



**ORIGINAL RESEARCH PAPER**

**Orthopaedics**

**ROLE OF PLATELET RICH PLASMA IN TREATMENT OF BED/PRESSURE SORES IN PATIENTS WITH ORTHOPEDIC INJURIES**

**KEY WORDS:** Bed sores, wound healing, platelet rich plasma, acute wound, chronic wound.

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**ABSTRACT**

**Aim:** To assess the effect of Platelet rich plasma (PRP) on healing of bed/pressure sores among immobilized orthopaedic patients. **Method:** A total of 138 patients with orthopaedic injuries under immobilization for >15 days to 5 years with presence of bed sores were enrolled in the study. Nature of wound (acute/chronic), duration of immobilization, wound and wound size was noted. Blood samples were obtained from all the patients and autologous PRP was prepared. Each patient received 5 ml of autologous PRP directly at the wound site. The process was repeated at every 4th day till achievement of >50% reduction or till day 60th. Final outcome was noted in terms of failure (<50% reduction), partial resolution (>50% reduction) and complete resolution (complete wound healing). Data was analysed using Independent samples 't'-test. **Results:** Mean age of patients was 39.89±17.07 years and majority were males (75.4%) There were a total of 169 wounds. There was a dominance of acute wounds (79.9%). Mean wound size was 62.17±115.92 cm<sup>2</sup>. Mean duration of immobility was 98.41±40.31 days. Mean number of PRP infiltrations was 4.30±2.18. At final follow up 127 (75.1%) had complete resolution and remaining 42 (24.9%) had <50% reduction in wound size. No significant difference in wound size was observed between chronic and acute wounds at different follow-up intervals. **Conclusion:** PRP proved to be effective in healing of bed sores of both chronic as well as acute origin in immobilized orthopaedic patients.

**INTRODUCTION**

Chronic immobilized patients are highly susceptible to pressure/bed sores<sup>1,2</sup>. Orthopedic patients are often immobilized for a prolonged period of time thus are an increased risk of developing bed sores<sup>3,4</sup>. Nearly one-fifth to one-third of immobilized orthopaedic patients are at a risk of developing bed sores<sup>5,6</sup>. Bed sores have a devastating impact on the overall burden of orthopaedic patient care. They are responsible for an increase in morbidity, mortality and treatment cost. They also seem to affect the progress and direction of postoperative orthopaedic outcomes<sup>7</sup>. Management of bed sores is a challenging task and involves a comprehensive approach targeted to manage local as well as distant infections, necrotic tissue removal, maintenance of a moist environment for wound healing, and surgery (whenever needed)<sup>8</sup>. Most common treatment alternatives include wound cleaning and debridement, optimised dressings, antibiotic use and reconstructive surgery. However, newer treatment modalities such as negative pressure wound therapy, hyperbaric oxygen therapy, cell therapy, etc. are also emerging<sup>9</sup>.

The focus of all these treatment modalities is on prompt wound healing. Platelet rich plasma, an autologous biological product derived from the patient's own blood enriched in platelet fraction and has been shown to be effective in accelerating the wound healing<sup>10-12</sup>. Its role in management of pressure ulcers/ bed sores has also been proven by some workers<sup>13,14</sup>. Encouraged by these reports, we made an attempt to study the role of platelet rich plasma in treatment of bed/pressure sores in patients with orthopedic injuries.

**MATERIAL AND METHOD**

The present study was carried out at Department of Orthopedics of a teaching hospital in Central India after obtaining ethical approval and getting informed consent from the participating patients. A total of 138 orthopedic patients immobilized for 15 days or longer duration with presence of pressure/bed sores (≥2 cm<sup>2</sup>) were enrolled in the study. Sample size calculation was done at a flip-coin probability of 50%, at a 95% confidence and 10% precision. The calculated sample size was 96. However, after adding for a provision of follow-up loss of 40%, the targeted sample size was 140, of which 138 completed the study. Patients with cancer, those having any serious illness, moribund state, haemoglobin level <10 g%, platelet count <75,000/cumm, having blood

transmitted diseases like HIV/Hepatitis, etc., and those on intravenous antibiotics/analgesics for >3 consecutive days were excluded from the study.

