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SECONDARY INTENTION HEALING OF AURICULAR WOUNDS WITH EXPOSED CARTILAGE: A LITERATURE REVIEW

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ABSTRACT

Auricular defects with exposed cartilage present a reconstructive challenge due to the limited vascularity of cartilage and the importance of preserving auricular contour and function. Secondary intention healing (SIH) represents an alternative approach for selected auricular wounds, allowing wound closure through granulation tissue formation, re-epithelialization, and wound contraction. This literature review aims to discuss current evidence regarding the outcomes, complications, and factors influencing SIH in auricular wounds with exposed cartilage. The review highlights that exposed cartilage is not an absolute contraindication to SIH, as acceptable healing and cosmetic outcomes have been reported, particularly for defects located in concave auricular areas. However, healing time, cosmetic outcomes, and the risk of complications may vary depending on wound location, defect characteristics, and perichondrial integrity. In conclusion, SIH is a viable option for selected auricular defects with exposed cartilage. Individualized treatment planning based on wound characteristics, perichondrial status, and anticipated cosmetic outcomes is essential to determine the suitability of this approach.

Keywords: Secondary Intention Healing; Auricular Defects; Exposed Cartilage; Ear Reconstruction

1 INTRODUCTION

Auricular defects are challenging to reconstruct because of the ear's complex three-dimensional anatomy and relatively thin soft-tissue coverage [1] The challenge is greater when cartilage is exposed. Auricular cartilage has limited intrinsic vascularity and relies primarily on the perichondrium for nutritional support; therefore, the condition of the perichondrium and surrounding tissues should be considered when selecting a reconstructive approach [2].

Secondary intention healing (SIH) is an option in which a wound is left open to heal without direct approximation of its edges. The process involves granulation tissue formation, re-epithelialization, and wound contraction [3]. A systematic review by Maghfour et al. reported that SIH can provide acceptable cosmetic and functional outcomes for selected surgical defects, including auricular wounds [4]. Clinical evidence also indicates that exposed cartilage is not necessarily a contraindication to SIH. In a series of 133 full-thickness auricular defects following Mohs surgery, all wounds were reported to heal by SIH within 10 weeks, including those with exposed cartilage [5]. Nevertheless, healing outcomes may vary according to wound location, defect size and depth, and the condition of surrounding tissues.

This literature review discusses the characteristics of auricular defects with exposed cartilage, the mechanism of SIH, clinical evidence for its use, associated complications, and factors to consider when selecting this approach.

2 MATERIAL AND METHODS

A literature search was conducted using PubMed, ScienceDirect, and SpringerLink with keywords related to secondary intention healing, auricular wounds, auricular defects, exposed cartilage, and ear reconstruction. Relevant literature was selected and reviewed to identify findings on the healing process, cosmetic and functional outcomes, complications, and factors influencing the use of SIH. The findings were synthesized descriptively and organized according to the themes addressed in this review.

3 REVIEW CONTENT

3.1 Characteristics of Auricular Defects with Exposed Cartilage

The auricle consists of elastic cartilage covered by perichondrium and tightly adherent skin. Because cartilage has limited intrinsic vascularity, its nutritional and vascular support depends on the perichondrium and surrounding tissues [6]. The auricle receives its blood supply mainly from branches of the superficial temporal and posterior auricular arteries. These vascular systems have anastomotic connections that support auricular tissue perfusion [7,8].

Cartilage may become exposed following excision of auricular lesions or neoplasms, including after Mohs surgery [9]. Defects should be assessed according to anatomical location, size, depth, cartilage involvement, and perichondrial status [4,5,9]. The perichondrium may remain intact, be partially preserved, or be absent from the exposed cartilage surface. Intact perichondrium can provide vascular support, whereas its absence may make granulation tissue formation more dependent on the wound margins or on intact perichondrium on the opposite surface [6]. Thus, the term exposed cartilage does not describe a uniform wound condition and should not, by it self, determine the choice of reconstruction.

3.2 Mechanism of Secondary Intention Healing

Wound healing involves four overlapping phases: hemostasis, inflammation, proliferation, and remodeling [10]. In secondary intention healing (SIH), wounds are left open to heal through granulation tissue formation and re-epithelialization [3]. As healing progresses, wound contraction reduces the defect area but may alter the auricular contour. Zitelli reported that wounds on concave surfaces generally achieve better cosmetic outcomes than those on convex surfaces or prominent free margins [11].

Anatomical variations in wound contraction have also been documented in auricular defects following Mohs micrographic surgery and managed by SIH [12]. A pilot study reported a mean wound contraction of approximately 34% in both auricular defects treated with a porcine xenograft and those managed without one [13]. However, a reduction in wound size does not necessarily translate into a favorable cosmetic outcome. Therefore, the anatomical location and characteristics of the defect should be considered when selecting SIH for auricular wound management.

