Perioperative antibiotic prophylaxis in orthognathic surgery: a systematic review and meta-analysis of clinical trials

Su Keng Tan, DDS, MDS,a John Lo, BDS, MDS,b and Roger A. Zwahlen, MD, DMD,c Hong Kong, China
DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY, UNIVERSITY OF HONG KONG

Objective. The aim of this study was to investigate whether the use of antibiotic prophylaxis in orthognathic surgery can effectively reduce the postoperative infection rate.

Study design. Electronic databases were searched and reference lists checked. Full articles meeting the inclusion criteria were retrieved. Study details and outcome data of these reports were statistically analyzed. There was no language limitation.

Results. Five randomized clinical trials were included in the final review process: 4 articles compared the period of prophylactic antibiotic usage, and 1 compared the infection prevention effect of different types of antibiotics with placebo. Although a significantly higher infection rate was found in the placebo group, no significant difference could be found related to infection prevention between short- and long-term antibiotic regimen.

Conclusions. Prophylactic antibiotic regimen is considered to be useful for infection prevention in orthognathic surgery. A single-dose regimen is recommended; application for extended postoperative period is not advocated. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;112:19-27)

Since the dawn of bimaxillary orthognathic surgery more than 40 years ago, it has become a well established elective procedure to correct any jaw discrepancy in patients with dentofacial deformity. The perioperative morbidity can be kept to a minimum with judicious general surgical principles. Orthognathic surgery was classified according to the categories of contaminated wounds by Alherabi et al. Peterson, in 1990, estimated the postoperative infection rate for orthognathic surgery to be between 10% and 15%, which was reduced to ~1% under concomitant antibiotic treatment. Others stated the prevalence of infection after maxillary and mandibular osteotomies to be higher, ranging from 1.4% to 33.4%. Clinically, postoperative infection may be associated with the patient’s discomfort, a prolonged hospital stay, and increases in postoperative morbidity and the cost of medical care. Therefore, the minimization of postoperative infection should be of utmost interest, especially regarding the elective character of orthognathic surgery.

The use of prophylactic antibiotics still remains somewhat controversial in orthognathic surgery, which is demonstrated in a high variability of recommendations within the literature. The need of prophylactic antibiotics and their appropriate regimen in orthognathic surgery is still heatedly debated. To date, there is no consensus regarding the type and duration of postoperative antibiotic regimen. Very few randomized clinical trials have been carried out that yield evidence-based results regarding these questions.

The purpose of the present study was to systematically review the current literature and to perform a comprehensive meta-analysis of this literature to investigate whether the use of antibiotic prophylaxis in orthognathic surgery can effectively reduce the postoperative infection rate. The primary objective of
this study was to scrutinize the best prophylactic antibiotic regimen for orthognathic surgery.

**MATERIAL AND METHODS**

A protocol has been composed before the commencement of the study regarding the methods and eligible criteria for this study.

**Electronic databases search**

Electronic databases, including PubMed, Ovid, Cochrane Library, Embase, ISI Web of Science, and MD Consult, were searched using the following keywords from the earliest year available to February 2010:

(#1) AND (#2) OR (#3)

#1: (orthognathic*) OR (bimaxillary osteotomies) OR (jaw surgery)

#2: (antibiotic*) OR (antibiotic treatment) OR (antibiotic agent) OR (antimicrobial agent)

#3: (infection*)

A combination of free text terms with boolean operators and truncation were used. No restrictions were placed on the year or language of publication. The search strategy was designed in consultation with a senior librarian.

The citations retrieved from each database were exported to the Endnote X3 (Thomson Reuters, Carlsbad, CA) bibliographic management software. Duplicates were removed. The abstracts of all articles related to perioperative antibiotic prophylaxis in orthognathic surgery were screened and their full texts obtained.

**Manual search**

The reference lists of all selected articles in the first round were manually searched for any related articles. All selected articles from electronic and manual searches were independently assessed by 2 authors (S.K.T. and R.A.Z.) according the inclusion criteria, i.e., clinical studies related to perioperative antibiotic prophylaxis in orthognathic surgery were screened and their full texts obtained.

