



## Wound Bed Preparation in the Management of an Extensive and Infected Leg Ulcer, in a Patient with Multiple Co Morbidities

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### Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

### Article Information

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- (1) Dr. Luis Ricardo Martinhao Souto, Universidade de Marília, Brazil.
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Complete Peer review History: <http://www.sdiarticle4.com/review-history/59460>

Case Report

Received 20 June 2020  
Accepted 25 August 2020  
Published 02 September 2020

### ABSTRACT

The case report presents the case of 45 years old female patient with multiple associated diseases sent for treatment to the Plastic Surgery Department, for multiple, extensive and infected left leg ulcer. In addition to systemic treatment, the patient has undergone multiple surgical procedures, debridement of the wound and then split skin grafting. The general treatment and the wound bed preparation prior to skin grafting have required a special attention, given the fragility of the patient condition and the obstacles to wound healing due to local and general deleterious factors. In order to ensure adequate local conditions for grafts integration, the proper wound bed preparation has consisted in serial debridement and application of topical agents with anti-infective, anti-inflammatory and nutritive activities, like medicinal honey dressings. The local and general evolution has been gradually favorable, with the remission of the leg phlegmon and stage integration of split skin grafts.

*Keywords: Wound bed preparation; leg ulcer; co morbidities; skin grafting.*

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## 1. INTRODUCTION

The concept of wound bed preparation (WBP) was proposed in 2002 by an international group of experts in wounds treatment, as a practical guide for the management of patients with wounds of various etiologies. WBP addresses all critical components of local treatment: debridement, bacterial load and exudate management, while taking into account the patient's general condition and how it can affect the wound healing process. The purpose of this therapeutic approach is providing the formation of good quality granulation tissue, leading to the complete closure of the wound, either naturally by marginal epithelialization, or by the use of skin grafts or substitutes [1-2].

WBP and the acronym TIME summarize the four main components of wound treatment:

- **T (Tissue):** Tissue (wound bed) management
- **I (Infection / inflammation):** Control of inflammation and infection
- **M (Moisture):** Adequate, balanced hydration
- **E (Edge / epithelial):** Advancing the wound edges (epithelialization).

WBP allows us to define all the stages involved in the management of wounds with difficult healing and to understand the appearance and how to solve clinical problems, which prevent further proper healing of these wounds [1-3].

WBP is a strategy that is more than simple wound debridement. In simple acute wounds, debridement is a good method of removing necrotic tissue and bacteria, after which a clean wound is obtained, that can heal with relative ease. But in burned or problem wounds, only debridement methods are not enough for optimum results. In burned wounds, not only eschars are necessary to be removed, but also wound exudate, as well as decreasing bacterial load, ensuring optimal local environment and promoting epithelialization.

Thus, WBP is especially recommended for extensive and infected chronic wounds, which are a challenge for the surgeon and require prompt and appropriate therapeutic measures. These situations are even more demanding if patients suffer from multiple and severe co

morbidities, which affect the local and general prognosis.

## 2. CASE PRESENTATION

We present the case of a 45 years old female patient with multiple associated diseases: diabetes, decompensated cirrhosis, hepatitis C, anemia, thrombocytopenia and chronic venous insufficiency. She was initially admitted in the Gastroenterology Department and then was sent for treatment to the Plastic Surgery Department, for multiple, extensive and infected left leg ulcers, having the size of approximately 30/20 cm [Fig. 1].

In addition to systemic rebalancing treatment, the patient has undergone multiple surgical procedures, debridement of the wound and then split skin grafting. The general treatment and the wound bed preparation prior to skin grafting have required a special attention, given the fragility of the patient overall condition and the obstacles to wound healing due to local and general deleterious factors, such as:

- The extent and the suppuration of the lesions
- Leg phlegmon
- Fibrous and sclerotic wound tissue
- Hepatic insufficiency
- Diabetes
- Chronic venous insufficiency
- Immunosuppression also caused by previous corticotherapy.



**Fig. 1. Left leg after initial debridement**

In order to ensure adequate local conditions for grafts integration, the proper wound bed preparation has consisted in serial debridements and application of topical agents with anti-infective, anti-inflammatory and nutritive activities, like medicinal honey dressings [Figs. 2,3].



**Fig. 2. Left leg 4 days later**



**Fig. 3. Left leg 15 days later**

### 3. RESULTS AND DISCUSSION

The local and general evolution of this difficult case has been gradually favorable, with the remission of the leg phlegmon and the stage integration of split skin grafts [Figs. 4,5].



**Fig. 4. Left leg 2 months later, after initial skin grafting**

The therapeutic approach aims to ultimately ensure formation of good quality granulation tissue, leading to the complete closure of the wound, either:

- naturally by the marginal epithelialization
- or by the use of skin grafts or substitutes.

TIME concept has been designed and then developed over time as a useful practical tool,

which is based on identifying barriers to optimal wound healing and on implementing a treatment plan to remove these barriers and promote wound healing.



**Fig. 5. Final result, after integration of split skin grafts**

WBP and TIME concept are implemented after detailed and careful assessment of the patient, and after identifying wound etiology, as well as systemic factors that can impede wound healing, such as the general state of nutrition or poor wound infusion of fluids and nutrients.

