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"The Role of Platelet-rich Plasma in Osteoarthritis of Knee-joint: A study in a tertiary care hospital of Bangladesh"

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Abstract:
Background: *Osteoarthritis (OA) leading causes of severe long-term pain and disability which affects approximately 1 in 10 of the global population. Platelet-rich plasma (PRP), which is basically a 'concentrate of platelet-rich plasma protein' derived from whole blood, centrifuged to remove red blood cells. Now day physicians are using PRP for the treatment of osteoarthritis. We have very limited research-based information regarding the role of platelet-rich plasma in osteoarthritis of knee-joint.*
Aim of the study*: The aim of this study was to assess the role of platelet-rich plasma in osteoarthritis of knee-joint.*
Materials and methods: *This prospective observational study was conducted in the Department of Physical Medicine & Rehabilitation, Shaheed Ziaur Rahman Medical College & Hospital, Bogura, Bangladesh during the period from July 2019 to December 2020. In total 37 patients with grade-I and grade-II arthritis were included in this study as the study people. In this study, to each of the patients 3 PRP injections were injected in a 4 weeks interval. The patients were followed up and their conditions regarding physical activities and pain associated with arthritis were evaluated consecutively by WOMAC (Western Ontario and McMaster) University arthritis index score at the time of induction and at the 6 months interval. All data were processed, analyzed and disseminated by MS Office and SPSS version 20 programs.*
Results: *In this study, in analyzing the baseline clinical status of the participants we observed, majority of the participants suffered from several signs and symptoms of OA in knees for more than 2 years which was 67.57%. On the other only 32.43% participants suffered from several signs and symptoms of OA in knees. As per the WOMAC scoring system, in analyzing the final outcomes of the participants for applying PRP we observed, at the baseline period the mean (±SD) WOMAC score was 3.61±0.61. On the other at the follow-up stage the WOMAC score was fond 1.39±0.56. So, PRP ensured extremely significant reduction of WOMAC score where p was found less than 0.0001.*
Conclusions*: The proper consecutive use of platelet-rich plasma (PRP) for the treatment of osteoarthritis of knee-joint may be considered as an effective treatment method. The results of this current study may be helpful in further similar researches and in the treatment arena of osteoarthritis. We recommend for its wider use in treating osteoarthritis of knee-joints.*

Key Words: *Osteoarthritis, Platelet-rich plasma (PRP), Knee joint.*

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I. Introduction

Osteoarthritis (OA) is one of the most common articular disease in today's world and it is also a leading cause of chronic disability, mostly as a consequence of knee OA [1]. Osteoarthritis affects the knee more often than any other joint [2]. With the ageing trend of the gross population and the growing trend of obesity, the frequencies of surgical procedures for knee with osteoarthritis (OA) may be increased dramatically in the coming years. In the medication of knee replacement is the costliest treatment approach in health care system and a very burdensome for the respective patients also. Sometimes, it may cause the defects in articular cartilage of the patients. OA significantly affects the quality of life of patients and it is considered as one of the causes for musculoskeletal disability. [3] Although OA can affect any joint of the musculoskeletal structure but mostly seen in knees, hands, hip, facet joints, and feet. [4] With advancing of the age, the prevalence of symptomatic knee osteoarthritis and the annual incidence. The prevalence of OA is found highest in people aged between 55 and 64 years among the US (United States) population. [5] Now a day, physicians are using platelet-rich plasma (PRP) for the treatment of osteoarthritis even in knee joints. Platelet-rich plasma derived from the 'autologous blood' containing growth factors is claimed to activate the 'healing process' in the damaged cartilage and helps in tissue regeneration. [6] A recently conducted research has identified a number of key biochemical pathways which could be targeted therapeutically through biological intervention [7]. New evidence recommends PRP has the potential to have a 'regenerative effect on the certain body tissues' in along with the main role platelet plays in haemostasis [8].

II. Objective

General Objective:

- To assess the role of platelet-rich plasma in osteoarthritis of knee-joint.

Specific Objective:

- To assess demographic status of participants.
- To determine the baseline clinical status of participants.
- To evaluate the final outcomes among the participants.

III. Methodology And Materials

This prospective observational study was conducted in the Department of Physical Medicine & Rehabilitation, Shaheed Ziaur Rahman Medical College & Hospital, Bogura, Bangladesh during the period from July 2019 to December 2020. In total 37 patients with grade-I and grade-II ((Kellgren–Lawrence) [9] arthritis was included in this study as the study people. Proper written consents were taken from all the participants before data collection. A pre-designed questioner was sed to collect patient data from all the participants. We utilized PRP method in all the patients. In this study, to each of the patients 3 PRP injections were injected in a 4 weeks interval. The patients were followed up and their conditions regarding physical activities and pain associated with arthritis were evaluated consecutively by WOMAC (Western Ontario and McMaster) [10] University arthritis index score at the time of induction and at the 6 months interval. Blood was collected from patient's cubital vein to ensure 4–6 mL of PRP. Blood samples of the participants were collected in bags containing anticoagulant agents. Then collected blood samples were transferred into a tube and centrifuged at a constant acceleration to separate the RBCs from the whole blood volume. It separates blood in three layers. The upper most layer and superficial buffy coat are centrifuged again in a 'new sterile tube' sufficient enough to form the soft pellets at the bottom. The upper two-thirds of the centrifuged volume was discarded while the remaining 'lower one-third' was homogenized to produce PRP. PRP was dispensed in a sterile syringe. PRP was injected in the knees of the patients through 'supra-lateral approach' in supra-patellar pouch. After injection, all patients were observed for 20 minutes and discharged home with instructions regarding signs of infection, pain, warmth, redness and inability to bear weight. Patients were then prescribed paracetamol in case of pain and advised not to take NSAIDs and steroids. They were followed-up in OPD on regularly. The WOMAC scores were calculated at the time of induction and at 6 months interval to evaluate the effects of PRP. All data were processed, analyzed and disseminated by MS Office and SPSS version 20 as per need.

