

Platelet-Rich Fibrin Membrane – as a Novel Local Autologous Blood Tissue Graft Stimulating Granulation Tissue Growth in Pressure Injury of a Spinal Cord Injury patient: A Case Report

Dr. Raktim Swarnakar¹, Dr. Hafis Rahman²

^{1,2}Department of Physical Medicine and Rehabilitation,
All India Institute of Medical Sciences, New Delhi, India

DOI: 10.29322/IJSRP.9.05.2019.p8906

<http://dx.doi.org/10.29322/IJSRP.9.05.2019.p8906>

Abstract: Pressure injury (PI) is such a common complications that impair quality of life and become the source of sufferings for the patients and care-givers in spinal cord injury (SCI) patients. Management of PI in SCI population is also expensive specially in developing nations. Autologous Platelet-Rich Fibrin (PRF) is simpler, cost-effective, safe new approach towards pressure injury managements. As second-generation Platelet Rich Plasma (PRP), PRF contains more growth factors than PRP. There are no studies on PRF membrane use in PI management in SCI population. Following PRF use there was improved granulation tissue formation in this patient. Here for the first time PRF membrane use in PI management in SCI population has been reported in this case.

Index Terms- Platelet-Rich Fibrin, Pressure Injury, Spinal cord injury

I. INTRODUCTION

“Healing is a matter of time, but it is sometimes also a matter of opportunity.” - Hippocrates

Pressure injuries (PI) are the second most frequent secondary complication in people with spinal cord injury (SCI) from acute stage to chronic stage.¹ It affects quality of life, length of stay during hospitalization and also increases mortality and morbidity. The prevalence of PI during the first year after SCI is 8%, and it even rises to 33% in resident-community cases.² It is estimated that 50% to 80% of subjects with SCI can develop PI at least once in their lives.^{2,3} PI are expensive and at the same time difficult to heal as SCI causes physiological deficits that delay wound healing.

Autologous PRP has been considered as a cost-effective approach for wound therapy.⁴ Growth factors from platelets here has the capabilities to accelerate wound healing. But there are no studies on Platelet-rich fibrin (PRF) membrane in

PI in SCI populations. PFR has recently been considered as a new generation platelet concentrate.⁵

II. CASE REPORT

Case: A case of SCI with paraplegia, neurogenic bowel and bladder and PI in ischial tuberosity came for rehabilitation care. This PI was a chronic non-healing one with full thickness skin loss which did not show improvement on normal saline dressing for past 1 year.

Intervention: A 10 ml blood sample was taken under aseptic precautions from patient’s antecubital vein without anticoagulant which was immediately (within 2 minutes) centrifuged at 3000 rpm (approximately 400g) for 10 minutes using REMI (R-8C Plus) centrifuge. After centrifugation a gel-like natural fibrin matrix was obtained at mid-portion of the tube with a separator and RBC’s below and a platelet-poor plasma at the top. Gel was converted to membrane by compressing it, then it was kept over the ulcer base and it was covered with a dressing under sterile precautions (Figure 1) and PRF dressing was left in for 7 days. PRF dressing was done at 0 week and at 1 week under all aseptic precautions. Routine rehabilitation care simultaneously was also followed. There were no any adverse events or complications during and after intervention.

Outcome measures: Granulation tissue formation. Assessments were done at baseline (0 week), at 1st week, 2nd week.

Results: Improvement was seen after 1 week of PFR membrane dressing. Granulation tissue formation was noticed and was also noticed at 2nd week as well (Figure 2). There were very little exudates formation after 1 week, but there were no changes in size of PI. There was a change in volume (from baseline, 1.3 cm³ to at 2nd week, 0.7 cm³). There were no adverse reaction after of PRF membrane application.

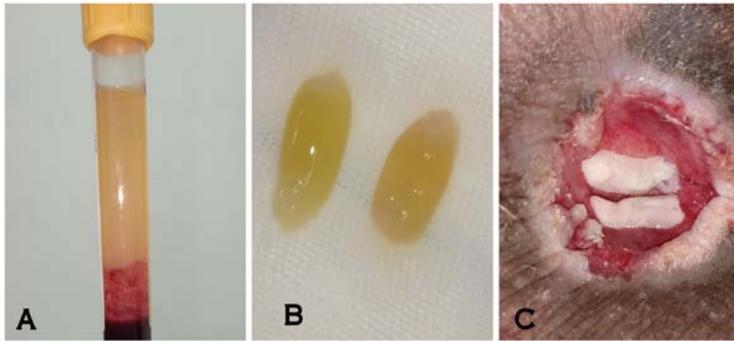


FIGURE 1: A: PRF PREPARATION, B: PRF MEMBRANES, C: PRF MEMBRANE DRESSING



FIGURE 2: BEFORE (0 WEEK) AND AFTER (1ST AND 2ND WEEK) PRF MEMBRANE DRESSING

[RED ARROW INDICATING GRANULATION TISSUE FORMATION]

