ROLE OF DERMAL EXTRACT IN WOUND BED PREPARATION (WBP) OF ULCERS

Preethitha Babu, *Ravi Kumar Chittoria, Sandhya Pandey, Mohapatra Devi Prasad, Friji MT, Dinesh Kumar Sivakumar

Abstract

Non healing ulcers represent a common problem in the plastic surgery practice. Many patients are unable to undergo definitive form of treatment immediately as they are medically unfit to undergo any procedure under general anesthesia or the wound bed is not ready for definitive cover. In such situations wound bed preparation plays a very important role. Many such therapies exist like autologous platelet rich plasma injections, autologous lipoaspirate injection, autologous bone marrow therapy etc. Dermal extract is one such method for wound bed preparation. The patient’s own dermis provides a scaffold for granulation tissue formation and epithelisation enabling wounds to heal faster. It serves as a safe, easy method for wound bed preparation when the patient is awaiting surgery in the form of graft or flap cover.

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INTRODUCTION

Wound bed preparation is defined as ‘the management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures’ [1]. The ultimate goal of wound bed preparation is to produce a well vascularised, stable wound bed with minimal or no exudates thereby creating optimal wound healing environment [2, 3].

Wounds of the sub acute and chronic nature require special attention in the form of adjuvant therapies to enable them to heal well. Sub acute wounds tend to have a higher load of infection [4]. Chronic wounds on the other hand are arrested in certain phases of wound healing in spite of providing standard wound care [5]. Such wounds require removing senescent or abnormal cells, decreasing the bacterial load, decreasing wound exudates and enhancing granulation tissue formation. When the entire above are achieved wound healing progresses in a normal and orderly fashion. Various adjuvant methods have been used to improve the wound bed. Some of these include autologous platelet rich plasma injections, autologous lipoaspirate injections, autologous bone marrow aspirate injections etc. In this case study we have tried to use dermal extract as an adjuvant therapy to prepare and improve the wound bed when the patient is awaiting a definitive cover for the wound.

Surgeons face difficulties in treating wounds in two main situations. The first is when treating patients who are medically unfit to undergo surgical cover for the wounds in the form of graft or flap cover. The second situation is when the wound is not fit for cover due to Beta Hemolytic Streptococcus infection etc. In such conditions different methods of wound bed preparation can be tried to make the wound better when the patient is awaiting surgery.

METHODOLOGY

This study was conducted in the department of plastic surgery, JIPMER, Pondicherry, India. This is a retrospective study done during the period of October 2015 to December 2015. 10 patients with non healing ulcers were analyzed in whom dermal extract application was done as an adjunctive measure when the patient was awaiting definitive reconstruction (Table 1). All patients and wounds were examined systematically; associated co morbidities were detected and managed according to standard protocol [6]. Documentation of ulcer was done according to
Bates-Jansen wound assessment tool and digital planimetry software at the time of presentation and was repeated weekly to access the condition of the wound \cite{7}.

(Figure 1)

**Figure 1. Digital Planimetry being done**

Wound culture and antibiotic sensitivity testing was done. Blood investigations like Hemoglobin level, Serum Albumin, Serum Protein levels and other investigations necessary for surgical fitness were obtained. All of the 10 patients enlisted in Table 1 were declared unfit for surgery under general anesthesia or had wounds that were not fit for immediate cover with skin graft or flap. Hence the patients were started on adjuvant therapy in the form of dermal extract application for wound bed preparation.

**Preparation of Dermal Extract**

Dermal extract was prepared as follows:

Step 1: Informed consent is taken.
Step 2: The site for dermal graft harvest was chosen. One of the following sites was chosen for harvest of dermis – groin, popliteal crease or inferior abdominal skin.
Step 3: Sterile preparation of the surgical site was done and 1% solution of lignocaine mixed with adrenaline was infiltrated in the line of incision.
Step 4: Using a motorized diamond burr, the epidermis over the site of dermis harvest was removed by dermabrasion. (Figure 2)

**Figure 2: post dermabrasion with diamond burr**
Step 5: Using a surgical scalpel, an incision over the dermis was made and the dermis elevated from the underlying subcutaneous tissue. Any excess subcutaneous tissue stuck to the undersurface of the harvested dermis was removed. (Figure 3)

Step 6: the donor site was closed primarily.

Step 6: The harvested dermis was minced into tiny pieces using an 11 number surgical blade.

Step 7: A mallet was used to crush the dermal pieces and further increase the surface area of the dermal extract. (Figure 4)

Figure 3: Harvested dermis

The procedure was repeated weekly till wound healed or became fit for reconstruction. Once the wound bed preparation completed various clinical decisions related to repair and reconstruction were taken according to ladder of reconstruction (figure 7) [9]. Rehabilitative measures were continued post operatively.

Figure 4: Prepared dermal extract

Figure 5: Dermal extract applied in cavity

Figure 6: Extract sprayed on wound
All the patients were followed up for 6 months and no complications were noted.

