

Role of Prolotherapy in Wound bed Preparation in Necrotizing Fasciitis

Shivanand Hosamani¹, Ravi Kumar Chittoria², Barath Kumar Singh. P³

How to cite this article:

Shivanand Hosamani, Ravi Kumar Chittoria, Barath Kumar Singh. P/Role of Prolotherapy in Wound bed Preparation in Necrotizing Fasciitis/Int J Practical Nurs. 2023; 11(1):27-30.

Abstract

Necrotizing fasciitis is an infection of subcutaneous tissue and fascia which may spread rapidly to deeper tissue and surrounding tissue which may cause damage to the tissue and present as a localized infection and fulminant septic shock with high mortality rate. Prolotherapy has been found to be effective in wound bed preparation. This study highlights our experience in wound bed preparation using prolotherapy as an adjuvant in a case of necrotizing fasciitis.

Keywords: prolotherapy; wound bedpreparation; necrotizing fasciitis; regenerative medicine.

INTRODUCTION

Necrotizing soft tissue infections (NSTIs) include necrotizing forms of fasciitis, myositis, and cellulitis. These infections are characterized clinically by fulminant tissue destruction, systemic signs of toxicity, and high mortality.¹ Accurate

diagnosis and appropriate treatment must include early surgical intervention and antibiotic therapy. There are many methods use for wound bed preparation, each method has a varying degree of success. Prolotherapy is one of the recent therapeutic strategies for wound healing. There are 3 stages in adult wound healing: the inflammatory phase, the proliferative phase, and the remodeling phase. These 3 stages have to occur in sequentially to result in healing of wound. Wound bed preparation is a new concept and can be summarized with the acronym T.I.M.E, T for tissue: non-viable or deficient. I for infection/inflammation, M for moisture balance. E for epidermis which was changed later to E for edge. Large wounds often require a graft or a flap for wound coverage, which require the wound bed preparation. Prolotherapy is a procedure in which an irritant is injected or sprayed into the wound. The irritant injected will initiate an inflammatory reaction, which is thought to promote healing of wound. The most common prolotherapy agent used in clinical practice is dextrose, with concentrations

Author's Affiliation: ¹Junior Resident, Department of Plastic Surgery, ²Professor & Registrar (Academic) Head of IT Wing and Telemedicine Department of Plastic Surgery & Telemedicine, ³Senior Resident, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) Pondicherry-605006, India.

Corresponding Author: Ravi Kumar Chittoria, Professor & Registrar (Academic) Head of IT Wing and Telemedicine Department of Plastic Surgery & Telemedicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) Pondicherry-605006, India.

E-mail: drchittoria@yahoo.com

Received on: 07.12.2022 **Accepted on:** 08.01.2023

ranging from 12.5% to 25%. Dextrose is considered to be an ideal proliferant because of its water solubility, a normal constituent, and can be injected safely into multiple areas and in large quantity. Hypertonic dextrose solutions will be dehydrating cells at the injection site, leading to local tissue trauma, which in turn attracts granulocytes and macrophages and promotes healing. In this article, we highlight our experience of using prolotherapy as an adjuvant in the preparation of wound bed in necrotizing fasciitis.

MATERIALS AND METHODS

This study was conducted in the department of plastic surgery in a tertiary care center after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. The study is a prospective observational type done on a 60 year old male with known comorbidities including hypertension & coronary artery disease with ejection fraction of 25%. Patient presented with raw area (Figure 1) over left lower limb & perineum of one month duration.



Fig. 1: At admission with extensive necrotizing fasciitis of left lower limb & perineum

He was apparently well one month back when he developed multiple blebs over left lower limb & perineum which ruptured leaving raw area with rapid progression of wound infection with foul smelling discharge. He was diagnosed with clinically as a case of necrotizing fasciitis. He underwent multiple debridement and Wound tissue culture was sent and appropriate antibiotic therapy was given. Regular cleaning and dressing were done. To hasten the wound bed preparation decision was made to give a trial of prolotherapy. Dextrose 25% solution was used as an agent for prolotherapy. It was spread evenly on to the wound followed by a non-adherent dressing (Figure 2). A repeated session of prolotherapy was given every three days. After 3 weeks of prolotherapy wound bed was prepared and skin grafting was planned.



Fig. 2: Prolotherapy-25% Dextrose sprayed over the wound bed

RESULTS

After 8 sessions of prolotherapy over 3 weeks period, the wound showed a good sign of healing. It was covered with red granulation tissue, margins also showed advancement of epithelialization (Figure 3). After the wound bed was prepared grafting was planned. No adverse local or systemic effect was noted with the use of prolotherapy.



Fig. 3: Wound bed with healthy granulation tissue

DISCUSSION

Necrotizing fasciitis are severe and may be fatal. Early identification and treatment are necessary. Usually, a multidisciplinary approach is required. To properly care for such individuals, early repair and efficient rehabilitation are also imperative. Studies that span multiple disciplines and institutions are necessary. Necrotizing Fasciitis can have a complicated and time-consuming course of treatment. Management of the infection begins with antibiotic treatment. In the majority of cases with NF (70-90%) the reasonable pathogens are two or more, suggesting the use of broad-spectrum antibiotics. The value of antibiotic treatment in NF is relatively low, and early and aggressive drainage and debridement is required. In NF of the extremities, the clinician should consider amputating the infected limb, although this will not reduce the risk of mortality.^{1,2} Finally, postoperative management of the surgical wound is important, along with proper nutrition of the patient. In our

study we used Prolotherapy as an adjuvant therapy in wound bed preparation of necrotizing fasciitis. Both hemostasis and the process of healing a wound depend heavily on platelets. Keratinocyte, fibroblast, and endothelial cell migration, proliferation, and activities are all aided by the release of cytokines and growth factors by platelets. Chronic wounds experience a delay in the inflammatory stage of recovery. The spectrum of modalities available to manage a wound is very wide. Conveniently it can be grouped into four categories - conventional therapy, novel therapy, reconstructive therapy, and cell-based. Conventional therapies include - conventional dressings with or without topical application of antimicrobial agents, growth factors; various biological dressings such as silver and alginate; hyperbaric oxygen, etc. Novel therapies include the use of platelet-rich plasma, negative pressure wound therapy (NPWT), and skin substitutes. These are minimally invasive with much better healing efficacy than conventional therapies. Reconstructive therapy, such as skin and flap grafting, are invasive and damage the normal tissue also. Cell-based therapy is rapidly emerging as a part of wound management but is seldom used alone. These cells can be harvested from bone marrow or adipose tissue.

