PERIOPERATIVE ANTIBIOTIC USAGE IN FESS, SEPTOPLASTY AND SKULL BASE SURGERIES

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R2
• The use of perioperative antibiotics to prevent postsurgical infections was first established in the 1960s and is now used commonly as it has been found to be beneficial in preventing postoperative infection.

• Its use has become widespread in otorhinolaryngology, where surgery is often categorized as clean contaminated
Commonly, patients are given a 7- to 14-day postoperative course of prophylactic oral antibiotics. Many surgeons cite not only reduction in postoperative infection but also improved surgical outcomes and reduction in morbidity if antibiotics are used routinely postoperatively.

Despite the routine use of postoperative antibiotic prophylaxis following endoscopic sinus surgery, there is a lack of published evidence to support this practice.
Antibiotic use can be associated with increased **bacterial resistance**, added **cost** to the patient, and potential **side effects** such as allergic reaction or **Clostridium difficile** infection.
**Literature Review**

**Prophylactic Perioperative Antibiotic Use in Endoscopic Sinus Surgery: A Systematic Review and Meta-analysis**

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Methods

Study Identification

An expert reference librarian (P.J.E.) designed and conducted the electronic search strategy with input from study investigators. There were no language, publication year, or publication status restrictions. Study designs included clinical trials and observational studies. The following databases were searched from their inception through May 2011: Ovid MEDLINE, Ovid EMBASE, Ovid EBM Reviews—Cochrane Central Register of Controlled Trials, ISI Web of Science, and Scopus.
Eligibility Criteria and Study Selection

Studies included were any clinical trials or observational studies that enrolled patients undergoing endoscopic sinus surgery and investigated the use of systemic antibiotic prophylaxis aimed at reducing the infection rate or improving secondary outcomes (i.e., healing, nasal symptoms) in the immediate postoperative period (30 days and less) and compared it with a placebo, no antibiotic, or a short course versus a longer course of antibiotics. Two authors (A.M.S. and K.M.T.) work-
Figure 1. Flow diagram showing process of systematic literature review.
Table 3. Characteristics of the Included Studies, Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Inclusion</th>
<th>Exclusion</th>
<th>Indication</th>
<th>Secretions Seen during Surgery</th>
<th>Other Postoperative Medications</th>
<th>Packing</th>
<th>Postoperative Debridement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorrisen et al, 2000\textsuperscript{12}</td>
<td>Undergoing ESS</td>
<td>Concurrent other septal or rhino surgery, allergy, asthma, immune deficiency, pregnancy, cystic fibrosis</td>
<td>Polyposis, CRS, RAS, Mucoid, none, purulent</td>
<td>Nasal saline rinse TID, betamethasone 2-1.5-1-0.5 mg/d for 5 days</td>
<td>No</td>
<td>Yes (3, 8, 15, 22 days)</td>
<td></td>
</tr>
<tr>
<td>Jiang et al, 2008\textsuperscript{11}</td>
<td>Undergoing ESS</td>
<td>Previous surgery, immunodeficiency, preop antibiotics within 1 week</td>
<td>CRS, None, thin, thick, or purulent</td>
<td>None</td>
<td>Yes (gel foam)</td>
<td>Yes (3 weeks)</td>
<td></td>
</tr>
<tr>
<td>Maier and Strutz, 1992\textsuperscript{13}</td>
<td>Undergoing ESS</td>
<td>Immunodeficiency or preop radiation, preop signs of purulence</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Albu and Lucaciu, 2010\textsuperscript{10}</td>
<td>Undergoing ESS</td>
<td>Atrophic rhinitis, odontogenic sinusitis, cystic fibrosis, extramucosal mycotic sinusitis, NSAID intolerance, diabetes, history of previous nasal/sinus procedures, endocarditis prophylaxis, immunodeficiency, recent antibiotic use</td>
<td>CRS, None, thin, thick, or purulent</td>
<td>Saline irrigations QID</td>
<td>Yes (gel foam)</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
• The main outcome measure was infection (purulent secretions in the setting of fever or cellulitis) that developed within the first month after surgery.