**Primary assessment**

The articles that fulfilled all of the inclusion criteria were assessed accordingly. The study details and outcome data regarding perioperative antibiotic prophylaxis in orthognathic surgery were collected using a prefabricated data extraction sheet. Data extraction (general demographic data, sample size, inclusion and exclusion criteria, type of intervention [i.e., different treatment regimens], infection rate, and follow-up period) were performed by 2 authors (S.K.T. and R.A.Z.) independently regarding following criteria. The completeness of the methodologic reporting of each study was checked according to the following criteria:

1. Complete description of patient’s demographic profile, i.e., age and gender.
2. Clear inclusion/exclusion criteria.
3. Statement about patients’ medical conditions.
4. Indication of type, dose, and duration of antibiotic agents being used.
5. Indication of criteria used to define infection.

The reporting of the first 3 criteria was important to include only medically fit and healthy individuals (aged ≥15 years) in this review; and the fourth criterion was important for the data analysis. The fifth criterion was set to check for any significant heterogeneity in the outcome measures in these prospective studies. Articles which met all of these were appraised critically in the final review. In case of any disagreements between the review authors (S.K.T. and R.A.Z.), it was resolved by consensus or consulting a third party (J.L.).

**Final review**

The articles included in this stage were studied in detail and critically appraised; the risk of bias was analyzed based on the Cochrane Collaboration’s tool for assessing risk of bias. The primary outcome measure was infection rate in orthognathic surgery with relative risk (RR) of infection rate of different treatment effects; the secondary outcome measure was adverse events in different treatment regimens.

**Data analysis and statistical methods**

The primary measure of treatment effect was the RR of infection rate reduction. Relative risks with 95% confidence intervals (CIs) for the trial results were calculated using Review Manager (RevMan version 5.0; Copenhagen: Nordic Cochrane Center, Cochrane Collaboration; 2008). The heterogeneity of trial results was assessed with a χ² test for heterogeneity (P = .1) and the I² measure of inconsistency. A significant het-
ergogeneity was considered when $P < .1$ for $\chi^2$ test or when $I^2 > 50\%$. Treatment effects across the studies were combined using the fixed effect model when there was no heterogeneity observed ($P > .1$); in case of heterogeneity observed, the random effect model was applied. Publication bias was assessed by the funnel plot method using Egger test.

Number needed to treat was calculated as the inverse of the absolute risk reduction; it was used to assess the number of patients who need to be treated to prevent 1 infection in orthognathic surgery.

RESULTS

The sequence of selecting studies and the number of articles remaining at each stage is illustrated in Fig. 1. Ten articles were included in primary assessment, but only 5 studies\textsuperscript{17-21} met the selection criteria and were included in the final review. Table I highlights the reasons for the exclusion of 5 articles\textsuperscript{12,22-25} from the final review. Generally, these articles were excluded owing to insufficient data provided to fulfill our inclusion criteria, i.e., medically fit individuals aged $\geq 15$ years.

Characteristics of included studies

\textbf{Study design and demographics.} All of the articles that met the inclusion criteria were randomized clinical studies and published in English (2 articles from The Netherlands and 1 each from Korea, India, and Thailand). Four of the articles\textsuperscript{17-20} compared the period of antibiotic prophylaxis in orthognathic surgery, and\textsuperscript{11} investigated the effect of antibiotic prophylaxis compared with placebo. A total of 452 patients were included in these 5 studies. Their ages ranged from 15 to 54 years (mean 25.8 years). The female-to-male ratio was 2:1. Demographic data of all articles are highlighted in Table II.

\textbf{Intervention.} Lindeboom et al.\textsuperscript{20} focused only on bilateral sagittal ramus osteotomy, whereas Jansisyanont et al.\textsuperscript{19} and Danda et al.\textsuperscript{17} included both single- and double-jaw surgeries in their studies. In contrast, the remaining 2 studies\textsuperscript{18,21} performed a Le Fort I in combination with different mandibular osteotomies. The study of Jansisyanont et al.\textsuperscript{19} reported a wide range of operation time (1.25-8.45 h), whereas the other 3 studies\textsuperscript{18,20,21} presented an operation time of $< 5$ hours. Danda et al.\textsuperscript{17} reported a similar operation time across the study groups but did not report their operation time.

The detail of the type, dosage, and duration of the antibiotics used in each study group and the associated infection rate are shown in Table III. The infection criteria defined in each study were not completely identical (Table IV), but in general the criteria being used to define infection within these 5 studies included: purulent or a positive-cultured serosanguineous drainage from the surgical site; pain or tenderness, localized swelling, and redness of the wound margin and surrounding tissue; an elevation of body temperature to $> 38.5^\circ\text{C}$ after $> 48$ hours; and clinician diagnosis of infection.