(SIZE DID NOT CHANGE: 2 CM X 1 CM)

III. DISCUSSION

Risk for developing pressure injury is relatively more in people with SCI.⁶ The most common areas like sacral area and ischial tuberosities are prone to develop pressure injury in these patients. Delayed healing of a pressure ulcer causes deconditioning that is difficult to restore and can lead to serious, and even life-threatening, medical conditions. Management of Pressure injury is always challenging in elderly, neurological impairment, chronic hospitalization, or in chronic spinal cord injury (SCI). Cost is often high due to need of multiple hospitalizations, surgeries etc. Chronic condition and decreased sensation makes SCI patients more susceptible to develop recurrent pressure ulcers.

PRF is known as second-generation platelet concentrate in a fibrin matrix gel which polymerized to form a tetra molecular architecture. It incorporates platelets, leucocytes, cytokines, and many circulating stem cells. PRF has many advantages over PRP. PRF preparation is simple and it does not require anticoagulant or a thrombin activator. Furthermore, PRF gel is easy to apply on a wound compared to a liquid PRP. Studies have also shown that growth factors concentration is significantly more in PRF compared to PRP and whole blood. Along with growth factors there are many factors of healing that all act in a complex synergy, such as leukocytes, fibrin matrix structure, and circulating progenitor cells. The growth factors along with stiffness of fibrin mesh formation show a different architecture that has specific bio-mechanical and physiological advantage to the healing process.

This case showed improvement in the condition of the ulcer. Previous study on PRF membrane was in leprosy⁷ neuropathic ulcer, but there were no such studies of PRF membrane use in SCI populations.

IV. CONCLUSION

To the best of our knowledge, this is the first case report of PRF membrane use in PI of SCI patient and results are promising. Pressure injury management in developing nations is very expensive many a times hence autologous PRF membrane graft may be a safe and effective promising agent in PI management SCI population. Future research on randomized controlled trials

are needed on these PRF membrane graft in Pressure injury management in SCI population to give more conclusive results.

REFERENCES

- [1] Brienza D, Krishnan S, Karg P, Sowa G, Allegretti AL. Predictors of pressure ulcer incidence following traumatic spinal cord injury: a secondary analysis of a prospective longitudinal study. *Spinal Cord*. 2017 Sep 12;56:28.
- [2] Sadeghi Fazel F, Derakhshanrad N, Yekaninejad MS, Vosoughi F, Derakhshanrad A, Saberi H. Predictive Value of Braden Risk Factors in Pressure Ulcers of Outpatients With Spinal Cord Injury. *Acta Med Iran*. 2018 Jan;56(1):56–61.
- [3] Wilczweski P, Grimm D, Gianakis A, Gill B, Sarver W, McNett M. Risk factors associated with pressure ulcer development in critically ill traumatic spinal cord injury patients. *J Trauma Nurs*: 2012;19:5-10.
- [4] Singh R, Rohilla RK, Dhayal RK, Sen R, Sehgal PK. Role of local application of autologous platelet-rich plasma in the management of pressure ulcers in spinal cord injury patients. *Spinal Cord*. 2014 Sep 2;52:809.
- [5] Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, Gogly B. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part I: technological concepts and evolution. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;101:e37–44.
- [6] Houghton PE, Campbell KE, Fraser CH, Harris C, Keast DH, Potter PJ, et al. Electrical Stimulation Therapy Increases Rate of Healing of Pressure Ulcers in Community-Dwelling People With Spinal Cord Injury. *Arch Phys Med Rehabil*. 2010 May 1;91(5):669–78.

- [7] Nagaraju U, Sundar PK, Agarwal P, Raju BP, Kumar M. Autologous Platelet-rich Fibrin Matrix in Non-healing Trophic Ulcers in Patients with Hansen's Disease. *J Cutan Aesthet Surg*. 2017;10(1):3–7.

AUTHORS

First Author – Dr. Raktim Swarnakar, MBBS, Post Graduate Resident, Department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences, New Delhi, India 110029.

Email: raktimswarnakar@hotmail.com

Second Author – Dr. Hafis Rahman, MBBS, MD, Senior Resident, Department of Physical Medicine and Rehabilitation, All India Institute of Medical Sciences, New Delhi, India 110029.

Correspondence Author – Dr. Raktim Swarnakar, MBBS, Post Graduate Resident, Department of Physical Medicine and Rehabilitation,

All India Institute of Medical Sciences, New Delhi, India 110029.

Email: raktimswarnakar@hotmail.com

Mobile number: +919674769763