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Effect of preoperative prednisolone with or without amoxicillin-clavulanate on intraoperative bleeding during endoscopic sinus surgery: a double-blind randomized controlled trial

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Abstract:

Introduction and objective

Background: Functional endoscopic sinus surgery is the treatment of choice in patients who failed medical therapy. However, intraoperative haemorrhage is often an obstacle during surgery. *Aim/Objective:* The aim of the study was to explore whether adding amoxicillin-clavulanate to preoperative prednisolone is associated with differences in intraoperative bleeding and selected perioperative outcomes during endoscopic sinus surgery.

Material and methods

Study design: This is a double-blinded, randomized, clinical trial. *Methods:* Twenty-four patients undergoing ESS were randomized into two groups. Group A received prednisolone 20 mg once daily for 7 days, whereas Group B received prednisolone 20 mg once daily plus oral amoxicillin-clavulanate 625 mg twice daily for 7 days. Intraoperative bleeding was assessed independently by two blinded surgeons using the Boezaart bleeding scale. Total blood loss, operative duration, and postoperative pain score were assessed as secondary outcomes.

Results: Twelve patients were included in each group. Compared with predniso-

lone alone, the combination group had lower mean blood loss (162.92 ± 8.11 mL vs. 171.67 ± 13.71 mL; mean difference, −8.75 mL; 95% CI, −18.11 to 0.61), shorter operative duration (69.17 ± 11.65 min vs. 86.67 ± 15.72 min; mean difference, −17.50 min; 95% CI, −28.71 to −6.29), and lower postoperative pain scores (2.17 ± 0.58 vs. 2.92 ± 0.79; mean difference, −0.75; 95% CI, −1.33 to −0.17). Between--group differences in Boezaart bleeding scores were statistically significant for some assessor/time-point comparisons but not all.

Conclusion and Significance: In this small, exploratory trial, adding amoxicillin--clavulanate to preoperative prednisolone was associated with more favorable perioperative outcomes. The findings are preliminary and should be confirmed in larger trials.

INTRODUCTION

Sinusitis is a common condition worldwide characterised by infection and inflammation of the paranasal sinuses. It is an increasingly common cause for patients to visit doctors for treatment and has a significant impact on society [1, 2, 3]. Sinus cavities are the moist, hollow spaces in the bony structure of the skull. There are four pairs of sinuses in the skull, namely the frontal, maxillary, ethmoid and sphenoid sinuses. However, sinusitis often co-exists with rhinitis in most patients; hence, the current accepted terminology is rhinosinusitis [4]. Rhinosinusitis can be divided into two subtypes, acute and chronic, based on the duration of symptoms [4]. There are a number of factors that play a role in the development of rhinosinusitis, including both host and environmental factors [4]. The frequent clinical manifestations include nasal obstruction, rhinorrhoea, headache, reduced sense of smell, postnasal drip, facial pressure or pain, sore throat and cough [4]. The prevalence of chronic rhinosinusitis (CRS) in Europe, the United States of America and Brazil are between 5–15%. Meanwhile, in the Asian region, the prevalence reported in Korea, China and Singapore is 7%, 8% and 2.7%, respectively [1]. The estimated prevalence of rhinosinusitis in Malaysia is approximately 12.80% [1].

Although the management of CRS remains controversial, endoscopic sinus surgery (ESS) is considered an appropriate surgical treatment for CRS refractory to medical therapy [4, 5]. However, given the vascularity of the paranasal sinuses, intraoperative haemorrhage can greatly affect surgical visibility and the overall conduct of surgery [6]. Surgeons use a multitude of techniques to diminish intraoperative haemorrhage, including local anaesthetic and adrenaline infiltration and other methods of haemostasis [6]. However, there has not been a consensus on the ideal strategy to decrease intraoperative bleeding during sinus surgery. Bleeding that obscures the surgical field can make endoscopic surgery technically challenging and may increase operative time and the risk of complications [6, 7].

