

Original Research Article

Comparative study on the effects of pre-operative intranasal steroid spray versus oral steroid on intraoperative bleed in FESS for nasal polyposis

Jagannath B., Nikitha Pillai*, Bharath Kumar K. L.

Department of ENT, KIMS Hospital, RGUHS, Bangalore, Karnataka, India

Received: 26 January 2021

Revised: 22 March 2021

Accepted: 06 April 2021

*Correspondence:

Dr. Nikitha Pillai,

E-mail: pillai_nikitha@hotmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Nasal polyps are associated with chronic inflammation of the nasal cavity and sinus mucosa. Steroids are the main stay of medical treatment. FESS is indicated when medical treatment fails. Bleeding during surgery can impair the surgical field during operation and increase the time duration and risks of complications. Pre-operative corticosteroids help reduce bleeding during surgery. The objectives of the study was to study and compare the effects of pre operative intra nasal steroid spray and oral steroid on intra-operative bleed in FESS for nasal polyposis.

Methods: 60 patients diagnosed with nasal polyposis were sequentially divided into 2 groups. Group A received intranasal steroid spray and Group B received oral steroid each for 7 days. Patients of both groups underwent FESS under general anaesthesia. Bleeding volume and quality of surgical field were assessed during the procedure to evaluate the effect of pre operative steroids in bleeding in FESS.

Results: Majority of our study patients of both the groups had moderate bleed. 33.3% of Group B patients showed the best outcome of surgery with just slight bleeding while 33.3% patients of Group B had moderate to severe bleed. Majority of our study patients (53.3%) had a blood loss of about 50-100 ml, of which 66.7% patients belonged to Group B.

Conclusions: Preoperative steroids are truly beneficial. Oral steroids has been found to be relatively better than intra nasal steroid spray in improving symptoms, reducing intra operative bleeding, and in providing better quality of surgical field.

Keywords: Nasal polyps, Steroids, Fluticasone, Prednisolone, FESS

INTRODUCTION

Sinonasal polyposis is an end stage, local manifestation of chronic inflammatory disease of the mucous membrane of the sinonasal tract, presenting as soft tissue masses, usually multiple, within the nose and paranasal sinuses of one or both the sides. It is composed of edematous, hyperplastic mucoperiosteum heaped up into a polypoid shape. The few mucus secreting glands and disordered vascular bed leads to accumulation of fluid and electrolytes contributing to the growth of the polyp.

The prevalence of nasal polyposis is about 1-4%.¹ It increases with age, reaching a peak in those aged 50 years and above. The male to female ratio is about 2:1. It presents a real challenge to the treating otolaryngologist because of its severity, chronicity, aggressive nature and its propensity to recur despite appropriate therapy.

Nasal polyposis occurs with a high frequency in groups of patients having specific inflammatory airway diseases. In its broadest sense, the condition is a distinct Chronic rhinosinusitis with polyps (CRSwNP), chronic

rhinosinusitis with polyps (CRSwNP). Unknown aetiology and inconclusive pathogenesis of nasal polyposis suggests a range from genetic, anatomic, allergic, inflammatory, and neurovascular factors and speculates about the nature of a possible 'localization factor'.² Associations may be seen with allergic or non allergic atopic rhinitis, asthma, infection, cystic fibrosis, aspirin intolerance and Kartagener's syndrome.³⁻⁵

Nasal polyposis can interfere with the quality of life of the patient. Patients present with profuse watery rhinorrhea for some years. Nasal blockage gradually develops and becomes persistent. Secretions are removed by noisy sniffing as 'postnasal drip'. Mucosa of paranasal sinuses which has many goblet cells and few seromucous glands, contributes to the viscosity of the discharge and can cause a feeling of congestion. Obliteration of sinus ostia may predispose to infections and cause nasal obstruction, occasional headache and a feeling of pressure over the sinuses. Impaired airflow in the upper part of the nose causes reduced or abolished sense of smell, and with that, taste, masking the pleasure of eating and drinking.

