Case Report

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Role of External Tissue Expansion and Wound Closure Technique in the Management of Postburn Raw Area Scalp

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Abstract

The reconstruction of scalp defects remains a significant challenge in plastic surgery. External Tissue Expansion (ETE) has garnered attention for its capacity to regenerate soft tissues, including skin, subcutaneous fat, and breast tissue. As a minimally invasive and cost-effective tissue engineering approach, ETE demonstrates great potential in wound regeneration. Despite promising outcomes, several challenges must be addressed before its routine clinical application can be realized.Basic in vivo and in vitro studies have explored the mechanisms underlying ETE-mediated tissue regeneration. Findings suggest that ETE facilitates cell proliferation and migration, enhances adipogenesis, promotes angiogenesis, and provides a favorable environment for soft tissue growth. Understanding the mechanical and chemical signals involved in ETE-induced tissue regeneration could enable its broader adaptation in clinical practice.This article reviews the clinical applications of ETE, examines preclinical animal models, and evaluates the potential mechanisms by which ETE promotes tissue regeneration, offering insights into its future integration into clinical settings.

Keywords: External Tissue Expansion (ETE), tissue regeneration, wound closure, scalp, raw area, burn.

INTRODUCTION

Reconstructing extensive scalp defects, such as those caused by burns or multiple craniotomies, poses significant challenges. Scalp contraction often necessitates more than basic subcutaneous undermining to achieve both functional and aesthetically pleasing closure. Within the field of plastic and reconstructive surgery, soft tissue expansion is widely regarded as the gold standard for addressing scalp defects. Despite its effectiveness, this approach is not yet widely adopted or commonly utilized by many surgeons. This article outlines a straightforward external tissue expansion technique, which demonstrates

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low complication rates and yields excellent cosmetic outcomes, enhancing patient satisfaction.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery at a Tertiary Care Centre following approval from the departmental ethics committee. Informed consent was obtained prior to the study. The subject was an 8-year-old boy who sustained a high-voltage electrocution burn injury, resulting in 35% total body surface area burns. The burns affected the face, neck, chest, abdomen, both upper limbs, and both lower limbs, with deep burn injuries to the scalp (entry wound) and the right great toe (exit wound). He was admitted to the burns care ICU and underwent wound debridement under general anesthesia.To protect the exposed scalp bone at the entry wound site, a dermal substitute was applied, followed by the application of negative pressure wound therapy (NPWT). The remaining unhealed raw area accounted for approximately 20% of the burn wound and included exposed scalp bone. Skin grafting was performed on the raw areas over the chest and abdomen. For the exposed scalp bone, periodic bone abrasion and excision of infarcted bone were carried out. Over time, adequate granulation tissue developed over the bone and dura, facilitating further wound management. Preprocedure wound measurements documented using imito software (fig. 1).

Fig. 1: Preprocedure wound measurements taken using imito software

Readily accessible blouse hooks and rubber bands were utilized to set up an external tissue expansion technique after sterilization. The rubber bands were sterilized using ethylene oxide gas. Under general anesthesia, a split-thickness skin graft was secured over the granulation tissue to facilitate wound coverage. (fig. 2).

Fig. 2: After split skin grafting

Over the graft, biological scaffold and Vac dressing applied. The skin hooks were sutured to the healthy skin edges of the wound using non-absorbable stitches.The hooks were strategically placed circumferentially around the wound. Rubber bands were then attached to the hooks and applied under controlled tension across the vacuum sponge. This setup facilitated the gradual advancement of the wound edges, promoting closure. (fig. 3).

Fig. 3: Application of hooks and rubber bands over vac sponge

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