

The Effect of Antibiotics and Corticosteroids on Orthognathic Surgery: A Meta-analysis and Systematic Review

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Abstract

Background and Objectives: Perioperative systemic corticosteroids are widely applied in orthognathic surgery so as to prevent postoperative complications; nevertheless the beneficial effects of this practice are questionable and concerns over its potential side effects are growing. Moreover, prescribing postoperative antibiotic regimes is considered a controversial issue. The present systematic review and meta-analysis were conducted to examine the effectiveness of antibiotics and corticosteroids in orthognathic surgery. **Materials and Methods:** The electronically searched resources between 2010 and 2019 included a direct scientific article; PubMed, Wiley online library, Google Scholar, Up-to-date, and the keywords used comprised antibiotics, corticosteroids, orthognathic surgery, orthognathic. The articles more relevant to the subjects were selected. **Results:** Only four of the 11 papers included in the primary evaluation satisfied the eligibility criteria and were used in the final review in studies that used antibiotics in orthognathic surgery. The remaining 7 articles were included in the final review in studies using corticosteroids in orthognathic surgery. A total of 622 patients, aged at least 30.5 years, were included in the 4 studies using antibiotics. **Conclusion:** The findings of the present systematic review did not reveal significant differences between the effects of five and fifteen mg of dexamethasone on facial reduction. Antibiotic regimen was also found to prevent infections in orthognathic surgery.

Keywords: Antibiotics; Corticosteroids; Orthognathic surgery

Introduction

Orthognathic surgery is a unique attempt in facial surgery. Patient appearance and occlusal function can be significantly improved, affecting the patient's well-being and sense of self. ^[1] The primary purpose of orthognathic surgery is to recreate the proper relationship between the maxilla and the mandible to improve mastication, speech esthetics. ^[2] Surgeons commonly prescribe antibiotics before or after orthognathic surgery to minimize the risk of wound infections. ^[3] Although there is a consensus on the risk of infection following surgery, the degree to which antibiotics prevent infections and what type and dose of antibiotics should be used is controversial. ^[4] In other words, there is no consensus on the use of antibiotics as prophylaxis for preventing infections in orthognathic surgery. ^[5] Steroids are administered in post-operative pain, trismus, swelling, nausea and vomiting and reducing inflammatory reactions following orthognathic surgery. The Short term systemic corticosteroid therapy has been commonly used after oral and maxillofacial surgery, particularly orthognathic surgery. Corticosteroids are known to reduce inflammation, fluid transudation, and edema. ^[6,7] Perioperative systemic corticosteroids are widely applied in orthognathic surgery so as to prevent postoperative complications; nevertheless, the beneficial effects of this practice are questionable and concerns over its potential side effects are growing. Moreover, prescribing postoperative antibiotic regimes is considered a controversial issue. The present systematic review and meta-analysis were conducted to examine the effectiveness of antibiotics and corticosteroids in orthognathic surgery. ^[8-10]

Literature Review

Study selection

The electronically searched resources between 2010 and 2019 included a direct scientific article, PubMed, Wiley online library, Google Scholar, Up-to-date, and the keywords used comprised antibiotics, corticosteroids, Orthognathic surgery, Orthognathic. The articles more relevant to the subjects were selected.

Data selection and meta-analysis

Selected studies on the use of antibiotics and cautery are shown in Tables 1 and 2. Data extracted from studies for meta-analysis (antibiotic use) in Table 3 and (use) are shown in Table 4.

Results

Only four of the 11 papers included in the primary evaluation satisfied

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the eligibility criteria and were used in the final review in studies that used antibiotics in orthognathic surgery. The remaining 7 articles were included in the final review in studies using corticosteroids in orthognathic surgery. A total of 622 patients, aged at least 30.5 years,

were included in the 4 studies using antibiotics. The ratio of the number of females to males was 1.76. Table 2 present the demographic data of all the papers. As observed in Table 3, neither of the four studies revealed any statistically significant differences between different administered

Table 1: Title of selected studies.