The disease can vary in severity from a single episode of nasal blockage, relieved by a short course of treatment, to a life-long disease, requiring continuous and combined treatment. Effective treatment may improve and help stabilize lower airway disease. Removal of the polyps and diseased mucosa to restore aeration of the mucosa and sinuses is enabled by a functional endoscopic sinus surgery (FESS) when medical treatment has failed or is contraindicated, taking into consideration the extent of disease, gravity of symptoms and patient and surgeon preferences.

The aims of medical treatment of SNP are to reduce polyp size, relieve nasal symptoms, restore nasal breathing and sense of smell, and prevent recurrence. Medical treatment consists of intranasal and systemic corticosteroids individually or in combination along with nasal decongestives and antibiotics based on sinus culture. Leukotriene antagonists may have an additional effect in selected patients. Dual medical therapy of intranasal and systemic steroids has proved to be successful in around 85% patients over a follow up period of 3 years.⁶

In more severe cases with persistent symptoms, surgery is added to medical treatment in order to reduce the amount of inflammatory tissue, open up the nasal airway and improve ventilation of the paranasal sinuses. In some mild cases, presenting for the first time with small polyps, polypectomy can have a long lasting effect while other severe cases require a functional endoscopic sinus surgery.

Our study involves a comparison between the effects of intranasal steroid spray, fluticasone and systemic oral steroid, prednisolone, in functional endoscopic sinus surgery.

Objectives

To study and compare the effects of intranasal steroid spray and oral steroid in decreasing intra operative bleed and improving quality of surgical field during FESS for nasal polyposis.

METHODS

This is a comparative prospective interventional study, conducted in the Department of ENT in Kempegowda Institute of Medical Sciences, Bangalore, from June 2016 to December 2017, involving 60 patients of both sexes, between the ages of 18 and 60 years. Purposive sampling was the sampling technique used for the study.

Patients included in the study were those who gave an informed written consent among those who attended the outpatient with symptoms and signs related to unilateral or bilateral nasal polyposis and not having used any form of steroids for the previous 3 months.

Patients having diabetes mellitus, hypertension, peptic ulcer, bronchial asthma, cystic fibrosis, cushings syndrome, obesity and other complications of steroid usage and those with serious unstable concurrent diseases were avoided.

Others excluded from the study were patients on medications like cyclosporine that affects nasal mucosa, those having undergone recent nasal surgery in the previous 6 weeks, those with recurrent nasal polyposis post surgery, pregnant women and non compliant patients.

Patients, meeting the inclusion criteria were sequentially randomized into two groups after detailed history taking, clinical examination including that of ENT and adequate blood and radiological investigations (CT scan).

Group A received intranasal steroid spray (Fluticasone, 400 micrograms/day) and Group B received oral steroid (Prednisolone 1 mg/Kg/day) each for 7 days. The patients were given a symptom diary to record symptoms pre and post treatment.

Patients of both groups underwent FESS under general anaesthesia with mean arterial blood pressure of 70-80 mmHg. Amount of blood loss was assessed based on the volume in suction jar (Total volume-Irrigation volume) and quality of surgical field was recorded in 0-10 score at the end of the procedure based on the intensity of bleeding and difficulty in performing the procedure and based on the number of stops taken to suction and pack the field.

Detailed statistical analysis was done using Chi square and student t tests. P value less than 0.05 was taken to be statistically significant. The data was analyzed using Statistical package for social sciences (SPSS) package.

RESULTS

Age distribution of patients

The most common age of presentation among our study patients belonged to the age group of 31-40 years followed by 21-30 years.

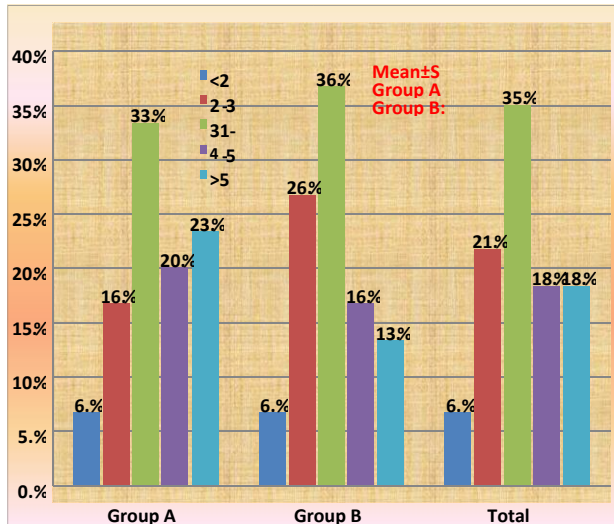


Figure 1: Age distribution among study groups.

