

Use of Nasal Steroid Sprays after Functional Endoscopic Sinus Surgery (FESS): Do They Really Help?

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ABSTRACT

Background: Functional Endoscopic Sinus Surgery (FESS) is an established intervention for chronic rhinosinusitis, yet postoperative inflammation, mucosal edema, and recurrence continue to affect long-term outcomes. Intranasal corticosteroids are routinely used after surgery to support mucosal healing, reduce inflammation, and maintain sinus patency. Ongoing variability in delivery methods has raised important questions regarding optimal postoperative therapy.

Objective: This study aimed to review and evaluate current evidence on the effectiveness, delivery techniques, safety, and clinical outcomes of intranasal corticosteroid therapies following FESS.

Methods: We have searched PubMed, Scopus, and the Cochrane Library for randomized controlled trials, meta-analyses, and comparative studies examining postoperative corticosteroid use after FESS. We have also reviewed international clinical guidelines (EPOS 2020, AAO-HNS) and manually screened high-impact otolaryngology journals for additional relevant evidence. Comparisons among nasal sprays, corticosteroid irrigations and steroid-eluting implants were analyzed with focus on symptom relief, endoscopic healing, recurrence reduction, quality-of-life improvement and safety. Documents written in languages other than English have been ignored. Papers that were not regarded as significant scientific research included dissertations, oral presentations, conference abstracts and unpublished manuscripts were excluded.

Conclusion: Intranasal corticosteroids remain a cornerstone of postoperative care after FESS, consistently improving mucosal healing, reducing inflammation and lowering recurrence risk with excellent safety. While conventional sprays are effective for routine maintenance, high-volume steroid irrigations and steroid-eluting implants provide deeper sinus penetration and offer added benefit for patients with extensive disease. Future work should aim to standardize dosing strategies and tailor postoperative therapy based on disease phenotype and surgical extent.

Keywords: Intranasal corticosteroids, Functional endoscopic sinus surgery, Chronic rhinosinusitis, Steroid irrigation, Steroid-eluting implants.

INTRODUCTION

Chronic rhinosinusitis (CRS) is a multifactorial inflammatory disorder affecting approximately 12% of the global population, leading to nasal obstruction, anosmia, facial pressure, and decreased quality of life [1, 2]. Functional Endoscopic Sinus Surgery (FESS) aims to restore mucociliary clearance and ventilation by removing diseased tissue and enlarging sinus ostia. However, surgery does not directly address the underlying inflammatory process. Persistent mucosal inflammation, polyp recurrence, and postoperative scarring remain common causes of treatment failure [3].

Consequently, postoperative medical management, particularly the use of intranasal corticosteroids (INCS), plays a critical role in maintaining surgical success. The use of topical steroids after FESS aims to suppress residual inflammation, reduce granulation tissue, and promote epithelial healing while minimizing systemic side effects associated with oral corticosteroids [4].

Hence, this review article aimed to throw the light and evaluate current evidence on the effectiveness, delivery techniques, safety, and clinical outcomes of intranasal corticosteroid therapies following FESS.

Mechanism of Action of Intranasal Corticosteroids

Intranasal corticosteroids (INCS) exert potent local anti-inflammatory effects by suppressing multiple

cytokine pathways. They inhibit transcription of inflammatory mediators such as IL-4, IL-5, IL-13 and TNF- α , decrease eosinophilic infiltration and reduce vascular permeability. These effects lead to decreased mucosal edema, reduced glandular hypersecretion and improved sinus ventilation [5, 6]. Commonly used agents include fluticasone propionate, mometasone furoate, budesonide, and beclomethasone. These molecules differ slightly in potency, bioavailability, and systemic absorption but share similar therapeutic outcomes when used appropriately [7].

Rationale for postoperative use

After FESS, the sinonasal mucosa undergoes a wound-healing process characterized by an initial inflammatory phase followed by proliferation and remodeling. Uncontrolled postoperative inflammation can result in synechiae formation, ostial stenosis, and recurrence of polyps [8]. Topical corticosteroids modulate this process by:

- Inhibiting fibroblast proliferation and collagen deposition.
- Reducing postoperative edema and crusting.
- Preventing recurrence of nasal polyposis.
- Improving mucociliary clearance and epithelial regeneration.

Their use is thus considered a standard component of postoperative care in CRS management.

Delivery methods: Spray vs Irrigation vs Steroid-Eluting Stents

Different delivery methods have been developed to enhance local corticosteroid deposition in the paranasal sinuses after surgery. The table below summarizes the advantages and limitations of each method ^[9, 10]. Sprays are ideal for maintenance therapy but may not reach surgically opened sinus cavities effectively. High-volume irrigations, especially with budesonide respules, achieve deeper sinus penetration. Steroid-eluting stents offer prolonged local drug delivery, particularly beneficial for severe or recurrent polyposis ^[11] (Table 1).