The average time taken for wounds bed preparation was 4.7 weeks. Most patients (70.00%) were treated finally with Split Skin Grafting of the wounds. In the remaining patients (30.00%), wounds healed without surgical intervention. (Figure 8)

Results

Ten patients were included in this study. The mean age was 49.16 years with male to female ratio of 1:1. The most common co-morbidity was Anemia and Hypertension (HTN) in 5 patients each (50.00 %), followed by diabetes mellitus (DM) in 4 patients (40.00 %), Ischemic heart disease (IHD) in 3 Patients (30.00%). One patient (10.00%) had Guillain Barre Syndrome (GBS). The most common etiology was post burns raw area, in 5 patients (50.00 %) and next most common etiology was bed sore, in 3 patients (30.00%). Mean duration of wound was 8.10 weeks. The average number of dermal extract applications done was 3.3.
Figure 8: diabetic foot ulcer with exposed bone covered with split skin graft after 4 dermal extract applications

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Etiology</th>
<th>Duration of wound (weeks)</th>
<th>Location</th>
<th>Co morbidity</th>
<th>No. of dermal extract applications</th>
<th>Total time taken for WBP (weeks)</th>
<th>Type of surgery done</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>23</td>
<td>F</td>
<td>Post burns raw area</td>
<td>4</td>
<td>Neck</td>
<td>Anemia</td>
<td>3</td>
<td>4</td>
<td>Split Skin Grafting</td>
</tr>
<tr>
<td>2.</td>
<td>67</td>
<td>M</td>
<td>Bed sore</td>
<td>8</td>
<td>Pre Sacral</td>
<td>GBS, HTN, IHD</td>
<td>3</td>
<td>8</td>
<td>–</td>
</tr>
<tr>
<td>3.</td>
<td>26</td>
<td>F</td>
<td>Post burns raw area</td>
<td>6</td>
<td>Anterior Chest</td>
<td>Anemia</td>
<td>3</td>
<td>5</td>
<td>Split Skin Grafting</td>
</tr>
<tr>
<td>4.</td>
<td>60</td>
<td>M</td>
<td>Diabetic foot ulcer (with exposed calcaneum)</td>
<td>10</td>
<td>Right Heel</td>
<td>DM, HTN, IHD</td>
<td>4</td>
<td>4</td>
<td>Split Skin Grafting</td>
</tr>
<tr>
<td>5.</td>
<td>60</td>
<td>M</td>
<td>Post fasciotomy ulcer</td>
<td>11</td>
<td>Right Leg</td>
<td>DM, HTN, IHD</td>
<td>4</td>
<td>4</td>
<td>Split Skin Grafting</td>
</tr>
<tr>
<td>6.</td>
<td>26</td>
<td>F</td>
<td>Post burns raw area</td>
<td>7</td>
<td>Neck</td>
<td>Anemia</td>
<td>2</td>
<td>3</td>
<td>Split Skin Grafting</td>
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<tr>
<td>7.</td>
<td>26</td>
<td>F</td>
<td>Post burns raw area</td>
<td>9</td>
<td>Right Arm</td>
<td>Anemia</td>
<td>3</td>
<td>3</td>
<td>Split Skin Grafting</td>
</tr>
<tr>
<td>8.</td>
<td>65</td>
<td>M</td>
<td>Bed sore</td>
<td>12</td>
<td>Pre sacral</td>
<td>HTN, DM</td>
<td>4</td>
<td>7</td>
<td>–</td>
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<tr>
<td>9.</td>
<td>60</td>
<td>M</td>
<td>Bed sore</td>
<td>10</td>
<td>Right trochanteric</td>
<td>HTN, DM</td>
<td>4</td>
<td>7</td>
<td>–</td>
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<tr>
<td>10.</td>
<td>28</td>
<td>F</td>
<td>Post burns raw area</td>
<td>4</td>
<td>Anterior abdominal wall</td>
<td>Anemia</td>
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<td>2</td>
<td>Split Skin Grafting</td>
</tr>
</tbody>
</table>

Table 1. Case Summary

DISCUSSION

Many situations arise when the surgeon is unable to provide cover for the wound bed immediately. In such situations wound bed preparation plays a very important role. Many such adjuvant methods have been tried. APRP has been shown to be very efficacious in the management of chronic ulcers [10, 11, 12].
Autologous lipoaspirate has also been utilized in the treatment of chronic non-healing ulcers and proved to be useful [13]. Through this case we would like to highlight the role of dermal extract application as an adjuvant method in making the wound bed ready for definitive reconstruction.

The TIME concept of wound bed preparation summarizes four main components viz Tissue management, Control of infection and inflammation, Moisture imbalance, Advancement of the epithelial edge of the wound [2]. Dermal extract application plays an important role in the advancement of the epithelial edge of the wound.

Lynch et al [14] used dermal autograft in tissue expander breast reconstruction. The structurally intact matrix of dermal autograft served as a scaffold that maybe necessary for tissue ingrowth and angiogenesis. The dermal extract that we have prepared in our study may also work on a similar basis providing the necessary structure for granulation tissue formation and epithelisation enabling wounds to heal faster.

Many studies have utilized acellular dermal tissue matrix or cultured human dermis for the treatment of diabetic ulcers [15, 16, 17]. The advantages of using autologous dermis as a means of wound bed preparation are plenty. Firstly, it can be performed under local anesthesia as a day care procedure. The donor sites can be closed primarily, leaving behind minimal scars. The dermal tissue that is harvested is autologous thus preventing any antigenic reaction and inflammation as occurs with allogenic dermal matrix [14].

**CONCLUSION**

Dermal extract application in chronic wounds appears to be an effective and safe means for wound bed preparation. It can be used for a wide variety of indications like post burns raw area, post infectious raw areas, bed sores etc. In patients who are medically unfit or in wounds that cannot be covered immediately due to various reasons this method of wound bed preparation can be used as a bridging therapy to improve the status of the wound so that definitive cover can be done faster. Thus it is a relatively simple, safe and effective method for wound bed preparation.

**Conflicts of interest** - None

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**Disclosures** - None
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