CASE SERIES

Autologous Platelet Rich Plasma (PRP) — A Treatment Modality of Neuropathic Ulcers in Leprosy Patients: An Interventional Study

Tejinder Kaur, Sahibpreet Kaur, Gurkim Kaur

Abstract

Neuropathic ulcers are a result of trophic changes among leprosy patients amidst sensory loss. Use of Autologous platelet-rich plasma (PRP) in trophic ulcers is known to facilitate the restoration of metabolic processes, promotion of neo-angiogenesis, improvement of cellular metabolism, and activation of local immune responses. Our case series of 10 leprosy patients aimed to assess the efficacy and safety of PRP in healing trophic ulcers among leprosy patients. Our results, substantiating the previous studies, showed acceleration in the formation of granulation tissue and rapid reduction of ulcer volume after three weekly sessions of PRP treatment. No side effects were noted.

Key Words

Leprosy, Autologous Platelet-Rich Plasma,Neuropathic Ulcers

Introduction

Leprosy patients are predisposed to trophic ulceration due to sensation loss and motor disabilities.[1] This "ulcer-prone" condition makes the treatment challenging. The chronic inflammatory state and senescence of local reparative cells further complicates the situation.[1,2] Results following conservative treatment modalities,use of microcellular rubber (MCR) footwears and other protective gears are often limited by slow healing time and cost imparting procedures. Platelet-rich plasma (PRP) therapy has been growing as a viable treatment option for chronic ulcers. It is known to stimulate wound healing in trophic ulcers by introducing growth factors directly into the ulcer site, which promote neo-angiogenesis, enhance cell metabolism, and activate local immunity. These actions collectively support the regeneration processes and further tissue repair.[3,4].

Aims & Objectives

To assess the therapeutic efficacy and safety of autologous Platelet Rich Plasma (PRP) in treatment of neuropathic / trophic ulcers in leprosy patients.

Methodology

The study was an interventional, non-randomized study conducted in Government Medical College Amritsar,a tertiary center in Northern India. Institutional Ethics Committee permission was obtained prior to the start of the study and written informed consent was obtained from all study participants. The study was done from July 2020 to May 2022. Ten leprosy patients of both sexes having trophic ulcers were enrolled. Assessment of ulcers was done using Wagner's classification. Patients having grade 1 and 2 ulcer type according to Wagner's classification, having no growth on culture and seronegative for HIV,

Department of Dermatology, Venereology and Leprosy, Govt Medical College, Amritsar, Punjab India

Correspondence to:Dr Tejinder Kaur, Prof and Head, Department of Dermatology, Venereology and Leprosy, Govt Medical College, Amritsar, Punjab India

Manuscript Received: 15.06.2024; **Revision Accepted**: 13.08.2024;

Published Online First: 10 Jan, 2025

Open Access at: https://journal.jkscience.org

Cite this article as: Kaur T, Kaur S, Kaur G. Autologous Platelet Rich Plasma (PRP) — A Treatment Modality of Neuropathic Ulcers in Leprosy Patients: An Interventional Study. JK Science 2025; 27(1):53-56

HBsAg and HCV were included.Patients taking anticoagulants owith bleeding tendencies, diabetes mellitus, malignancy, those in lepra reaction and pregnant patients were excluded from the study. Patients with haematological indices with haemoglobin <10 g%, platelet count <1.5 lacs/mm^3 were also excluded.

At Baseline (day 1) patient's assessment was done on the basis of

- Photographs
- Wagner's classification.
  Grade 0- No ulcer but high-risk foot
  Grade 1- superficial ulcer
  Grade2- Deep ulcer, no bony involvement or abscess
  Grade 3- Abscess with bony involvement (as shown by Xray)
  Grade 4- Localized gangrene e.g. toe, heel etc
  Grade 5- Extensive gangrene of the whole foot
- X-ray followed by orthopedic assessment.
- Measurement of volume of the ulcer.

After taking into consideration full medical history, duration, signs and symptoms, inclusion and exclusion criteria 8 out of 10 patients were selected.

PRP preparation

Ten milliliters of patient's venous blood was mixed with one milliliter of 3.8% sodium citrate dextrose in centrifuge test tube. The tube was first centrifuged at 2600rpm for 15 minutes (soft spin) resulting into plasma and red blood cells separation. Plasma and buffy coat were pipetted into another test tube and it was centrifuged (hard spin)at the rate of 3600 rpm for 5 min. The upper two-third portion was then separated as platelet-poor plasma (platelet-poor plasma) while the lower one-third was taken as PRP.

