

Long-term antibiotic prophylaxis regimen compared to short-term antibiotic prophylaxis regimen in patients undergoing orthognathic surgery

Matthias Wallach¹, Javier Cuéllar¹, Francisca Verdugo-Paiva^{2,3}, Ana Alarcón^{1,4}

¹ Servicio Maxilofacial, Hospital Clínico San Borja Arriarán, Santiago, Chile.

² Proyecto Epistemonikos, Santiago, Chile.

³ Centro Evidencia UC, Facultad de Medicina, Pontificia Universidad Católica de Chile.

⁴ Departamento de Cirugía y Traumatología Bucal y Maxilofacial, Facultad de Odontología, Universidad de Chile.

* Corresponding author matthewswallach@gmail.com

Citation Wallach M, Cuéllar J, Verdugp-Paiva F, Alarcón A. Long-term antibiotic prophylaxis regimen compared to short-term antibiotic prophylaxis regimen in patients undergoing or-thognathic surgery. *Medwave* 2020;20(11):e8071

Doi 10.5867/medwave.2020.11.8071

Submission date 11/06/2020

Acceptance date 03/08/2020

Publication date 11/12/2020

Origin This article is a product of the Evidence Synthesis Project of Epistemonikos Foundation, in collaboration with Medwave for its publication.

Type of review Not non-blind peers by the UC Evidence Center methodological team in collaboration with Epistemonikos Evidence Synthesis Project.

Potential conflicts of interest The authors do not have relevant interests to declare.

Key words orthognathic surgery, long term antibiotic prophylaxis, short term antibiotic prophylaxis, Epistemonikos, GRADE.

Abstract

Introduction

Orthognathic surgery, being an invasive surgical procedure, may present significant postoperative morbidities for the patient. Among the most frequently described complications is surgical site infection. The administration of prophylactic antibiotics prior to this type of procedure is a common practice, however, the cost-benefit of the use of antibiotics, the type of antibiotics, the route of administration, the dosage, and the regimen to be used have not been clearly defined and are still considered a controversial issue. In this summary of evidence, we will compare long-term antibiotic prophylaxis with short-term prophylaxis.

Methods

We searched in Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others. We extracted data from the systematic reviews, reanalyzed data of primary studies, conducted a meta-analysis and generated a summary of findings table using the GRADE approach.

Results and conclusions

We identified five systematic reviews including nine studies overall, of which all nine were randomized trials. We conclude that administering a long-term prophylactic antibiotic regimen probably decreases the risk of surgical site infection and that it may increase the risk of hospital stay longer than two days, nevertheless, regarding this last point, the certainty of the evidence is low.

Problem

Orthognathic surgery corresponds to a set of surgical techniques that allow the correction of the anomalies of the maxillofacial complex through the realignment of the maxillary and mandibular bones; allowing the improvement of the functionality, facial harmony, and aesthetics. Some of the postoperative complications include hemorrhage, temporary or permanent neurological alterations and infections.

In relation to this last complication, the use of antibiotic prophylaxis is frequent, and is defined as the use of antibiotics to prevent infection at the surgical site¹. However, there is no clear consensus regarding the type of antibiotic, dose, route of administration or regimen to use.

Additionally, prophylactic antibiotic schedules can be classified according to the time of administration:

1. Preoperative prophylaxis: a single dose before surgery
2. Short-term prophylactic antibiotic regimen: begins with pre-surgical doses and is maintained for and/or up to 24 hours after surgery.
3. Long-term prophylactic antibiotic regimen: starts with pre-surgical doses and is maintained for and beyond 24 hours after surgery¹.

In this summary of evidence, the long-term and short-term prophylactic antibiotic regimen will be comparatively evaluated, with the intention of clarifying which of these would be more effective in reducing postoperative complications.