The term prolotherapy was coined by Dr. George Hackett in 1956. This word is derived from the Latin word proles meaning offspring or progeny and the English word- therapy. It involves injecting an irritant substance (such as dextrose) into a ligament or tendon to promote the growth of new tissue. Multiple agents are used in prolotherapy, some classified as irritants (such as phenol), some as chemoattractant (commonly sodium morrhuate), and others as osmotic agents (commonly dextrose). Although the exact mechanism of prolotherapy is not clear, proponents of the technique believe that the injection of hypertonic dextrose causes cell dehydration and osmotic rupture at the injection site that leads to local tissue injury that subsequently induces granulocyte and macrophage migration to the site, with the release of the growth factors and collagen deposition.³ In vitro studies have shown that even concentrations as low as 5% dextrose have resulted in the production of a number of growth factors critical for tissue repair. Some of these growth factors include PDGF, TGF- β , EGF, b-FGF, IGF-1, and CTGF.⁴ In vitro studies have shown that the cultivation of cells in high glucose culture medium can increase PDGF expression. PDGF has multiple pro-reparative effects in skin wounds, including the promotion of angiogenesis, fibroblast proliferation, extracellular production. TGF- β

expression is also upregulated by high glucose.^{5,6} TGF- β is involved in all steps of wound healing including inflammation, angiogenesis, fibroblast proliferation, collagen synthesis, matrix deposition, and remodeling, and wound re-epithelialization. Other growth factors upregulate by high glucose include EGF, b-FGF, IGF and CTGF, all having multiple pro-reparative functions and improves healing in some animal wound models of impaired healing.⁷

Some studies on prolotherapy suggest that there are direct effects on collagen synthesis.⁸ A few studies demonstrate the up-regulation of matrix in response to dextrose prolotherapy or in vitro cultivation with high concentrations of glucose. Collagen expression is increased after exposure of patellar tendon fibroblasts to the prolotherapy agents' dextrose and thus may contribute to tissue regeneration within a cutaneous wound. Collagen type I synthesis is also increased in high-glucose cultivation of renal fibroblasts, in a TGF- β -mediated pathway.^{9,10} Changes in the cartilage matrix protein aggrecan is reported in chondrocytes cultured in high glucose, and in patients who have received intraarticular injections of 12.5% dextrose.

CONCLUSION

In this study, we found that prolotherapy has a role in the wound bed preparation of necrotizing fasciitis. Definite conclusion cannot be made as it is a single case. Large randomized control trials are required to confirm the efficacy of Prolotherapy.

Conflicts of interest: None

Authors' contributions: All authors made contributions to the article

Availability of data and materials: Not applicable.

Financial support and sponsorship: None.

Consent for publication: Not applicable

REFERENCES

1. Bonne SL, Kadri SS. Evaluation and Management of Necrotizing Soft Tissue Infections. *Infect Dis Clin North Am* 2017; 31:497.
2. Camille Hua, Tomas Urbina, Romain Bosc, et al. Necrotising soft-tissue infections. *Lancet Infect Dis* 2022.
3. Frykberg RG, Banks J. Challenges in the treatment of chronic wounds. *Adv Wound Care (New Rochelle)* 2015; 4:560-582.
4. Farpour HR, Fereydooni F. Comparative

- effectiveness of intra-articular prolotherapy versus periarticular prolotherapy on pain reduction and improving function in patients with knee osteoarthritis: a randomized clinical trial. *Electron Physician* 2017; 9:5663–5669.
5. Barrientos S, Stojadinovic O, Golinko MS, Brem H, Tomic-Canic M. Growth factors and cytokines in wound healing. *Wound Repair Regen* 2008; 16:585–601.
 6. Oh JY, Choi GE, Lee HJ, et al. High glucose-induced reactive oxygen species stimulate human mesenchymal stem cell migration through snail and EZH2-dependent E-cadherin repression. *Cell Physiol Biochem* 2018; 46:1749–1767.
 7. Penn JW, Grobbelaar AO, Rolfe KJ. The role of the TGF-beta family in wound healing, burns and scarring: a review. *Int J Burns Trauma* 2012;2:18–28
 8. Freeman JW, Empson YM, Ekwueme EC, Paynter DM, Brolinson PG. Effect of prolotherapy on cellular proliferation and collagen deposition in MC3T3-E1 and patellar tendon fibroblast populations. *Transl Res* 2011; 158:132–139.
 9. Wu TJ, Fong YC, Lin CY, Huang YL, Tang CH. Glucose enhances aggrecan expression in chondrocytes via the PKC alpha/p38-miR141-3p signalling pathway. *J Cell Physiol* 2018; 233:6878–6887.
 10. Topol GA, Podesta LA, Reeves KD, et al. Chondrogenic effect of intra-articular hypertonic dextrose (prolotherapy) in severe knee osteoarthritis. *PM R* 2016;8:1072–1082.
-
-