Hydrogen Peroxide as a Hemostatic Agent During Dermatologic Surgery

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We highlight the use of intraprocedural hydrogen peroxide (H_2O_2) as a hemostatic agent during dermatologic surgery, with no clinical evidence of wound-healing impairment or worsening scar outcome. We describe the use of H_2O_2 to clean the surgical field and prevent mild persistent oozing of the wound edges intraoperatively.

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The number of skin cancer surgeries continues to rise, especially in the older population, many of whom are on blood thinners. The sequela of bleeding, even in minor cases, is one of the most frequently encountered complications of cutaneous surgery. Surgical site bleeding can increase the risk for infection, skin graft failure, wound dehiscence, and hematoma formation, which may lead to disrupted wound healing and eventual poor scar outcome. Although achieving hemostasis is important, it is recommended to limit certain alternative modalities such as electrosurgery due to the accompanied thermal tissue damage that in turn can prolong healing time, worsen scarring, and increase the risk for infection.[1]

Practice Gap

Hydrogen peroxide (H_2O_2) is a common topical antiseptic used to clean wounds by killing pathogens through oxidation burst and local oxygen production.[2] It is generally affordable, nonallergenic, and easy to obtain. We describe our positive experience using H_2O_2 as a hemostatic agent during dermatologic surgery, highlighting the agent's underutilization as well as the recent literature negating traditional viewpoints that it probably causes tissue necrosis and impaired wound healing through its high oxidative property.

The Technique

Before surgery, the site is prepared with chlorhexidine gluconate. A stack of 4×4-in gauze on the surgical tray is saturated with 3% H_2O_2 and used by the surgeon and surgical assistant throughout the procedure. We currently use this technique during standard excisions, Mohs micrographic surgery stages, repairs, and dermabrasion. Additionally, as a first measure of hemostasis, we recommend H_2O_2 soaks immediately postoperatively in patients with active bleeding.

We have been utilizing this technique since H_2O_2 was described as an intraprocedural hemostatic agent during manual dermabrasion.[3] Hydrogen peroxide is known to facilitate hemostasis with several accepted mechanisms that include regulating the contractility and barrier function of endothelial cells, activating latent cell surface tissue factor and platelet aggregation, and stimulating platelet-derived growth factor activation.[4] It has been reported that increasing H_2O_2 levels leads to a dose-response increase in aggregation in the presence of subaggregating amounts of collagen.[5] This concept was described in an article that utilizes H_2O_2 as a way to obtain hemostasis before skin grafting burn patients.[6] A PubMed search of articles indexed for MEDLINE using the terms *h202, hydrogen peroxide, hemostasis, wound healing, surgery,* and *wound* produced several surgical specialties—neurosurgery, orthopedics, gastroenterology, and maxillofacial surgery—that also utilize H_2O_2 as a hemostatic agent.[7,8] One article described a dual-enzyme H_2O_2 generation machinery in hydrogels as a novel antimicrobial wound treatment.[9]

Practice Implications

The use of H_2O_2 as a topical hemostatic agent during surgery was described in 1984.[2] The use of H_2O_2 is not suggested as a substitute for other strong and well-known hemostatic agents, such as aluminum chloride and ferric subsulfate, but rather as a technique that can be used in conjunction with standard methods of hemostasis and antisepsis. For surgical sites that are intended to be closed, we do not suggest these hemostatic agents, as they are known to be caustic, irritating, and pigmenting. In addition to H_2O_2's known hemostatic and antiseptic

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properties, more recent literature invalidates wound impairment concerns and describes its possible role in signaling effector cells to respond downstream, contributing to tissue formation and remodeling.[4] The use of H_2O_2 in wound and incision care has been controversial and avoided due to described skin irritation and possible premature removal of suture[10]; however, positive biochemical effects of H_2O_2 on acute wounds have been reported and dispel arguments that this agent causes tissue damage.[4] Contrary to the traditional viewpoint that H_2O_2 probably impairs tissue through its high oxidative property, a proper level of H_2O_2 is considered an important requirement for normal wound healing. The report published in 1985 that raised concerns of H_2O_2 causing impaired wound healing through its effect on fibroblasts has been challenged given that the killed cultured fibroblasts were in an in vitro model and not likely representative of the complexities of a healing wound.[10] In our experience, the use of H_2O_2 has not demonstrated any impairments or delays in wound healing, and we postulate that the exposure to H_2O_2 as described in our technique is not sufficient to cause notable impairment in fibroblast function in vivo. In addition, the role of H_2O_2 promoting oxidative stress as well as resolving inflammation may suggest it serves as a bidirectional regulator.

Future Directions

Additional studies are needed to assess this precise balance of H_2O_2 forming a favorable microenvironment in wounds. Similarly, although we discuss minimal and brief use of H_2O_2 during a procedure, the lack of data on the role of H_2O_2 as a prophylactic anti-infective agent for postoperative wound care also may be an area of future exploration.

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