Corticosteroids are frequently used in otorhinolaryngological conditions because of their anti-inflammatory properties. Systemic corticosteroids have been investigated as perioperative treatment in patients undergoing ESS and may reduce mucosal inflammation, improve the surgical field and facilitate surgery [8, 9, 10]. Several studies have reported beneficial effects of preoperative systemic corticosteroids on intraoperative bleeding and surgical field quality in patients with nasal polyposis [3, 8, 10].

The nasal cavity is frequently colonised by bacteria, although the clinical significance of bacterial colonisation in chronic rhinosinusitis varies. Antibiotics have been used in the management of selected patients with chronic rhinosinusitis because of their antimicrobial and, in some circumstances, anti-inflammatory effects [4-11]. However, the role of routine systemic antibiotic prophylaxis in sinonasal surgery remains uncertain, and previous literature has questioned its routine use in uncomplicated nasal surgery [12]. Therefore, whether adding an antibiotic to preoperative corticosteroid therapy provides additional benefit in reducing intraoperative bleeding during ESS remains unclear.

The purpose of this study is to evaluate the effects of corticosteroid therapy alone compared with corticosteroid combined with antibiotic therapy in reducing intraoperative bleeding and improving the surgical field during endoscopic sinus surgery in patients with chronic rhinosinusitis with nasal polyposis.

MATERIALS AND METHODOLOGY

This prospective, double-blind, randomized clinical trial was conducted at Universiti Kebangsaan Malaysia Medical Centre. The study was approved by the UKM Ethics Committee (approval code UKM PPI/111/8/JEP-2018-163). All participants provided written informed consent before enrolment.

Patients diagnosed with chronic rhinosinusitis (CRS), with or without nasal polyps, who underwent endoscopic sinus surgery (ESS) were eligible for inclusion in the study, in accordance with the European Position Paper on Rhinosinusitis and Nasal Polyps 2020 (EPOS 2020). Patients with sinonasal tumours, granulomatous disease, con-

nective tissue diseases, or known allergies to the study antibiotics were excluded. All randomized participants who completed the study protocol were analysed according to the per-protocol approach. No dropouts, protocol violations, or missing data were reported among the recruited participants.

A total of 24 patients were included in the study and allocated to two treatment groups, with 12 patients in each group. Patients were recruited using convenience sampling, and group allocation was performed preoperatively. Group A received oral prednisolone at a dose of 20 mg daily for 7 days, whereas Group B received oral prednisolone at the same dose combined with oral amoxicillin/clavulanic acid (625 mg twice daily) for 7 days. All patients underwent endoscopic sinus surgery following the 7-day treatment period.

Throughout surgery, mean arterial pressure (MAP) was maintained between 60 and 80 mmHg. Before surgery, the nasal cavities were packed with 1-inch ribbon gauze soaked in modified Moffett solution for 15 minutes. Digital video recordings of the surgical procedure were obtained for 30 minutes from the first incision. The total volume of blood collected in the suction canister was recorded as an objective quantitative measure of intraoperative blood loss, and the duration of surgery was documented. Postoperative pain was assessed using a visual analogue scale (VAS) 24 hours after surgery, before patient discharge.

Two surgeons independently reviewed the intraoperative video recordings in random order to assess intraoperative bleeding. Both assessors were blinded to treatment-group allocation, and patient identifiers and information regarding preoperative medication assignment were removed before review to minimize assessment bias. Intraoperative bleeding was graded over the 30-minute observation period using the Boezaart grading system (Figure 1), which classifies bleeding on a six-point scale from Grade 0 to Grade 5:

Grade 0: No bleeding, equivalent to a cadaveric condition. Grade 1: Slight bleeding, with no suctioning required. Grade 2: Slight bleeding, requiring occasional suctioning. Grade 3: Slight bleeding, requiring frequent suctioning, with bleeding threatening the surgical field a few seconds after suction is removed. Grade 4: Moderate bleeding, requiring frequent suctioning, with bleeding threatening the surgical field immediately after suction is removed. Grade 5: Severe bleeding, requiring continuous suctioning, with bleeding occurring faster than it can be removed, severely compromising the surgical field and usually preventing surgery from proceeding.