3.3 Secondary Intention Healing in Exposed Cartilage

The traditional view that exposed cartilage is unsuitable for SIH has been challenged by clinical series. Levin et al. observed 133 patients with full-thickness auricular defects after Mohs surgery and recorded location, depth, size and antibiotic use; all wounds healed by SIH within 10 weeks, and the authors concluded that exposed cartilage is not a contraindication to SIH and that results were often more cosmetically pleasing than those of surgical repair [5]. A later review summarizing this series reported excellent esthetic outcomes, particularly in concave areas, even when cartilage had been removed, with the exception of the helix [14]. In the systematic review, most wounds of the postauricular area achieved good to excellent cosmetic results [4].

Indirect support comes from other sites. Defects of the nasal ala reconstructed with free cartilage grafts left to heal by secondary intention healed uneventfully in one series [15] and similar results were reported by others [16]. Such reports suggest that cartilage can act as a framework for SIH, although they cannot be extrapolated directly to the ear.

Comparative data are limited. In the prospective study of 30 patients, maximum pain occurred on the night of surgery and was lower after SIH (mean 3.6 with STSG versus 0.8 with SIH), but healing was significantly faster with STSG: 87% of patients were fully healed at 1 week versus 21% after SIH, and no major complications occurred in either group over 30 days [17]. Full-thickness skin grafts and SIH have been compared for helical defects [18], split-thickness grafts harvested from adjacent hairy skin have been proposed for concave auricular surfaces (16 patients, one partial graft failure) [19], and patient satisfaction after SIH versus primary closure has also been examined [20]. The systematic review concluded that SIH may yield acceptable results for selected defects, but this must be weighed against the potentially better cosmesis and faster healing of primarily closed defects [4]. Direct comparisons between SIH and grafts remain few [3].

3.4 Complications and Factors Influencing SIH

Secondary intention healing (SIH) of auricular defects with exposed cartilage may be associated with complications, including delayed wound healing, infection, perichondritis, scar pigmentary changes, and excessive wound contraction that may distort the auricular contour. However, exposed cartilage is not an absolute contraindication to SIH. Levin et al. reported that all 133 auricular defects healed within 10 weeks, with defect location influencing cosmetic outcomes [5]. A pilot study by Coman et al. also found no statistically significant difference in wound contraction between conventional SIH and SIH supplemented with a porcine xenograft [13].

The success of SIH depends on several factors, including defect location, size and depth, perichondrial integrity, wound care, and patient-related factors. Defects located in concave areas of the auricle tend to yield favorable cosmetic outcomes, whereas contraction involving prominent structures, such as the helix, may result in contour distortion. Appropriate wound care and postoperative monitoring are essential for detecting complications and supporting the healing process. Nevertheless, evidence regarding the individual contributions of these factors to the healing of auricular defects with exposed cartilage remains limited [5,13,14].

3.5 Advantages and Disadvantages of SIH

Secondary intention healing (SIH) is a relatively simple and effective wound-healing approach for selected auricular defects [21]. Its advantages include facilitating surveillance of the tumor excision site, reducing the need for surgical reconstruction, and avoiding the additional costs and potential complications associated with further procedures [5]. Compared with split-thickness skin grafting (STSG), SIH has also been associated with less early postoperative pain. However, STSG provides faster wound closure, with complete healing reported in 87% of wounds at the first week compared with 21% in the SIH group, although no major complications occurred in either group [17].

The limitations of SIH include prolonged healing time and the risk of wound contraction and auricular contour distortion. Defects involving the helical rim require particular attention because contraction may result in notching of the ear margin. In addition, perichondrial damage may increase the risk of cartilage necrosis and impair granulation tissue formation [22,23]. Therefore, the selection of SIH should take into account the location, size, and depth of the wound, as well as the condition of the surrounding tissues. Although exposed cartilage is not an absolute contraindication to SIH, assessment of perichondrial integrity and the potential for auricular deformity remains essential when determining the most appropriate treatment approach [22,23].

4 CONCLUSION

Exposed auricular cartilage is not an absolute contraindication to secondary intention healing. In selected small to moderate defects, particularly in concave subunits, SIH can provide acceptable cosmetic and functional results with low morbidity, simple management and good oncologic surveillance. Its drawbacks are a longer healing period, the burden of wound care, and the risk of contraction, pigmentary change and contour irregularity, especially in the helix. Decisions should be individualized according to defect location, size, depth, perichondrial status, patient comorbidities and preferences. Higher-quality prospective evidence is required to define optimal indications and techniques.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

There is no conflict of interest.

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