment (fusion surgery or disc replacement), moreover the efficacy of surgical interventions is also variable and surgical interventions are fraught with their own complications.[8] It is therefore many researchers have come up with interventional conservative procedures such as radiofrequency interventions, intradiscal injection of methylene blue and intradiscal injection of platelet rich plasma.[9]

Platelet rich plasma (PRP) is autologous blood derivative having enhanced platelet concentration which basically has properties of biologically enhancing the healing process naturally. Such platelet rich plasma helps in tissue repair and healing process owing to the presence of various growth factors such as platelet- derived growth factor (PDGF) and transforming growth factor-beta (TGF-beta). Injections of platelet rich plasma has been subject of immense research in conditions such as plantar fasciitis, degenerative changes involving knee articular cartilage and degenerative changes in spinal cord. Many studies have reported beneficial effect of platelet rich plasma injections in backpain caused by degenerative diseases involving intervertebral discs.[10]

With this background we undertook this prospective study to analyze effectiveness of platelet rich plasma injections in the management of discogenic backpain.

METHODS

This was a prospective study conducted in the Department of orthopaedics Sambhram Institute of Medical Sciences and Research BEML Nagar India over a period of 2 years (March 2018 to February 2020). In this study 30 patients with low backpain due to lumbar disc degeneration were included on the basis of a predefined inclusion and exclusion criteria. The study was approved by the institutional ethical committee and informed written consent was obtained from all the participants. Patients were admitted in and a detailed history was taken with particular emphasis on type, site and duration of backpain. A detailed general and systemic examination was done.

Inclusion criteria

Age between 30-60 years. Patient with h/o previous spine surgery. Confirmed Disc prolapse on MRI imaging. Low backpain since more than 3 months. Lumbar disc degeneration on the basis of MRI imaging. Patient gave written informed consent.

Exclusion criteria

Those who refused consent. Patients with bleeding disorders or coagulopathies. Low backpain due to causes other than disc degeneration.

Presence of any systemic illness such as diabetes, hypertension, autoimmune disorders or arthropathies were noted. Basic investigations such as Complete blood count, ESR, CRP and rheumatoid factor were done in all the cases. All patients were subjected to radiological investigation. After the patient was diagnosed with discogenic backpain patients were assessed for severity of pain by the Visual Analogue Score for pain.

Platelet rich plasma preparation

10 ml of patients own venous blood was collected via blood draw in anticoagulated tubes and then immediately blood sample was transferred to EDTA vial. The tube was then kept in Centrifuge machine for 15-20 min at 3000 rpm speed (whole blood separates into 3 layers: upper layer that contains mostly platelets and WBC, an intermediate thin layer that is known as buffy coat and that is rich in WBC and a bottom layer that consist mostly of RBC's.). For the production of pure PRP upper layer and superficially buffy coat were transferred to empty sterile tube (without anticoagulant). The second spin is then performed at 2000 rpm for 10 minutes, followed by formation of platelet pellets with few RBC's at the bottom of the tubes. Homogenize platelet pallets by thoroughly mixing into lower 1/3rd volume of plasma, discarding upper 2/3rd, and thereafter yielding platelet rich plasma (PRP) as supernatant. Platelet rich plasma thus obtained was stored at 20^0C till the time it was used.[11]

Platelet rich plasma thus obtained was injected in nucleus pulposus of the affected part of lumbar spine (on the basis of MRI imaging) under fluoroscopic guidance. The improvement in the pain was assessed by visual analogue score (VAS Score) and Roland-Morris Low Back Pain and Disability Questionnaire (RDQ score) consisting of 24 points.[12,13] Patients were followed up for 3 months following injection of platelet rich plasma. The statistical

analysis was done using SSPS 21.0 software and p value less than 0.05 was taken as statistically significant.

RESULTS

We conducted this prospective study to find out clinical outcome in the patients with discogenic backpain of more than 3 months duration who were treated with autologous Platelet-rich plasma injection in the department of orthopedics of a tertiary care medical college. Total 30 patients were included in this study on the basis of a predefined inclusion and exclusion criteria. Out of the 30 patients there were 12 (40%) males and 18 (60%) females with a M:F ratio of 1:1.5.

