ORIGINAL ARTICLE

Role of Platelet-Rich Plasma (PRP) in Early Stages of Knee Osteoarthritis

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Abstract

Background: Osteoarthritis (OA) is the most prevalent chronic joint disorder worldwide and is associated with significant pain and disability. The primary objective in knee OA treatment focus on pain reduction, joint mobility improvement, as well as the reduction of disease progression and to preserve patients' independence and quality of life. The aim of the present study was to evaluate the effectiveness of Platelet-rich plasma (PRP) for the management of early knee OA.

Methods: This experimental study was conducted in NITOR from February 2021 to June 2021. Total 30 patients were purposively selected. Pain and functional improvement were measured using the Visual Analogue Scale (VAS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) respectively. All patients were followed up for 3 months.

Results: Almost 63% of the patients were female and their mean age was 59±7.58 years. Among them, 86.7% were in Kellgren-Lawrence grade 2. The mean duration of the disease was 16.3±9.1 months. Both VAS and WOMAC score has improved significantly in every follow up from baseline (VAS score 7.52±0.68 at baseline, 5.6±1.03 after 1 month of intervention and 4.24±1.27 after 3 months, p-value <0.05; WOMAC score 73.02±4.22 at baseline, 59.64±3.42 after 1 month of intervention and 53.26±4.65 after 3 months, p-value is <0.05).

Conclusion: Intra-articular platelet-rich plasma improves pain and function of the knee in patients with osteoarthritis.

Keywords: Osteoarthritis (OA), Platelet-rich plasma (PRP), Visual Analogue Scale (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), NITOR

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Introduction

Osteoarthritis (OA) is by far the most common form of arthritis. Its prevalence rises progressively with age and it has been estimated that 45% of all people develop knee OA at some point during life[1]. The incidence of symptomatic knee OA in Bangladesh was 0.9% (0.8% in men and 1.1% in women)[2].

The current standard of care for patients with symptomatic OA includes oral anti-inflammatory drugs, physiotherapy, topical anti-inflammatory gels, and intraarticular injections[3,4]. Nonsurgical treatments including exercise and weight loss are recommended[5]. However, compliance with nonsurgical treatments is poor, and medications, such as simple analgesics and nonsteroidal anti-inflammatory drugs, are associated with adverse events[6].

During the past decade, there has been increasing interest in the use of autologous growth factors, such as intra-articular injections of platelet-rich plasma (PRP) to treat knee osteoarthritis[7]. PRP is an autologous concentration of human platelets by centrifugation of the patient's blood[8], which contains many components, including growth factors, cytokines, and many other mediators[9]. PRP has shown an agonistic effect on chondrogenesis and mesenchymal stem cell proliferation[10]. Furthermore, PRP was shown to have antinociceptive and anti-inflammatory activities to reduce pain and modulate the OA process[11].

Despite being a potential therapy, there is limited use of PRP in Bangladesh. Moreover, there is scarcity published data about the effectiveness in the management of knee OA with PRP in Bangladesh. Therefore, the aim of the study was to evaluate the effectiveness of PRP in the treatment of knee OA.

Methods

Study design and patients

This was an experimental study conducted at NITOR from February, 2021 to June, 2021. A total 30 patients with osteoarthritis of knee joint (Kellgren-Lawrence grade I, II) with a VAS score >4, attending at the outdoor of NITOR, were included in the study. On the other hand, patients with VAS score <4, those who required hospital admission were excluded.

Intervention

All the recruited patients received PRP therapy. PRP was prepared according to Kon et al.[12]. Under aseptic conditions, 5 mL of platelet concentrate was injected directly into joint through a lateral parapatellar approach with an 18- gauge needle without local anesthetic. Total three injections were given to the patients with one week interval[13]. The knees were immobilized for 10 minutes after injection. During the follow-up period for both group, nonsteroidal anti-inflammatory drugs were not be allowed. Paracetamol (dosage, 500 mg tds) was prescribed in case of discomfort and pain. All patients were instructed to stop medications 48 hours before follow-up assessment. Follow up visit was given in each patient at 4th week and 12th week.

Data collection

Baseline sociodemographic information was collected on recruitment by face-to-face interview and review of medical records by the attending physician. During each follow up visit any improvement and appearance of side effects was recorded in data information sheet. Knee pain was assessed was by Visual Analogue Scale (VAS) and functional disability was evaluated in Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index.

Statistical analysis

Descriptive statistics like mean with standard deviation (SD) for continuous variables and frequency with percentage for categorical variables were used to present data. The difference of Visual Analogue Scale (VAS) score for pain and Western Ontario and McMaster Universities Osteoarthritis (WOMAC) score for functional disability during different follow-ups were assessed by independent t-test. P-value <0.05 was considered as statistically significant. All the statistical analyses were carried out in SPSS version 24.0.

Results

A total of 30 patients were recruited in the present study. The mean age of the patients was 59 ±7.58 years. Among them, 63.3% were female. Out of the patients, 86.7% were in Kellgren-Lawrence grade 2. The mean duration of the disease was 16.3±9.1 months. The mean BMI of the patients was 28.9±3.4 kg/m^2.