In clinical practice, WBP and TIME concept allow various aspects of wound care to be separated into its individual components and to be analyzed, while maintaining an overview of the process of healing and summarizing adequate therapeutic means [4].

The local management of difficult healing wounds involves:

- A continuous phase of debridement: autolytic, surgical, enzymatic [5] or mechanical
- Exudate management by providing an optimal moist local environment, which promotes keratinocyte migration, maintains an electrical gradient and accelerates wound healing
- Remission of bacterial load and wound infection, by improving the body's own defense mechanisms, debridement, wound cleansing, topical antiseptic and antimicrobial agents.

The application of medicinal honey is an effective therapeutic method that can contribute to the management of chronic wounds through multiple actions: debridement, moisture balance, infection and inflammation control, drainage, wound nutrition, wound healing effect [6].

In chronic wounds or in deep, neglected burns, there is often pro inflammatory stimulation due to:

- the persistence of necrotic tissue
- increased bacterial load
- tissue damage, that causes cellular and biochemical changes in wound bed and also increased levels of MMP (matrix metalloproteinase).

WBP addresses all critical components of local treatment: debridement, bacterial load and exudate management, while taking into account the patient's general condition and how it can affect the wound healing process [1,2].

According to WBP principle, if the local treatment of the wound, the underlying causes and the overall condition of the patient were adequately addressed, but the wound still fails to heal, then the wound healing can be stimulated by applying additional methods: skin grafts, skin substitutes or biological agents, such as growth factors, blood platelets or autologous platelet-rich plasma [2,7-10].

However, these methods will lead to favorable results only if they will be implemented on an optimally prepared wound bed, by completely debridement of devitalized tissue, reducing bacterial load, adequate hydration and nutrition at the level of the wound [11,12].

In our case, the concept of wound bed preparation was applied by carefully evaluating and correctly addressing all the local and general conditions that prevented the optimal wound healing. The debridements were practiced systematically, depending on the wound evolution, with the removal of debris and the appearance of good quality granulation tissue. They were judiciously combined with the applications of medicinal honey dressings, in order to ensure all the necessary aspects for the healing of the wound and its grafting in optimal conditions.

Our approach involves the application of WBP principle, through multiple, serial wound debridements, application of medicinal honey and final wound closure by split skin mesh graft, without the use of negative wound therapy or of other devices, as in similar cases, but still less severe [13,14]. The peculiarities of the case are

given by the huge size of the ulcer (30/20 cm), the extensive leg infection and the multiple co morbidities, which led to special therapeutic problems, especially diabetes, immune-suppression and hemorrhagic diathesis.

In the present case, the co-morbidities (diabetes, decompensated cirrhosis, hepatitis C, anemia, thrombocytopenia and chronic venous insufficiency) were highlighted by:

- anamnesis
- previous medical records
- medical exam
- medical imaging (ultrasound, Doppler)
- blood tests (blood count for mild anemia and thrombocytopenia, blood glucose for diabetes). Thrombocytopenia was found grade 2:  $50-75 \times 10^3/\mu\text{L}$ , according to classification [15].

The patient received complex and careful intensive care treatment: hydro electrolytic rebalancing, targeting antibiotic therapy (against multiresistant *Proteus*, *Acinetobacter*, *Klebsiella* and *MRSA*, identified in the wound by periodic bacteriologic tests), anti-inflammatory, analgesic, blood transfusions (platelet and fresh frozen plasma) [16], haemostatics, diuretics and parenteral nutrition. Care had to be taken not to overload the patient too much, given the occurrence of decompensated cirrhosis. Also, special attention had to be paid to the debridement maneuvers, in order not to cause too much bleeding, considering the thrombocytopenia and the bleeding tests.

To allow subsequent grafting operations, more aggressive debridements were performed at intervals of about 4-5 days, according to local and general evolution parameters:

- stable patient
- thrombocytopenia not very severe or partially compensated by platelet transfusions
- satisfactory bleeding times
- loaded wound, with more abundant detritus, secretions and granulation tissue.

The immunosuppression caused by diabetes and liver damage, as well as the extensive leg infection, aggravated the prognosis and required careful local care, through repeated debridement and application of anti-infective products, among which a clear effective action was exerted by medicinal honey dressings [6].

#### 4. CONCLUSIONS

The problem wounds, in difficult patients, require special attention, careful assessment and adequate therapeutic combined measures. Multiple treatment strategies and topical products have been used for the chronic infected wounds, but none have achieved therapeutic consensus.

The concept of wound bed preparation represents a very useful and versatile instrument in the armamentarium of plastic surgery. The case presented above is illustrative in a significant degree for the value of this concept, in the situation of challenging and extensive chronic wounds, in patients with local deleterious complications and serious associated diseases. However, additional research and specialist agreement may be necessary for shaping the treatment framework in the situation of problem patients presenting serious chronic wounds.

#### CONSENT

As per international standard, patient's consent has been collected and preserved by the authors.

#### ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Author has declared that no competing interests exist.

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*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
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