Study	Title
Use antibiotics in orthognathic surgery	
Jürgen Zix, et al. [8]	The role of postoperative prophylactic antibiotics in the treatment of facial fractures: a randomized, double-blind, placebo-controlled pilot clinical study
Bouchard, et al. [9]	Infections after sagittal split osteotomy: a retrospective analysis of 336 patients
SK Tan, et al. [10]	Are postoperative intravenous antibiotics necessary after bimaxillary orthognathic surgery
CM Davis, et al. [11]	Prevalence of surgical site infections following orthognathic surgery
Use Corticosteroids in orthognathic surgery	
Widar, et al. [12]	The effects of steroids in preventing facial edema, pain, and neurosensory disturbances after bilateral sagittal split osteotomy
Gecaj-Gashi, et al. [13]	Intrathecal clonidine added to small-dose bupivacaine prolongs postoperative analgesia in patients undergoing transurethral surgery
Abukawa, et al. [14]	Intravenous Dexamethasone Administration Before Orthognathic Surgery Reduces the Postoperative Edema of the Masseter Muscle
Lin, et al. [15]	Higher Dose of Dexamethasone Does Not Further Reduce Facial Swelling After Orthognathic Surgery

Table 2: Patient numbers and demographic profiles of included studies use antibiotics in orthognathic surgery.

Study	No. of patients included	Male	Female	Ages, y (mean)
Jürgen Zix, et al. [8]	62	39	21	42years
Bouchard, et al. [9]	336	89	247	27years
SK Tan, et al. [10]	42	14	28	26 years
CM Davis, et al. [11]	182	82	100396	27

Table 3: Prophylactic antibiotic regimens and associated infection rates.

Study	Study groups	Preoperative Antibiotic	Postoperative Antibiotic	Infection rate (%)
Jürgen Zix, et al. [8]	Group 1 (5-day)	amoxicillin/clavulanic ½ g and amoxicillin/clavulanic acid 625mg orally 3 times a day for an additional 4 days.	amoxicillin/clavulanic ½ g and amoxicillin/clavulanic acid 625mg orally 3 times a day for an additional 4 days.	6.8%
	Group 2 (1-day)	amoxicillin/clavulanic ½ g and placebo orally 3 times a day for the same period	amoxicillin/clavulanic ½ g and placebo orally 3 times a day for the same period	3.2%
Bouchard, et al. [9]		Most patients received 2 g of intravenous cefazolin (or 90 mg of clindamycin when Allergic to penicillin) 30 minutes 80 mg of methylprednisolone 30 minutes	2 g (or 900 mg of clindamycin) every 3 hours until the end of surgery every 4 hours for a total of 4 doses	11.3%
SK Tan, et al. [10]	Group 1	Intravenous ampicillin 1 g and 500 mg every 6 h during the operation	Oral amoxicillin 500 mg three times daily and intravenous placebo. Injection four times daily in the first 2 days after orthognathic surgery. Participants intravenous ampicillin 1 g four times daily and oral lactose (placebo) three times daily for the first 2 days after the orthognathic surgery.	3.21
	Group 2	Intravenous ampicillin 1 g and 500 mg every 6 h during the operation	All participants received oral amoxicillin 500 mg three times daily for another 3 days	6.21
CM Davis, et al. [11]	Group 1	cefazolin 1 or 2 g, which was administered 30 minutes	cefazolin 1 or 2 g, which was administered 30 minutes followed by 3 postoperative doses every 8 hours	6.2
	Group 2	penicillin G received penicillin G 2 million U 30 minutes	penicillin G received penicillin G 2 million U 30 minutes, followed by 4 doses every 6 hours	14.3
	Group 3	clindamycin 600 mg was given 30 minutes	clindamycin 600 mg was given 30 minutes, followed by 3 postoperative doses every 8 hours	10.4

Table 4: Selected corticosteroid in orthognathic surgery.