The data were analysed using SPSS 23. The demographic variables (Table 1) were analysed with one-way ANOVA and chi-square test to assess the significant association of each group. The significance of operative variables (Table 2) between groups were assessed with Mann Whitney U test to get a p value of < 0.05. Intraclass correlation coefficient were used to analyse between the two surgeons. Lastly, Spearman correlation test was used to assess Boezaart bleeding scale with post-operative variables.

Table 1. Blood loss, duration of surgery and pain score among both groups

	Group A		Group B		P-value
	Mean	SD	Mean	SD	
Blood Loss	171.67	13.71	162.92	8.11	0.035
Duration	86.67	15.72	69.17	11.65	0.011
Pain score	2.92	0.79	2.17	0.58	0.021

Table 2. Association of intraoperative bleeding with total blood loss, duration of surgery and pain score

		Blood Loss	Duration	Pain score	Boezaart 1st surgeon
Duration	Correlation Coefficient	.527**			
	Sig. (2-tailed)	.008			
Pain score	Correlation Coefficient	.393	-.082		
	Sig. (2-tailed)	.058	.703		
Boezaart 1st surgeon	Correlation Coefficient	.742**	.455*	.459*	
	Sig. (2-tailed)	.000	.026	.024	
Boezaart 2nd surgeon	Correlation Coefficient	.664**	.409*	.315	.817**
	Sig. (2-tailed)	.000	.047	.133	.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 1. Boezaart grading for categorizing the quality of surgical field.

Grade	Description
0	No bleeding (cadaveric conditions)
1	Slight bleeding: no suctioning required
2	Slight bleeding: occasional suctioning required
3	Slight bleeding: frequent suctioning required, bleeding threatens surgical field a few seconds after suction is removed
4	Moderate bleeding: frequent suctioning required and bleeding threatens surgical field directly after suction is removed
5	Severe bleeding: constant suctioning required; bleeding appears faster than can be removed by suction; surgical field severely threatened and surgery usually not possible

Figure 1: Intraoperative bleeding scoring by Boezaart system. (Athanasiadis 2007, Jahanshahi 2014)

RESULTS

A total of 24 patients were included in the study, with 12 patients in each treatment group. The mean age was 48.50 ± 12.75 years in Group A and 43.50 ± 7.00 years in Group B, with no statistically significant difference between groups (Mann–Whitney U test, p = 0.590). The mean body weight was 65.25 ± 16.50 kg in Group A and 68.25 ± 20.75 kg in Group B (p = 0.630). Group A comprised equal proportions of male and female patients (50.0% each), whereas Group B included 66.7% females and 33.3% males (p = 0.408). The reported prevalence of nasal polyps was 33.3% in each group (p = 1.000). Asthma was present in 8.3% of patients in Group A and 16.7% in Group B (p = 0.537). Hypertension was more frequent in Group B than in Group A (50.0% versus 16.7%; p = 0.083), whereas diabetes mellitus was reported in 16.7% and 8.3% of patients, respectively (p = 0.537). Smoking was reported in 41.7% of Group A and 25.0% of Group B (p = 0.386). Although no statistically significant differences were detected in these baseline characteristics, the small sample size limits the ability to establish that the groups were equivalent, and the observed differences in sex distribution and hypertension prevalence should be considered when interpreting the findings.

