Case Report

Dermatology Research

Jodhpur Technique for Chronic Non-Healing Leg Ulcer

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Introduction
Chronic non healing ulcer (NHU) is defined as the loss of skin and soft tissue which takes more than 6 weeks to heal [1]. A chronic NHU is most commonly seen over the legs (NHUL) and may arise from diverse aetiologies. Leprosy (even after successful completion of multi-drug therapy or MDT), poorly controlled diabetes, chronic venous stasis, arterial insufficiency arising out of a peripheral vascular disease (PVD), vasculitis, certain infections, and pressure sores (decubitus ulcers) constitute major etiological reasons for a chronic NHU. Although targeting the primary pathology may lead to complete remission, many chronic NHU pose a therapeutic challenge. The ulcer may not heal owing to undiagnosed or untreatable underlying condition as well as despite apparent success in controlling the same. Irrespective of the aetiology, the lack of necessary growth factors seems to contribute hugely to persistence and chronicity of substantial number of NHUs [2].

Autologous non-cultured non-trypsinised keratinocyte and melanocyte grafting also known as Jodhpur Technique (JT) is a novel method of epidermal grafting innovated by us. We have demonstrated its successful use in repigmentation of stable vitiligo lesions [3]. Owing to the bounty of various growth factors in the 'donor paste' (vide infra), we extrapolated the concept and attempted its use in inducing healing of a chronic NHLU over the leg of a 52-year old Indian man, a treated case of leprosy.

Case Details
A 52-year-old Indian man, known case of treated borderline lepromatous (BL) leprosy presented to us with a 3-year old NHLU over the lateral aspect of his right lower leg around the ankle. The patient was non-diabetic, and had no clinical suggestion of varicose veins or vasculitis, or intermittent claudication. He was a non-smoker, and did not have any concurrent or past history of vasculitis. The patient successfully completed 12 month MB-MDT around 6 month back. Examination revealed a solitary 5cm × 2.5cm painless, non-tender polygonal ulcer with scant serous discharge located over the lateral malleolus of right foot [Figure 1(A)]. The ulcer had, slightly indurated sloping edges and pale unhealthy granulation tissue at the base. The surrounding skin was hyper pigmented and scaly.

Clinical examination of the peripheral nervous system revealed bilateral mildly thickened fibrotic ulnar, radial, and lateral popliteal nerves. Moderate glove-and-stocking pattern of hypoesthesia was present. The patient had bilateral partial claw hands and hammer toes but no foot drop.

Routine haematological and biochemical investigations, X-Ray chest, and USG Doppler were normal. Slit skin smear for Acid fast bacilli (AFB) was negative. Pus-swab from the ulcer was negative for bacterial growth. An ulcer edge biopsy revealed a non-specific ulcerated lesion with hyperkeratosis, irregular acanthosis, and dense diffuse and perivascular lymphohistiocytic infiltrate in the dermis. AFB stain was negative. The patient had received daily collagen wound dressings, honey-phenytoin dressings, and

platelet rich fibrin treatments in the past 2.5-3 years with modest improvement followed by relapse.

Materials & Methods

In view of the chronic treatment-refractory non-healing trait of his leg ulcer, we took his special consent for attempting ulcer healing with JT, i.e. our innovation of autologous non-cultured non-trypsinised keratinocyte and melanocyte grafting. Principles of ethical human research outlined in the Declaration of Helsinki 2013 were adhered to.

Donor (lateral thigh region) and recipient areas were prepared under aseptic precautions. 2% lidocaine (without adrenaline) was used for local anaesthesia followed by micro-motor dermabrasion as detailed below at 4000-5000 rpm.

First, the ulcer margin was dermabraded with pin-point bleeding as the end point. The area of the donor site (lateral thigh region) that was prepared for graft extraction was roughly calculated as measuring around 'one-third to one-half of recipient area' of the dimensions of the recipient ulcer. 2% mupirocin ointment was thoroughly smeared over the donor region, followed by motor dermabrasion of the site till the endpoint of pin-point bleeding. This approach ensured enmeshment of the epidermis and upper dermis onto the ointment applied at the site, expectedly containing a mix of keratinocytes, melanocyte and fibroblasts. The dermabraded 'skin graft' was collected in a spatula and was homogenized by adding carboxymethyl cellulose to enhance the ease of spreading. The homogenized graft was then applied at the recipient ulcer as a paste.

Post procedure dressing (non-absorbable) was done and bandaged with gauge with instructions of strict avoidance of wetting of the dressing till seven days. Post procedure, course of oral augmentin was given for a week. Additionally, oral vitamin C 500 mg BID and Multivitamin capsule containing at least 22.5 mg zinc OD were recommended for 4 weeks. The first follow-up visit was after seven days and then once-a-week. Weekly visits for follow up were done for upto 8 weeks and consisted of global clinical photography as well as arithmetic follow-up of healing in terms of reduction in the ulcer volume as per the formula - length× breadth× 0.7854, which is taken for an ellipsoidal structure [4]. After achieving complete healing, two more follow-up visits were done, after 6 and 12 weeks to monitor for relapse.