Gender distribution of patients

A male predominance was seen among our patients of nasal polyposis. Among 50 patients, 35 were males while 25 were females.

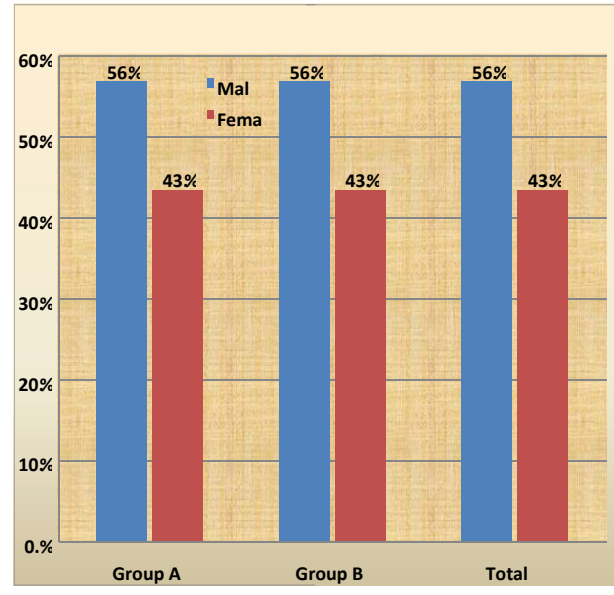


Figure 2: Gender distribution among study groups.

Table 1: Symptoms in two groups studied.

Symptoms	Group A (n=30)		Group B (n=30)		Total (n=60)		P value
	N	%	N	%	N	%	
Nasal	30	100.0%	30	100.0%	60	100.0%	1.000
Ocular	20	66.7%	15	50.0%	35	58.3%	0.190
Throat	21	70.0%	16	53.3%	37	61.7%	0.184
Bronchial	22	73.3%	14	46.7%	36	60.0%	0.035
Others	8	26.7%	7	23.3%	15	25.0%	0.766

Comparison of mean total symptom score in group A and group B patients

The various symptoms were scored from 0 to 3+ based on its severity.

The nasal symptoms which were observed among our study patients included discharge, obstruction and nasal itching along with sneezing.

Ocular symptoms which were next common included watering and itching of eyes. Other common symptoms included post nasal drip, throat irritation, cough, chest congestion and wheeze.

Both our study groups showed significant reduction in the symptoms score, but the maximum was observed in Group B patients.

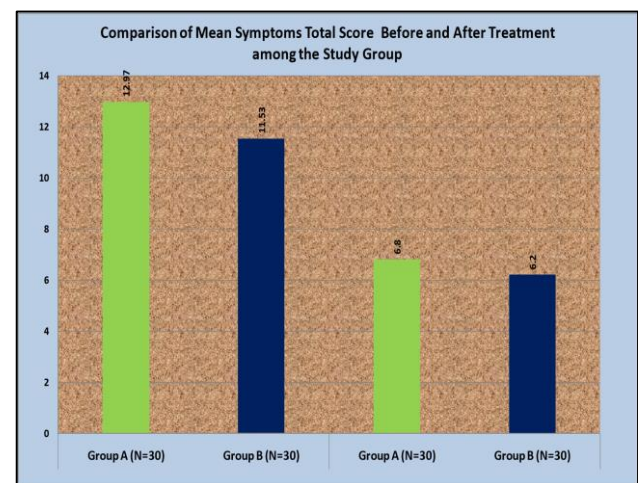


Figure 4: Comparison of mean symptoms total score before and after treatment among the study groups. P=0.034.