Study	Number of participants		Drug regimen	Comparator	Side effects (Number)	Outcome measures
	Corticosteroid	Control				
Widar, et al. [12]	25	12	Betamethasone 4mg PO day before surgery; 8mg IV at induction; 4mg PO on POD 1 or 16mg IV at induction	No intervention	No	Facial edema; Pain and mechanical sensitivity
Gecaj-Gashi, et al. [13]	21	21	Dexamethasone 8mg IV 1 minute prior to induction	Other intervention (Metoclopramide)	NM	PONV
Abukawa, et al. [14]	16	8	Dexamethasone 8 and 16 mg IV and in control group 0 mg	intervention	No	The 16 mg dose dex for BSSOs was better
Lin, et al. [15]	31	25	In the control group, a single the dose of dexamethasone 5 mg/mL, 15 mg of dexamethasone (5 mg 3 vials) was intravenously infused before surgery	intervention	No	Effects of 5 and 15 mg of dexamethasone on reducing facial swelling after orthognathic surgery and on preventing PONV did not differ significantly.

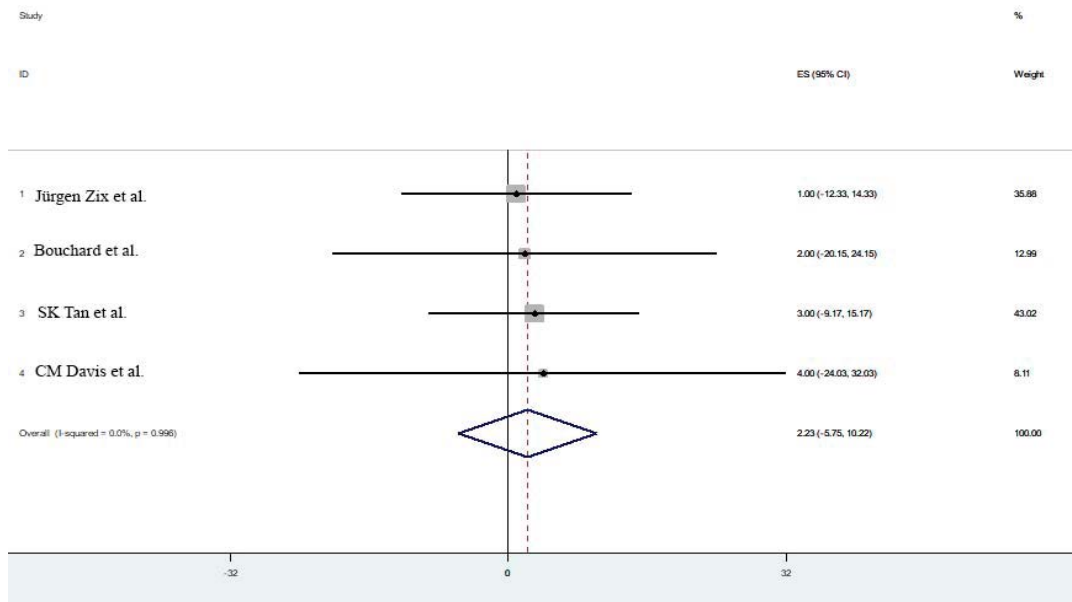


Figure 1: The infection rate in orthognathic surgery.

