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BEYOND STEM CELL: WHERE ARE WE?

Subcutaneous and Topical Mesenchymal Stem Cell Therapy vs. Skin Grafting in Burn Management: A Case Report

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1 Introduction

- Burn injuries cause significant **morbidity** and **mortality**, especially in low- and middle-income countries.
- Severe burns lead to **extensive** tissue **damage**, **inflammation**, prolonged healing, hypertrophic **scarring**, and **contractures**.
- Standard treatments, including **debridement and grafting**, often fail to address these long-term issues, highlighting the need for innovative therapies.
- Umbilical cord mesenchymal stem cells (UC-MSCs), derived from Wharton's jelly, offer a **promising solution** for burn management due to their: regenerative effects, immunomodulation, and differentiation potential.

2 Case Presentation

A 45-year-old female presented with bilateral superficial partial-deep partial-thickness burns following a gas explosion in the lower extremity.

- **Right Foot:**
  - **7%** TBSA burn treated with traditional skin grafting (Figure 1)
  - Partial healing was observed, but areas of erythema suggest local inflammation on the 28th day. (Figure 2)
  - There is evidence of infection, with redness, graft breakdown, and delayed epithelialization noted on the 49th day. Likely exacerbated by the patient's low compliance with dressing changes, reportedly due to pain.
- **Left Foot:**
  - **5%** TBSA burn treated with MSCs of 5 million cells/cc (Figure 1)
  - Formation of healthy granulation tissue, covering most of the wound bed. Some epithelialization was noted on the 49th day but not yet complete.
  - Although the wound surface remains partially raw, it was free from signs of infection.

Immediate post-operative result

Figure. 1

Healing progression of burn injury

Figure. 2

Immunomodulatory effect and Infection Control

- MSCs exert antimicrobial effects indirectly through the secretion of bioactive molecules such as antimicrobial peptides, as well as by enhancing the phagocytic activity of immune cells. This mechanism likely contributed to the absence of infection in the stem cell-treated left foot.
- By reducing excessive inflammation through immunomodulation, MSCs create a controlled environment that inhibits bacterial overgrowth and prevents secondary infections.
- Skin grafts rely heavily on adequate blood supply and immune competence for survival. Any disruption, such as infection, can compromise graft take and healing as seen in this case.
- Graft-treated wounds are more dependent on external factors, such as proper dressing changes and environmental sterility, to prevent infection.

The importance of Patient Compliance & Outcome of this Case

- Inadequate dressing changes can result in bacterial overgrowth, accumulation of exudate, and a compromised wound environment, creating conditions favorable for infection.
- Comprehensive patient education on the importance of dressing changes, even in the presence of pain, is critical for preventing complications.
- Regular follow-up appointments are scheduled to help monitor patient compliance, and pain management therapies are delivered to this patient.

3 Discussion

This case presents a unique opportunity to **compare** the outcomes of burn treatments in the same patient with different modality

Wound Healing Time

- The stem cell-treated foot showed **slow but steady** granulation, yet infection-free, epithelialization.
- The faster initial closure in the skin graft-treated foot underscores the advantage of grafting for rapid wound coverage but at the cost of higher infection risk **if** complications arise.

4 Conclusion

- MSC therapy provides a promising, less infection-prone option for burn management, especially in patients with limited ability to adhere to strict dressing schedules.
- Further research is warranted to establish its long-term efficacy and expand its clinical applications.
- While skin grafting achieved faster re-epithelialization in the early stages, it showed higher dependency on frequent and proper dressing changes.
- The infection on the graft-treated site (right foot) highlights the critical role of patient compliance and pain management in post-operative care.
- Combination of both MSC and skin grafting may/should provide a better clinical outcome theoritically.

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