Comparison of nasal endoscopic grades in group A and group B patients

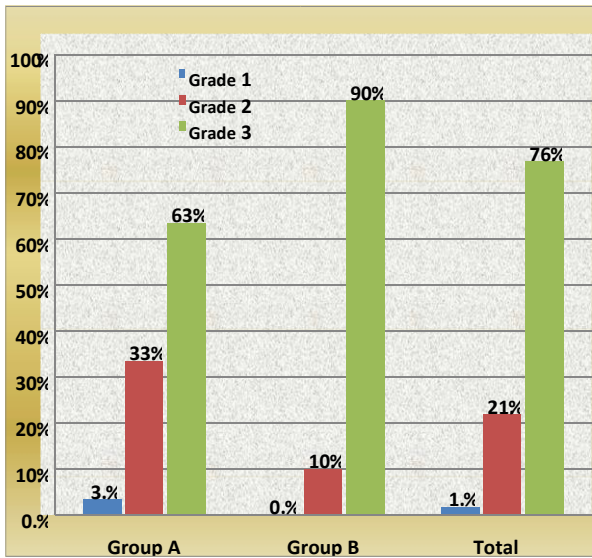


Figure 5: Distribution of nasal endoscopic grades among the study groups.

P=0.046.

Table 2: Comparison of quality of surgical field score during surgery in group A and group B patients.

Quality of Surgical field	Group		Total	χ^2 value	P value
	Group A	Group B			
0-1 (no bleeding; excellent to outstanding surgical conditions)	0	0	0	2.551	0.4662
2-3 (slight bleeding; fairly easy surgery; no stop for haemostasis &/or suction)	0	1	1		
4-5 (slight bleeding; surgery mildly difficult; 1 stop for haemostasis &/or suctioning)	7	10	17		
6-7 (moderate bleeding; surgery moderately difficult; occasional stop for haemostasis &/or suctioning)	13	14	27		
8-9 (moderate to severe bleeding; surgery very difficult; multiple stops for haemostasis &/or suctioning)	10	6	16		
10 Surgery terminated due to severe bleeding in surgical field)	0	0	0		

The quality of surgical field was assessed on the basis of the bleed during the procedure which determined the operation time and the outcome. Majority of patients of both the groups had moderate bleed which made the surgery just about moderately difficult. The best quality of surgery was seen among 10 of the Group B patients while the same was seen only among 7 of the Group A patients. 10 patients of Group A had moderate to severe bleeding while only 6 patients of Group B exhibited that severe bleed.

Comparison of blood loss in group A and group B patients

Majority of our study patients had a blood loss of about 50-100 ml, of which 66.7% belonged to Group B. 11 patients of Group A had the least blood loss of <50 ml and

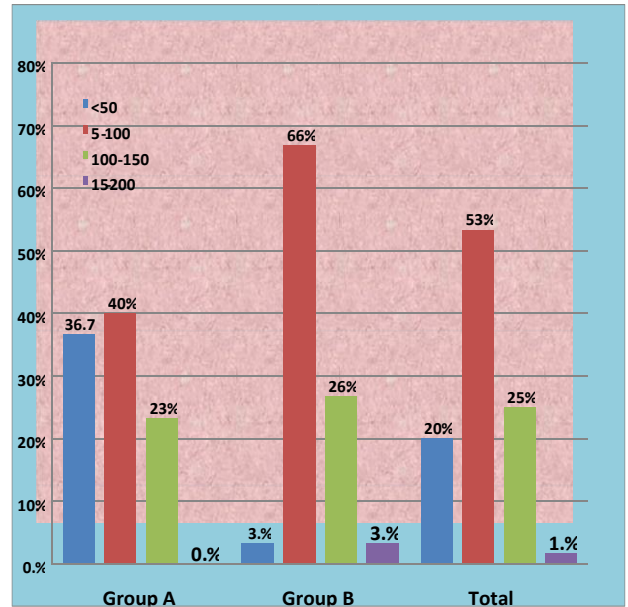


Figure 6: Distribution of blood loss among the study groups.

p=0.010

1 patient of Group B had the maximum blood loss of 150-200 ml.

