

Selected Topics: Wound Care



LACERATION MANAGEMENT

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Abstract—Background: Traumatic lacerations to the skin represent a fairly common reason for seeking emergency department care. Although the incidence of lacerations has decreased over the past decades, traumatic cutaneous lacerations remain a common reason for patients to seek emergency department care. **Objective:** Innovations in laceration management have the potential to improve patient experience with this common presentation. **Discussion:** Studies have confirmed that delays in wound closure rarely confer increased rates of infection, although comorbidities such as diabetes, chronic renal failure, obesity, human immunodeficiency virus, smoking, and cancer should be considered. Antibiotics should be reserved for high-risk wounds, such as those with comorbidities, gross contamination, involvement of deeper structures, stellate wounds, and selected bite wounds. Topical anesthetics, which are painless to apply, have a role in select populations. In most studies, absorbable sutures perform similarly to nonabsorbable sutures and do not require revisit for removal. Novel atraumatic closure devices and expanded use of tissue adhesives for wounds under tension further erode the primacy of regular sutures in wound closure. Maintaining a moist wound environment with occlusive dressings is more important than previously thought. Most topical wound agents are of limited benefit. **Conclusions:** Recent innovations in wound closure are allowing emergency physicians to shift toward painless, atraumatic, and rapid closure of lacerations. © 2017 Elsevier Inc. All rights reserved.

Keywords—laceration; wound; local anesthetic; lidocaine; epinephrine; bupivacaine; ketamine; surgical zipper; sutures; absorbable; absorbable staples

INTRODUCTION

Traumatic lacerations to the skin represent a fairly common reason for seeking emergency department (ED) care. Historically, nearly all lacerations were treated the same way. They were anesthetized with infiltrated lidocaine, cleaned with iodine or hydrogen peroxide, and then explored. Assuming there was no significant damage to the underlying structures, absorbable suture was used to close muscle and fascia, while the skin was sewn with nylon. A dry gauze dressing was applied and tetanus was updated. The patient was advised to return in 3–14 days for suture removal. In general, wounds older than 6 h were considered to be “contaminated” and were not closed in the ED at all.

Since the turn of the 21st century, there have been several incremental improvements in laceration management, such as newer and less-painful closure techniques, expanded use of tissue adhesives, new methods for anesthesia, reconsidered antibiotic recommendations, and updates in wound dressings.

Epidemiology

Although total ED volume in the United States (US) has continued to increase over the past 2 decades, the number of lacerations managed in the ED has declined. In 1992, it was estimated that 9.27 million patients were treated for lacerations in US EDs, representing 10.4% of total US ED volume (1). In 2013, there were approximately

7 million lacerations, making up only 5.2% of total ED visits (Figure 1) (2). It is unclear why lacerations are becoming less common in the ED. It may be a result of improvements in the safety of automobiles, consumer products, or industrial workplaces. Another possibility is that care of minor lacerations has shifted from EDs to urgent care centers. A final consideration is that when confronted with high costs of health care, patients are opting for more conservative management.

The societal cost of lacerations can range from trivial to staggering in terms of lost wages and lost productivity. The out-of-pocket cost to a patient with health insurance can easily reach \$1000 or more for a simple laceration (3).

History and Physical Examination

The history should begin with eliciting the time and exact mechanism of injury. Crush injuries are much more likely to destroy blood supply, which can lead to worse outcomes. Contamination of the wound with dirt or other material can increase the risk of infection. If blood or body fluids from another person or animal have entered the wound, post-exposure prophylaxis for blood-borne infection should be considered. Medical history should be reviewed for predictors of poor wound healing. Tetanus status should be recorded.

If circumstances cast any doubt as to the nature of the wounding event, a social history must be sought to determine if domestic violence or another unsafe condition was responsible for the injury.

The physical examination should include a meticulous search for contamination and the presence of a removable foreign body. Distal neurovascular function, including testing for two-point discrimination for finger injuries should be carefully documented as well as any other injury to nerve, tendon, bone, or other structures.

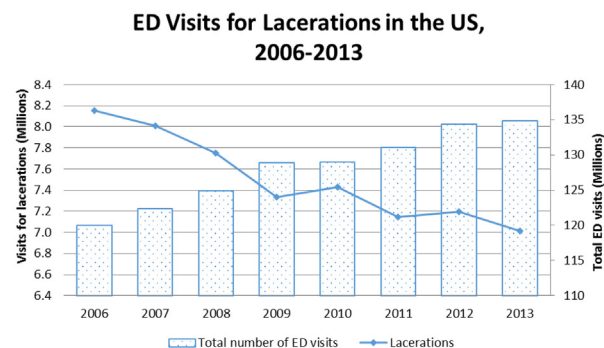


Figure 1. Emergency department (ED) visits for lacerations in the United States, 2006–2013. Decreasing prevalence of lacerations presenting to the ED during the period 2006–2013 against a backdrop of the overall increase in ED visits. Data extracted from Agency for Healthcare Research and Quality, US Department of Health and Human Services.

What Is the Pathophysiology of Wound Healing?

The inflammatory phase of wound healing begins after hemostasis and clot formation, lasting from 24 h to several days. During this phase, granulocytes flood the wound, removing bacteria and debris. Shortly afterward, epithelial cells migrate into the wound, and the wound is considered waterproof by day 2. New growth, such as neovascularization and matrix deposition occurs during the proliferative phase. By day 3–4, macrophages reorganize the wound and remove the remnants of the inflammatory phase. By day 5–7, collagen deposition begins along with tissue remodeling. This final phase lasts 6–12 months and results in wound contraction and scar formation (4,5).

What Elements of History Are Predictors of Poor Outcome?

Predicting which ED wounds are likely to become infected has proven difficult. In one study of 1142 wounds seen in an academic ED, a neural network identified certain risk factors such as wound location, wound age, depth, configuration, contamination, and patient age. In this study, the clinician's estimation ("gestalt") performed similarly to the computational model. Specific odds ratios (OR) and relative risk ratios (RR) were not provided (6). An observational study of 5521 patients with traumatic lacerations treated in the ED revealed increased risk in certain conditions, such as diabetes (RR 3.9), bite wound (RR 1.6), jagged wound margin (RR 1.7), stellate shape (RR 1.6), visible contamination (RR 1.8), injury deeper than subcutaneous tissue (RR 1.6), and presence of a foreign body (RR 2.9) (7). Another study found that diabetes (RR 2.7), lower-extremity lacerations (RR 4.1), contaminated lacerations (RR 2.0), and lacerations > 5 cm (RR 2.9) were more likely to develop an infection (8).

Is There a "Golden Period" for Wound Closure?

Many surgical textbooks recommend delayed wound closure for lacerations older than 6–8 h (9,10). The rationale for this advice is that older wounds give bacteria more time to replicate and are therefore more likely to become infected. Closure of potentially infected wounds is expected to result in a poorer outcome.

In 1990, Morgan et al. showed a slight increase in wound infection in wounds that were treated more than 4 h after injury. Among those wounds, there was no significant improvement among patients that received prophylactic antibiotics (11). The American College of Emergency Physicians clinical policy of 1999 states that wounds can generally be closed if they are less than 8–12 h old, and beyond that on a case-by-case basis (12).

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