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Brief Communication

Surgical Management for Foul-Smelling Wounds

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ABSTRACT

Microorganisms infiltrate necrotic tissue over time, resulting in wound infections and odor. However, patients with odorous wounds occasionally cannot obtain adequate wound care regarding the odor owing to their systemic state. Although a variety of conservative or interventional wound treatments have been studied, the strategy for managing and caring for odorous wounds remains unknown. Odor can be reduced by preventing microbial colonization or infections that cause an objectionable odor. As a result, wounds are treated with systemic antibiotics and/or topical exudate-control dressings. The most effective method to eliminate wound odors is wound debridement. However, the debridement of necrotic tissue causing malodor is known to be painful unless performed under local or general anesthesia. This adds to physical and mental strain as well as the risk of interventional treatment as a whole. Therefore, an awareness of the fundamental mechanisms of odorous wounds and establishment of treatment strategies for optimal odor management, including aggressive debridement, is essential. The aim of this brief communication is to describe and suggest interventional odor treatment alternatives, focusing on topical surgical management.

Key words : bacterially emitted volatile molecules, debridement, odor, surgical management, wound

Introduction

The most effective treatment for odor removal is the simple debridement of devitalized tissues as both aerobic and anaerobic bacteria can create odor from wounds[1]. However, it is cumbersome for some patients with odorous wounds to receive sufficient wound care regarding odor due to their systemic condition (Fig. 1). In these patients, surgical debridement with a knife and scalpel may lead to symptom relief and postoperative improvement in the quality of life (QOL). Fujioka et al. and Hayashida et al. have reported palliative surgery in patients with malignant tumors involving odorous ulcers[2, 3]. They reported that simple debridement reduced odor and consequently improved the QOL of these patients. In addition, there are several odor-management options available for patients. However, the optimal procedure for ensuring cost-effectiveness and efficacy remains unknown. In this report, we suggest potential therapies that focus on the surgical management for the treatment of odorous wounds.

Fig. 1. Malodorous foot wounds in a patient with serious heart failure.

Characteristics of chemical compounds of wound odor

Bacteria reproduce quickly, with a mean cell production time under ideal circumstances of approximately 20 min. Consequently, a single bacterial cell can multiply to more than 10 billion cells per day. The odor of wounds can be attributed to a combination of two factors (necrotic tissue and bacteria). In addition, both aerobic and anaerobic bacteria contribute to unpleasant odors in the wound environment. A variety of volatile metabolites, including cadaverine, sulfur, putrescine,

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and short-chain fatty acids, such as n-butyric, n-caproic, n-haptonic, n-valeric, and caprylic acids, are among the malodorous compounds produced by bacteria[1]. However, bacteria have a variety of enzymes, as well as breakdown abilities. As a result, various metabolites were identified. Consequently, it is challenging to detect the pathogens that produce malodor in wounds.

Tools for assessing wound odor

Tools for the subjective assessment of wound odor include the visual analogue scale, verbal rating scale, support team assessment schedule, and overall valuation scale. However, these evaluation scales are generally used to evaluate the effectiveness of drugs or dressings for odor control. In addition, none of these scales have gained widespread acceptance as an objective scale in clinical practice. It is well known that some bacterial culture studies using gas chromatography/mass spectrometry have identified numerous volatile metabolic compounds. Therefore, the electronic nose (e-nose), which can recognize odorant gases, has been investigated and used as an olfactory system in humans[1]. However, the e-nose cannot provide details regarding individual volatile compounds from bacteria. Further studies are expected to develop the e-nose as an objective clinical diagnostic tool for wound odor and detection of wound infections.

Surgical debridement

The surgical excision of necrotic tissue causing odor can lead to relief. Sharp debridement involves the removal of non-viable wound components and is the gold standard for wound care; however, this method may be determined by patient and wound characteristics[4]. The burn wound surface (particularly in deep partial-thickness and full-thickness burns) is a protein-rich environment composed of avascular necrotic tissue, which provides a favorable microenvironment for bacterial colonization and proliferation. To prevent burn wound infections, severe burn injuries should be treated with immediate debridement and skin grafting[5]. However, due to the patients' general condition, limitation of autologous donor site, large number of admissions, and poor equipment, this treatment strategy is not always possible. Microbial colonization of odorous granulation tissue is a serious issue that limits graft use while also raising problems, expenses, and the duration of hospital stay. Moreover, surgical stress may cause the production of different cytokines and growth factors, which is a significant disadvantage of debridement surgery. Furthermore, bleeding that necessitates electrocautery might result in thermal burns, which can worsen tissue damage. This can worsen the general condition and surgical site conditions of patients. Therefore, all alternatives, including the timing of debridement for odor control, should be carefully considered by clinicians.