DISCUSSION

FESS is the surgical procedure of choice for nasal polyposis as it can be customized to the disease extent and helps in restoring mucociliary clearance and improves ventilation by clearing obstructions of osteomeatal complex.

The outcome of FESS depends on many factors, one of the most important being a clean surgical field during the procedure. Because of the anatomic characteristics of the sinonasal area and the inflammatory and vascular characteristics of polyps, bleeding can be severe enough to limit the visual field and increase the risk of complications,

such as damage to the skull base or orbit. Additionally, bleeding increases the operative time and may also necessitate the need to stop the surgery.⁷

Techniques such as total intravenous anaesthesia, topical application of intraoperative adrenaline solutions along with local anaesthesia by injecting to the pterygopalatine fossa and hypotensive anaesthesia have all shown to improve intra operative visualization by reducing the intraoperative blood loss.⁸

Corticosteroids have been proved beneficial pre, intra and post operatively. Their multifactorial effect is initiated by their binding to cytoplasmic glucocorticoid receptor cell. Along with significant decrease in symptoms it also helps in tissue remodelling. They inhibit transudate formation and tissue edema and decreases inflammatory mediators in the nose and sinus mucosa by suppressing cytokine synthesis in eosinophils and basophils.⁹ Steroids increase the spastic reactivity of the smooth muscles and heighten the effects of endogenous adrenaline and noradrenaline in causing vascular constriction.¹⁰

Although steroids do not cure the disease, long-term therapy may break vicious circles and have a long-lasting effect, especially in mild cases. A short course of pre operative steroids can help improve breathing, especially in asthmatics and make polyp resection easier.¹¹ These effects are particularly important in the narrow areas of the nasal cavity especially considering the traumatic effects of the instruments used during surgery.

Intranasal corticosteroids, in the form of drops or spray are, by far, the most studied and documented treatment for nasal polyposis. These are found to be advantageous due to its low bioavailability, fixed dosage volume which help in achieving controlled administration and also in decreasing the polyp volume and symptoms and increasing peak nasal inspiratory flow, with minimal or negligible side effects.^{12,13}

There are various studies done to compare the efficacies of various intranasal steroids like Fluticasone, Mometasone, Beclomethasone and Triamcinolone.^{14,15} We have restricted our study to the use of Fluticasone propionate.

Lund et al demonstrated that fluticasone propionate aqueous nasal spray can reduce polyp size and symptoms caused by nasal polyps.¹⁶ Fluticasone has been preferred in terms of having fewer odours, causing less run out or throat run down and having fewer after tastes.¹⁷ Rino et al, in their study, encountered very few patients complaining of mild burning sensation and malaise following the use of fluticasone propionate nasal spray which was seen to have subsided in few days.⁹

Intranasal steroids will not eliminate polyps, but the treatment clearly reduces their size and hence, most symptoms. The effects on sneezing and secretion are varied. Studies have clearly shown a significant effect of

topical treatment on blockage symptom scores and on objective measures of nasal patency.¹⁸ However, a patent nasal airway is not necessarily a normal airway. Only a small fraction of the spray reaches the middle meatus, reducing its effect on the polyps in the meatus as the spray gets delivered mainly at the nasal septum and anterior head of turbinate.¹⁹ The effect of topical steroids on loss of sense of smell, and with that 'taste', caused by polyp obstruction of the nasal cavity, in contrast to systemic administration, is poor. This is probably because the spray may not reach the olfactory epithelium due to the obstruction by polyps.

Our study has shown an improvement in the quality of surgical field and a decrease in the intraoperative blood loss with the use of preoperative intranasal steroid spray, which is also in concurrent to the study done by Albu et al.²⁰

The anti-rhinitis effect of topical steroids is found to be maintained and symptoms only slowly recur with the discontinuation of the treatment. Controlled studies have shown that topical steroids can delay the recurrence of polyps after surgery and with that postpone the need for another surgery. However, the effect is merely partial, in particular, in cases of pronounced inflammatory activity.²¹

Apparently, some patients do not respond to topical steroids. This may be due to inadequate intranasal distribution of the spray in a very blocked nose. The benefit of intranasal steroids may not be immediate; some benefit may be achieved within 3-4 hours, but these medications provide optimal symptom control only when used continually for long periods.²² Responsiveness can then be achieved after a short course of systemic steroids.