Table I: Clinical and demographic characteristics of the study patients

Age (in years)	**(Mean±SD)**	**59.00 ±7.58**
Gender	Male Female	11 (36.7) 19 (63.3)
Kellgren-Lawrence grade	Grade 1 Grade 2	4 (13.3) 26 (86.7)
Duration of disease (in months)	(Mean±SD)	16.3±9.1
BMI (kg/m2)	(Mean±SD)	28.90 ±3.38

At baseline, the mean VAS was 7.52±0.68 which was decreased significantly to 5.6±1.03 after 1 month of intervention which again has decreased significantly to 4.24±1.27 after 3 months (p value is <0.05 in every follow up) (Fig. 1). At baseline, the mean WOMAC was 73.02±4.22 which was decreased significantly to 59.64±3.42 after 1 month of intervention which again has decreased significantly to 53.26±4.65 after 3 months (p value is <0.05 in every follow up) (**Fig. II**).

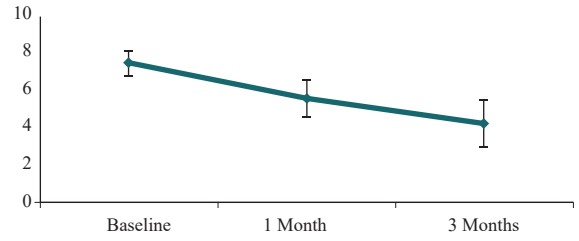

Fig. I: Visual Analogue Scale at different follow up time

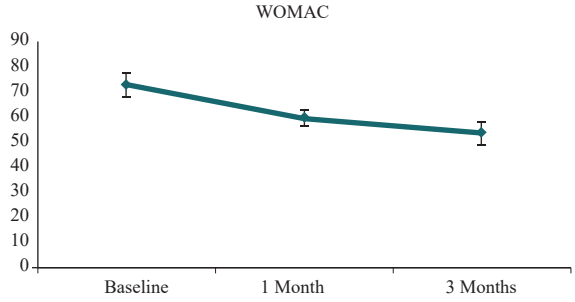

Fig. II: WOMAC at different follow up time

Discussion

OA knee, a chronic progressive joint disease, is the second leading cause of loss of function followed by a heavy economic and social burden[14]. Age is the most potent risk factor for OA. The results of the present study showed that the mean age of the patients was more than 50 years which matched other studies where the age ranged from 52-58 years[13,15].

Women are about twice as likely as men to develop OA. Although women have a lower prevalence of OA than men before age 50 years, there is a marked increase in prevalence among women after 50[16].

The mean BMI of patients in both groups were more than 28 kg/m^2. Obesity is a strong risk factor, particularly for knee OA. It may have some systemic influence, perhaps through changes in obesity-related biochemical factors such as leptin levels[17]. Studies of Raeissadat et al.[15] and Cole et al[18] also found patients with high BMI (27-29 kg/m^2) with knee OA.

Most people with clinical OA report discomfort or pain in or around the joints affected. Pain in OA is likely to have multiple sources, including subchondral bone lesions, synovium and the periostium as well as soft tissues surrounding the joint including extra-articular bursae and infra-patellar fat pad[19]. At the initial stage of treatment, the VAS scores of the patients were 7.52±0.68. The VAS scores significantly decreased to 4.24±1.27 after three months of intervention with PRP ($p<0.001$) which was consistent with other study[15]. Clinical outcome was assessed with the help of WOMAC. After three months of treatment, highly significant statistical difference was observed in the pain subscale and stiffness subscale. However, physical activity subscales did not show any significant statistical difference. The platelet concentrate is activated by addition of calcium chloride, which results in the formation of platelet gel and this stimulate the release of growth factors and bioactive molecules[19]. Therefore, PRP actively participate in healing processes by delivering a broad spectrum of growth factors (insulin-like growth factor, transforming growth factor β.I, platelet derived growth factor, and many others) and other active molecules (e.g., arachidonic acid metabolites, cytokines, chemokines, ascorbic acid, extracellular matrix proteins, and

nucleotides) to the injured site[20]. These factors altogether contribute to comprehensive roles of PRP, including anti-inflammation, angiogenesis, chondrogenesis, chondrocyte proliferation, bone remodeling, coagulation, and cell differentiation and this, in turn, reduces inflammation and pain[21].PRP is prepared from autologous blood, so any concerns of allergic reactions or disease transfer are eliminated. PRP does not promote hyperplasia, carcinogenesis, or tumor growth[22].

There are limitations of the study. The study place was selected purposively. So the samples included in the study may not be representing the population. Long term follow up could not be done.

Conclusion

Intra-articular platelet-rich plasma improves pain and function of the knee in patients with osteoarthritis. It might be considered as a potential therapy for OA in clinical management.

Declaration

Ethics approval

Ethical approval was taken from the Ethical Review Board of NITOR.

Author contributions

Conception and development of the idea *KSU, DS*
Data collection *SI, SMTR, DS*
Data analysis *DS, SSI, MH*
Writing - Original draft preparation *DS, KSU*
Writing - Review & Editing *KSU, DS, MH*

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Conflict of interests None

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