ROLE OF CALF BLOOD HEMODIALYSATE IN THE MANAGEMENT OF OPEN WOUNDS

ABSTRACT

Objective: To determine the role of calf blood hemodialysate in the management of open wounds.

Design: Descriptive; Quasi-experimental.

Methods: A total of 39 open granulating wounds of myriad etiologies were treated with calf blood hemodialysate between January 2005 and December 2011. The response to treatment was documented for: wound contraction; change of depth; complications; and, time to definitive healing/closure.

Results: Mean decrease in wound length was: abdomen-0.8 cm; extremity-2.3 cm; post-abscess-4.3 cm. Mean decrease in depth was: abdomen-0.5 cm; extremity-0.2cm; post-abscess-1.4cm. Duration of healing was highest for extremity wounds (mean: 22.8 days). Four patients developed a local allergic reaction to the hemodilysate.

Conclusion: Calf blood hemodialysate augments the healing process and has a positive impact on healing of open wounds.

Key-Words: hemodialysate; Solcoseryl; hexosylceramide.

INTRODUCTION

Wound failure is the Achilles’ heel of general surgery, accounting for significant morbidity (1). In addition to acute wound dehiscence, the general surgeon also encounters a fair number of open wounds not related to surgical process, the commonest example being diabetic foot. Healing in some such wounds often is punctuated by infection and late closure, spontaneous or surgical, is delayed. The problem is further compounded by patient-related factors like malnutrition, sepsis, hypoalbuminemia and diabetes mellitus, all of whom have proven to be independent risk-factors in effecting delayed wound healing (2). In such clinical scenarios, it is often safe to be content with secondary healing, although time factor tends to get the better of patience for both the patients and physicians. Several emollients and chemical filtrates have thus far been researched, employed, praised and even condemned to promote desloughing and expedite healing by secondary intention. Some such examples are: EUSOL (3), Iodine (4), Hydrogen Peroxide (5) and Vinegar (6). A newer agent that has been extensively researched over the past decade is calf-blood hemodialysate, marketed by the name of Solcoseryl (ICN Pharma, Switzerland).

Laboratory experiments have proven the role of Solcoseryl in effecting enhanced collagen accumulation, increased vascularity and cellularity in granulation tissue (7). It has also been shown to improve revascularization of ischemic skin lesions (8), as well as enhancing ATP synthesis and oxygen consumption by mitochondria (9). Studies on rats have shown reduced healing time in minor burns and skin ulcers, an effect that starts early in the healing process (10). In human beings, the dialysate has so far been employed in limited studies, such as on gums (11) and sickle cell ulcers (12). One study from Japan has reported its use in bed sores in the geriatric population (13), while another from Russia employed it for diabetic foot (14).
This objective of this study was to investigate the healing effects of the hemodialysate on open wounds encountered in the General Surgical practice.

MATERIALS AND METHODS
Patients were recruited from the Hospitals where the authors are involved in the surgical practice. These included one public sector (the Civil Hospital Karachi) and three private sector hospitals. Patients of all age groups who required open wound management, either as outpatients or inpatients, were included, regardless of the etiology of the wound. A suppurating, discharging wound; extensive or known dermatological ailment; severe allergic reaction to the hemodialysate were the exclusion criteria. Patients who were lost to follow-up were also excluded from the final analysis.

The wounds were dressed once daily in either of the two settings: outpatient clinic, or the dressing room in the ward. In either case strict sterile precautions were observed. After removal of the dressing, the surrounding area was painted with Povidone Iodine. The wound itself was gently irrigated with 250-500 ml of saline, and then coated with a rich layer of hemodialysate gel. It was then covered with sterile gauze and secured with adhesive tape. The response to therapy was documented as follows: dimensions of the wound were measured in length and depth on every alternate day using a plastic ruler; time to clearance of slough and complete healing, as verified by complete covering of healthy granulation and near complete obliteration of wound dimensions (length and depth) were duly recorded. Any complications, especially locoregional (erythema; edema etc) or constitutional (fever) were also inquired after and documented.

All documentation was recorded in writing on a proforma specifically designed for the study. Results were expressed as frequency percentage and means; p-value was set at 0.05 level of significance and paired t-test was employed to compare the means within each category of wounds. Analysis was computed on SPSS version 11.

RESULTS
A total of 42 open wounds were treated with calf blood hemodialysate during the study duration. Three patients were later lost to follow-up and were therefore excluded.

Demographics
The mean age of the study population was 39.5 years (range 18-67 years). These included 25 males and 14 females (male to female ratio, 1.7:1).