After enrolment details related with demographic profile, number of wounds, type of wound, time since immobilization and wound size were noted. Presence of wounds for >one month was marked as chronic wound while those for less than one month were termed as acute wounds. A total of 20 ml of whole blood was obtained from all the consenting patients and autologous PRP was prepared. After the preparation of PRP was infiltrated locally at the wound site with a 22-gauge needle. The patient were kept under observation for half an hour. As per STARS protocol. 16 Tablet paracetamol (650 mg) was given stat in patients who experienced pain at injection site after 10 minutes.

Only local moist saline ocult dressing was performed on alternate days or daily as per the need. Diluted cetrimide and chlorhexidine gluconate solution were used for cleaning dirty wounds, by soaking into a warm diluted solution for 15-30 minutes and rinsing with normal saline. No further surgical interventions like debridement, reconstructions etc. were undertaken. No antibiotics were given unless life threatening infection or co-morbid conditions demanded. Culture swabs were taken from wound at the start of therapy and at the end of 1st, 5th, 10th and 15th sessions (0 day, 4 day, 20 day, 40 day and if needed further after every 3 weeks). Analgesics were avoided as far as possible, unless pain score was more than 5/10 on VAS scoring.

All the patients were followed up on each fifth day. Progress in wound healing was categorized as follows:

- <50% wound healing - Unresolved
  - 50-99% wound healing - Partial resolution
  - 100% wound healing - Complete resolution
- PRP sessions were continued at every fourth day in patients who did not achieve partial / complete healing. Final outcome was noted on 60<sup>th</sup> day.

**Statistical Analysis:** Data was analysed using SPSS version 21.0 package. Data has been represented in numbers and percentages and mean±SD. Comparison of healing status at different follow-up periods between acute and chronic wounds was done using Independent samples 't'-test.

**RESULTS**

A total of 138 patients were enrolled in the study. Age of patients ranged from 4 to 74 years. Mean age of patients was 39.89±17.07 years. Majority of patients were males (75.4%) (M:F=3.06). There were a total of 169 wounds. Mean number of wounds was 1.22±0.38. Majority of patients had only single wound (80.4%). There was a dominance of acute wounds (79.9%). Only 34 (20.1%) wounds were found to be of chronic nature. Mean wound size was 62.17±115.92 cm<sup>2</sup> (range 2 to 262 cm<sup>2</sup>). Duration of immobilization ranged from 15 to 1825 days. Mean duration of immobility was 98.41±40.31 days. Number of PRP infiltrations required ranged from 2 to 15. Mean number of PRP infiltrations was 4.30±2.18 (Table 1).

Treatment response in terms of complete resolution, partial resolution and unresolved wound was 7.7%, 60.9% and 25.4% respectively on day 20, 40.4%, 34.0% and 25.6% between day 20 and day 40 and 54.8%, 0% and 45.2% respectively between day 40 and day 60. Overall complete resolution as seen in 127/169 (75.1%) wounds. A total of 42 (24.9%) wounds remained unresolved (Table 2).

No significant difference in wound size was observed between chronic and acute wounds at different follow-up intervals.

Mean wound size of acute and chronic wounds was 45.60±23.70 and 46.31±24.29 cm<sup>2</sup> at day 20, 36.98±19.99 and 34.88±22.10 cm<sup>2</sup> at day 40 and 22.60±19.20 and 22.05±19.05 cm<sup>2</sup> respectively at day 60, thus showing a regular declining trend in both the groups, however, at none of the time intervals the difference between two groups was significant statistically (p>0.05) (Table 3).