Laser debridement

Laser treatment is occasionally used for debridement and can reduce the burden of malodor. YAG laser, a cautery knife with an air spray to maintain better view of the bleeding wound areas, or wound coloring with methylene blue to facilitate thorough debridement. It has been shown to be effective in reducing biofilm[6]. In a prospective investigation of patients with halitosis, some trials have used laser tongue debridement. These studies investigated the potential use of Er,Cr:YSGG laser in the treatment of halitosis[7]. However, other invasive laser therapies for odorous wounds have not yet been developed.

Hydrosurgery debridement

Hydrosurgery, which uses an accelerated water jet, has recently been proven to be effective for eschar removal. When the tissue is friable or tangential excision is necessary in large wounds with a thin layer of nonviable tissue, hydrosurgery may be particularly beneficial. Some case series and randomized controlled trials have demonstrated the feasibility of the procedure. However, compared to standard surgical debridement, they were unable to demonstrate any benefits of the more conservative hydrosurgical approach in terms of the wound infection rate or healing time[8]. Wound debridement by means of hydrosurgery is precise and preserves a viable dermis; however, a positive effect compared to classical tangential or meticulous debridement for odor control has not been shown.

Other debridement

Early eschar elimination has been demonstrated to be successful with enzyme debridement. Some agents, such as bromelain and collagenase gel are used for enzymatic debridement. One randomized controlled trial compared enzymatic debridement to surgical excision and found that enzymatic debridement took significantly lesser time to accomplish escharectomy and required lesser surgical excision compared to surgical excision[9]. Chronic or acute wounds with necrotic tissue are occasionally debrided with maggots. Mumcuoglu found that using maggots for wound care resulted in significant or complete debridement of necrotic tissue in 80–95 percent of the cases. Furthermore, the foul odor arising from necrotic tissue was observed to considerably reduce[10]. In unstable patients, enzyme debridement and maggot therapy may be advantageous for preventing the negative effects of delayed wound excision and lowering mortality. They can be performed without anesthesia and the options are usually

dictated by the practitioner's previous experience.

Conclusion

Surgical debridement for odorous lesions is mainly performed using a scalpel, curettage, or tangential hydrosurgery and usually requires anesthesia. However, prior to debridement, a thorough examination for ischemia is essential, as surgical procedures may worsen necrosis in ischemic wounds. We believe that sharp debridement is the gold standard for odorous wounds; however, this method may be altered by the patient status and wound characteristics. In addition, wound care givers should discuss, investigate, and carry out studies of odor control in various intractable wounds.

Conflicts of interest

All the authors have no conflicts of interest to declare.

References

1) Hayashida K, Yamakawa S: Topical odour management in burn patients. *Burns Trauma* 2021; 9: tkab025.
2) Fujioka M, Yakabe A: Palliative surgery for advanced fungating skin cancers. *Wounds* 2010; 22: 247-50.
3) Hayashida K, Murakami C, Fujioka M: Palliative surgery for cutaneous ulcers improves the symptoms of patients with terminal cancer. *J Palliat Med* 2013; 16: 831-2.
4) Eriksson E, Liu PY, Schultz GS, et al: Chronic wounds: treatment consensus. *Wound Repair Regen* 2022; 30: 156-71.
5) Barret JP, Herndon DN: Effects of burn wound excision on bacterial colonization and invasion. *Plast Reconstr Surg* 2003; 111: 744-50; discussion 51-2.
6) Reynolds N, Cawrse N, Burge T, Kenealy J: Debridement of a mixed partial and full thickness burn with an erbium: YAG laser. *Burns* 2003; 29: 183-8.
7) Poormoradi B, Gholami L, Fekrazad R, et al: Comparison of the effect of Er,Cr:YSGG Laser and Halita mouthwash on oral malodor in patients with chronic periodontitis: a randomized clinical trial. *J Lasers Med Sci* 2021; 12: e26.
8) Ziegler B, Fischer S, Pieper D, Mathes T, Kneser U, Hirche C: Evidence and trends in burn wound debridement: an evidence map. *Plast Surg (Oakv)* 2020; 28: 232-42.
9) Rosenberg L, Krieger Y, Bogdanov-Berezovski A, Silberstein E, Shoham Y, Singer AJ: A novel rapid and selective enzymatic debridement agent for burn wound management: a multi-center RCT. *Burns* 2014; 40: 466-74.
10) Mumcuoglu KY: Clinical applications for maggots in wound care. *Am J Clin Dermatol* 2001; 2: 219-27.