Measurement of ulcer

Dimensions of the ulcer were measured using disposable scales from wound edges.Depth was measured from the deepest point of the ulcer bed to the level of skin surface. Ulcer volume was collected using the formula– Length X Width X Depth.

Procedure

After cleaning the ulcer with betadine solution, callus debridement was done using surgical blade. Autologous PRP was injected (0.1 ml each site) subcutaneously around the margins of the ulcer & also sprayed topically. Procedure was followed by dressing under proper aseptic conditions.

The procedure was performed up to maximum of 4 sittings at weekly intervals. Further follow-up for next 2 weeks was done. The total ulcer area and volume was measured at the end of 6 weeks.

Patient assessment was done on basis of-

- Serial Photographs were compared from baseline.
- Measurement of percentage reduction in volume

$$\frac{\text{Initial volume} - \text{final volume}}{\text{Initial volume}} \times 100$$

of the ulcer at 6 weeks-
Total improvement was assessed as =
(in the end of 6 weeks.)

- Complications (if any) were recorded

Results

Out of 8 patients, 6 patients (75%) were males. Maximum patients belonged to age group of 40-50 years (n=5, 62.5%) followed by 20-40 years (n=3, 37.5%) of age. Five patients (62.5%) belonged to endemic region and 2 (25%) patients were on MBMDT-A treatment. Rest of the patients were released from treatment.

Most common site of ulcer involvement was forefoot in 50% (n=4), heels and lateral malleoli in 38% (n=3) and hands in 12% (n=1) of patients. Mean duration of ulcer was maximum of 3-5 years in 38% (n=3) patients, 1-2 years in 25% (n=2) patients, >5 years in 25% (n=2) patients and 6 months in 12% (n=1) patient.

Response after treatment was assessed as the percentage reduction in the ulcer volume.

Table 1 : Treatment responseat 6 weeks

Percentage (%) improvement	Number of patients	Percentage
100% (Complete improvement)	1	12.5%
Partial Improvement		
80-99 %	4	50%
40-79 %	3	37.5%
0-39 %	0	0.0

Side effects: No complications or adverse effects were observed during this period.

Discussion

Plantar ulceration is a major disability occurring in leprosy patients. Anesthesia is the central factor in the pathogenesis of trophic ulcers. The moment an ulceration sets in, a vicious cycle of scar-ulcer-scar also sets in this "ulcer-prone" area. Other factors contributing to ulcers are walking barefoot, poor quality of scar from previous ulceration, undue load on the scar, and enduring pockets of infection.[1]

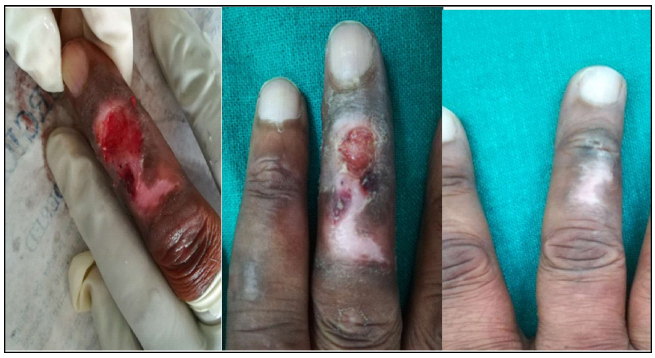

Figure-1A Figure-1B Figure-1C

Fig 1: Follow up of trophic ulcers on the hand in patient 1
Fig 1a : clinical aspect of the ulcer on day-1 [pre-treatment] (X= initial volume= 5.6 cm^3)
Fig 1b : partial healing of ulcer at 2 weeks
Fig 1c : complete healing of ulcer at 6 weeks (Y= final volume = 0) showing 100% improvement