• They also evaluated the patients with a symptom scale and endoscopically to evaluate healing as secondary outcomes.
Quantitative Analysis

Antibiotic prophylaxis was associated with a nonsignificant reduction in the incidence of infections (RR, 0.76; 95% CI, 0.64 to 1.09), symptoms scores (SMD, −0.04; 95% CI, −0.46 to 0.38), and endoscopic scores (SMD, −0.09; 95% CI, 0.30 to 0.13; Figure 2). The heterogeneity associated with the analysis was significant only for the outcome of change in symptoms score (I-squared values, 0%, 70%, and 0% for the 3 outcomes, respectively).
eligible trials. A meta-analysis of 3 trials demonstrates that routine postoperative antibiotic prophylaxis did not show a statistically significant reduction in the incidence of infection, endoscopic scores, and symptoms.
The main limitation of this report is the small number of patients and studies, which leads to imprecision and wide confidence intervals. Imprecision lowers the confidence of guideline developers and clinicians. It is plausible that patients with more complex clinical syndromes or anatomic abnormalities might derive an increased benefit from postoperative prophylaxis; however, published evidence to date does not allow for this type of multivariate analysis. At the present time, more evidence is needed to support the use of routine prophylaxis for patients undergoing endoscopic sinus surgery.
Future randomized trials are needed to evaluate the utility of prophylactic antibiotics in this setting. The results of future trials should ideally be stratified by different populations of patients, for example, elderly patients, patients with diabetes, or cystic fibrosis patients. This has not traditionally been done when investigating perioperative antibiotic use in the literature, but we believe it would be useful for further stratification of recommendations for prophylaxis. Trials evaluating topical or local antibiotics perioperatively are also needed. The existing evidence relating to topical therapy is limited.
CONCLUSION

- The current evidence does not support the routine use of prophylactic postoperative antibiotics following endoscopic sinus surgery.

- There was not sufficient evidence to evaluate whether a preoperative dose or intraoperative dosing affects the outcomes of endoscopic sinus surgery.
• Difficulty in nasal breathing is probably the most common complaint in rhinology practice.

• Among the major causes is nasal septum deviation (NSD), about 80% of the general population has a deviated nasal septum to some degree.

• Septoplasty is one of the most common procedures
• The postoperative management is also highly variable with no accepted guidelines for many issues such as antimicrobial prophylaxis (AMP) versus no AMP.

• There is a distinction between the normal flora of the nasal vestibule and those of the nasal cavity concerning potential infectious pathogens (PIPs), in particular, Staphylococcus aureus.
• Staphylococcus aureus resides predominately in the nasal vestibule and facial skin but is also present in 18% to 50% of microbiologic cultures from nasal mucosal smears of healthy subjects.

• Because of this potential contamination, use of postoperative antibiotics in septoplasty is becoming more important.
• The most common complication of nasal surgeries is hemorrhage, with incidence rate between 0.7 to 3.6% of the cases.

• The second most common complication is infection.
Prophylactic versus postoperative antibiotics in septoplasty

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many Gram-negative bacilli. This study aimed to compare the efficacy of prophylactic versus postoperative antibiotic use in septoplasty and strengthen the evidence base for antibiotic use in septoplasty with the use of single parenteral injection of ciprofloxacin 500mg orally once daily for five days.
Methods

This prospective study was designed and performed on 100 patients who underwent septoplasty surgery over a six months period from August 1st, 2012 to January 31st, 2013 in the Otolaryngology Department in Rizgary Teaching Hospital, Erbil city. Patients undergoing only septoplasty were included in the study. Only 90 patients were included in the study as ten patients were originally excluded from the study; 3 had nasal polyp, 2 undergone revision septoplasties, 2 undergone septorhinoplasties, and another 3 were septoplasty with submucous diathermy (SMD). Patients underwent medical evaluation, including history and physical examination. The surgical procedure was performed under general anesthesia. Postoperative care included antibiotics and nasal decongestants. The patients were followed up at one week, one month, and three months postoperatively. The outcomes were assessed using the University of Washington Rhinologic Symptom Score (UWRSS) and the University of Pittsburgh Nasal Symptom Score (UPNSS).
Classical septoplasty was done by several otorhinolaryngologists. The patients were randomly divided into two groups; Group A and Group B. The patients from Group A received oral antibiotic suprax (cefixime 400mg) once daily for five days postoperatively and paracetamol tablet (500 mg) three times daily as pain killer, while those from Group B received only a single parenteral per-operative dose of ceftriaxone 1g (enoxirt), and paracetamol tablet (500 mg) three times
• Both antibiotics are belonging to the 3rd generation cephalosporins.

