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Review Articles

Steroid-Eluting Implants for Chronic Rhinosinusitis with Nasal Polyps: A Comparative Review of Propel and Sinuva for Post-Endoscopic Sinus Surgery Management

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Abstract

Objective: To synthesize current evidence on steroid-eluting sinus implants for chronic rhinosinusitis with nasal polyps (CRSwNP), focusing on the FDA-approved SINUVA and PROPEL devices and comparing their drug-release profiles, clinical outcomes, and practical applications.
Methods: A narrative review of randomized trials, prospective studies, pharmacokinetic analyses, and safety data evaluating SINUVA and PROPEL in postoperative or recurrent CRSwNP.
Results: Both implants improved nasal obstruction, polyp burden, mucosal inflammation, and endoscopic healing. SINUVA delivers 1350 μg of mometasone furoate over 90 days and reduced revision endoscopic sinus surgery rates by up to 60% in controlled trials, supporting its use in recurrent postoperative disease with in-office placement. PROPEL releases 370 μg over 30 days and consistently reduced postoperative inflammation, adhesions, and the need for additional interventions across multiple randomized studies. Both devices demonstrated favorable safety profiles with low rates of serious adverse events. Evidence on cost-effectiveness and long-term outcomes remains limited.
Conclusion: SINUVA and PROPEL provide clinically meaningful benefit in selected patients with postoperative or recurrent CRSwNP. Differences in release duration, implant design, and placement setting support personalized device selection rather than superiority of one implant. Further independent comparative trials and long-term health-economic evaluations are needed.

Keywords: Chronic Rhinosinusitis; Nasal Polyps; Steroid-Eluting Implants; Endoscopic Sinus Surgery; Corticosteroid

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1. Introduction

Rhinosinusitis is a group of disorders characterized by inflammation of the mucosa of the nose and the paranasal sinuses. Chronic Rhinosinusitis (CRS) is a type of Rhinosinusitis, characterized by inflammation of the nose and sinuses lasting more than 12 weeks. Whereas acute Rhinosinusitis (ARS) lasts for less than 4 weeks and sub-acute can last for 4 to 12 weeks. [1] Its causative agents include environment, certain allergens, pre-existing asthma, genetic predisposition, socio-economic status, ARS and other upper respiratory tract infections (URTIs). [1–3]
CRS exhibits significant variability in both its clinical presentation and underlying molecular mechanisms, with diagnosis typically confirmed through nasal endoscopy and CT scans. Based on nasal endoscopy results, CRS is categorized into two primary phenotypes: chronic rhinosinusitis with nasal polyps (CRSwNP) and chronic rhinosinusitis without nasal polyps (CRSsNP). [4]

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CRS poses a significant global health burden. According to EPOS 2020, CRS affects approximately 5–12% of the general population, with CRSwNP accounting for 20–30% of cases. Patients frequently experience impaired quality of life, reduced productivity, and high healthcare costs due to recurrent symptoms and repeated medical visits. Despite the availability of medical therapies including topical corticosteroids, systemic steroids, macrolides, nasal irrigation, antibiotics, and biologics, treatment responses remain suboptimal. [5–7] Rapid mucociliary clearance limits the penetration and retention of topical corticosteroids, reducing their effectiveness. Surgical intervention, primarily functional endoscopic sinus surgery (FESS), is recommended for individuals with persistent symptoms and up to 50% of CRS patients may ultimately require it. [1] However, this approach may still fail to achieve complete resolution, and postoperative recurrence remains substantial. EPOS 2020 reports that polyp recurrence may occur in up to 40–60% of CRSwNP patients within several years post-surgery, and revision surgery rates range between 4% and 15%. Even when outcomes are favorable, extensive long-term follow-up is required. [8]

Many patients also decline FESS, and it is estimated that approximately 40–60% of individuals with CRS do not achieve adequate recovery using standard treatments. Clinical practice guidelines recommend topical intranasal corticosteroids as a cornerstone of chronic rhinosinusitis management; however, their effectiveness is limited by rapid clearance from the nasal cavity, resulting in suboptimal drug penetration into deeper inflammatory tissue. [9] CRSwNP is predominantly driven by type 2 inflammation, characterized by eosinophilic infiltration, cytokine-mediated edema, and persistent mucosal remodeling; thus, sustained local corticosteroid delivery is essential to suppress inflammation, reduce edema, and maintain sinus patency. Additionally, long-term symptom relief typically depends on keeping the sinuses open, which can be affected by complications such as synechiae, turbinate lateralization, and stenosis. [10]

Smith et al. found that 60% of patients agreed that ESS resolved their symptoms as expected, and 19% admitted that they didn't get the results from ESS as expected. [11] Hence, although many clinical treatment options exist, the long-term effectiveness of a single treatment option is lacking. [9]