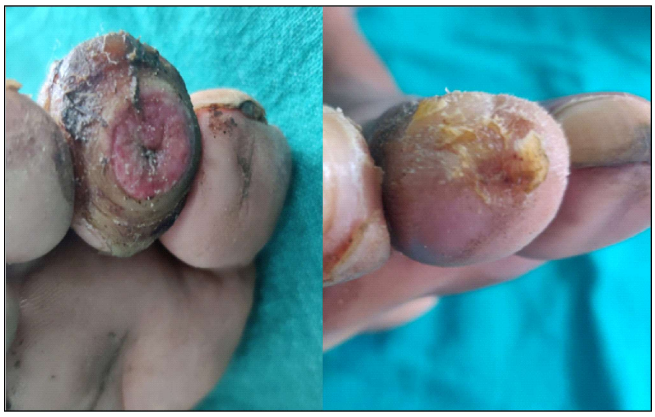

Fig 3A Fig 3B

Fig 3 : Follow up of trophic ulcers on the right forefoot (plantar surface of 2nd toe) in patient 3
Fig 3a : clinical aspect of the ulcer on day-1 [pre-treatment] (X= initial volume= 2.875 cm^3)
Fig 3b : complete healing of ulcer at 6 weeks (Y= final volume = 0.03 cm^3) showing 99.12% improvement

Conventional therapy such as dressings, surgical debridement, and skin grafting often fall short in complete healing because they lack the essential growth factors needed to modulate the healing process effectively.[2] Platelet-rich plasma, contains these growth factors, thus promoting the proliferation of the cells taking part in tissue repair, such as mesenchymal stem cells, osteoblasts, fibroblasts, endothelial cells, and epidermal cells.[3] This stimulation supports tissue regeneration, promotes new

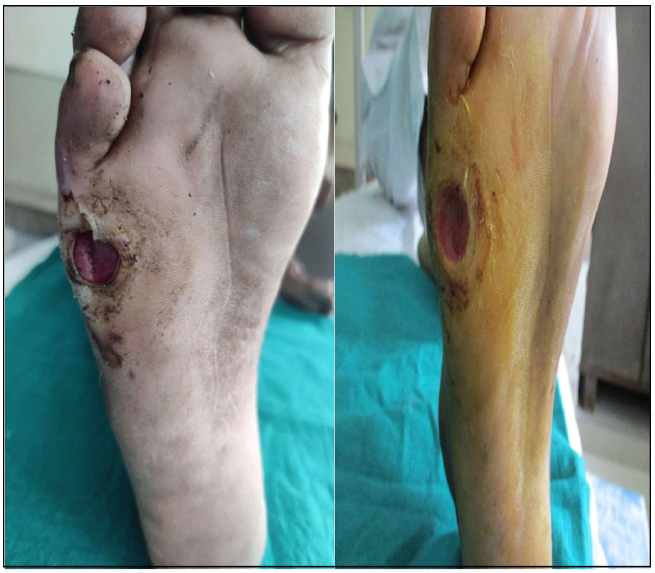

Fig 2A Fig 2B

Fig 2: Follow up of deep trophic ulcers on theright forefoot (lateral aspect) in patient 2-
Fig 2a : clinical aspect of the ulcer on day-1 [pre-treatment] (X = initial volume = 49.5 cm^3)
Fig 2b : complete healing of ulcer at 6 weeks (Y= final volume= 10.41 cm^3) showing 86.6% improvement

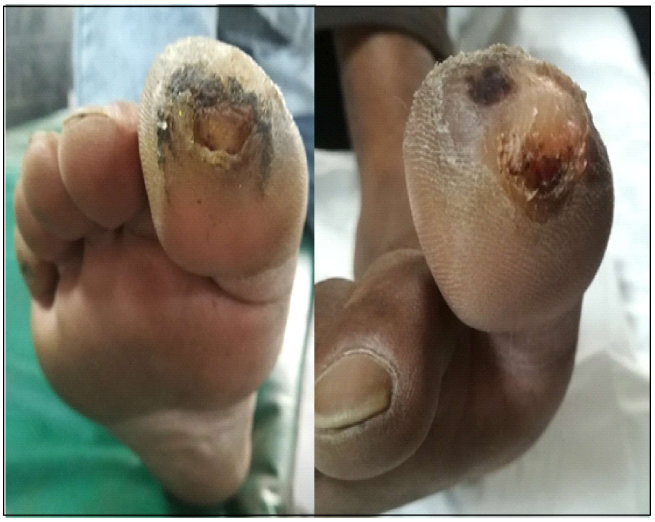

Fig 4A Fig 4B

Fig 4: Follow up of trophic ulcers on the right forefoot (plantar surface of great toe) in patient 4
Fig 4a : clinical aspect of the ulcer on day-1 [pre-treatment] (X=initial volume= 26.25 cm^3)
Fig 4b : complete healing of ulcer at 6 weeks (Y= final volume = 1.5 cm^3) showing 93.3% improvement

blood vessels formation, and accelerates the re-growth of the outer skin layer, which in summation are known to play pivotal roles in the wound healing process. [4,5]