\textbf{Follow-up period.} Kang et al.\textsuperscript{18} had the shortest follow-up period (2 weeks). This was followed by Danda et al.\textsuperscript{17} and Zijderveld et al.\textsuperscript{21} who evaluated their patients for up to 1 month. The other studies\textsuperscript{19,20} examined the participants for a longer duration (3 months).

Primary outcome

The primary outcome assessed in all studies was postoperative infection rate across different intervention groups (Table III). All 5 studies found no statistically significant differences between the different prophylactic antibiotic regimens they administered. However, Zijderveld et al.\textsuperscript{21} successfully demonstrated the importance of prophylactic antibiotic in orthognathic surgery by detecting a significantly increased risk of infectious complications (52.63\%) after bimaxillary orthognathic surgery without antibiotic prophylaxis.

Fig. 1. Flow diagram of article selection.
laxis. Based on that study, the number needed to treat to prevent 1 infection in orthognathic surgery is 2.61; this means that 1 in every 2.61 patients who has received antibiotic prophylaxis will benefit from the treatment compared with control subjects.

Single dose versus placebo. There was only 1 trial\(^{21}\) comparing the infection rate between 2 types of antibiotics with placebo. The 2 antibiotic groups were pooled to detect statistical different with placebo. There was a statistically significantly reduced infection rate found in the antibiotic group (RR 0.27, 95% CI 0.11-0.68; Fig. 2).

Single dose versus single day. (Two trials) There was no difference in infection rate in patients who were administered single-dose antibiotic or single-day antibiotic regimen (RR 3.00, 95% CI 0.83-10.79; Fig. 3).\(^{17,20}\)

Short term versus long term. (Two trials) Short-term antibiotic regimen did not show statistically significantly different infection rates compared with long-term antibiotic regimen (RR 1.33, 95% CI 0.31-5.67; Fig. 3).\(^{18,19}\)

Secondary outcome

There was only 1 study\(^{20}\) out of the 5 articles reported the adverse events associated with the antibiotic treatment, and none were observed in that study.

Risk of bias

The outcome of the quality appraisal based on the Cochrane Collaboration's tool for assessing risk of bias\(^{16}\) is presented in Table V.

DISCUSSION

The basic idea of antibiotic prophylaxis is twofold: to provide an adequate drug level in the tissues before and during any procedure, and to provide the shortest entire administration period possible.\(^{26}\) The initial dose should be administered parenterally before the operation; other than this is considered to be associated with an increased wound infection rate.\(^{2}\) In a prospective study, Classen et al.\(^{27}\) found that the administration of prophylactic antibiotics within 2 hours before the operation was associated with the lowest rate of wound infection. Furthermore, they detected that the infection...
rate increased with each hour of surgery after the incision. Burke\textsuperscript{28} showed in his animal study that delayed antibiotic administration exceeding a period of \(>3\) hours after bacterial inoculation consistently failed to reduce the infection rate. Therefore, he emphasized that maximum infection suppression can be achieved only if antibiotics were administered before bacteria had gained tissue access.

The development of wound infection is a complex interaction between intraoperative bacterial inoculation and various factors of the host’s local and systemic resistance to infection.\textsuperscript{2} The decision to administer prophylactic antibiotics is based on various factors, including the patient’s general state of health, the surgical site and extension, the preoperative diagnosis, and even the surgeon’s preference. Extended antibiotic regimens