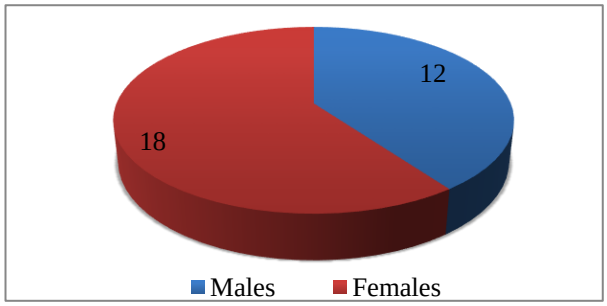

Figure 1: Gender distribution of the studied cases.

The analysis of the age groups of the studied cases showed that the most common affected age group was between the age of 51-60 years (53.33%) followed by 41–50 years (26.67%) and 31-40 years (20%).

Table 1: Age groups of the studied cases.

Age (years)	No. of patients	Percentage (%)
31-40	6	20.00
41-50	8	26.67
51-60	16	53.33
Total	30	100

The Mean age of the male patients was found to be 50.05±9.04 while the mean age of females was found to be 48.50±10.19. The difference was not found to be statistically significant (p=0.66) and age groups of men and women were found to be comparable.

Overweight and obesity was found to be one of the common features of the studied cases. 18 (60%) patients were either overweight or obese. Remaining 12 (40%) patients had a normal BMI.

Table 2: Mean age of males and females in studied cases.

Gender	Mean age	Std deviation	Test of significance
Males	50.05	9.04	p=0.66 statistically not significant
Females	48.50	10.19	

Table 3: Body mass index of the studied cases.

Age (years)	N	%
Normal BMI (<25)	12	26.67
Overweight (BMI≥25 but <30	10	33.33
Obese (BMI≥30)	8	40.00
Total	30	100

The analysis of the duration of the pain in studied cases showed that the duration of pain in majority of the patients was between 7-9 months (60%) followed by 3-6 months (16.66%) and more than 9 months (23.33%). Patients with duration of pain less than 3 months were excluded from the study.

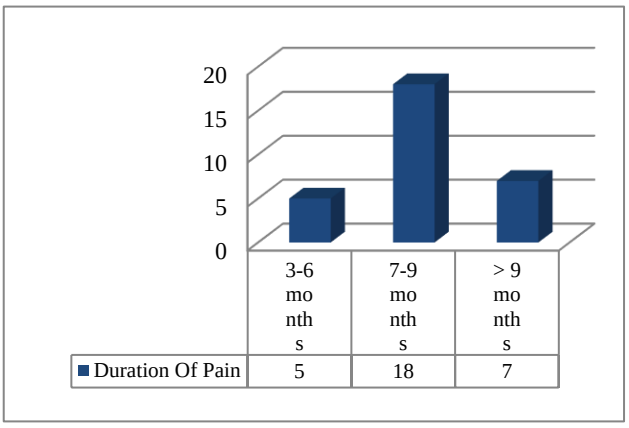

Figure 2: Duration of the back pain.

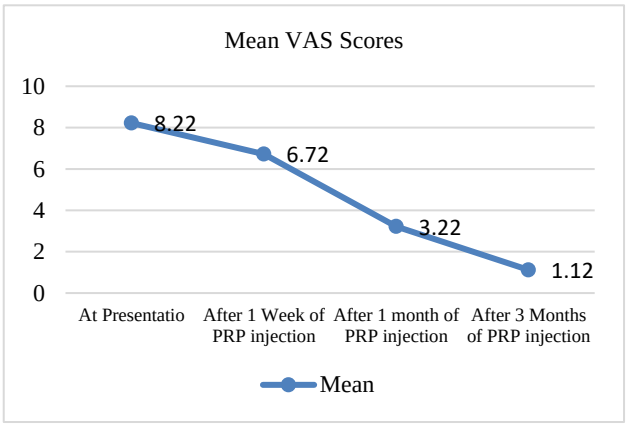

Figure 3: Mean VAS Scores at presentation and after PRP injection.

Patients were assessed for severity of pain by Visual Analogue Scores (VAS). AT the time of presentation, the mean VAS score of the patients was found to be 8.22±0.58. After 1 week of PRP injection the mean VAS score was found to be 6.72±1.48. Mean VAS scores during 1 month and 3 months follow up were found to be 3.22±1.48 and 1.12±0.82. The difference between mean VAS scores at presentation and 3 months after PRP

injection was found to be statistically highly significant (p<0.0001).

Patients were also assessed for functional improvement by Roland-Morris low back pain and Disability Questionnaire (RDQ score) consisting of 24 points. AT the time of presentation, the mean RDQ score of the patients was found to be 16.56±2.18. After 1 week of PRP injection the mean RDQ score was found to be 11.23±1.87. Mean RDQ scores during 1 month and 3 months follow up were found to be 6.26±1.94 and 3.73±1.38. The difference between mean RDQ scores at presentation and 3 months after PRP injection was found to be statistically highly significant (p<0.0001).