• The patients were given follow up appointments at 3\textsuperscript{rd} and 7\textsuperscript{th} day post op.

• observed for signs and symptoms such as fever, bleeding, pain, septal hematoma, and any other constitutional signs and symptoms as erythema, localized oedema and tenderness.
• At the 7th postoperative day after removal of the splint, simultaneously swab was taken from nasal mucosa and sent for culture and sensitivity.

• The results of both groups A and B were compared.
Figure 1: Distribution of sample according to severity of septal deviation.
Table 1: Number of patients with septal haematoma.

<table>
<thead>
<tr>
<th>Septal haematoma</th>
<th>Group B</th>
<th>Group A</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septal haematoma at the end of 1\textsuperscript{st} 72 hrs</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Septal haematoma at the end of 1\textsuperscript{st} week</td>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>44</td>
<td>44</td>
</tr>
</tbody>
</table>
**Table 2:** Frequency distribution of signs and symptoms of infection between Group A and Group B at the end of 1\(^{st}\) 72 hrs and the end of 1\(^{st}\) week.

<table>
<thead>
<tr>
<th>Variables</th>
<th>End of period</th>
<th>Group</th>
<th>Total</th>
<th>(P) value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group A No. (%)</td>
<td>Group B No. (%)</td>
<td>No. (%)</td>
</tr>
<tr>
<td>Fever</td>
<td>1(^{st}) 72 hrs</td>
<td>2 (4.4%)</td>
<td>3 (6.7%)</td>
<td>5 (5.6%)</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>4 (8.9%)</td>
<td>3 (6.7%)</td>
<td>7 (7.8%)</td>
</tr>
<tr>
<td>Pain</td>
<td>1(^{st}) 72 hrs</td>
<td>17 (37.8%)</td>
<td>18 (4%)</td>
<td>35 (38.9%)</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>6 (13.3%)</td>
<td>7 (15.6%)</td>
<td>13 (14.4%)</td>
</tr>
<tr>
<td>Bleeding</td>
<td>1(^{st}) 72 hrs</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Mucopurulent discharge</td>
<td>1(^{st}) 72 hrs</td>
<td>2 (4.4%)</td>
<td>3 (6.7%)</td>
<td>5 (5.6%)</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>3 (6.66%)</td>
<td>1 (2.2%)</td>
<td>4 (4.4%)</td>
</tr>
<tr>
<td>Other constitutional symptoms</td>
<td>1(^{st}) 72 hrs</td>
<td>6 (13.33%)</td>
<td>5 (11.1%)</td>
<td>11 (12.2%)</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>4 (8.88%)</td>
<td>4 (8.9%)</td>
<td>8 (8.9%)</td>
</tr>
<tr>
<td>Infection</td>
<td>1(^{st}) 72 hrs</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1(^{st}) week</td>
<td>4 (8.9%)</td>
<td>3 (6.7%)</td>
<td>7 (7.8%)</td>
</tr>
</tbody>
</table>
Figure 3: Number and types of bacteria found on swab cultures.
CONCLUSION

• Infection after septoplasty is rare and if occur is usually minor in nature.

• The outcome of postoperative antibiotic use does not outweigh that of a single prophylactic dose of antibiotic.
Perioperative antibiotic prophylaxis is commonly used in skull base surgery, a specialty that developed in the late 1980s and gained considerable acceptance and popularity in 1990.

However, endoscopic approaches still traverse the nasal cavity and paranasal sinuses, a corridor densely colonized by microbes and potential pathogens.

Sterilization of this field is not possible with current techniques.
• prophylaxis against infectious complications, such as meningitis and sinusitis.

• However, there is no accepted standardized antibiotic regimen with proven efficacy.

• Postoperative meningitis is uncommon and seems to be most commonly associated with postoperative cerebrospinal fluid (CSF) leak.
• This *rarity* of reported meningitis is thought to be due to the high *vascul arity* of the head and neck, and infrequency of dural disruption during dissection.

• so the presence of CSF leak may be worth examining as an independent risk factor
• It is **unclear** if perioperative antibiotics are necessary in **preventing** infectious complications after skull base surgeries.