IV. Results

In this study, the total participants were 37 in number who had completed the full tenure of the intervention with proper documentation. In analyzing the gender of the participants of this study we observed, among total 37 participants, 43% (n=16) were male and the rest 57% (n=21) were female. So, female participants were dominating in number and the male-female ratio was 1:1.3. In this current study, we observed, the highest number of participants were from 41-50 years' age group which was 32%. Besides this, 11%, 27%, 22% and 8% participants were from <30, 31-40, 51-60 and >60 years' age groups respectively. The mean height of the total participants was 166.67 cm and the mean weight was 69.17 Kg. In this study, in analyzing the

baseline clinical status of the participants we observed, majority of the participants suffered from several signs and symptoms of OA in knees for more than 2 years which was 68%. On the other only 32% participants suffered from several signs and symptoms of OA in knees. As per the WOMAC scoring system, in analyzing the final outcomes of the participants for applying PRP we observed, at the baseline period the mean (±SD) WOMAC score was 3.61±0.61. On the other at the follow-up stage the WOMAC score was fond 1.39±0.56. So, PRP ensured extremely significant reduction of WOMAC score where p was found less than 0.0001.

Table 1: Demographic status of participants (N=37)

Characteristics	n	%
Gender distribution		
Male	16	43.24
Female	21	56.76
Age distribution		
<30	4	10.81
31-40	10	27.03
41-50	12	32.43
51-60	8	21.62
>60	3	8.11
Mean height and weight distribution		
Height (cm)	166.67	
Weight (Kg)	69.17	

Table 2: Baseline clinical status of participants (N=37)

Characteristics	n	%
Duration of symptoms		
≤ 2 Years	12	32.43
> 2 Years	25	67.57
Kellgren–Lawrence grade		
Mean (±SD)	3.61±0.61	

Table-3: Final outcomes of among the participants as per WOMAC score (N=37)

Period	Mean (±SD) Score	P value
Baseline	3.61±0.61	<0.0001
At follow-up	1.39±0.56	

V. Discussion

This study aimed to assess the role of platelet-rich plasma in osteoarthritis of knee-joint. In this study, the total participants were 37 in number who had completed the full tenure of the intervention with proper documentation. In analyzing the gender of the participants of this study we observed, among total 37 participants, 43% (n=16) were male and the rest 57% (n=21) were female. So, female participants were dominating in number and the male-female ratio was 1:1.3. In this current study, we observed, the highest number of participants were from 41-50 years' age group which was 32%. Besides this, 11%, 27%, 22% and 8% participants were from <30, 31-40, 51-60 and >60 years' age groups respectively. In this current study, we found remarkable clinical improvement among patients with osteoarthritis in knees who received PRP injections. The difference in the WOMAC scores at 6 month's interval was extremely significant. Patients with symptoms for ≤2 years showed more improvement in WOMAC score. Nonsurgical treatments like PRP, hyaluronic acid and corticosteroids have been prescribed by physicians with good short-term results as per the statements of several studies. In our study, in analyzing the baseline clinical status of the participants we observed, majority of the participants suffered from several signs and symptoms of OA in knees for more than 2 years which was 68%. On the other only 32% participants suffered from several signs and symptoms of OA in knees. As per the WOMAC scoring system, in analyzing the final outcomes of the participants for applying PRP we observed, at the baseline period the mean (±SD) WOMAC score was 3.61±0.61. On the other at the follow-up stage the WOMAC score was fond 1.39±0.56. So, PRP ensured extremely significant reduction of WOMAC score where p was found less than 0.0001. A recent systematic review as well as meta-analysis showed the

superior efficacy for PRP as compared to hyaluronic acid in improving the clinical symptoms over a period of two years. They also recommended about the necessity of long-term studies for the exact effects of PRP. [11] Another systematic review showed that, multiple sequential PRP injections have better features of symptomatic relief as compared to 'hyaluronic acid' or normal saline solutions at the '6 month's follow- up. [10] Basically, PRP is minimally invasive and a simple alternative, being used to enhance the 'healing process as well as tissue regeneration. However, in another study, they found that, in the initial 6 months, the results were some stable; in the second half (7–12 months), the results became some worse at 12 months as compared to the first 6 months. Besides these, the results were some better in the patients with early grade of arthritis. [12] In another study the claimed that such results were some better in the younger age-group patients with early osteoarthritis. [13]

VI. Conclusion And Recommendations

The proper consecutive use of platelet-rich plasma (PRP) for the treatment of osteoarthritis of knee-joint may be considered as an effective treatment method. The results of this current study may be helpful in further similar researches and in the treatment arena of osteoarthritis. We recommend its wide use in the treatment of osteoarthritis of knee-joint. But in nature this was a single centered study with a small sized sample. So, the findings of this study may not reflect the exact scenario of the whole country. For getting more reliable information we would like to recommend for conducting more studies in several places with larger sized samples.

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