Systemic steroids can be given as tablets (prednisolone) and as a depot injection, probably having similar therapeutic indices. The total glucocorticoid dose in a depot-injection corresponds to about 100 mg prednisolone. When treatment is given orally, a higher total dose is probably necessary, example- 25 mg prednisolone daily for 10- 14 days. Within a few days it can reduce all nasal symptoms considerably, including anosmia.

A short course of systemic steroid is equally effective as simple polypectomy with a snare and it may serve as a 'medical polypectomy'. In severe or recurrent disease, requiring endoscopic surgery, preoperative use of a systemic steroid will considerably facilitate surgery.

Oral steroids can cause various adverse effects like disruption of the hypothalamic-pituitary-adrenal axis, hyperglycemia and glucose intolerance, gastrointestinal ulcer, osteoporosis, water retention and weight gain.^{23,24} These adverse effects may not be expected with a short course and may be outweighed by increased quality of life in patients with severe disease.

Recently, Blomqvist and coworkers concluded that medical treatment is sufficient to treat most cases of nasal

polyposis.²⁵ If nasal obstruction remains a main problem after medical treatment then surgical treatment is indicated. The choice of surgical approach and the need of a more conservative or radical approach will depend upon the individual surgeon's experience and the severity of the disease. A few large polyps can be removed under local anaesthesia by a snare. In a study done by Khosla et al involving a study group administered with pre operative steroids and a control group, intraoperative bleeding and operative time during endoscopic sinus surgery in the steroid group were significantly reduced as compared with the control group with no serious side effects. This was shown to have a significant effect on improving endoscopic surgical field visibility during sinus surgery.²⁶

A similar result was shown in a study done by Pathak in which, using the Boezaart-Vandermerwe Grading System, intra-operative bleeding was evaluated and moderate to heavy bleeding was found to be significantly ($p=0.01$) higher in the non-steroid group than the steroid group. Other parameters like postoperative scarring and crusting along with subjective parameters like postnasal discharge, difficulty to sense smell etc. were also found to have favorable results in the steroid group.²⁷

Gunel observed the surgical field quality scores to be higher in the corticosteroid group than in the control group, but the difference was not significant as was also observed by Sieskiewicz.^{28,29}

A meta analysis done by Pundir et al showed significant benefits from the use of pre operative steroids, both systemic and topical, on operative time, blood loss and surgical field quality while the non usage of steroids pre operatively made the surgery technically difficult in a study performed by Wright et al.^{30,31}

Various other studies as those done by Bonfils et al, Rino et al, Cassano et al and Kowalski and have all shown a combined steroid therapy using oral and topical steroids to be the most beneficial in causing involution of polyp size and delaying the need for a surgical intervention.^{6,9,15,32,33} This happens as the effects of both topical and oral steroids complement each other when used pre or post operatively.

In our study, comparing the efficacy of intranasal steroid spray and oral steroid, mean total symptoms scores decreased in both the treatment groups after study period. Considerable reduction in severity of individual symptoms in each patients of group B compared to group A could be appreciated. Our study has been in par with majority of the studies showing a significant reduction in intraoperative blood loss with the use of preoperative steroids, of which oral steroids have shown a better effect when compared to intranasal steroid spray. This provided with a better surgical field for enabling a relatively complication free procedure.

Hence, we can conclude that, oral steroid is better than intra nasal steroid spray in, improving symptoms reducing

intra operative bleeding and providing with a better quality of surgical field.