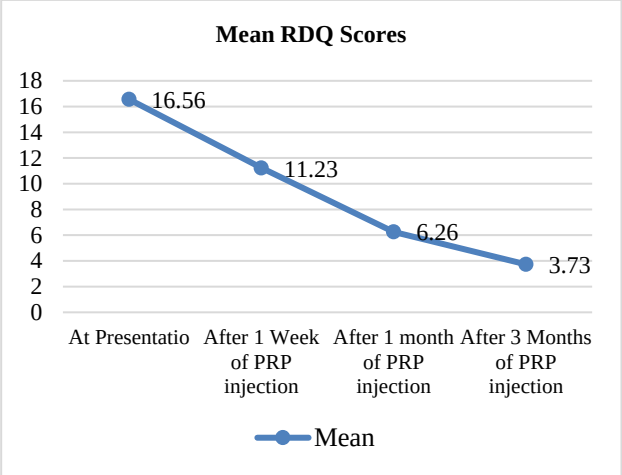

Figure 4: Mean RDQ scores at presentation and after PRP injection.

DISCUSSION

This prospective study was conducted to find out the outcome of patients with chronic backpain secondary to lumbar disc degeneration treated with autologous platelet rich plasma injection in the department of orthopedics. Out of 30 studied cases there were 12 (40%) males and 18 (60%) females with a M:F ratio of 1:1.5. Female predominance seen in our study was also reported by many other authors. Wang et al conducted a prospective cohort study to analyze the relationship between gender, BMD, and disc degeneration in the lumbar spine.[14] The authors found that female subjects had more severe disc degeneration than male subjects. After removing age effect, a positive trend was observed between T-score and severity of lumbar disc degeneration. This was significant in female subjects while not significant in male subjects. Some other studies such as those conducted by Saleem et al and Miller et al reported a male preponderance in the incidence of lumbar disc degeneration.[15,16]

The analysis of age groups of the affected cases showed that the mean age of the male patients was found to be 50.05±9.04 while the mean age of females was found to be 48.50±10.19. The mean age of affected men and women were found to be comparable without any statistically significant difference. The overall mean age of the patients with low backpain due to lumbar disc degeneration was found to be 49.27 years. Matsumoto M et al conducted a study to investigate the frequency of tandem lumbar and cervical intervertebral disc degeneration in asymptomatic subjects.[17] For this purpose, the authors evaluated magnetic resonance imaging (MRI) results from 94 volunteers (48 men and 46 women; mean age 48 years) for age-related intervertebral disc degeneration in the lumbar and cervical spine. The study found that degenerative changes were present in the lumbar spine in 79 subjects (84%), with decreased disc signal intensity in 74.5%, posterior disc protrusion in 78.7%, anterior compression of the dura in 81.9%, disc space narrowing in 21.3 %, and spinal canal stenosis in 12.8%. The mean age of the affected cases was found to be 48.0±13.4 year. The age of the affected patients in this study was found to be similar to our study. Other Authors such as Oh CH et al and Morishita et al found mean age of the affected cases to be 48.1 years and 46.9 years respectively.[18,19]

We studied the improvement in severity of pain and functional disability by way of VAS scores and Roland-Morris low back pain and Disability Questionnaire (RDQ score). The patients were assessed for VAS and RDQ scores at the time of presentation, 1 week, 1months and 3 months after injection of platelet rich plasma. We found that there was statistically significant reduction in VAS scores of the patient. Similarly, there was significant functional improvement in the patients as depicted by statistically significant reduction in RDQ scores. Akeda et al conducted a study to determine the safety and initial efficacy of intradiscal injection of autologous platelet-rich plasma (PRP) releasate in patients with discogenic low back pain.[20] The authors found that mean VAS and RDQ scores before treatment were significantly decreased at one month, and this was generally sustained throughout the observation period. The study concluded that intradiscal injection of autologous PRP in patients with low back pain was safe, with no adverse events observed during follow-up. Similar improvement in VAS score after PRP injection has also been reported by the authors such as Levi et al and Comella et al.[21,22]

CONCLUSION

We found that intradiscal injection for the management of chronic backpain is an effective treatment modality. It results in significant reduction in Pain as seen by reduction in VAS scores. We also found significant reduction in RDQ scores signifying improvement in functional abilities.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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