Intraoperative bleeding scores and inter-rater reliability

Boezaart scores increased between the 15- and 30-minute assessments for both raters. For the first surgeon, scores increased in 8 patients, remained unchanged in 16 patients, and decreased in none; the within-patient change was statistically significant (Wilcoxon signed-rank test, $p = 0.005$). For the second surgeon, scores increased in 10 patients, remained unchanged in 14 patients, and decreased in none ($p = 0.002$). These findings suggest that bleeding scores tended to increase over the observation period, although the magnitude of these changes should be interpreted in the context of the limited sample size.

Inter-rater agreement at 15 minutes was substantial, with a weighted Cohen's kappa of 0.746 (95% confidence interval [CI]: 0.515–0.977; $p < 0.001$). The intraclass correlation coefficient (ICC) also indicated good agreement between raters at 15 minutes, with a single-measure ICC of 0.804 (95% CI: 0.603–0.910; $p < 0.001$) and an average-measure ICC of 0.892 (95% CI: 0.752–0.953; $p < 0.001$). At 30 minutes, the single-measure ICC was 0.784 (95% CI: 0.560–0.901; $p < 0.001$), and the average-measure ICC was 0.879 (95% CI: 0.718–0.948; $p < 0.001$). Overall, these estimates suggest consistent ratings between the two surgeons, although the confidence intervals indicate uncertainty in the precision of the reliability estimates.

Between-group comparison of Boezaart scores

Between-group comparisons using the Mann–Whitney U test identified statistically significant differences in Boezaart scores assessed by the first surgeon at 15 minutes ($p = 0.008$) and 30 minutes ($p = 0.007$), and by the second surgeon at 15 minutes ($p = 0.021$). The difference between groups in the second surgeon's 30-minute assessment did not reach statistical significance ($p = 0.066$). These results provide preliminary evidence of between-group differences in intraoperative bleeding scores at some assessment points. However, the findings should be interpreted cautiously because of the small sample size and the uncertainty associated with multiple comparisons..

Secondary surgical outcomes

Group A had higher mean values for all three secondary outcomes than Group B. Mean blood loss was 171.67 ± 13.71 in Group A and 162.92 ± 8.11 in Group B, with a statistically significant between-group difference (Mann–Whitney U test, $p = 0.035$). Mean operative duration was 86.67 ± 15.72 minutes in Group A and 69.17 ± 11.65 minutes in Group B ($p = 0.011$). Similarly, mean postoperative pain scores were 2.92 ± 0.79 in Group A and 2.17 ± 0.58 in Group B ($p = 0.021$). Thus, Group B showed lower observed blood loss, shorter operative duration, and lower postoperative pain scores than Group A. These differences are exploratory and should not be interpreted as definitive evidence of superiority.

Post-hoc power analysis

A post-hoc power analysis was performed using G*Power version 3.1.9.7, with a two-tailed significance level of 0.05 and 12 patients per group. For the Boezaart scores assessed by the first surgeon, the observed standardized effect sizes were Cohen's $d = 1.28$ at 15 minutes and $d = 1.27$ at 30 minutes, with estimated achieved powers of 85.2% and 84.7%, respectively. For the second surgeon, the corresponding effect sizes were $d = 1.08$ at 15 minutes and $d = 0.78$ at 30 minutes, with estimated powers of 71.5% and 44.4%, respectively. For the secondary outcomes, the reported effect sizes and estimated achieved powers were $d = 0.78$ and 44.4% for blood loss, $d = 1.26$ and 84.1% for operative duration, and $d = 1.08$ and 71.7% for postoperative pain scores.

These post-hoc power estimates varied across outcomes and should be interpreted cautiously. They do not establish that the study was adequately powered, nor do they determine the reliability of the observed treatment effects. Given the small sample size, emphasis should be placed on the estimated magnitude and precision of between-group differences rather than on achieved power alone.

Correlation analysis

Spearman's rank correlation analysis demonstrated a positive association between blood loss and operative duration (ρ = 0.527, p = 0.008), indicating that greater blood loss tended to be associated with longer procedures. Postoperative pain scores were not significantly correlated with blood loss (ρ = 0.393, p = 0.058) or operative duration (ρ = −0.082, p = 0.703).