Categorization of Wounds
A variety of open wounds of myriad etiologies were treated with this therapy. In order to streamline the analysis, they were categorized arbitrarily, taking into consideration the type of wound and the region involved (table 1).

Change in the wound length:
A decrease in the wound length till the time of complete healing was highest for post-abscess wounds; however, this change was not statistically significant. Table 2 summarizes the change in wound length in the respective categories.

Change in wound depth:
Post-incision and drainage wounds filled up with granulation tissue far more efficiently than other types. This outcome measure showed a statistically significant result in all categories (table 3).

Complications:
Four patients developed local allergic reaction as witnessed by macular rash on the skin surrounding the wound. Topical application of steroid cream sufficed in all cases and the treatment was continued.

DISCUSSION
Calf blood hemodialysate (solcoseryl) is a relatively newer wound emollient which has shown promise in in vitro studies (7, 8, 9, 10). Studies on humans are limited, and have mostly concentrated on specific kinds of wounds (11-14). This study is the first of its kind since it aims to define the role of this agent in the most common kinds of open wounds encountered in the general surgical practice. We included a wide spectrum of pathologies in order that the results may be generalisable in a wide variety of clinical settings. Several methods have been employed to study the healing process in open wounds. These include wound chemistry (21), cytochemistry (13), angiogenesis and circulation (6, 13) and histology (10). Isler (16) employed the morphometric technique to evaluate the healing process. We assessed the healing process in our patients using a modified morphometry for three reasons: the parameters employed are simple, quick and pragmatic; they can easily be reproduced in any future research; and, they do not require any expensive tests or technique.

The mean changes in both the length and depth of wounds were statistically These encouraging results are attributable to the positive augmentation of granulation tissue by the hemodialysate. Niinokoski et al. (17) have proclaimed statistically significant increase in granulation tissue cellularity, DNA and RNA content with the application of hemodialysate. They have also shown an increment in the amount of collagen hydroxyproline in the same experimental model. They employed the glycolipid hexosylceramide fraction of the

<table>
<thead>
<tr>
<th>Type/Region of wound</th>
<th>Total number</th>
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<tbody>
<tr>
<td>Abdomen:</td>
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<tr>
<td>Midline</td>
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<tr>
<td>Kocher’s</td>
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<tr>
<td>Extremity:</td>
<td>19</td>
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<tr>
<td>Necrotizing fasciitis</td>
<td>8</td>
</tr>
<tr>
<td>Venous Ulcer</td>
<td>6</td>
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<tr>
<td>Diabetic foot</td>
<td>5</td>
</tr>
<tr>
<td>Post Incision-drainage:</td>
<td>10</td>
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<tr>
<td>Breast abscess</td>
<td>5</td>
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<tr>
<td>Carbuncle</td>
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<td>Pilonidal abscess</td>
<td>2</td>
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<tr>
<td>Hand abscess</td>
<td>1</td>
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<td>Type of wound</td>
<td>Mean length before treatment</td>
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<tr>
<td>---------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Abdomen</td>
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</tr>
<tr>
<td>Extremity</td>
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<td>Post-abscess</td>
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<table>
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<th>Mean depth after treatment</th>
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<td>1.4 cms</td>
<td>0.004</td>
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</table>

FIGURE 1: THIGH WOUND POST-NECROTISING FASCIITIS

FIGURE 2: THE SAME WOUND AS IN FIGURE 1, AFTER TREATMENT WITH SOLCOSERYL

FIGURE 3: DEHISCED ROOF-TOP INCISION, AFTER TREATMENT WITH SOLCOSERYL

hemodilaysate in this study. In another model, Liebich et al \((18)\) obtained similar results in equine wounds with the hexosylceramide fraction. It seems highly probable that this particular glycolipid is primarily responsible for most, if not all, of the therapeutic effect of the hemodialysate.

The time to definitive healing in our patients was fairly long. We strongly believe this was partly due to a high prevalence of co-morbid diseases in our study population. We did not take into account the co-morbid status in the analyses of our results. In hindsight, however, several patients in the current study sample were diabetic, and/or otherwise immunocompromised due to such myriad co-morbid conditions as malnutrition, sepsis or tuberculosis. A stratification of the sample on the basis of such co-morbid conditions would have revealed more meaningful data vis-à-vis the healing potential of this new therapy. For future research prospects, we recommend that the role of this agent be studied in specific clinical situations using the simple and practical technique of wound morphometry.
as proposed in the current study.

CONCLUSION
Calf blood hemodialysate is a useful new agent in the treatment of open wounds. It augments the granulation tissue, hastens the wound contracture and reduces the duration of recovery.

REFERENCES