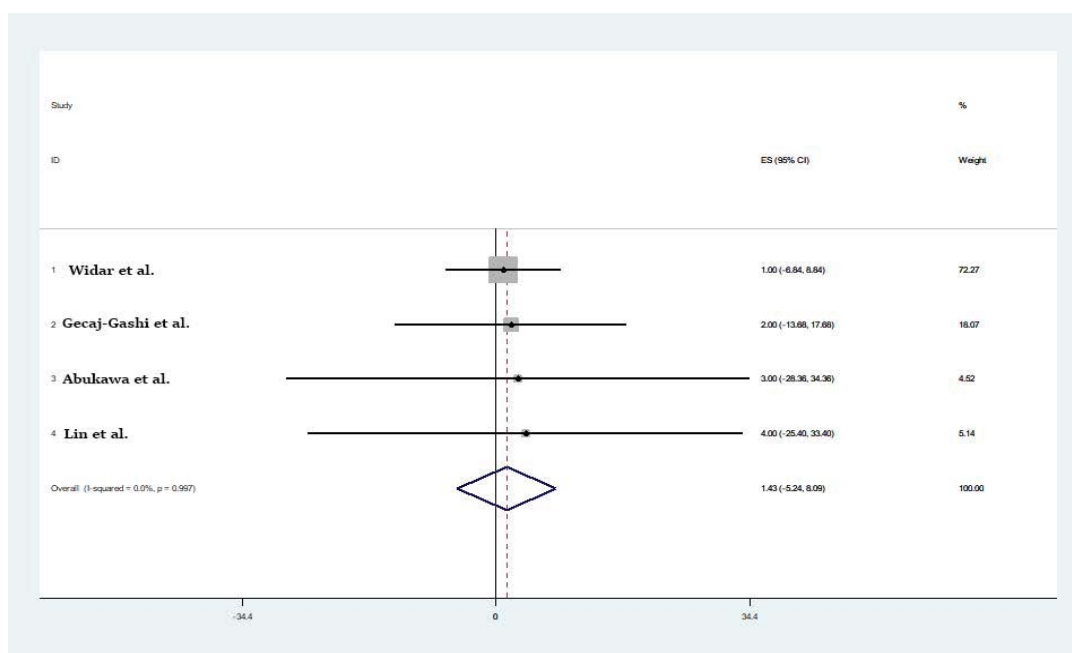


Figure 2: Dose of corticosteroids.

prophylactic antibiotic regimens. Figure 1 showed infection rate in orthognathic surgery and Figure 2 showed the dose of corticosteroids CM Davis et al. [11] The number of patients required to be treated to prevent infections in orthognathic surgery was 2.23, meaning that, compared to the controls, one in every 2.23 patients receiving antibiotic prophylaxis benefits from the treatment. In terms of wound infection rates, Jürgen Zix et al. [8] observed no significant differences between the groups, suggesting that the postoperative antibiotic prophylaxis for more than 24 h does not prevent postoperative infections. Bouchard et al. [9] found statistically significant relationships between age and infections (odds ratio:1.04; 95% CI, 1.01-1.07, P=0.02).

The post-operative infection rates were evaluated in both the study groups for six weeks. Nine (21.4%) patients were found to have developed infections, while no adverse drug events were identified. Group 1 (3/21) and group 2 (6/21) were found not to be significantly different (p=0.45) in terms of infection rate. Age, operative procedure duration, type of surgical procedures, blood loss, surgical procedure-associated events, and blood transfusion were all found not to be associated with infections SK Tan et al. [10] In orthognathic surgery, the prophylactic use of the first-generation cephalosporins, including cefazolin, appears more effective compared to penicillin and clindamycin in preventing SSIs.

At Widar et al. [12] study, Betamethasone did not reduce neurosensory disturbances over time. The intrathecal administration of clonidine combined with bupivacaine improves both the duration and quality of spinal anesthesia, and also provides longer duration of postoperative analgesia, without significant side effects Gecaj-Gashi et al. [13] at Abukawa et al. [14] result showed that a 50-mg dose of pre-emptive pregabalin lowered the postoperative opioid consumption in the first 24 hours following the double-jaw surgery. No significant differences were observed in the effects of five and fifteen mg of dexamethasone on facial swelling reduction, nausea, and vomiting following orthognathic surgery Lin et al. [15]

Discussion

A single-day course of postoperative antibiotics is as effective in preventing infective complications in displaced orbital fractures as it is a 5-day regimen. [8] Furthermore, Bouchard et al. [9] observed the associated infections. In case an antibiotic is prescribed, the patient can be considered infected, and this could have been overestimated.

The study by Tan et al. [10] included only healthy adults; the findings cannot be therefore generalized to immune compromised, systemically ill or younger patients. Concomitant procedures, including septorhinoplasty, bone grafting, and distraction osteogenesis were not evaluated. [16] Determining the effective hospitalization duration; to ensure the patients' compliance with the medication over a 5-day postoperative period, while none of them were discharged before 5 days of the operation.

CM Davis et al. [11] determined the effects of the patients' demographic information, including age and gender, medical comorbidities, smoking status, surgery duration, third molar extractions, bimaxillary surgery and the type of surgery on the prevalence of infection. The prevalence of SSIs was found to be correlated with none of the patients' demographic data and third molar extractions.

Conclusion

The findings obtained from the present systematic review suggested no significant differences between the effects of five and fifteen mg of dexamethasone on the facial reduction. Antibiotic regimens were also found to prevent infections in orthognathic surgery.

Conflict of Interest

The authors disclose that they have no conflicts of interest.

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