• A question that is increasingly important in light of the rising rate of antibiotic resistance and current challenges with development of new, effective antibiotics.
Systematic review of the effectiveness of perioperative prophylactic antibiotics for skull base surgeries

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ABSTRACT

Background: Perioperative antibiotics are commonly used in endoscopic skull base surgeries as prophylaxis for infectious complications, e.g., meningitis. The role of perioperative prophylactic antibiotics in endoscopic sinus surgery is unclear, and the routine use of prophylactic antibiotics in endoscopic skull base surgery is also highly debated. Currently, there is no formal recommendation for perioperative antibiotic use in skull base surgery, and regimens vary greatly from one institution to the next.

Objective: To assess perioperative antibiotics as prophylaxis against infectious complications in patients who underwent endoscopic skull base surgery.

Data Sources: PubMed, Ovid EMBASE, and the Cochrane Library.

Methods: A systematic review that examined perioperative antibiotic use in endoscopic skull base and craniofacial surgeries was conducted. Inclusion criteria were prospective or retrospective study design and clinical trials related to the use of antibiotics within 30 days of skull base surgery. End points included infectious complications such as (1) meningitis and (2) sinusitis.

Results: A total of 2543 articles were identified by the initial search, and 5 articles met inclusion criteria. The five eligible trials were all observational and involved different types of skull base surgical procedures and antibiotic regimens.

Conclusions: Despite institutional variability in antibiotic regimens, meningitis rarely occurs after skull base procedures and seems to be encountered most frequently in open craniofacial surgeries. A systematic review revealed a limited number of published studies, all observational in study design, which precluded a formal meta-analysis. A novel large-scale randomized-controlled clinical trial is needed to evaluate antibiotic selection and need in endoscopic skull base surgery.

antibiotics. The goal of this study was to perform a systematic review of the literature on the effectiveness of perioperative antibiotic prophylaxis in preventing infectious complications in patients who underwent skull base surgery.

ian at the University of Colorado Health Sciences Library. The search was restricted to English only, and there were no publication year or status restrictions. Inclusion criteria were prospective or retrospective study design and clinical trials related to the use of antibiotics within 30 days of skull base surgery. Both endoscopic and open approaches to skull base pathology were included. End points included infectious
Eligibility Criteria and Study Selection

Studies were included if they were clinical trials or observational studies of patients who underwent skull base surgery and investigated the use of systematic antibiotic prophylaxis aimed at reducing the rate of infectious complications in the perioperative period (defined as within 30 days of surgery). Titles, keywords, and abstracts of the identified citations were used to exclude trials that clearly did not meet the inclusion criteria of the review.

Data Extraction

The following data were extracted: year of publication; study design; surgery type; antibiotic treatment regimen; and the number of patients who experienced surgery-related meningitis, sinusitis, any other infection, and CSF leak.
met inclusion criteria (Fig. 1). The five eligible studies were observational in design (level 3–4 evidence) and involved a variety of skull base surgical procedures and antibiotic regimens. Only one study compared a standardized antibiotic regimen with a nonstandardized surgeon preference based approach.23 Details of the year, study de-
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Level of Evidence</th>
<th>Type of Surgery</th>
<th>Antibiotics</th>
<th>Duration of Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little and White&lt;sup&gt;25&lt;/sup&gt;</td>
<td>2011</td>
<td>Prospective cohort</td>
<td>4</td>
<td>Microscopic transsphenoidal</td>
<td>Cefuroxime</td>
<td>30 min before surgery and 8 hr later Mean, 3 days</td>
</tr>
<tr>
<td>Orlando &lt;i&gt;et al.&lt;/i&gt;&lt;sup&gt;27&lt;/sup&gt;</td>
<td>2007</td>
<td>Retrospective cohort</td>
<td>4</td>
<td>Endoscopic transsphenoidal</td>
<td>Cephalosporin + aminoglycoside (94%) or alone (6%)</td>
<td></td>
</tr>
<tr>
<td>Brown &lt;i&gt;et al.&lt;/i&gt;&lt;sup&gt;26&lt;/sup&gt;</td>
<td>2007</td>
<td>Prospective cohort</td>
<td>4</td>
<td>Endoscopic skull base surgery</td>
<td>Cefazolin (87%), vancomycin (10%), or clindamycin (3%)</td>
<td>24–48 hr</td>
</tr>
<tr>
<td>Kraus &lt;i&gt;et al.&lt;/i&gt;&lt;sup&gt;23&lt;/sup&gt;</td>
<td>2005</td>
<td>Prospective and retrospective case-control</td>
<td>3</td>
<td>Craniofacial resection</td>
<td>Ceftazidime, flagyl, and vancomycin vs nonstandardized</td>
<td>Mean, 8 days, or until all the packing was removed and the drains were discontinued vs nonstandardized</td>
</tr>
<tr>
<td>Carrau &lt;i&gt;et al.&lt;/i&gt;&lt;sup&gt;28&lt;/sup&gt;</td>
<td>1991</td>
<td>Retrospective cohort</td>
<td>4</td>
<td>Cranial base surgery</td>
<td>Multiple regimens</td>
<td>Mean, 3.7 days</td>
</tr>
</tbody>
</table>
Individual Study Review