Key messages

- Administering a long-term antibiotic prophylaxis regimen, compared to administering a short-term antibiotic prophylaxis regimen probably decreases the risk of surgical site infection.
- Administering a long-term prophylactic antibiotic regimen, compared to administering a short-term prophylactic antibiotic regimen, may increase hospital stay longer than two days (low certainty of evidence).
- No studies were found that looked at mortality, systemic infection and adverse effects.

Methods

We searched in Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others, to identify systematic reviews and their included primary studies. We extracted data from the identified reviews and reanalyzed data from primary studies included in those reviews. With this information, we generated a structured summary denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos) using a pre-established format, which includes key messages, a summary of the body of evidence (presented as an evidence matrix in Epistemonikos), meta-analysis of the total of studies when it is possible, a summary of findings table following the GRADE approach and a table of other considerations for decision-making.

About the body of evidence for this question

What is the evidence. See evidence matrix in Epistemonikos later	We identified five systematic reviews ¹⁻⁵ including nine studies overall ⁶⁻¹⁴ , of which all were randomized trials.
What types of patients were included*	All trials included patients that underwent orthognathic surgery, without distinction in the subtype of surgery. The trials included men and women with ages ranging from 15 to 48 years ⁶⁻¹⁴
What types of interventions were included*	All trials evaluated long antibiotic prophylaxis regimens compared with short prophylaxis regimens. Long-term prophylactic regimens considered administration of antibiotics before the operation, on the day of the surgery, and for several additional postoperative days: two days ^{7,13} , three days ¹² , five days ^{6,11} , seven days ^{10,14} . This information was not reported in two trials ^{8,9} Short-term prophylactic antibiotic regimens considered preoperative and during the same day (up to 24 hrs.) antibiotic administration ⁶⁻¹⁴ . Three trials used placebo within the regimen ^{6,7,13} . The antibiotics used by each trial were:

	<ul style="list-style-type: none"> • Cefpiramide¹² • Penicillin G^{7,10,11,13,14} • Penicillin V⁷ • Amoxicillin⁶ • Amoxicillin and clavulanic acid¹¹ • Clindamycin^{6,10} (only in patients presenting penicillin allergy) <p>The routes of drug administration used were</p> <ul style="list-style-type: none"> • Endovenous:¹² • Intramuscular and intravenous¹³ • Endovenous and oral^{6,7,10,11,14} <p>Two trials did not report the regimen, antibiotic or route of administration used^{8,9}.</p>
<p>What types of outcomes were measured</p>	<p>The trials evaluated multiple outcomes, which were grouped by the systematic reviews as follows:</p> <ul style="list-style-type: none"> • Surgical Site Infection • Hospital Stay <p>The average follow-up of the trials was nine weeks with a range of four to 24 weeks.</p>

* Information about primary studies is not extracted directly from primary studies but from identified systematic reviews, unless otherwise stated.

Summary of findings

The information on the effects of antibiotic prophylaxis in a long-term regimen is based on nine randomized trials⁶⁻¹⁴, involving 472 patients.

Nine trials measured the outcome surgical site infection⁶⁻¹⁴ (472 patients) and only one trial measured the outcome hospital stay longer than two days (171 patients)⁸.

The summary of findings is the following:

- The use of a long-term prophylactic antibiotic regimen compared with a short-term prophylactic antibiotic regimen probably decreases the risk of surgical site infection (moderate certainty of evidence).
- The use of a long-term prophylactic antibiotic regimen compared to a short-term prophylactic antibiotic regimen may increase the risk of hospital stay longer than two days (low certainty of evidence).
- No studies were found that looked at adverse effects.
- No studies were found that looked at mortality.
- No studies were found that looked at systemic infection.

