

DISCLAIMER: These guidelines were prepared by the Department of Surgical Education, Orlando Regional Medical Center. They are intended to serve as a general statement regarding appropriate patient care practices based upon the available medical literature and clinical expertise at the time of development. They should not be considered to be accepted protocol or policy, nor are intended to replace clinical judgment or dictate care of individual patients.

ANTIBIOTIC ADMINISTRATION IN FACIAL FRACTURES

SUMMARY

Antibiotic administration in the care of patients with facial fractures can be divided into three phases: preoperative (time of admission until operation), perioperative (prior to incision but not greater than 24 hours postoperatively) and postoperatively (greater than 24 hours following the operation). Antibiotic administration is supported by the literature for the *perioperative* phase, but not the preoperative and postoperative phases.

RECOMMENDATIONS

- **Level 1**
 - **None**
- **Level 2**
 - **Perioperative antibiotic dosing significantly decreases postoperative infection in facial fractures**
 - **Prophylactic long course (>24 hours) antibiotic administration does not decrease infection rates compared to short course (<24 hours) antibiotics in facial fractures**
 - **Prophylactic antibiotic dosing (at time of admission) does not decrease infection rates or pain scores compared to perioperative dosing of antibiotics in compound facial fractures**
 - **In patients undergoing open reduction/internal fixation of zygomatic, mandibular, or orbital blowout fractures who receive preoperative and intraoperative antibiotics, additional postoperative antibiotic dosing does not decrease the incidence of infection**
- **Level 3**
 - **Prophylactic antibiotics are likely beneficial in compound mandibular fractures**
 - **Hydrogen peroxide should be avoided as an irrigant or daily wound care**
 - **Triple antibiotic ointment applied three times per day for one week until follow up may be beneficial for sutured lacerations to reduce infection rate**

INTRODUCTION

Facial fractures are a common diagnosis in the United States, with approximately 3 million individuals sustaining craniofacial trauma on an annual basis. Facial fractures accounted for more than 400,000 hospital admissions in 2007, and many of these patients received antibiotics as a component of their care (1). The prevention of surgical site infections (SSI) has become a primary focus of hospitals across the nation as a metric of quality care. Antibiotic stewardship has also become a primary focus, in part due to the increasing awareness of drug-resistant organisms as well as increased reporting of drug side effects.

EVIDENCE DEFINITIONS

- **Class I:** Prospective randomized controlled trial.
- **Class II:** Prospective clinical study or retrospective analysis of reliable data. Includes observational, cohort, prevalence, or case control studies.
- **Class III:** Retrospective study. Includes database or registry reviews, large series of case reports, expert opinion.
- **Technology assessment:** A technology study which does not lend itself to classification in the above-mentioned format. Devices are evaluated in terms of their accuracy, reliability, therapeutic potential, or cost effectiveness.

LEVEL OF RECOMMENDATION DEFINITIONS

- **Level 1:** Convincingly justifiable based on available scientific information alone. Usually based on Class I data or strong Class II evidence if randomized testing is inappropriate. Conversely, low quality or contradictory Class I data may be insufficient to support a Level I recommendation.
- **Level 2:** Reasonably justifiable based on available scientific evidence and strongly supported by expert opinion. Usually supported by Class II data or a preponderance of Class III evidence.
- **Level 3:** Supported by available data, but scientific evidence is lacking. Generally supported by Class III data. Useful for educational purposes and in guiding future clinical research.

A survey of experts reported use of preoperative antibiotics in 47-69% of patients, perioperative antibiotics in 94-100% of patients, and postoperative antibiotics in 65-71% of patients depending on facial fracture type (2). These numbers are in contention with available literature regarding appropriate use of antibiotics in facial fracture cases. Further studies are needed to define the role of antibiotics on a granular level, with specific attention to known risk factors for infection, fracture complexity and specific antibiotic regimens.

LITERATURE REVIEW

Preoperative Antibiotic Administration

Zosa et al. retrospectively studied the outcomes of patients presenting to a Level 1 trauma center intensive care unit with isolated injuries to the head a neck, with at least 1 facial fracture (3). Two groups receiving initial prophylactic antibiotics received either a short course (<24 hours) (n=280) of antibiotics or an extended course (>24 hours) (n=123). Subsequent head and neck infection rates were compared for the two groups. Propensity score-matched analysis found no differences in head & neck infection rates between the two groups. In combined group analysis, independent risk factors for developing head & neck infections included younger age, penetrating injury type, open fractures, upper face or mandibular fractures, multiple fractures, vascular injury and hypertension.