These factors led to the idea and creation of the steroid-eluting sinus implant, a corticosteroid stent placed into the paranasal sinuses post-FESS. It slowly releases corticosteroid directly into the inflamed mucosa. This helps prevent nasal congestion and obstruction due to edema and nasal polyps, hence ensuring a better lifestyle for CRS patients. The first of this kind, mometasone furoate-containing corticosteroid, PROPEL got approval by the Food and Drug Administration (FDA) in 2011. [10] A recent study found that these implants have no significant side effects and offer more benefits than risks. Although they are more expensive upfront, they can save money in the long run by reducing the need for post-operative interventions. [12]

A Delphi study was used to gather expert opinions on the use of steroid-eluting sinus implants for chronic rhinosinusitis, which concluded that sinus stents and implants can be useful to reduce inflammation, scarring, and blockage after surgery or in case of relapse. [13] With advancements in technology and biomaterials, a new stent with more amount of mometasone furoate released over longer periods, hence giving more long-term sinus patency, was developed and approved by the FDA in 2017, by the name SINUVA. [14]

Despite increasing use of both devices, a critical evidence gap persists, as no direct head-to-head trials have compared SINUVA and PROPEL regarding efficacy, safety, cost-effectiveness, or patient-centered outcomes. To address this gap, the present narrative review adopts a domain-based comparative framework to systematically evaluate the two FDA-approved steroid-eluting sinus implants. Specifically, comparison is structured across four key domains: pharmacokinetics and drug-release profiles, to assess differences in steroid dose, duration of delivery, and temporal alignment with inflammatory phases; clinical efficacy, encompassing both short-term postoperative outcomes and longer-term control of recurrent disease; safety, including trial-reported adverse events and post-marketing surveillance data; and procedural workflow, examining differences in timing of implantation, anatomical placement, and perioperative versus in-office deployment. This framework enables an integrated comparison beyond product descriptions and facilitates clinically meaningful interpretation of existing evidence.

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2. Methodology

This structured narrative review incorporated a comprehensive literature search to enhance methodological transparency. Literature search was performed in the databases PubMed and Google scholar using the search string, "steroid implant AND (chronic rhinosinusitis OR CRS) AND PROPEL AND SINUVA" to identify all relevant English or English-translated literature, published from the year 2000 to November 2024. 27 results from PubMed and 49 from Google scholar, totaling 76, were identified and saved for further screening. No filters were applied until this stage. MeSH terms were used but didn't produce any meaningful results.

Using the purpose-built software Rayyan ai, 12 duplicates were spotted and excluded. 64 articles were then screened for exclusion criteria. Reasons for exclusion were as follows:

- Wrong publication type: n=31
- Full text was not available: n=4
- Non-English language: n=2
- Wrong population: n=1

Papers finally retrieved for full text search numbered 26. Full texts for all of them were accessed and studied. A few more articles were searched to create relevant preliminary points for introduction. Some narrative reviews were not discarded during the screening process, for their closeness to our topic. References found in those articles were also accessed and any unique original study was cited in our manuscript. This brought the total number of cited references to 35.

This work was conducted as a structured narrative review incorporating a comprehensive literature search to enhance transparency and reproducibility. While elements of systematic methodology were applied, the study was not intended to fulfill the formal requirements of a full systematic review, such as formal risk-of-bias assessment or quantitative meta-analysis.

3. Results

3.1. Efficacy and Safety

Three SINUVA studies with study periods of 90 days each were reviewed. Two of them were RCTs (one was a phase 3, sham-controlled, double-blinded trial [20] and the other was a RESOLVE trial [21]), and the third one was a prospective single-centre, open-label study [17]; having 300, 100 and 5 participants respectively, all candidates for a revision ESS. The RCTs were designed such that a treatment group was administered a sinus implant, and a sham procedure was used for the control group. In the phase 3 trial, patients were divided into the ratio 2:1 (treatment grp: control group, 201:99). A decrease of 61% was seen in patients requiring revision ESS. Only one adverse event, significant bleeding, was observed. In the RESOLVE trial, 53% fewer patients required revision ESS. No adverse events were reported. In a prospective study, patients were assessed via SNOT-22 scores and drug levels and were evaluated endoscopically; statistically significant improvement in polyp grade and ethmoid sinus obstruction in the treatment group as compared to the controls was observed. [15–17] Across PROPEL trials, reductions in the need for postoperative interventions or surgical revisions were reported, including outcomes from large RCTs such as ADVANCE II, where bioabsorbable steroid-releasing implants showed significant decreases in postoperative interventions. Additional PROPEL studies also reported reductions in adhesion formation and postoperative inflammation. [18, 19]

Two articles were also reviewed for long-term efficacy of SINUVA. These included a Randomized controlled, blinded study of 100 patients divided into a treatment and control group [19] and a prospective multicentre study of 12 patients. [20] The participants were recruited based on having CRSwNP and recurrent polyposis respectively. The patients were then assessed via Nasal Obstruction score evaluation (NOSE), congestion scores (in RCT), and SNOT-22 scores (in the prospective, multicentre study), which displayed significant improvement in the symptoms. Endoscopic evaluation showed that there was a significant decrease in ethmoid sinus obstruction and polyp grade. There was a significant reduction of 31% of patients in the treatment group in the RCT and 64% of the patients in the prospective study now do not require revision ESS. PROPEL studies, including those by Smith et al., Luong et al., and Marple et al., reported improvements in endoscopic scores, including reductions in inflammation, polyp recurrence, adhesion formation, and maintenance of sinus ostial patency. Additional PROPEL Mini and PROPEL Contour evaluations showed similar patterns of improvement in treated sinuses.