### Table III. Prophylactic antibiotic regimens and associated infection rates

<table>
<thead>
<tr>
<th>Study</th>
<th>Study groups</th>
<th>Preoperative antibiotic</th>
<th>Postoperative antibiotic</th>
<th>Infection cases</th>
<th>Infection rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danda et al.\textsuperscript{17}</td>
<td>Single-dose group</td>
<td>1 g ampicillin intravenously at induction</td>
<td>Saline solution intravenously every 6 h for 24 h</td>
<td>7/75</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td>Single-day group</td>
<td>1 g ampicillin intravenously at induction</td>
<td>500 mg ampicillin intravenously every 6 h for 24 h</td>
<td>2/75</td>
<td>2.6</td>
</tr>
<tr>
<td>Kang et al.\textsuperscript{18}</td>
<td>Experimental group</td>
<td>1.0 g cefpiramide intravenously 30 min before surgery</td>
<td>—</td>
<td>3/28</td>
<td>10.71</td>
</tr>
<tr>
<td></td>
<td>Control group</td>
<td>1.0 g cefpiramide given intravenously 30 min before surgery</td>
<td>1.0 g cefpiramide intravenously twice daily for 3 d after surgery</td>
<td>2/28*</td>
<td>7.14</td>
</tr>
<tr>
<td>Jansisyanont et al.\textsuperscript{19}</td>
<td>Short-term amoxicillin–clavulanic acid</td>
<td>1.2 g amoxicillin–clavulanic acid intravenously 30 min before surgery and every 8 h during operation</td>
<td>1.2 g amoxicillin–clavulanic acid intravenously 8 h after surgery</td>
<td>1/33</td>
<td>3.03</td>
</tr>
<tr>
<td></td>
<td>Long-term amoxicillin–clavulanic acid</td>
<td>1.2 g amoxicillin–clavulanic acid intravenously 30 min before surgery and every 8 h during operation</td>
<td>625 mg amoxicillin–clavulanic acid tablet orally every 8 h after surgery for 5 d</td>
<td>0/28</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Short-term penicillin</td>
<td>2 MU penicillin G intravenously 30 min before surgery and every 4 hours during operation</td>
<td>2 MU penicillin G intravenously 4 h after surgery</td>
<td>0/29</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Long-term penicillin</td>
<td>2 MU penicillin G intravenously 30 min before surgery and every 4 hours during operation</td>
<td>500 mg oral amoxicillin every 8 h for 5 d</td>
<td>1/32</td>
<td>3.13</td>
</tr>
<tr>
<td>Lindeboom et al.\textsuperscript{20}</td>
<td>Single-dose regimen</td>
<td>600 mg clindamycin intravenously 15 min before surgical incision</td>
<td>Saline solution intravenously every 6 h for 24 h</td>
<td>2/35</td>
<td>5.71</td>
</tr>
<tr>
<td></td>
<td>4-dose regimen</td>
<td>600 mg clindamycin intravenously 15 min before surgical incision</td>
<td>600 mg clindamycin intravenously every 6 h for 24 h</td>
<td>1/35</td>
<td>2.86</td>
</tr>
<tr>
<td>Zijderveld et al.\textsuperscript{21}</td>
<td>Amoxicillin–clavulanic acid</td>
<td>2,200 mg amoxicillin–clavulanic acid dissolved in 50 mL 0.9% sodium chloride intravenously 30 min before surgery</td>
<td>—</td>
<td>2/18</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td>Cefuroxime</td>
<td>1,500 mg cefuroxime dissolved in 50 mL 0.9% sodium chloride intravenously 30 min before surgery</td>
<td>—</td>
<td>3/17</td>
<td>17.65</td>
</tr>
<tr>
<td>Placebo</td>
<td>Placebo</td>
<td>—</td>
<td>—</td>
<td>10/19</td>
<td>52.63*</td>
</tr>
</tbody>
</table>

All researchers found no statistically significant difference in their studies (* except \(p > .004\)).

\*There was 1 case of wound dehiscence in this group, without any sign of infection.
may predispose to the development of resistant bacterial strains, changes in physiologic host flora, secondary infection, and increased health care costs.2,4,7,9,14,29

Furthermore, antibiotic application bears the risk of adverse reactions which range from simple skin rash to severe anaphylactic shock.4,21,29-31 Therefore, one should consider administering prophylactic antibiotic regimen when its benefit outweighs its risk.4,7,19,21,29

The majority (80%) of the included articles did not report on the adverse events associated with the antibiotic usage, and this is a severe flaw in the clinical studies on antibiotics.

Although some authors3,6,32 doubt the importance of prophylactic antibiotics in orthognathic surgery, Peterson9 advocated that short-term perioperative antibiotic regimen should be recommended; this recommendation was supported by the finding of Conover et al.,33 who demonstrated its effectiveness in preventing postoperative wound infection. Other recommendations for the usage of prophylactic antibiotic regimen include medically compromised patients or surgery requiring sizable bone grafts.3,6

Patient’s age, operation time, and hospitalization after surgery in a large ward were considered in the past to be factors affecting wound infection.4,6,7,11,14,34,35 Although oral and maxillofacial operations that last >3 hours were suggested in 1990 to be associated with increased infection rate,9 later studies5,20,21 have failed to identify such relationship. Zijderveld et al.21 detected no significant correlation between infection and patients’ gender or age.