Little and White\textsuperscript{25} published a prospective cohort study with 442 patients who, from January 2005 to February 2010, underwent microscopic transsphenoidal surgery and did not require lumbar drainage. Overall, an intraoperative CSF leak was identified in 85 patients (19\%). Patients received a short chemoprophylaxis regimen of intravenous (IV) cefuroxime administered 30 minutes before surgery and a single postoperative dose 8 hours later. The main outcome measure was the incidence of perioperative meningitis (within 30 days of surgery), with a secondary outcome being the overall incidence of bacterial meningitis. No cases of perioperative meningitis were reported. However, three patients developed delayed meningitis (>30 days) between 2 and 9 months of surgery. All three patients had an intraoperative CSF leak. The researchers concluded that delayed meningitis is related to the presence of persistent CSF leakage and is unlikely to be influenced by a dose of antibiotics given at the time of surgery. The researchers also indicated that their results were comparable with those seen with an endoscopic technique. They hypothesized that the biggest risk factor is intraoperative CSF leak independent of the surgical approach because both approaches transgress the same anatomy.\textsuperscript{25}
Brown *et al.* reported a prospective case series with 90 patients who, from January 2004 to May 2006, underwent endoscopic skull base surgery. Intraoperative CSF leak was present in 58 of the patients (64%). The patients received 24 to 48 hours of a single antibiotic based on patient allergies: cefazolin (87%), vancomycin (10%), or clindamycin (3%). Additional antibiotics were subsequently required during the hospital stay in 8 patients (9%) for a variety of indications. After discharge, the patients were placed on gentamicin nasal spray beginning 2 weeks after surgery until the wound cavity was considered well healed (usually 2–3 months after surgery). The main outcome measure was occurrence of infectious complications and the need for additional antibiotics. No cases of intracranial infections or meningitis were reported.
Orlando et al.²⁷ reported a retrospective cohort of 170 patients who, between January 1997 and July 2001, underwent endoscopic trans-sphenoidal surgery. Twenty-four of the 170 patients in the study underwent an intradural surgery, with entry into the subarachnoid space and intraoperative CSF leak. All the patients received IV prophylaxis with a third-generation cephalosporin plus aminoglycoside (160 cases) or alone (10 cases) for a mean of 3 days. The main outcomes analyzed were infectious complications. Two patients developed infectious complications: one case of S. epidermidis meningitis and one case of sphenoid sinusitis without microbiologic identification. The patient who developed meningitis had an intraoperative CSF leak with symptoms of headache, stiff neck, fever, and right sixth and seventh cranial nerve palsy 4 days after surgery. Asymptomatic sphenoid sinusitis was diagnosed in two other patients.²⁷
CONCLUSION

Meningitis is a rare complication of skull base surgery despite institutional variability in antibiotic regimens and seems to be more frequently encountered in open craniofacial surgeries. A systematic review revealed a limited number of published studies, all observational in study design, which precluded a formal meta-analysis. The limited available data also preclude clear recommendations for the routine use of prophylactic antibiotics in endoscopic skull base surgery. A novel, large-scale, randomized-controlled clinical trial is recommended to evaluate the utility of antibiotic prophylaxis in endoscopic skull base surgery.