Additionally, safety and efficacy of the PROPEL family was compared by placing drug-eluting stents in one sinus and either non-drug-eluting stents or no intervention in the other sinus. Some studies also used bilateral drug-eluting stents, and significant effects were observed in reducing inflammation, polyp formation, and adhesions in patients with chronic rhinosinusitis who underwent FESS. [21–23] Several studies also studied the efficacy of PROPEL mini and PROPEL contour, and they also showed desirable results. [19, 24, 25]

3.2. Side effects

For SINUVA, a Manufacturer and User Facility Device Experience (MAUDE) database review did not identify any reports of serious adverse events; however, this absence should not be interpreted as definitive evidence of superior safety. According to the brochure released by intersect ENT (manufacturer of SINUVA), and available on their website, the most common adverse reactions (in more than 1% of subjects) were bronchitis, nasopharyngitis, otitis media, headache, presyncope, asthma, and epistaxis. Patients with increased intraocular pressure, glaucoma, and/or cataract are at risk with SINUVA implant. Patients having any type of hypersensitivity with mometasone furoate or other ingredients of SINUVA implant were contraindicated. [14] Additionally, other SINUVA studies reported no serious adverse events, only minor problems which were solved without any complications, supporting the implant's safety for in-office use/placement. [15–17]

The PROPEL implant successfully meets its primary safety goal having a good efficacy with almost no side effects or any undesirable effects. However, in the study by Marple BF et. al., a patient required bilateral adhesiolysis and implant removal on day 14 due to crusting and scarring of the middle turbinate (MT). [23] In the same study, an additional case was reported in which the control implant was removed at one week, and the patient subsequently developed an infection in the contralateral sinus by the second week. This was successfully managed with a prednisone taper and antibiotic therapy, and both events resolved without long-term sequelae.

The most reported adverse events are infection, throat obstruction, and headache/pain. Each of the PROPEL stents is indicated for specific locations within the sinuses. Incorrect placement of the implant can result in the need for early removal as it starts causing ocular or nasal inflammation. [13] The stent can also be dislodged and may cause crusting, granulation, and scarring. [23, 26, 27]

Some uncommon side effects experienced by patients during clinical trials for PROPEL include sinus discomfort, nosebleeds, and an altered sense of smell. [16, 18, 21] Malfunction of the stent is reported less frequently. [7] Increased intraocular pressure (IOP) is also reported as a hypothetical side effect. [10] While MAUDE reports have documented adverse events associated with the PROPEL family over extended periods of use, these data should be viewed as descriptive signals rather than comparative safety metrics.

4. Discussion

This narrative review summarizes the available evidence on steroid-eluting sinus implants, focusing on SINUVA and the PROPEL family, across short-term and long-term outcomes. Overall, both implants demonstrate beneficial effects in patients with CRSwNP, particularly those with persistent symptoms after ESS.

The clinical roles of SINUVA and the PROPEL family are best interpreted through their design intent and biological targeting rather than as interchangeable devices. Their distinct structural configurations and drug-release kinetics are purposefully aligned with different phases of CRSwNP pathophysiology. SINUVA is a bio-absorbable, mometasone furoate–eluting sinus implant approved by the FDA in 2017 for adults ($\geq$18 years) with recurrent CRSwNP who have previously undergone ethmoid sinus surgery. [14] It can be placed in-office under topical anaesthesia without surgical intervention. [20, 28] The PROPEL implant is a PLGA device that gradually releases mometasone furoate into the sinus mucosa. The standard PROPEL implant is FDA-approved for the ethmoid sinus, the 16-mm PROPEL Mini can be used in the ethmoid or frontal sinuses, and the hourglass-shaped PROPEL Contour is designed for the frontal or maxillary sinuses. PROPEL implants are optimized for short-term mechanical support and localized corticosteroid delivery during the early postoperative period, when mucosal edema, synechiae formation, and ostial restenosis are most likely to occur. [13, 23–25]

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Additionally, CRSwNP exhibits substantial phenotypic and anatomical variability, including differences in sinus anatomy, polyp distribution, and type 2 inflammatory profiles. [9] These factors may influence the choice of implant, optimal placement site, and expected outcomes. For example, PROPEL Contour is specifically designed for frontal or maxillary sinuses, while SINUVA is optimized for ethmoid sinuses with in-office deployment. [15, 25] Individualized patient assessment, including prior ESS history, polyp severity, and anatomical considerations, is essential for implant selection.