Mamthashri et al. prospectively studied 50 patients undergoing open reduction and internal fixation for compound facial fractures (4). Patients were assigned to two study arms, the first receiving antibiotics at the time of admission and the second receiving antibiotics upon induction of anesthesia. The two groups were evaluated for endpoints of pain scores and perceived infection as determined by local erythema, swelling, fever and purulent discharge. No statistical difference in outcome was present.

Linkugel et al. retrospectively studied 269 patients who were treated for mandible fractures and evaluated outcomes of infection as well as hardware complications (5). Patients who received both preoperative and perioperative antibiotics (n=216) were compared against patients receiving only perioperative antibiotics (n=53). No statistical difference in outcome was present.

Kyzas, in a systematic review of literature identified that there was paucity of high-powered, descriptive randomized controlled trials evaluating the use of prophylactic antibiotics in compound mandibular fractures (1). Among 31 eligible studies, there was agreement that prophylactic antibiotics were superior to no antibiotics in preventing infection though the degree to which this was true, and number needed to treat, could not be determined.

Perioperative Antibiotic Administration

Chole et al. performed a randomized control trial comparing infection rates in patients with facial fractures who had not received pre-operative prophylactic antibiotics (6). 101 patients were randomized into two groups, one which received no perioperative antibiotics and another which received cefazolin 1 gm IV 1 hour prior to the surgical procedure and a second dose eight hours later. Of these patients, 79 had mandibular fractures, 18 zygoma fractures, and 4 Le Fort fractures. The group receiving antibiotics had a statistically significant decrease in postoperative infections compared to the no-antibiotic group (9% vs 42%).

Postoperative Antibiotic Administration

Baliga et al. prospectively studied 60 patients undergoing open reduction and internal fixation of zygomatic and mandibular fractures who received preoperative and intraoperative antibiotic dosing (7). Patients were divided into two arms; the first 30 received additional postoperative antibiotics and the second 30 did not. These patients were evaluated for evidence of infection at 7 and 21 days post operatively. There was no statistical difference in outcome between the two groups.

Soong et al., in a randomized, double-blind, placebo-controlled study, evaluated the rate of postoperative wound infections in patients with displaced *Le Fort or zygomatic fractures* that required operation (8). All patients received amoxicillin/clavulanic acid 1.2 gms IV q 8 hours from the time of admission until 24 hours postoperatively. The first group received placebo only and the second group continued to receive

amoxicillin/clavulanic acid 625 mg PO q 8 hours for 4 additional days. These patients were evaluated at 1, 2, 4, 6, and 12 weeks for evidence of infection and wound breakdown. There were no significant differences in the incidence of infection or side effects between the two groups. Schaller et al., in an identical study, evaluated the rate of postoperative wound infections in patients with *mandibular fractures* requiring operation (9). Again, no significant differences in infection rate were found. Zix et al., from the same group of investigators, performed an identical study in *orbital blow-out fractures* requiring operation (10). No significant difference found in infection rates between the two groups.

Wound Management in Open Fractures

In patients with open facial wounds, thorough irrigation should be performed. Studies have evaluated the effectiveness of various irrigants on infection rates comparing tap water, normal saline, and 1% povidone-iodine solution. These studies have shown no statistically significant benefit to any particular irrigant (11, 12, 13).

The use of hydrogen peroxide as an irrigant has become less favored after several studies demonstrated negative effects on wound healing (14-17). One study noted an inhibitory effect on keratinocyte migration, decreasing proliferative potential of cells (16). A more recent study analyzed the effects of hydrogen peroxide on various sutures, noting a significant decrease in tensile strength of fast-absorbing gut sutures which are commonly used in head and neck repairs (17). While this study was performed in the lab, they hypothesized that hydrogen peroxide irrigants could lead to early breakdown of suture and increased risk for hypertrophic scarring.

Studies regarding the use of antibiotic irrigants for facial fracture wounds are lacking. Studies evaluating the use of topical antibiotics, however, suggest possible benefit (14,18). One randomized control trial studied a three times per day application of four different ointments on wound infection rates (18). All three antibiotic regimens were statistically superior to petrolatum alone in reducing the incidence of wound infection rates as follows:

- Petrolatum (control group): 17.6%
- Bacitracin zinc ointment: 5.5%
- Bacitracin zinc, neomycin sulfate, and polymyxin B sulfate combination ointment: 4.5%
- Silver sulfadiazine cream: 12.1%

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