Table IV. Infection criteria

<table>
<thead>
<tr>
<th>Study</th>
<th>Criteria to define postoperative infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danda et al.17</td>
<td>1. Purulent discharge from an incision&lt;br&gt;2. Serosanguineous drainage and a wound culture positive for a known pathogen&lt;br&gt;3. Clinician diagnosis of infection</td>
</tr>
<tr>
<td>Kang et al.18</td>
<td>1. Purulent drainage from the surgical site with or without laboratory confirmation&lt;br&gt;2. At least 1 of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat, and a superficial incision deliberately opened by surgeon unless the incision is culture negative&lt;br&gt;3. An abscess or other evidence of infection found on direct examination, during reoperation, or by the histopathologic or radiologic examination&lt;br&gt;4. Diagnosis of surgical site infection by the surgeon or attending physician</td>
</tr>
<tr>
<td>Janssyanont et al.19</td>
<td>1. Purulent discharge from the surgical site&lt;br&gt;2. Serosanguineous drainage and a wound culture proved positive from a known pathogen&lt;br&gt;3. An elevation of temperature to &gt;38.5°C after &gt;48 h and tother causes of infection ruled out by complete blood count, chest x-ray, and urinary analysis&lt;br&gt;4. Pain or tenderness, localized swelling, and redness of the wound margin and surrounding tissue&lt;br&gt;5. The infection presenting at the surgical site ≤42 d (6 wk) after surgery</td>
</tr>
<tr>
<td>Lindeboom et al.20</td>
<td>1. Presence of purulent drainage (either spontaneously or by incision), accompanied with pain or tenderness, localized swelling, redness, and heat or fever (&gt;38.5°C)&lt;br&gt;2. An increase in localized swelling, after an initial postoperative decrease of edema, together with pain, discomfort, induration, and increase in body temperature (&gt;38.5°C)</td>
</tr>
<tr>
<td>Zijderveld et al.21</td>
<td>1. Appearance of the wound on the third and seventh days after surgery and after 1 mo, subdivided into 4 categories: normal, edematous, exudate with drainage of nonpurulent material, or an abscess with drainage of purulent material with or without incision&lt;br&gt;2. Wound infection defined as any inflammatory condition previously described that prompted the surgeon to give additional treatment that was not part of the routine postoperative protocol&lt;br&gt;3. Presence of wound dehiscence scored separately</td>
</tr>
</tbody>
</table>

Fig. 2. Infection rate in orthognathic surgery: single-dose prophylactic antibiotics versus placebo.
The selection of the appropriate antimicrobial agent depends on the identification of the pathogens being most likely associated with particular surgical procedure. Penicillin with its broad spectrum is effective against most oral pathogens. It is considered to be the antibiotic of first choice in preventing infection during intraoral procedures, whereas first-generation cephalosporin was preferably administered during interventions involving transcutaneous surgery. Lindeboom et al. investigated the efficacy of clindamycin in preventing perioperative infections, but all infection cases were caused by penicillin-sensitive streptococci. Therefore, penicillin may suffice for prophylaxis in orthognathic surgery.

Among the 4 articles where orthognathic surgery was performed in both jaws, the majority of infection (77.42%) occurred in the mandible. Two reasons for this finding may be presumed: first, a poorer blood supply of the mandible when compared with the maxilla; and second, a gravity pooling effect probably causing stagnation of the bacteria-rich saliva in the lower jaw area. Koole and Egyedi detected the presence of saliva in the mandibular osteotomy site for at least 3 days after surgery. According to this finding, they considered that the saliva entering the surgical wound might cause infection of the osteotomy site. The administration of local antimicrobial agent might have played a role in reducing postoperative wound infection rate. Lindeboom et al. prescribed chlorhexidine 0.12% for 2 weeks after surgery for all participants regardless of their allocation. This antimicrobial mouthwash might be important for their decreased infection rate compared with other studies.

Fig. 3. Infection rate in orthognathic surgery: short-term versus long-term antibiotic regimen.

Table V. Quality appraisal of the included studies based on The Cochrane Collaboration’s tool for assessing risk of bias

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Danda et al17</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Yes (Double-blinded)</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Kang et al18</td>
<td>Yes</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Jansisyanont et al.19</td>
<td>Yes</td>
<td>Unclear</td>
<td>Yes (Double-blinded)</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Lindeboom et al.20</td>
<td>Yes</td>
<td>Unclear</td>
<td>Yes (Assessor)</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Zijderveld et al.17</td>
<td>Yes</td>
<td>Unclear</td>
<td>Yes (Double-blinded)</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Risk of bias</td>
<td>Low risk</td>
<td>Unclear</td>
<td>Low risk</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
</tbody>
</table>
Future randomized controlled trials should consider local antimicrobial agents as a potential confounding factor in their study.