4.1. Dosage and duration

SINUVA delivers a higher dose of mometasone furoate than PROPEL, resulting in a longer duration of drug release. The SINUVA implant delivers a higher dose 1350 μg of the corticosteroid over an extended period of 90 days, aligning with the chronic, type 2–mediated inflammatory process characteristic of recurrent CRSwNP and late polyp recurrence. [16, 17, 19–21] Whereas PROPEL and its variants release a smaller total corticosteroid load ($\sim$370 μg) over a shorter duration ($\sim$30 days), which coincides with the acute inflammatory phase following ESS and early wound healing. [22–27, 31] For managing CRSwNP's persistent symptoms, this extended release of a larger drug quantity allows for longer-lasting anti-inflammatory effects. Patients can experience prolonged relief from nasal obstruction and polyp recurrence due to the longer duration of action, potentially reducing the need for additional treatments or interventions. [13, 29] This "temporal matching" between steroid release and disease biology provides a mechanistic rationale for differential implant application: shorter-duration release may optimally suppress postoperative edema and adhesion formation, whereas longer-duration release may better mitigate delayed inflammatory cascades that underlie recurrent disease. Integrating these domains allows the present review to move beyond product summaries toward an evidence-based comparison anchored in biological and clinical significance.

Compared with PROPEL, SINUVA provides a higher and longer-duration corticosteroid exposure. [28] Because mometasone furoate has a high glucocorticoid receptor affinity, even low concentrations exert potent anti-inflammatory effects, helping reduce mucosal edema, maintain sinus patency, and relieve persistent symptoms in patients who do not respond to conventional therapies. [10, 18, 19] In contrast, PROPEL demonstrates a predictable bioabsorption pattern, with stent material decreasing to approximately 15% by day 30 and almost completely resorbing by day 60. [1, 18] This controlled resorption supports sustained but shorter-term steroid delivery that facilitates mucosal healing and reduces postoperative complications such as inflammation, adhesions, and polyp recurrence. [30, 31] Originally designed for perioperative use to prevent sinus collapse, PROPEL is now also effectively deployed in-office for postoperative management, providing targeted steroid delivery while functioning as a temporary structural stent. [32]

4.2. Efficacy: Short-Term and Long-Term Outcomes

SINUVA demonstrated improvements in nasal obstruction scores, ethmoid sinus patency, reduction in polyp grade, and decreased need for revision ESS across both RCT and prospective data. [15–18, 20] Short-term outcomes (30–90 days) consistently showed reductions in mucosal edema and improved endoscopic scores. Long-term studies reported sustained improvements, although sample sizes were small.

PROPEL implants have shown reductions in inflammation, adhesions, polyp recurrence, and postoperative interventions across multiple RCTs and prospective trials. [19, 21–25, 32, 33] Endoscopic assessment confirmed predictable absorption and sustained local steroid delivery for approximately 30 days. Several studies also reported improved wound healing and decreased need for postoperative interventions. [19, 22, 23]

The evidence supporting corticosteroid-eluting sinus implants is derived from studies with varying methodological rigor, including RCTs, prospective cohort studies, and small case series. To enhance transparency and interpretability, the strength of evidence for key outcomes was graded using the Oxford Centre for Evidence-Based Medicine (OCEBM) Levels of Evidence. High-quality evidence (Level 1) is primarily available from industry-sponsored RCTs evaluating PROPEL implants in the postoperative setting, which demonstrated significant reductions in postoperative inflammation, adhesion formation, and the need for revision interventions following endoscopic sinus surgery (ESS). [1–4] These trials consistently reported improved ostial patency and decreased necessity for postoperative medical or surgical interventions.

In contrast, evidence supporting SINUVA largely originates from prospective, non-randomized studies and smaller case series (Levels 1b), particularly in patients with recurrent CRSwNP managed in the office setting. [5–7] These studies demonstrated meaningful improvements in nasal obstruction scores, endoscopic polyp grade, and reduced need for revision ESS in selected patient populations. Several pivotal trials for both implants were funded by device manufacturers, which may introduce potential biases related to study design, outcome selection, and reporting. [1–7] While industry sponsorship does not inherently invalidate findings, it necessitates cautious interpretation, particularly in the absence of independent replication or direct head-to-head comparative trials. [8] Additional limitations across studies include modest sample sizes, heterogeneity in outcome measures, and variable follow-up durations.

Despite these constraints, the overall consistency of reported clinical benefits across studies supports the therapeutic role of steroid-eluting implants in selected CRSwNP populations. However, no direct head-to-head randomized controlled trials comparing SINUVA and PROPEL exist, representing a critical evidence gap. Because definitions of "symptomatic improvement," "revision ESS," and "endoscopic score changes" vary across studies. As a result, comparative conclusions must be interpreted cautiously, relying on indirect evidence across separate trials with heterogeneous patient populations, implant designs, and outcome measures.

4.3. Safety Profile

Across the studies reviewed, both implants had favourable safety profiles with few serious adverse events reported. [15–25, 33] SINUVA studies reported minimal procedure-related complications during in-office deployment, and adverse events were generally limited and self-resolving. SINUVA offers a safer alternative for managing nasal polyps by delivering corticosteroids directly to the sinus mucosa, reducing systemic exposure and minimizing side effects like weight gain, diabetes complications, and infection. [13, 34] PROPEL studies similarly reported few significant complications, with predictable resorption profiles verified endoscopically.