CONCLUSION

Nasal polyposis is very common and causes considerable morbidity. Clinical symptoms of nasal polyposis are often under recognized and underreported causing the delay in seeking medical attention and subsequent reduction in health related quality of life. Nasal polyposis might present as a distinct clinical entity or might coexist with (and contribute to) other disease states such as sinusitis, asthma, and laryngitis. Adequate and appropriate treatment along with environmental manipulations lead to significant control of disease and hence, improvement in quality of life. With the risk of the adverse effects with oral steroids, nasal steroids may be preferred preoperatively, but considering the efficacy in bringing down the symptomatology and improving the effect of surgery, systemic oral steroids hold an upper hand which may outweigh the side effects especially when administered only for a short duration. Preoperatively, a combination of both has proven to be the most effective when compared to the individual therapies.

ACKNOWLEDGEMENTS

We extend our gratitude to all the faculty members of the department of ENT, KIMS and the management for guiding us and extending their help and support towards working towards our study and making it a success. We extend our gratefulness to all our patients and their family members for their cooperation and patience during the course of recovery. A special mention goes to the late Dr. Anil H. T, our ex HOD, Dr. Smitha S. G., Associate Professor, and Dr. Nirmala, Assistant Professor, and all our colleagues and friends, Department of ENT, KIMS, for giving us the needful guidance and help during the course of our study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Settipane GA. Epidemiology of nasal polyps. Allergy Asthma Proc. 1996;17:231-6.
2. Bernstein JM. Nasal polyps: finding the cause, determining treatment. J Respir Dis. 1997;18:847-56.
3. Small P, Frenkiel S, Black M. Multifactorial etiology of nasal polyps. Ann Allergy. 1981;46:317-20.
4. Fein B. Aspirin shock associated with asthma and nasal polyps. Ann Allergy. 1971;29:598.
5. Perkins JA, Blakeslee DB, Andrade P. Nasal polyps: A manifestation of allergy? Otolaryngol Head Neck Surg. 1989;101:641-5.
6. Bonfils P, Nore's JM, Halimi P, Avan P. Corticosteroid treatment in nasal polyposis with a