In our study, males out-numbered females as also seen in the studies done by Anandan *et al* , Raju *et al* .[3, 6] Existing literature indicates that Hansen's disease and associated deformities tend to be more prevalent and intense in males. While females exhibit a higher susceptibility to reactions, timely therapy and limited outdoor activities help mitigate the risk of developing grade 2 deformities.[6]

Regarding plantar ulcers, our study reveals that the most frequent site among patients was the forefoot (n=4, 50%), followed by the lateral malleoli and heel (n=3, 38%). This distribution pattern is consistent with literature suggesting that plantar ulcers are not evenly distributed on the sole and are more prevalent over the forefoot and over lateral malleolus, particularly influenced by cultural practices among Indians. These findings are consistent with a previous study conducted by Anandan *et al* on 50 patients stating forefoot the most common site.[3]

Carter *et al*., in their study, found that applying PRP to ulcers led to faster healing responses with reduced pain and infection rates compared to conventional therapies [7].

Despite completing MBMDT- A treatment packs, ulcers persisted in 75% of our patients, lasting an average of 2.5 years. Our study demonstrated a significant average improvement of 97% in reducing ulcer volume with PRP treatment, regardless of ulcer duration or treatment status. Our study, thus establishes that PRP has good efficacy in trophic ulcers. This is supported by Anandan *et al* , who studied 50 leprosy ulcer patients,showing a 92% rate of complete healing with six applications of topical PRP. [3] Conde-Montero *et al* and Rather *et al* documented two cases of recalcitrant chronic ulcers in leprosy patients achieving complete re-epithelialization after nine weeks of PRP injections.[5,8] Suryawati *et al* also reported a case where a leprosy ulcer healed completely within four weeks of PRP treatment, with no observed side effects during therapy. [9] In our study also no side effects were noted during and after procedure. All the equipment required for the procedure was readily procured.

In conclusion, PRP therapy emerges as a cost friendly, safe, and effective treatment option. It accelerates granulation tissue formation and promotes rapid healing, potentially reducing treatment durations and enhancing the quality of life for patients.

Limitations- Less number of patients. Lack of control group.

Financial Assitance and Sponsorship: Nil
Conflict of Intrest : Nil

References

1. Andersen JG. Plantar ulcers in leprosy. Their pathogenesis and natural history, and their therapy and prevention. Lepr Rev 1961;32:16-27.
2. Saha S, Patra AC, Gowda SP, Mondal N, Rahaman S, Ahmed SK, et al. Effectiveness and safety of autologous platelet-rich plasma therapy with total contact casting versus total contact casting alone in treatment of trophic ulcer in leprosy: An observer-blind, randomized controlled trial. Indian J Dermatol Venereol Leprol 2020;86:262-71
3. Anandan V, Jameela WA, Saraswathy P, Sarankumar S. Platelet rich plasma: Efficacy in treating trophic ulcers in leprosy. J Clin Diagn Res 2016;10:WC06-9.
4. Birang R, Torabi A, Shahabooei M, Rismanchian M. Effect of plasma-rich in platelet-derived growth factors on peri-implant bone healing: An experimental study in canines. Dent Res J (Isfahan) 2012;9:93-9.
5. Rather S, Kour S, Aslam A . Autologous Subcutaneous Platelet-Rich Plasma in the Management of Non-Healing Trophic Ulcer in Leprosy. Indian J Lepr 2023;95: 221-224.
6. Raju SP, Sondarva P, Jadwani MM, Bhuptani NV.. Autologous Platelet-Rich Fibrin Matrix (PRFM) Therapy in Non-Healing Trophic Ulcers in Patients of Hansen's Disease. Indian J Lepr 2020;92: 131-7.
7. Carter MJ, Fylling CP, Parnell LK. Use of platelet rich plasma gel on wound healing: A systematic review and meta-analysis. Eplasty 2011;11:e38
8. Conde-Montero E, Horcajada-Reales C, Clavo P, Delgado-Sillero I, Suárez-Fernández R. Neuropathic ulcers in leprosy treated with intralesional platelet-rich plasma. Int Wound J 2016;13:726-8.
9. Suryawati N, Praharsini IG, Juliyanti J. Management Non-healing Trophic Ulcer in a Leprosy Patient with Combination of Injection and Topical Platelet Rich Plasma. Journal of Skin and Stem Cell 2019 ;6(3) :e 101432