Although some spontaneous reporting databases (e.g., MAUDE) have suggested higher adverse event reporting for PROPEL, these sources are not standardized and cannot reliably indicate comparative safety. However, it is important to emphasize that MAUDE is a passive surveillance system composed of unverified, voluntarily submitted reports; therefore, true incidence rates cannot be calculated, causality cannot be established,

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and direct safety comparisons between devices are not appropriate.
Accordingly, MAUDE findings should not be used to infer comparative safety or superiority between implants, nor should the absence of reported serious adverse events be interpreted as evidence of enhanced safety. Instead, conclusions regarding safety are more appropriately drawn from controlled clinical trials, well-designed observational studies, and structured post-marketing evaluations. Overall, evidence from controlled trials, observational studies, and post-marketing surveillance suggests that both SINUVA and PROPEL implants have favorable and largely comparable safety profiles when used according to approved indications and proper procedural protocols. Safety differences should therefore be interpreted within the context of device design, placement technique, patient selection, and duration of clinical use, rather than inferred from passive reporting databases alone.

4.4. Procedural Considerations and Patient Convenience

One of the SINUVA implant's primary advantages is its ability to be used in the workplace without the need for surgical dilation or anesthesia beyond topical application. [15, 20] PROPEL, in contrast, is typically placed during surgical procedures, although studies describe successful in-office placement in postoperative patients under select conditions. [19, 22] SINUVA can be used in-office, allowing patients to receive treatment quickly and conveniently, reducing the need for hospitalization and the associated recovery time. Since patients can obtain care without the complexities and complications of surgical procedures, this accessibility may increase patient compliance and satisfaction. [29, 34]

4.5. Cost effectiveness and Adherence

Evidence regarding the cost-effectiveness of either implant is limited. Some studies suggest that reductions in revision ESS may partially offset implant cost. [19, 22] The longer duration and higher corticosteroid dose of SINUVA (1350 μg over 90 days) compared to PROPEL (370 μg over 30 days) may reduce the need for additional interventions and improve adherence, but high-quality health-economic analyses are lacking. [15, 20, 29, 34] Further studies are required to evaluate comparative cost-effectiveness and real-world adherence for both implants.

4.6. Patient Selection and Clinical Guidelines

Both EPOS and AAO-HNS guidelines support the use of steroid-eluting implants in postoperative management of CRSwNP in selected patients, particularly those at high risk of restenosis, polyp recurrence, or postoperative inflammation. [17, 21, 28] The choice between SINUVA and PROPEL depends on factors such as timing relative to surgery, anatomical considerations, prior ESS history, and the need for in-office versus perioperative placement. Clinical guidelines do not currently favor one implant over the other due to the absence of direct comparative trials. Current evidence supports a stratified, indication-driven approach to steroid-eluting sinus implant use rather than interchangeable application. [13, 26]
PROPEL-family implants are best suited for the immediate postoperative period following ESS. Their intraoperative placement, lower total steroid dose, and ∼30-day drug-release profile align with the biology of early postoperative inflammation, mucosal edema, and synechiae formation. Randomized controlled trials demonstrate reductions in postoperative interventions, adhesion formation, and restenosis, particularly in frontal, ethmoid, and maxillary sinus surgery. [23, 25, 27, 31] Thus, PROPEL implants are most appropriate for patients with surgically opened sinuses at high risk of early scarring, including extended frontal sinus procedures and revision ESS. [24, 26]
In contrast, SINUVA is optimally positioned for patients with recurrent nasal polyposis after prior ESS who wish to avoid revision surgery or are poor surgical candidates. Its higher cumulative mometasone furoate dose and sustained 90-day release are temporally matched to late inflammatory recurrence and polyp regrowth, rather than acute postoperative healing. Phase 3 randomized trials and RESOLVE studies demonstrate significant reductions in polyp burden, nasal obstruction, and need for revision ESS, supporting SINUVA as an effective office-based alternative to repeat surgery in selected patients. [19–21, 35]

4.7. Evidence Base and Quality Considerations

Most SINUVA studies are industry-sponsored randomized or prospective trials with relatively short follow-up durations (typically 90 days). [15–18, 20] While these provide high internal validity, sponsorship introduces potential reporting and publication bias, and follow-up durations are often limited (typically 90 days). Similarly, early PROPEL studies were partially industry-funded, which may influence outcome reporting. [23–27, 31] Independent, long-term evaluations are needed to strengthen confidence in real-world effectiveness and safety. Evidence for PROPEL includes multiple randomized controlled trials and prospective studies evaluating frontal, ethmoid, and paranasal sinus applications. [17, 19, 21–25]
Patient populations, implant types, and outcome definitions vary, making cross-study comparison challenging. Adverse event reporting from post-marketing surveillance, including MAUDE database analyses, suggests a favorable overall safety profile, though such passive reporting systems may underestimate event frequency. [10, 32] These limitations highlight the need for independent comparative studies and transparent reporting of funding sources to strengthen confidence in clinical recommendations.
All comparative interpretations in this review are based on indirect evidence and should be interpreted with caution due to heterogeneity in study design, patient populations, and outcome measures. Additionally, our review is limited by its search strategy, which primarily included PubMed and Google Scholar; however, these databases provide robust coverage of high-quality, peer-reviewed biomedical literature relevant to the topic. Future reviews incorporating additional databases may further enhance search sensitivity and comprehensiveness.