Long-term Antibiotic Prophylaxis Regimen Compared to Short-term Antibiotic Prophylaxis Regimen in Patients Undergoing Orthognathic Surgery				
Patients	Patients undergoing orthognathic surgery			
Intervention	Long-term antibiotic prophylaxis			
Comparison	Short-term antibiotic prophylaxis			
Outcome	Absolute effect*		Relative effect (95% CI)	Certainty of evidence (GRADE)
	WITH short-term prophylaxis	WITH long-term prophylaxis		
	Difference: patients per 1000			
Surgical site infection	158	65	RR 0.41 (0.26 to 0.67)	⊕⊕⊕○ ¹ Moderate
	MD: 93 less (Margin of error: 52 to 117 less)			
Hospital stay longer than two days	835	869	RR 1.04 (0.92 to 1.18)	⊕⊕⊕○ ^{1,2} Low
	MD: 34 more (Margin of error: 67 less to 150 more)			
Adverse effects	The outcome adverse effects was not measured or reported or measured by systematic reviews.		--	--
Mortality	The outcome mortality was not measured or reported or measured by systematic reviews.		--	--
Systemic infection	Systemic infection The outcome systemic infection was not measured or reported or measured by systematic reviews.		--	--

Margin of error: 95% confidence interval (CI).

RR: Risk ratio.

GRADE: Evidence grades of the GRADE Working Group (see later).

* The risk **WITH short-term antibiotic prophylaxis** is based on the risk in the control group of the trials. The risk **WITH long-term antibiotic prophylaxis** (and its margin of error) is calculated from relative effect (and its margin of error).

¹ The certainty of evidence was downgraded in one level for risk of bias, as the random sequence generation, allocation concealment and blinding of participants is unclear in most trials.

² The certainty of evidence was downgraded in one level for imprecision, as each end of the confidence interval would lead to different clinical decisions.

Follow the link to access the interactive version of this table ([Interactive Summary of Findings – iSoF](#))

About the certainty of the evidence (GRADE)*

⊕⊕⊕⊕

High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕○

Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate.

⊕⊕○○

Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕○○○

Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

* This concept is also called 'quality of the evidence' or 'confidence in effect estimates'.

† Substantially different = a large enough difference that it might affect a decision

Other considerations for decision-making

To whom this evidence does and does not apply

The results of this summary are applicable to patients who are undergoing orthognathic surgery; and especially to those who present an increased risk of infection, either by concomitant chronic pathologies, drug treatment or by factors inherent to the surgical act, such as magnitude of the osteotomies, exposure to oral fluids and operating time.

About the outcomes included in this summary

All the selected outcomes are considered critical for decision making according to the opinion of the authors of this summary, which coincide in general with those evaluated by the systematic reviews.

The outcome mortality was included in the summary of findings table because it is a relevant outcome for clinical experts, even though it is not a frequent outcome, and was not reported by the reviews either. This also applies to the outcome of adverse effects, which was included because it reports relevant information regarding complications or post-operative aspects associated with orthognathic surgery. However, they were not reported in the reviews.

Balance between benefits and risks, and certainty of the evidence

The evidence included for this summary shows a likely benefit in terms of reducing the risk of surgical site infection using a long-term antibiotic prophylaxis regimen compared to using a short-term one.

On the other hand, the risk of a hospital stay longer than two days using a long-term prophylactic antibiotic regimen is unclear due to the certainty of the evidence. Therefore, we suggest caution when assuming conclusions on this matter.

Based on the above, the risk/benefit balance is favorable towards the use of a long-term prophylactic antibiotic regimen.

Resource considerations

None of the trials conducted a cost analysis regarding the use of antibiotic prophylaxis. However, there is evidence that the additional costs associated with complications of orthognathic surgery can be considerable¹.

What would patients and their doctors think about this intervention

Given the evidence presented in this summary, most patients and surgeons should prefer a long-term prophylactic antibiotic regimen rather than a short-term one, since with the long-term regimen, there is a likely reduction in the risk of infectious postoperative complications and thus in their socio-economic consequences.

Additionally, it is important to emphasize that this is valid as long as there is a correct and precise indication for antibiotic administration.

Differences between this summary and other sources

The conclusions of this summary are consistent with four of the five identified systematic reviews^{1,2,4,5}, which consider that the long-term prophylactic antibiotic regimen probably reduces the risk of surgical site infection compared to a short-term regimen.