The 30-minute Boezaart score assessed by the first surgeon was positively correlated with blood loss (ρ = 0.742, p < 0.001), operative duration (ρ = 0.455, p = 0.026), and postoperative pain scores (ρ = 0.459, p = 0.024). For the second surgeon's 30-minute Boezaart score, positive correlations were observed with blood loss (ρ = 0.664, p < 0.001) and operative duration (ρ = 0.409, p = 0.047), whereas the correlation with postoperative pain scores was not statistically significant (ρ = 0.315, p = 0.133). These correlations suggest that higher intraoperative bleeding scores tended to accompany greater blood loss and longer operative duration. However, the results do not establish causation, and the correlation estimates should be interpreted cautiously given the small sample size and the number of associations examined (Table 2).

DISCUSSION

CRS is a chronic inflammatory disease that can substantially impair quality of life and daily functioning. CRSwNP represents an important inflammatory phenotype of CRS and is characterized by persistent sinonasal inflammation and polyp formation [12, 13]. Although medical treatment with intranasal corticosteroids, saline irrigation and, when appropriate, short courses of systemic corticosteroids is the mainstay of management, some patients with severe or uncontrolled CRSwNP remain symptomatic despite appropriate medical therapy and may subsequently require endoscopic sinus surgery (ESS) [12, 13].

ESS is an established treatment option for patients with CRSwNP who remain uncontrolled despite appropriate medical management [12]. The principal objectives of ESS are to remove diseased tissue and nasal polyps, restore sinus ventilation and drainage, and facilitate postoperative delivery of topical therapies while minimizing injury to healthy sinonasal mucosa [12]. However, intraoperative bleeding remains an important technical challenge during ESS. Excessive bleeding can obscure the surgical field, impair identification of anatomical landmarks and potentially increase operative difficulty and duration [14, 15]. Consequently, achieving adequate haemostasis and maintaining a clear surgical field are important components of safe and effective ESS.

Systemic corticosteroids have potent anti-inflammatory and anti-oedematous effects and may reduce mucosal congestion and inflammatory oedema before ESS [12, 14, 16]. Reduction of mucosal oedema can improve the available surgical space and facilitate endoscopic identification of anatomical landmarks. In patients with CRSwNP, systemic corticosteroids can also reduce nasal polyp size and inflammatory activity, potentially improving intraoperative surgical-field conditions [12, 14].

Evidence from previous studies supports the use of preoperative systemic corticosteroids in selected patients with CRSwNP undergoing ESS. A recent systematic review by Assiri et al. found that preoperative corticosteroid administration was associated with improved surgical-field conditions and reductions in intraoperative blood loss in several studies, although substantial heterogeneity existed regarding corticosteroid type, dose and duration [14]. Chrysouli et al. similarly concluded that perioperative corticosteroid treatment may reduce blood loss and operative duration and improve surgical-field quality during sinonasal endoscopic surgery for CRSwNP [15]. These findings provide a rationale for the use of preoperative corticosteroids in patients with extensive inflammatory disease or nasal polyposis.

The optimal corticosteroid regimen, however, remains uncertain. Kominsky et al. conducted a randomized controlled trial comparing different preoperative corticosteroid dosing regimens in patients with CRSwNP undergoing ESS. Although the medium-dose group demonstrated numerically better surgical visibility, there were no stati-

stically significant differences between dosing groups in surgical-field visibility, blood loss or operative time [16]. These findings suggest that the benefit of preoperative corticosteroids may not necessarily increase with higher doses and that the optimal balance between surgical benefit and corticosteroid-related adverse effects remains to be established.