5. Conclusion

5.1. Clinical Implications and Future Directions

Overall, both SINUVA and PROPEL demonstrate improvements in postoperative and recurrent CRSwNP outcomes, though differences in steroid dose, duration, and placement setting reflect distinct clinical applications rather than superiority. Personalized medicine approaches are

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increasingly important, as patient anatomy, polyp phenotype, prior surgical history, and inflammatory profile can guide implant selection to optimize therapeutic benefit. Next-generation sinus implants are under investigation with features designed to enhance therapeutic precision and patient outcomes. These include adjustable-release systems designed to tailor corticosteroid delivery over variable timeframes, as well as biodegradable multi-drug platforms that may combine anti-inflammatory agents with antimicrobial or anti-fibrotic therapies. Additional areas of development include improved anatomical conformity, bioresorbable scaffolds, and more controlled drug-release mechanisms, although their clinical utility remains to be established.

Future research should move beyond descriptive efficacy data toward studies that directly guide clinical practice. Key priorities include head-to-head randomized controlled trials comparing SINUVA and PROPEL using standardized endpoints such as symptom scores, endoscopic findings, revision ESS rates, and healthcare utilization. Real-world effectiveness studies with longer follow-up are needed to assess durability of benefit across diverse patient populations and disease phenotypes. With the growing use of biologics in CRSwNP, combination-therapy studies evaluating implants alongside biologics in severe or refractory disease are warranted. Additionally, biomarker- and phenotype-driven studies may help identify patients most likely to benefit from each implant, supporting a personalized, precision-based approach to device selection.

Author Contributions

Conceptualization: Muhammad Khurshid Siddiqui, Syed Qasim Hashmi; Methodology: Muhammad Anzar, Ahmed Hasan; Formal analysis: Abdul Hadi Shahid; Writing—original draft: Muhammad Khurshid Siddiqui, Muhammad Anzar; Writing—review and editing: Ahmed Hasan, Abdul Hadi Shahid, Syed Qasim Hashmi; Supervision: Syed Qasim Hashmi.

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Data Availability

Not applicable.

Ethics Statement

Not applicable as this is a narrative review.

Conflict of Interest

The authors declare no conflict of interest.

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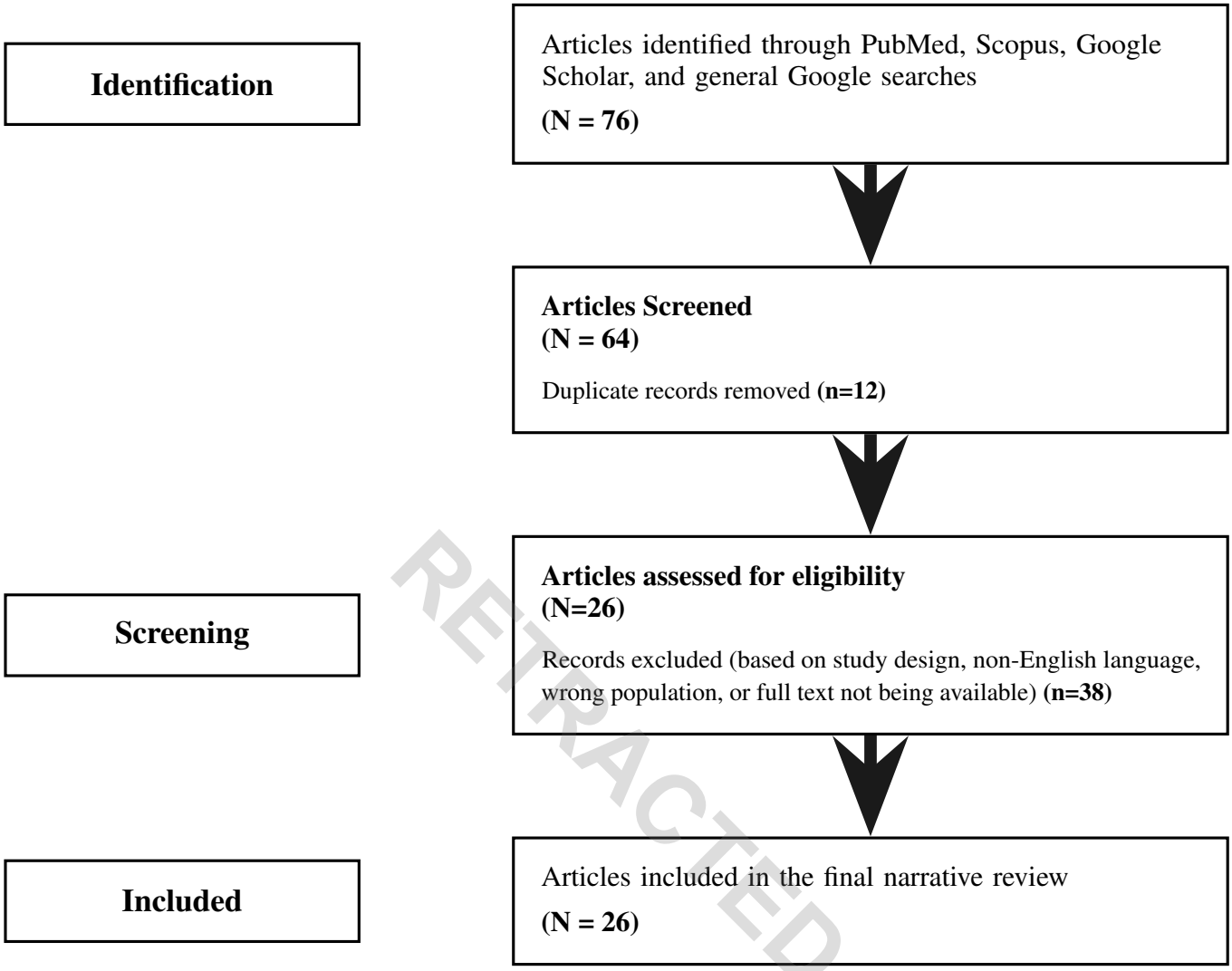
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References