Table (1): Comparison of postoperative intranasal corticosteroid delivery methods following FESS

Method	Advantages	Limitations	Common agents
Nasal spray	Convenient, widely available and easy to administer	Limited sinus penetration and poor deposition beyond nasal cavity post-FESS	Fluticasone and Mometasone
Nasal irrigation with steroid	Improved sinus penetration & mucosal coverage and higher local concentration	Requires preparation and risk of small systemic absorption	Budesonide respules and Mometasone solution
Steroid-eluting stent/spacer	Provides sustained release, maintains ostial patency and reduces need for systemic steroids	Costly, limited access and may require removal	Mometasone-eluting (PROPEL™) and Fluticasone-eluting implants

FESS: Functional Endoscopic Sinus Surgery

CLINICAL EVIDENCE

Nasal steroid sprays

Multiple randomized controlled trials have demonstrated that nasal steroid sprays reduce postoperative edema, polyp regrowth and inflammation after FESS. As study showed that patients using fluticasone spray had significantly better endoscopic healing and SNOT-22 scores compared to saline-only controls ^[12].

Mometasone furoate sprays have been shown to reduce the need for systemic corticosteroids postoperatively while maintaining excellent safety profiles ^[13].

Steroid irrigations

Budesonide nasal irrigation has been widely studied for its enhanced sinus penetration. A study of **Kang et al.** ^[14] demonstrated that budesonide irrigation significantly improved endoscopic appearance, reduced need for oral steroids and decreased revision surgery rates compared to saline alone.

A 2023 systematic review by **Jin et al.** ^[15] found that steroid irrigations were superior to sprays for improving Lund–Kennedy and SNOT-22 scores, as well as reducing recurrence of polyps.

Steroid-eluting stents

Several clinical trials support the efficacy of steroid-eluting implants (e.g., PROPEL™). A study reported reduced adhesions, faster mucosal healing and fewer postoperative interventions in patients treated with mometasone-eluting implants compared to placebo ^[16].

These devices also decreased the need for systemic corticosteroids in the early postoperative period.

OUTCOMES AND BENEFITS

1. Symptom improvement:

Intranasal steroids improve nasal obstruction, rhinorrhoea, and smell perception as reflected by higher SNOT-22 and NOSE score improvements ^[17].

2. Endoscopic healing:

Postoperative steroid therapy leads to cleaner cavities, reduced crusting, and better epithelialization. Studies consistently report better Lund–Kennedy endoscopic scores compared to saline alone ^[18–21].

3. Recurrence and revision rates:

Budesonide irrigation and steroid implants significantly reduce polyp recurrence and revision surgery rates within 1–3 years after FESS ^[22].

4. Quality of life:

Several studies have demonstrated improved disease-specific and general quality-of-life outcomes with postoperative steroid use ^[4, 23].

SAFETY AND ADVERSE EFFECTS

Intranasal corticosteroids are generally safe, even with long-term use.

- **Local effects:** Mild epistaxis, mucosal dryness, or throat irritation.
- **Systemic effects:** Minimal due to low bioavailability, no significant hypothalamic-pituitary-adrenal axis suppression even with prolonged therapy.
- **Caution:** Avoid concurrent high-dose oral or inhaled steroids to minimize cumulative systemic exposure.

Meta-analyses confirm no significant increase in systemic adverse events with budesonide irrigation compared to saline [4, 23].

Guideline recommendations

- **EPOS 2020** (European Position Paper on Rhinosinusitis and Nasal Polyps): Recommends topical corticosteroids postoperatively for all CRS patients following FESS [24].
- **AAO-HNS guidelines**: Endorse intranasal corticosteroids for postoperative management and long-term maintenance in CRS with nasal polyps [25].
- **Consensus**: Begin topical steroids immediately after surgery (usually after crusting subsides, within 5–7 days) and continue for long-term maintenance [26].

LIMITATIONS OF CURRENT EVIDENCE

- Most trials are short-term (3–6 months); long-term recurrence data remain limited.
- Heterogeneity exists in dosage, delivery technique, and treatment duration across studies.
- Few head-to-head trials directly compare spray vs irrigation vs stent.
- Limited data on individualized therapy based on endotypes (eosinophilic vs neutrophilic CRS).

FUTURE DIRECTIONS

Future studies should:

- Standardize steroid irrigation dosing protocols.
- Evaluate cost-effectiveness of steroid-eluting implants in recurrent disease.
- Investigate biomarkers predicting response to postoperative topical therapy.
- Explore combination therapies (e.g., steroid + biologics).

Emerging delivery systems, such as pressurized atomizers and mucoadhesive gels, may offer improved deposition with reduced systemic exposure.

CONCLUSION

Postoperative use of intranasal corticosteroids following FESS is strongly supported by clinical evidence. They reduced inflammation, improved healing, and decreased recurrence with minimal risk. While standard nasal sprays are effective for maintenance, high-volume steroid irrigations or steroid-eluting implants provide superior sinus penetration and better long-term outcomes in selected patients. Continued research should aim to personalize postoperative steroid therapy based on disease phenotype and surgical extent.

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