**DISCUSSION**

In present study, complete resolution of wounds was seen in 75.1% of wounds. Wound healing (partial/complete) was seen in nearly three-quarter of patients even at earlier follow ups (day 20 and day 40) too. Nearly half the wounds (n=76/169; 45.0%) had complete resolution on day 40 itself. PRP use for wound healing and other therapeutic purposes in orthopaedic patients is widely prevalent. In a study Follo *et al.*<sup>12</sup> have reported more than two hundred orthopedic patients with satisfactory wound healing outcomes. In another study use of PRP in treatment of pressure wounds considerable reductions in mean size of wounds were observed in at the final follow-up after 4 weeks of PRP treatment<sup>13</sup>.

In present study, progressive changes in wound healing were seen from day 20 of follow-up itself. In a previous study, Singh *et al.*<sup>14</sup> well-formed granulation tissue and epithelialization in pressure ulcer wounds of spinal injury patients by 5<sup>th</sup> week of intervention. There is an active role of platelets in wound healing owing to their ability to maintain hemostasis. Platelets also help to stimulate cytokine function and growth stimulation by promoting migration of macrophages and fibroblasts and synthesis of collagen and proteoglycan synthesis<sup>15</sup>. PRP therapy is based on the fact that platelet growth factors (PGFs) support the three phases of wound healing and repair cascade (inflammation, proliferation, remodeling) and is thus able to provide a satisfactory response in management of pressure/bed sores. It has been found to be useful in management of chronic wounds too<sup>16</sup>. In present study too we found that PRP was equally effective in management of both acute as well as chronic wounds.

In present study, we did not use any antibiotic or analgesic, thus showing that PRP was helpful not only in wound healing and tissue regeneration but also offered an antibiotic and analgesic effect too. PRP is known to have an analgesic effect in various musculoskeletal diseases<sup>20,21</sup>, the present study showed it extended that effect during wound healing too. A recent animal study<sup>22</sup> has also endorsed the antibiotic effect of

PRP. Although, we do not endorse the antibiotic role of PRP through this study, however, this added dimension of PRP needs to be explored further.

The findings of study showed PRP was a useful modality for management of bed sores in orthopaedic patients. One of the limitation of study was absence of any comparative group, hence further studies with addition of a comparative treatment modality will help to understand the relative usefulness of PRP role in treatment of bed sores.

**CONCLUSION**

PRP was an effective treatment modality with no side effect in management of bed sores in orthopaedic patients.

**Table 1: Demographic Profile And Patient Characteristics (n=138)**

SN	Variable	Statistic
1.	Mean age±SD (Range) (Years)	39.89±17.07 (4-75)
2.	Sex	
	Male	104 (75.4%)
	Female	34 (24.6%)
2.	No. of wounds	169
	Single	111 (80.4%)
	Two or more	27 (19.6%)
3.	Type of wound	
	Acute	135/169 (79.9%)
	Chronic	34/169 (20.1%)
4.	Mean number of wounds±SD (Range)	1.22±0.38 (1-3)
5.	Mean duration of immobilization±SD (Range) days	98.41±40.31 (15-1825)
6.	Mean wound size±SD (Range) cm <sup>2</sup>	62.17±115.92 (2-262 cm <sup>2</sup> )
7.	Mean number of PRP infiltrations±SD (Range)	4.30±2.18 (2-15)

**Table 2: Outcome at different follow-up intervals**

SN	Follow-up interval	Unresolved		Partial resolution		Complete resolution	
		No.	%	No.	%	No.	%
1.	Day 20 (n=169)	43	25.4	103	60.9	13	7.7
2.	Day 40 (n=156)	40	25.6	53	34.0	63	40.4
3.	Day 60 (n=93)	42	45.2	0	0	51	54.8
Overall treatment response (n=169)		42	24.9	-	-	127	75.1

**Table 3: Comparison of wound size at different time intervals between Acute and Chronic wounds (cm<sup>2</sup>)**

SN	Variable	Acute (n=135)	Chronic wound (n=34)	Significance of difference (Independent samples 't'-test)
1.	Day 20	45.60±23.70	46.31±24.29	t'=0.155; p=0.878
2.	Day 40	36.98±19.99	34.88±22.10	t'=0.536; p=0.593
3.	Day 60	22.60±19.20	22.05±19.05	t'=0.150; p=0.881

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