1. Suh JD, Kennedy DW. Treatment options for chronic rhinosinusitis. Proc Am Thorac Soc. 2011;8(1):132–140. doi:10.1513/pats.201006-038RN
2. Hopkins C, Surda P, Bast F, Hettige R, Walker A, Hellings PW. Prevention of chronic rhinosinusitis. Rhinology. 2018;56(4):307–315. doi:10.4193/Rhin18.217
3. Tomassen P, Vandeplas G, Van Zele T, et al. Inflammatory endotypes of chronic rhinosinusitis based on cluster analysis of biomarkers. J Allergy Clin Immunol. 2016;137(5):1449–1456.e4. doi:10.1016/j.jaci.2015.12.1324
4. Hastan D, Fokkens WJ, Bachert C, et al. Chronic rhinosinusitis in Europe—an underestimated disease: a GA²LEN study. Allergy. 2011;66(9):1216–1223. doi:10.1111/j.1398-9995.2011.02646.x
5. van der Lans RJL, Fokkens WJ, Reitsma S. Therapeutic options for chronic rhinosinusitis in NSAID-exacerbated respiratory disease patients. Front Allergy. 2021;2:735768. doi:10.3389/falgy.2021.735768
6. Neposlan J, Sowerby LJ, Biadsee A. Mepolizumab for the treatment of chronic rhinosinusitis with nasal polyps in adults. Expert Rev Respir Med. 2023;17(3):227–236. doi:10.1080/17476348.2023.2173291
7. Bachert C, Han JK, Desrosiers MY, et al. Efficacy and safety of benralizumab in chronic rhinosinusitis with nasal polyps: a randomized, placebo-controlled trial. J Allergy Clin Immunol. 2022;149(4):1309–1317.e12. doi:10.1016/j.jaci.2021.11.019
8. Gliklich RE, Metson R. Effect of sinus surgery on quality of life. Otolaryngol Head Neck Surg. 1997;117(1):12–17. doi:10.1016/S0194-5998(97)70201-2
9. Han JK. Subclassification of chronic rhinosinusitis. Laryngoscope. 2013;123(Suppl 15):S15–S27. doi:10.1002/lary.24403
10. Narwani V, Torabi SJ, Kasle DA, Patel RA, Lerner MZ, Manes RP. Adverse events associated with corticosteroid-eluting sinus stents: a MAUDE database analysis. Otolaryngol Head Neck Surg. 2022;166(1):179–182. doi:10.1177/01945998211040343
11. Smith TL, Schlosser RJ, Mace JC, et al. Long-term outcomes of endoscopic sinus surgery in the management of adult chronic rhinosinusitis. Int Forum Allergy Rhinol. 2019;9(8):831–841. doi:10.1002/alr.22369
12. Hoffman V, Mortimer KM, Mulder K, Topuria I, Gliklich R, Kallman JE. Real-world evidence analysis of the impact of steroid-eluting implants on healthcare resource use among chronic rhinosinusitis patients undergoing sinus surgery. Curr Med Res Opin. 2022;38(3):375–381. doi:10.1080/03007995.2022.2026338
13. Lee VS, Patel P, O'Brien D, et al. Indications for absorbable steroid-eluting sinus implants: viewpoint via the Delphi method. Int Forum Allergy Rhinol. 2022;12(10):1225–1231. doi:10.1002/alr.23001
14. Intersect ENT. Localized steroid-releasing sinus implant (SINUVA™). Product information.
15. Lavigne F, Miller SK, Gould AR, Lanier BJ, Romett JL. Steroid-eluting sinus implant for in-office treatment of recurrent nasal polyposis: a prospective, multicenter study. Int Forum Allergy Rhinol. 2014;4(5):381–389. doi:10.1002/alr.21296
16. Shen J, Welch K, Kern R. Mometasone furoate sinus implant: a new targeted approach to treating recurrent nasal polyp disease. Expert Rev Clin Pharmacol. 2018;11(12):1163–1170. doi:10.1080/17512433.2018.1549481
17. Ow R, Groppo E, Clutter D, Gawlicka AK. Steroid-eluting sinus implant for in-office treatment of recurrent polyposis: a pharmacokinetic study. Int Forum Allergy Rhinol. 2014;4(10):816–822. doi:10.1002/alr.21368