A systematic review³ reports that the quality of the available evidence is not good enough, and therefore a determination cannot be made with sufficient certainty.

The American Association of Oral and Maxillofacial Surgeons (AAOMS)¹⁵ and British Association of Oral and Maxillofacial Surgeons (BAOMS)¹⁶ clinical guidelines for orthognathic surgery suggest the judicious use of antibiotic prophylaxis to contribute to the reduction of possible postoperative complications, without making any distinction on the type of scheme to be used.

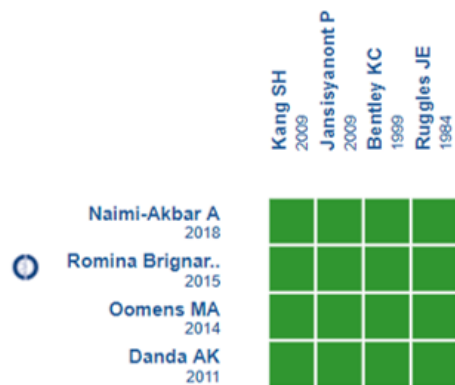
Could this evidence change in the future?

Future research is likely to change the conclusions of this summary, especially in respect to hospital stay longer than two days, because of the uncertainty surrounding this outcome.

We did not identify any ongoing systematic reviews or randomized clinical trials in the National Institute for Health Research's International prospective register of systematic reviews (PROSPERO) and the World Health Organization's International clinical trials registry platform, respectively.

How we conducted this summary

Using automated and collaborative means, we compiled all the relevant evidence for the question of interest and we present it as a matrix of evidence.



An evidence matrix is a table that compares systematic reviews that answer the same question. Rows represent systematic reviews, and columns show primary studies. The boxes in green correspond to studies included in the respective revisions. The system automatically detects new systematic reviews including any of the primary studies in the matrix, which will be added if they actually answer the same question.

Follow the link to access the **interactive version** [Long-term antibiotic prophylaxis regimen compared to short-term antibiotic prophylaxis regimen in patients undergoing orthognathic surgery.](#)

Referencias

1. Brignardello-Petersen, R., Carrasco-Labra, A., Araya, I., Yanine, N., Jara, L. C., & Villanueva, J. Antibiotic prophylaxis for preventing infectious complications in orthognathic surgery. *Cochrane Database of systematic reviews*; (2015), (1).
2. Danda, A. K., & Ravi, P. Effectiveness of postoperative antibiotics in orthognathic surgery: a meta-analysis. *Journal of Oral and Maxillofacial Surgery*; (2011), 69(10), 2650-2656.
3. Naimi-Akbar, A., Hultin, M., Klinge, B., Tranaeus, S., & Lund, B. Antibiotic prophylaxis in orthognathic surgery: A complex systematic review. *PloS one*; (2018), 13(1), e0191161.
4. Oomens, M. A. E. M., Verlinden, C. R. A., Goey, Y., & Forouzanfar, T. Prescribing antibiotic prophylaxis in orthognathic surgery: a systematic review. *International journal of oral and maxillofacial surgery*; (2014), 43(6), 725-731.
5. Tan, S. K., Lo, J., & Zwahlen, R. A. Perioperative antibiotic prophylaxis in orthognathic surgery: a systematic review and meta-analysis of clinical trials. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*; (2011), 112(1), 19-27.
6. Baqain, Z. H., Hyde, N., Patrikidou, A., & Harris, M. Antibiotic prophylaxis for orthognathic surgery: a prospective, randomised clinical trial. *British Journal of Oral and Maxillofacial Surgery*; (2004), 42(6), 506-510.
7. Bentley, K. C., Head, T. W., & Aiello, G. A. Antibiotic prophylaxis in orthognathic surgery: a 1-day versus 5-day regimen. *Journal of oral and maxillofacial surgery*; (1999), 57(3), 226-230.