Primary outcome criterion was percentage reduction in ulcer volume at 6th week measured by (1) arithmetic formula for ulcer volume, and (2) global photography. Secondary outcome was measured as patient satisfaction on the visual analogue scale (VAS), with 10 suggesting total non-healing and 0 referring to complete healing.

Results

The baseline: The ulcer volume was 9.82 cm^3. Gross photography is shown in Figure 1(A). Patient's VAS was 9.

Follow-up:

On the seventh day follow-up visit, there was no pus or discharge on opening of the dressing. A healthy granulation tissue was seen within the entire ulcer, which was only mildly tender suggesting initiation of good healing. The site was left open, but with the instructions of strict avoidance of any trauma and scratching. Twice-daily application of mupirocin 2% ointment was suggested for next 1-2 weeks.

At the 3rd week (2 weeks after opening the dressing) the ulcer volume reduced to 3.7 × 1.4 × 0.7854 = 4.1 cm3, i.e.58.2% reduction was sustained. At the 5th week, ulcer volume was reduced to 0.3 × 0.2 × 0.7854 = 0.047 cm^3, calculated to 99.5%reduction. The healing of the ulcer was 100% complete at the 6th week by formula as well as appreciable on global photography [Figure 1(B)]. Except mild scarring, no complication such as infection or otherwise was noted. The patient's satisfaction on VAS reduced from 9 (at the baseline) to 6 (at the 3rd week) and 0 at the 5th week itself and persisted thereafter. Mild pruritus was compliant after the 3rd week, which was managed by gentle application of coconut oil and Tab cetrizine SOS. There was no relapse on the follow-up visits.

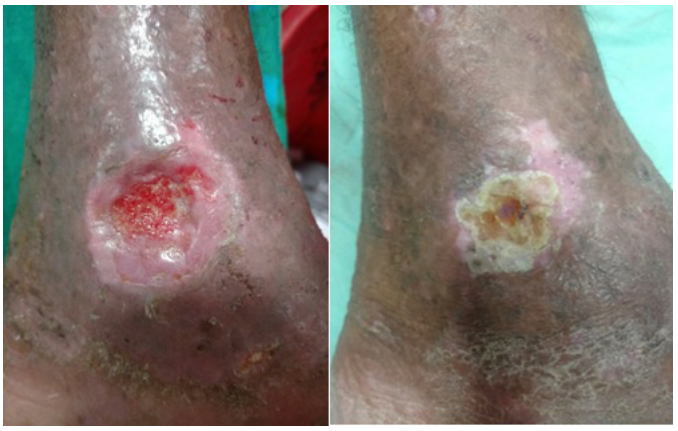

Figure 1: Ulcer over right foot . A. Ulcer before JT. B. Healed ulcer after 5 weeks.

Discussion

Healing chronic NHULs has become a major therapeutic challenge. Venous and diabetic foot ulcers account for 70–90% of these ulcers; leprosy foot ulcers due to peripheral neuropathy continue to contribute a substantial proportion off NHUL in developing countries. These ulcers typically afflict geriatric population who often have multiple pathophysiological factors that impede wound healing despite best treatments.

Prompt wound healing is essential to prevent irreversible damage. Moreover, the longer it takes to heal an ulcer, the greater the severity and the financial burden [4].

Although the involvement of growth factors was discovered decades ago with subsequent development of recombinant growth factors, these molecules are expensive, needed in combination, and often not available. PRP, PRFM, and newer adjuvant modalities attempt to provide ingenious growth factors, but suffer from their

own coterie of limitations [5,6].

We previously demonstrated that Jodhpur Technique was an inexpensive, simple and convenient approach to attain repigmentation in vitiligo patches [3]. We attempted repurposing this approach, on a plausible ground for induction of healing of NHUL in this patient and got excellent result with no adverse effect.

The successful healing of a treatment-refractory NHUL after a single session of Jodhpur Technique has prompted us to use it in other NHULs as well. And pending publication, we have had an almost 100% healing after a single session in most of the ulcers. The postulated mechanism of induction of healing is that the healing tissue at NHU site provides the base on which the grafts clutches. The graft provides a rich extra-cellular matrix (ECM) containing glycosaminoglycans as well as a cellular component of keratinocytes, melanocyte and fibroblasts. Additionally, dermabrasion is conjectured to have promoted the release of cytokines and growth factors like epidermal growth factor (EGF), vascular endothelial growth factor (VEGF), platelet derived growth factor (PDGF), etc from the enmeshed keratinocytes, melanocyte and fibroblasts of the donor graft that accelerate the proliferation and migration of keratinocyte and melanocyte at the recipient site, enhance neo-angiogenesis and activate other ulcer-healing mechanisms resulting in a completely healed ulcer with scarring.

Conclusion

Thus, Jodhpur technique is a simple method of epidermal grafting wherein a small donor graft can be used for a larger ulcer size , with an easy learning curve and doesn't at the same time requires expensive setup. Hence our technique offers ease, pace and negligible complications and at the same time rapid ulcer healing.

References

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