In the present study, patients receiving prednisolone together with amoxicillin-clavulanate demonstrated significantly better intraoperative bleeding scores than those receiving corticosteroids alone. The combination group also had significantly lower measured blood loss, shorter operative duration and lower postoperative pain scores. These findings suggest that the addition of an antibiotic to preoperative corticosteroid therapy may provide an additional benefit in selected patients with CRSwNP.

The potential role of antibiotics in CRS is complex. Although microorganisms may be detected in the sinonasal environment, CRS is primarily a heterogeneous inflammatory disease rather than simply a persistent bacterial infection [12, 17]. Antibiotics may be appropriate in selected clinical circumstances, but evidence for routine systemic antibiotic treatment in CRS remains limited. In particular, potential immunomodulatory effects have been investigated mainly with macrolide antibiotics and should not automatically be extrapolated to amoxicillin-clavulanate [17]. Therefore, the mechanisms underlying the apparent benefit of amoxicillin-clavulanate in the present study remain uncertain.

The available evidence also does not support routine antibiotic prophylaxis for all patients undergoing ESS. In a randomized, double-blind, placebo-controlled trial, Lehmann et al. found that postoperative antibiotic prophylaxis did not provide clinically important advantages over placebo in postoperative sinonasal quality of life, endoscopic outcomes or infection rates, while diarrhoea was significantly more common among patients receiving antibiotics [17]. These findings support a selective rather than routine approach to antibiotic use. Therefore, the improvement observed in the combination group in the present study should not be interpreted as evidence that routine perioperative antibiotic administration is required for all patients undergoing ESS.

The findings of the present study are nevertheless of interest because relatively limited literature has specifically examined the combination of systemic corticosteroids and antibiotics before sinonasal endoscopic surgery in patients with CRSwNP. Chrysouli et al. specifically reviewed the effects of systemic corticosteroid and antibiotic premedication on inflammation and intraoperative bleeding in CRSwNP and concluded that perioperative corticosteroids may improve the surgical field and reduce blood loss and operative time [15]. However, the authors also highlighted uncertainty regarding the optimal corticosteroid regimen and the need for further research. The present study contributes additional clinical data by comparing a corticosteroid-antibiotic regimen directly with corticosteroid therapy alone.

The shorter operative duration observed in the combination group is clinically relevant. A clearer surgical field and reduced bleeding may allow more efficient identification of anatomical structures and facilitate completion of the planned surgical steps. The systematic review by Assiri et al. and the review by Chrysouli et al. both identified operative-field quality and operative duration as relevant outcomes associated with perioperative corticosteroid use [14, 15]. Nevertheless, because operative duration can be influenced by several factors, including disease extent, surgical technique, surgeon experience and anatomical variation, the shorter operative time observed in the present study cannot be attributed exclusively to the reduction in bleeding.

The relationship between intraoperative bleeding and operative duration observed in the present study is consistent with the established importance of surgical-field visualization during ESS. In our study, Boezaart scores demonstrated significant correlations with measured blood loss and, for some assessments, operative duration and postoperative pain. The high inter-rater agreement observed between the two surgeons also supports the reproducibility of the bleeding assessment within this study population. The Boezaart grading system has been widely used to assess intraoperative bleeding during ESS, although previous methodological work has demonstrated that standardized assessment methods can improve inter- and intra-rater reliability [18]. Accordingly,

the use of a standardized bleeding score in the present study strengthens the objectivity of the intraoperative assessment.

Postoperative pain is another clinically relevant outcome following ESS. Perioperative factors that influence surgical trauma, inflammation and haemostasis may potentially affect postoperative discomfort. In the present study, patients receiving the corticosteroid-antibiotic combination reported lower postoperative pain scores than those receiving corticosteroids alone. The association between bleeding-related variables and postoperative pain may suggest that improved intraoperative conditions could contribute to a more favourable postoperative course. However, this interpretation should remain cautious because postoperative pain is multifactorial and can also be influenced by the extent of surgery, anaesthetic technique, analgesic administration and individual patient factors. Therefore, the present study demonstrates an association rather than a causal relationship between improved haemostasis and reduced postoperative pain.