Notes

The upper portion of the matrix of evidence will display a warning of “new evidence” if new systematic reviews are published after the publication of this summary. Even though the project considers the periodical update of these summaries, users are invited to comment in *Medwave* or to contact the authors through email if they find new evidence and the summary should be updated earlier.

After creating an account in Epistemonikos, users will be able to save the matrixes and to receive automated notifications any time new evidence potentially relevant for the question appears.

This article is part of the Epistemonikos Evidence Synthesis project. It is elaborated with a pre-established methodology, following rigorous methodological standards and internal peer review process. Each of these articles corresponds to a summary, denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos), whose main objective is to synthesize the body of evidence for a specific question, with a friendly format to clinical professionals. Its main resources are based on the evidence matrix of Epistemonikos and analysis of results using GRADE methodology. Further details of the methods for developing this FRISBEE are described here (<http://dx.doi.org/10.5867/medwave.2014.06.5997>)

Epistemonikos foundation is a non-for-profit organization aiming to bring information closer to health decision-makers with technology. Its main development is Epistemonikos database

www.epistemonikos.org

8. Davis, C. M., Gregoire, C. E., Davis, I., & Steeves, T. W. Prevalence of surgical site infections following orthognathic surgery: a double-blind, randomized controlled trial on a 3-day versus 1-day postoperative antibiotic regimen. *Journal of Oral and Maxillofacial Surgery*; (2017), 75(4), 796-804.
9. Eshghpour, M., Khajavi, A., Bagheri, M., & Banihashemi, E. Value of prophylactic postoperative antibiotic therapy after bimaxillary orthognathic surgery: a clinical trial. *Iranian journal of otorhinolaryngology*; (2014), 26(77), 207.
10. Fridrich, K. L., Partnoy, B. E., & Zeitler, D. L. Prospective analysis of antibiotic prophylaxis for orthognathic surgery. *The International journal of adult orthodontics and orthognathic surgery*; (1994), 9(2), 129-131.
11. Jansisanont, P., Sessirisombat, S., Sastravaha, P., & Bamroong, P. Antibiotic prophylaxis for orthognathic surgery: a prospective, comparative, randomized study between amoxicillin-clavulanic acid

- and penicillin. *Journal of the Medical Association of Thailand*; (2011), 91(11), 1726.
12. Kang, S. H., Yoo, J. H., & Yi, C. K. The efficacy of postoperative prophylactic antibiotics in orthognathic surgery: a prospective study in Le Fort I osteotomy and bilateral intraoral vertical ramus osteotomy. *Yonsei medical journal*; (2009), 50(1), 55-59.
 13. Ruggles, J. E., & Hann, J. R. Antibiotic prophylaxis in intraoral orthognathic surgery. *Journal of Oral and Maxillofacial Surgery*; (1984), 42(12), 797-801.
 14. Samman N, Cheung LK. Antibiotic prophylaxis for orthognathic surgery: a prospective trial of four penicillin regimes. *Journal of cranio-maxillo-facial surgery*. 1996;24(Suppl 1).
 15. American Association of Oral and Maxillofacial Surgeons (AAOMS). *Parameters of care: Clinical Practice Guidelines for Oral and Maxillofacial Surgery. Surgical Correction of Skeletal Deformities*. 2017.
 16. British Association of Oral and Maxillofacial Surgeons (BAOMS). *Commissioning Guide: Orthognathic Procedures*. 2013.

Correspondence to

Centro Evidencia UC
Pontificia Universidad Católica de Chile
Diagonal Paraguay 476
Santiago
Chile



Esta obra de Medwave está bajo una licencia Creative Commons Atribución-No Comercial 3.0 Unported. Esta licencia permite el uso, distribución y reproducción del artículo en cualquier medio, siempre y cuando se otorgue el crédito correspondiente al autor del artículo y al medio en que se publica, en este caso, Medwave.