- three-year follow-up period. *Laryngoscope.* 2003;113:683-7.
7. Lal D, Stankiewicz JA. Primary sinus surgery. In: Flint PW, Haughey BH, Lund VJ (eds) *Cummings otolaryngology, head and neck surgery.* Mosby Elsevier, Philadelphia. 2012;743.
 8. Thongrong C, Kasemsiri P, Carrau RL, Bergese SD. Control of Bleeding in Endoscopic Skull Base Surgery: Current Concepts to Improve Hemostasis. *ISRN surgery.* 2013;191543.
 9. Rino K, Chettri MN, Moirenthem NS, Zoramthari R. Effects of oral prednisolone and fluticasone nasal spray in the management of nasal polypi. *Journal of Medical Society.* 2016.
 10. Ullian ME. The role of corticosteroids in the regulation of vascular tone. *Cardiovasc Res.* 1999;41(1):55-64.
 11. Uri N, Cohen-Kerem R, Barzilai G, Greenberg E, Doweck I, Weiler-Ravell D. Functional endoscopic sinus surgery in the treatment of massive polyposis in asthmatic patients. *J Laryngol Otol.* 2002;116:185-9.
 12. Daley-Yates PT, Baker RC. Systemic bioavailability of fluticasone propionate administered as nasal drops and aqueous nasal spray formulations. *Br J Clin Pharmacol.* 2001;51:103-5.
 13. Holmstrom M. Clinical performance of fluticasone propionate nasal drops. *Allergy.* 1999;54(suppl 53):21-5.
 14. Yonezaki M, Akiyama K, Karaki M. Preference evaluation and perceived sensory comparison of fluticasone furoate and mometasone furoate intranasal sprays in allergic rhinitis. *Auris Nasus Larynx.* 2016;43(3):292-7.
 15. Cassano P, Marini F, Indraccolo AS. Corticosteroid therapy in the prevention of recurrent post-surgical nasal polyposis. *Acta Otorhinolaryngol Ital.* 1996;16(4):334-338.
 16. Lund VJ, Flood J, Sykes AP, Richards DH. Effect of fluticasone in severe polyposis. *Arch Otolaryngol Head Neck Surg.* 1998;124:513-8.
 17. Seidman MD, Gurgel RK, Lin SY. Guideline Otolaryngology Development Group. AAO-HNSF. Clinical practice guideline: allergic rhinitis. *Otolaryngol Head Neck Surg.* 2015;152(1 Suppl):S1-S43.
 18. Mygind N, Lund V. Intranasal Corticosteroids for Nasal Polyposis. *Treat Respir Med.* 2006;5:93-102.
 19. Hardy JG, Lee SW, Wilson CG. Intranasal drug delivery by spray and drops. *J Pharm Pharmacol.* 1985;37:294-7.
 20. Albu S, Gocea A, Mitre I. Preoperative treatment with topical corticoids and bleeding during primary endoscopic sinus surgery. *Otolaryngol Head Neck Surg.* 2010;143:573-8.
 21. Kang G, Yoon BK, Jung JH, Cha HE, Kim ST. The Effect of High-dose Topical Corticosteroid Therapy on Prevention of Recurrent Nasal Polyps after Revision Endoscopic Sinus Surgery. *American Journal of Rhinology.* 2008;22(5):497-501.
 22. Bridgeman MB. Overcoming barriers to intranasal corticosteroid use in patients with uncontrolled allergic rhinitis. *Integr Pharm Res Pract.* 2017;6:109-19.
 23. Fokkens WJ, Lund VJ, Mullol J. European position paper on rhinosinusitis and nasal polyps 2012. *Rhinology.* 2012;50(1):1-12.
 24. Nash JJ, Nash AG, Leach ME, Poetker DM. Medical malpractice and corticosteroid use. *Official Journal of American Academy of Otolaryngology-Head and Neck Surgery.* 2011;144(1):10-5.
 25. Blomqvist E, Lundblad L, Ånggård A, Haraldsson P-O, Stjärne P. A randomized controlled study evaluating medical treatment versus surgical treatment in addition to medical treatment of nasal polyposis. *The Journal of Allergy and Clinical Immunology.* 2001;107(2):224-8.
 26. Khosla, AJ, Pernas, FG, Maeso, PA. Meta-analysis and literature review of techniques to achieve hemostasis in endoscopic sinus surgery. *Int Forum Allergy Rhinol.* 2013;3:482-7.
 27. Pathak RK, Kumar N, Mohit Bagde M. A Study on the Effect of Preoperative Systemic Corticosteroids on Intraoperative Outcome in Patients Undergoing Functional Endoscopic Sinus Surgery for Sinonasal Polyposis. *IOSR Journal of Dental and Medical Sciences.* 2020;19(1):19-24.
 28. Günel, C, Basak, HS, Bleier, BS. Oral steroids and intraoperative bleeding during endoscopic sinus surgery. *B-ENT.* 2015;11:123-8.
 29. Sieskiewicz A, Olszewska E, Rogowski M, Grycz, E. Preoperative corticosteroid oral therapy and intraoperative bleeding during functional endoscopic sinus surgery in patients with severe nasal polyposis: a preliminary investigation. *Ann Otol Rhinol Laryngol.* 2006;115:490-4.
 30. Pundir V, Pundir J, Lancaster G. Role of corticosteroids in Functional Endoscopic Sinus Surgery--a systematic review and meta-analysis. *Rhinology.* 2016;54(1):3-19.
 31. Wright ED, Agrawal S. Impact of perioperative systemic corticosteroids on surgical outcomes in patients with chronic rhinosinusitis with polyposis: Evaluation with the novel Perioperative Sinus Endoscopy (POSE) scoring system. *Laryngoscope.* 2007;117(115):1-28.
 32. Tuncer U, Soyulu L, Aydogan B. The effectiveness of steroid treatment in nasal polyposis. *Auris Nasus Larynx.* 2003;30(3):263-8.
 33. Kowalski ML. Oral and nasal steroids for nasal polyps. *Curr Allergy Asthma Rep.* 2011;11(3):187-8.

Cite this article as: Jagannath B, Pillai N, Bharath KKL. Comparative study on the effects of pre-operative intranasal steroid spray versus oral steroid on intraoperative bleed in FESS for nasal polyposis. *Int J Otorhinolaryngol Head Neck Surg* 2021;7:782-8.