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Role of Prolotherapy in Wound Bed Preparation of Non-Healing Ulcer

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Abstract

Wounds frequently occur as a result of burns, trauma, or infections. While there are several techniques available to prevent infection and protect the exposed area, no definitive method exists that reliably speeds up the healing process. Prolotherapy is a procedure that entails injecting a local irritant into the wound, which is said to promote healing. This article discusses the significance of prolotherapy in preparing the wound bed.

Keywords: Prolotherapy; Wound Management

Introduction

Wound care is a frequent challenge for plastic surgeons, with various methods available, each demonstrating different levels of success [1]. Large wounds often necessitate grafts or flaps for proper coverage, but it's essential to prepare the wound bed first. Several techniques can enhance wound bed preparation, and prolotherapy has emerged as a novel approach to promote healing [2].

Prolotherapy involves injecting an irritant into the wound, triggering an inflammatory response that is believed to aid in the healing process. Dextrose, typically used at concentrations between 12.5% and 25%, is the most common agent in clinical settings. It is regarded as an ideal proliferant due to its water solubility, presence in normal blood chemistry, and safety for injection in multiple locations and larger volumes. Hypertonic dextrose solutions work by dehydrating cells at the injection site, causing local tissue trauma that attracts granulocytes and macrophages, thereby facilitating healing. A review of the literature reveals a scarcity of Indian studies on the use of prolotherapy for wound management. Here, we share our experience with using 25% dextrose in managing wounds.

Materials and Methods

A study was conducted in the Department of Plastic Surgery at a tertiary care center in South India. The patient was a 15-year-old male with a history of post-burn contracture who underwent contracture release surgery, after which he developed a non-healing ulcer on the dorsum of his right foot. Regenerative therapy was administered, involving the application of 10 ml of 25% dextrose solution to the wound, followed by a two-layer scaffold and a sterile dressing with splinting.

Results

This study demonstrates the application of prolotherapy with 25% dextrose for wound bed preparation in a non-healing ulcer. Notably, the ulcer exhibited a reduction in size after the application of the treatment (Figure 1&2).

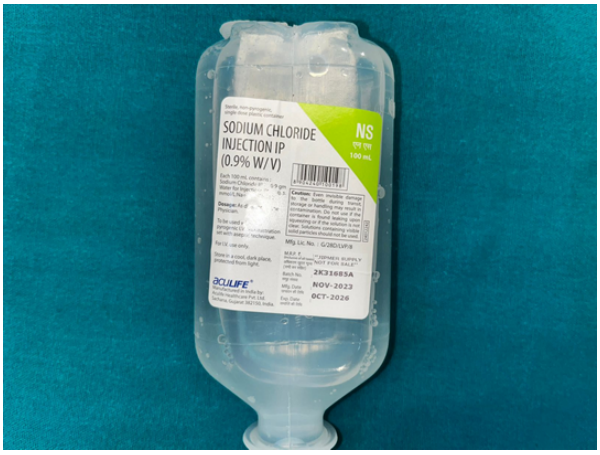

Figure 1: 25% Dextrose used for prolotherapy.

Figure 2: Application of 25% dextrose over the non-healing ulcer.

Discussion

There is a wide range of modalities available for wound management, which can be conveniently categorized into four main groups: conventional therapy, novel therapy, reconstructive therapy, and cell-based therapy.

Conventional Therapies

Include standard dressings, with or without topical antimicrobial agents and growth factors, as well as various biological dressings like silver and alginate, and hyperbaric oxygen treatment.

Novel Therapies

Encompass methods such as platelet-rich plasma, negative pressure wound therapy (NPWT), and skin substitutes. These approaches are minimally invasive and tend to provide improved healing outcomes compared to conventional methods.

Reconstructive Therapies

Which involve procedures like skin and flap grafting, are more invasive and can damage surrounding healthy tissue.

Cell-Based Therapies

Rapidly gaining traction in wound management, although they are rarely used in isolation, with cells typically harvested from sources like bone marrow or adipose tissue.