The present study has several limitations. First, the sample size was small, with only 12 patients in each treatment group. Consequently, the study may have been underpowered to detect differences in some secondary outcomes, as reflected by the post-hoc power calculations. The relatively small sample also limits the generalizability of the findings. Second, no microbiological assessment was performed. Therefore, it was not possible to determine whether the observed benefit associated with amoxicillin-clavulanate was related to bacterial colonisation, an antimicrobial effect, an indirect effect on inflammatory activity, or another mechanism.

Third, the study design did not include an antibiotic-only group or a placebo/no-treatment group. Consequently, it was not possible to determine the independent effect of the antibiotic or to establish whether corticosteroids and antibiotics have an additive or synergistic effect. Fourth, the corticosteroid dose and treatment duration used in the present study may not represent the optimal regimen for all patients with CRSwNP. Recent randomized evidence indicates that there remains no clear consensus regarding the optimal preoperative corticosteroid dose or duration [16].

Finally, although the study demonstrated significant differences in bleeding, blood loss, operative duration and postoperative pain, these outcomes should be interpreted in the context of multiple clinical and surgical variables that may influence perioperative outcomes. Larger studies with standardized surgical techniques, objective blood-loss measurements and validated patient-reported outcomes would help determine whether the observed differences remain clinically meaningful in a larger population.

Further adequately powered randomized controlled trials involving corticosteroid-only, antibiotic-only, combination and placebo/control groups are warranted to determine the independent and combined effects of these interventions. Future studies should also incorporate microbiological assessment and inflammatory biomarkers to investigate whether particular inflammatory or microbial phenotypes are associated with greater benefit from antibiotic-containing preoperative regimens. Such studies may help identify selected patients who could benefit from combination treatment while avoiding unnecessary antibiotic exposure in patients unlikely to derive benefit.

CONCLUSION

In this small exploratory trial, participants who received prednisolone plus amoxicillin–clavulanate had more favourable observed results for several intraoperative and postoperative outcomes than participants who received prednisolone alone. Because small sample size was included in each group, the estimates are uncertain and do not support definitive conclusions about efficacy. Larger, adequately powered randomized trials with clearly reported allocation procedures and a clearly defined study population are needed to confirm these findings.

References:

1. Min HK, Lee S, Kim S, Son Y, Park J, Kim HJ, et al. Global incidence and prevalence of chronic rhinosinusitis: a systematic review. Clin Exp Allergy. 2025;55(1):52-66. doi:10.1111/cea.14592.
2. Peters AT, Rolland C, Lavoie L, Fung S, Basoff D, Chitnis A. The burden of chronic rhinosinusitis without nasal polyps: a systematic review of epidemiological, clinical, humanistic, and economic evidence. Adv Ther. 2026;43(7):2871-2896. doi:10.1007/s12325-026-03575-7.
3. Bhattacharyya N. Contemporary incremental healthcare costs for chronic rhinosinusitis in the United States. Laryngoscope. 2021;131(10):2169-2172. doi:10.1002/lary.29454.
4. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European position paper on rhinosinusitis and nasal polyps 2020. Rhinology. 2020;58(Suppl S29):1-464. doi:10.4193/Rhin20.600.
5. Shim SR, Shin J, Hwang CM, Kim YK, Park JB, Kim J. Reduction of bleeding from pterygopalatal injection: a systematic review and meta-analysis. JAMA Otolaryngol Head Neck Surg. 2025;151(4):389-395. doi:10.1001/jamaoto.2024.5047.
6. Albu S, Baciut M. Failures in endoscopic surgery of the maxillary sinus. Otolaryngol Head Neck Surg. 2010;142(2):196-201. doi:10.1016/j.otohns.2009.10.038.
7. Wright ED, Agrawal S. Impact of perioperative systemic steroids on surgical outcomes in patients with chronic rhinosinusitis with polyposis: evaluation with the novel Perioperative Sinus Endoscopy (POSE) scoring system. Laryngoscope. 2007;117(11 Pt 2 Suppl 115):1-28. doi:10.1097/MLG.0b013e31814842f8.
8. Kominsky E, Liu KY, Ninan S, Arrighi-Allisan A, Filimonov A, Kidwai S, et al. Seeking an optimal dose of preoperative corticosteroids in chronic rhinosinusitis with nasal polyposis: a randomized controlled trial. Am J Otolaryngol. 2022;43(4):103476. doi:10.1016/j.amjoto.2022.103476.
9. Ecevit MC, Erdag TK, Dogan E, Sutay S. Effect of steroids for nasal polyposis surgery: a placebo-controlled, randomized, double-blind study. Laryngoscope. 2015;125(9):2041-2045. doi:10.1002/lary.25352.
10. Van Zele T, Gevaert P, Holtappels G, Beule A, Wormald PJ, Mayr S, et al. Oral steroids and doxycycline: two different approaches to treat nasal polyps. J Allergy Clin Immunol. 2010;125(5):1069-1076.e4. doi:10.1016/j.jaci.2010.02.020.
11. Saleh AM, Torres KM, Murad MH, Erwin PJ, Driscoll CLW. Prophylactic perioperative antibiotic use in endoscopic sinus surgery: a systematic review and meta-analysis. Otolaryngol Head Neck Surg. 2012;146(4):533-538. doi:10.1177/0194599811434117.
12. Hellings PW, Alobid I, Anselmo-Lima WT, Bernal-Sprekelsen M, Bjermer L, Caulley L, et al. EUFOREA/EPOS2020 statement on the clinical considerations for chronic rhinosinusitis with nasal polyps care. Allergy. 2024;79(5):1123-1133. doi:10.1111/all.15982.
13. Rank MA, Chu DK, Bognanni A, Oykhman P, Bernstein JA, Ellis AK, et al. The Joint Task Force on Practice Parameters GRADE guidelines for the medical management of chronic rhinosinusitis with nasal polyposis. J Allergy Clin Immunol. 2023;151(2):386-398. doi:10.1016/j.jaci.2022.10.026.
14. Assiri K, Alroqi A, Alromaih S, Alzarei A. Impact of preoperative steroids administration on endoscopic sinus surgery: systematic review of literature, and a survey in Saudi Arabia. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 3):4612-4622. doi:10.1007/s12070-021-02888-z.
15. Chrysouli K, Kyrodimos E, Papanikolaou V. The effect of the premedication with systemic corticosteroids and antibiotics on inflammation and intraoperative bleeding during sinonasal endoscopic surgery for chronic rhinosinusitis with nasal polyps (CRSwNP). J Craniofac Surg. 2022;33(4):e405-e408.

doi:10.1097/SCS.0000000000008285.

16. Head K, Chong LY, Piromchai P, Hopkins C, Philpott C, Schilder AGM, et al. Systemic and topical antibiotics for chronic rhinosinusitis. Cochrane Database Syst Rev. 2016;(4):CD011994. doi:10.1002/14651858.CD011994.pub2.

17. Lehmann AE, Raquib AR, Siddiqi SH, Meier J, Durand ML, Gray ST, et al. Prophylactic antibiotics after endoscopic sinus surgery for chronic rhinosinusitis: a randomized, double-blind, placebo-controlled noninferiority clinical trial. Int Forum Allergy Rhinol. 2021;11(7):1047-1055. doi:10.1002/alr.22756.

18. Athanasiadis T, Beule A, Embate J, Steinmeier E, Field J, Wormald PJ. Standardized video-endoscopy and surgical field grading scale for endoscopic sinus surgery: a multi-centre study. Laryngoscope. 2008;118(2):314-319. doi:10.1097/MLG.0b013e318157f764.