Clinical studies not mentioning anything about the host’s defense state were excluded in the present systematic review. Immunocompromised patients’ states inevitably affect the infection rate. Therefore, it was considered to be crucial for a clinical study to report the medical condition of their study population to reduce the potential study bias. Although Kang et al. did not report their exclusion criteria, we included their study in our final review based on their inclusion of young patients without specific medical history. However, those investigators assessed the patients for only 2 weeks after surgery, a period that, to the authors’ opinion, is considered to be insufficient to detect all eventual postoperative infections during the wound and bone healing.

All of the 5 articles excluded during primary assessment did not report about the criteria being used to define the term of infection. The Committee on Antimicrobial Agents declared that written definitions of wound infection as a highly important criteria to design and report results of clinical studies evaluating the efficacy of various prophylactic antimicrobial agents in surgery. The lack of information regarding the infection criteria was therefore considered to be a severe bias of infection studies. Defined infection criteria specifically for the oral and maxillofacial area should be compiled for future clinical studies.

Many studies have been performed to detect an eventual evidence-based need for prophylactic antibiotic regimen in orthognathic surgery. Zijderveld et al. successfully demonstrated an unacceptably high infection rate (52.63%) in their placebo group. However, their result was in contrast to many earlier studies showing no significant difference in infection rates between groups of antibiotic prophylaxis and placebo. Nonetheless, most surgeons administer different kinds of prophylactic antibiotics in orthognathic surgery according to their experience. One might assume that this is based on the concept that orthognathic surgery is performed in a clean-contaminated area, possibly predisposing to significant risk of postoperative infection. Direct communication between surgically mobilized bony segments and the oral or nasal cavity and maxillary sinuses provide a basic rationale for the use of prophylactic antibiotic in orthognathic surgery. In our opinion, a large randomized controlled trial with high power should be performed to yield an evidence-based answer to the question regarding the most appropriate antibiotic prophylaxis regimen in orthognathic surgery.

The need for multicenter trials with an appropriate sample size calculation is of paramount importance.

Future randomized controlled trials regarding antibiotic prophylaxis in orthognathic surgery should report randomization procedures in detail, including sequence generation, allocation concealment, and implementation, as suggested by the CONSORT statement. Moreover, definitions of infection criteria as well as descriptions of the patients’ medical conditions need to be provided. In addition, surgical procedures should be equally distributed in each arm of the trial and the administration of concomitant perioperative local antimicrobial or antiseptic agents should be controlled. The association of infection rate with age, gender, surgical site, operation time, size of the ward, and period of hospitalization would also be a very interesting field of future research regarding antibiotic prophylaxis. Finally, the adverse events of antibiotic treatment must be reported.

The main limitation of the present meta-analysis is the small number of randomized controlled trials available to date regarding antibiotic prophylaxis regimen in orthognathic surgery. Furthermore, none of the included articles mentioned allocation concealment, and therefore an increased potential bias exists in all the included studies. Publication bias might represent a limitation in this review. Although we performed searching with the main electronic databases without limitation of language of publications, there are many papers reported in other language (e.g., Chinese) which were not available in the databases used.

CONCLUSIONS

This systematic review confirmed a significant reduction of infection rate with the application of antibiotic prophylaxis in orthognathic surgery regardless of the regimen used. Orthognathic surgery is mainly performed in young, healthy adults without significant comorbidities. Thus, a single-dose antibiotic regimen is effective in preventing infection after the orthognathic surgery within this target group. An extended antibiotic regimen needs a clear indication, and the risk and benefit of it to the patients need to be clearly pondered. Future double-blinded randomized controlled trials with high power need to be performed to yield evidence-based answers to the question of the most appropriate antibiotic prophylaxis regimen in orthognathic surgery.

The authors express their gratitude to Mrs. Eschle, librarian of the University of Zurich, for her concepts of the search strategy.

REFERENCES


Reprint requests:
Roger A. Zwahlen
Associate Professor
Department of Oral and Maxillofacial Surgery
University of Hong Kong
34 Hospital Road
Hong Kong
People’s Republic of China
zwahlen@hkucc.hku.hk