The term "prolotherapy" was introduced by Dr. George Hackett in 1956, derived from the Latin word "proles," meaning offspring or progeny, combined with the English word "therapy." This technique involves injecting an irritant substance, such as dextrose, into a ligament or tendon to stimulate the growth of new tissue. Various agents are used in prolotherapy, classified into irritants (like phenol), chemoattractants (such as sodium morrhuate), and osmotic agents (most commonly dextrose). The injection of hypertonic dextrose leads to cell dehydration and osmotic rupture at the injection site, resulting in localized tissue injury. This injury triggers the migration of granulocytes and macrophages to the area, along with the release of growth factors and collagen deposition [3]. Research has demonstrated that even concentrations as low as 5% dextrose can stimulate the production of several key growth factors essential for tissue repair, including PDGF, TGF–β, EGF, b–FGF, IGF–1, and CTGF.

In vitro studies indicate that high glucose concentrations can enhance PDGF expression, which has various pro-reparative effects on skin wounds, such as promoting angiogenesis, fibroblast proliferation, and extracellular matrix production. TGF–β expression is also increased in high glucose environments [4-6]. TGF–β plays a critical role in all phases of wound healing, including inflammation, angiogenesis, fibroblast proliferation, collagen synthesis, matrix deposition, remodelling, and re-epithelialization. Other growth factors elevated by high glucose levels include EGF, b–FGF, IGF, and CTGF, all of which have beneficial roles in healing, particularly in certain animal models with impaired wound healing.

Some studies suggest that prolotherapy may directly influence collagen synthesis. Evidence shows that dextrose prolotherapy or high glucose cultivation can lead to increased matrix production. For instance, exposure of patellar tendon

fibroblasts to dextrose has been associated with enhanced collagen expression, potentially aiding tissue regeneration in skin wounds. Additionally, collagen type I synthesis is elevated in renal fibroblasts cultivated in high glucose, likely through a TGF–β-mediated pathway. Changes in the cartilage matrix protein aggrecan have also been noted in chondrocytes cultured in high glucose, as well as in patients receiving intra-articular injections of 12.5% dextrose [7-8].

Conclusion

The use of hypertonic dextrose in prolotherapy presents a promising approach to wound management. By inducing local tissue injury and stimulating the migration of reparative cells, this method enhances the release of key growth factors and supports collagen synthesis, ultimately facilitating better healing outcomes.

References

1. Frykberg RG, Banks J (2015) Challenges in the treatment of chronic wounds. Adv Wound Care (New Rochelle) 4: 560-582.

2. Pathan I, Chittoria RK, Gupta S, Reddy CL, Mohan PB, et al. (2020) Role of Prolotherapy in Wound Bed Preparation. RFP Journal of Dermatology 5(1): 5-7.

3. Barrientos S, Stojadinovic O, Golinko MS, Brem H, Tomic-Canic M (2008) Growth factors and cytokines in wound healing. Wound Repair Regen 16: 585-601.

4. Oh JY, Choi GE, Lee HJ, Jung YH, Ko SH, et al. (2018) High glucose induced reactive oxygen species stimulates human mesenchymal stem cell migration through snail and EZH2–dependent E-cadherin repression. Cell Physiol Biochem 46: 1749-1767.

5. Wu TJ, Fong YC, Lin CY, Huang YL, Tang CH (2018) Glucose enhances aggrecan expression in chondrocytesvia the PKCalpha/p38– miR141–3p signaling pathway. J Cell Physiol 233(9): 6878-6887.

6. Topol GA, Podesta LA, Reeves KD, Giraldo MM, Johnson LL, et al. (2016) Chondrogenic effect of intra-articular hypertonic dextrose(prolotherapy) in severe knee osteoarthritis. PM R 8(11): 1072-1082.

7. Penn JW, Grobbelaar AO, Rolfe KJ (2012) The role of the TGF-beta family in wound healing, burns and scarring: a review. Int J Burns Trauma 2(1): 18-28.

8. Freeman JW, Empson YM, Ekwueme EC, Paynter DM, Brolinson PG (2011) Effect of prolotherapy on cellular proliferation and collagen deposition in MC3T3–E1 and patellar tendon fibroblast populations. Transl Res158(3): 132-139.