18. Schilling AL, Cannon E, Lee SE, Wang EW, Little SR. Advances in controlled drug delivery to the sinonasal mucosa. Biomaterials. 2022;282:121430. doi:10.1016/j.biomaterials.2022.121430
19. Forwith KD, Han JK, Stolovitzky JP, et al. RESOLVE: bioabsorbable steroid-eluting sinus implants for in-office treatment of recurrent sinonasal polyposis after sinus surgery—6-month outcomes. Int Forum Allergy Rhinol. 2016;6(6):573–581. doi:10.1002/alr.21708
20. Kern RC, Stolovitzky JP, Silvers SL, et al. A phase 3 trial of mometasone furoate sinus implants for chronic sinusitis with recurrent nasal polyps. Int Forum Allergy Rhinol. 2018;8(4):471–481. doi:10.1002/alr.22056
21. Han JK, Forwith KD, Smith TL, et al. RESOLVE: a randomized, controlled, blinded study of bioabsorbable steroid-eluting sinus implants. Int Forum Allergy Rhinol. 2014;4(11):861–870. doi:10.1002/alr.21395
22. Wei CC, Kennedy DW. Mometasone implant for chronic rhinosinusitis. Med Devices (Auckl). 2012;5:75–80. doi:10.2147/MDER.S23306
23. Smith TL, Singh A, Luong A, et al. Randomized controlled trial of a bioabsorbable steroid-releasing implant in the frontal sinus opening. Laryngoscope. 2016;126(12):2659–2664. doi:10.1002/lary.25970
24. Santarelli GD, Han JK. Evaluation of the PROPEL Mini sinus implant for the treatment of frontal sinus disease. Expert Opin Drug Deliv. 2016;13(12):1789–1793. doi:10.1080/17425247.2016.1227785
25. Luong A, Ow RA, Singh A, et al. Safety and effectiveness of a bioabsorbable steroid-releasing implant for the paranasal sinus ostia. JAMA Otolaryngol Head Neck Surg. 2018;144(1):28–35. doi:10.1001/jamaoto.2017.2616
26. Han JK, Kern RC. Topical therapies for management of chronic rhinosinusitis: steroid implants. Int Forum Allergy Rhinol. 2019;9(Suppl 1):S22–S26. doi:10.1002/alr.22336
27. Murr AH, Smith TL, Hwang PH, et al. Safety and efficacy of a novel bioabsorbable, steroid-eluting sinus stent. Int Forum Allergy Rhinol. 2011;1(1):23–32. doi:10.1002/alr.20007
28. Forwith KD, Chandra RK, Yun PT, Miller SK, Jampel HD. ADVANCE: a multisite trial of bioabsorbable steroid-eluting sinus implants. Laryngoscope. 2011;121(11):2473–2480. doi:10.1002/lary.22215
29. Matheny KE. Bioabsorbable steroid-releasing sinus implants in the frontal and maxillary sinuses: 2-year follow-up. Allergy Rhinol (Providence). 2015;6(2):e88–e93. doi:10.2500/ar.2015.6.0110
30. Matheny KE, Carter KB Jr, Tseng EY, Fong KJ. Safety, feasibility, and efficacy of placement of steroid-eluting bioabsorbable sinus implants in the office setting. Int Forum Allergy Rhinol. 2014;4(10):808–815. doi:10.1002/alr.21357
31. Marple BF, Smith TL, Han JK, et al. Advance II: a prospective, randomized study assessing safety and efficacy of bioabsorbable steroid-releasing sinus implants. Otolaryngol Head Neck Surg. 2012;146(6):1004–1011. doi:10.1177/0194599812437499
32. Shah VN, Pasick LJ, Benito DA, Ghiam MK, D'Aguillo C. Complications associated with PROPEL mometasone furoate bioabsorbable drug-eluting sinus stents from 2012 to 2020. Am J Rhinol Allergy. 2022;36(2):185–190. doi:10.1177/19458924211043657
33. Douglas RG, Psaltis AJ, Rimmer J, et al. Phase 1 clinical study to assess the safety of a novel drug delivery system providing long-term topical steroid therapy. Int Forum Allergy Rhinol. 2019;9(4):378–387. doi:10.1002/alr.22266
34. DeFatta Health. PROPEL® and SINUVA™ sinus implants. Product information.
35. Stolovitzky JP, Kern RC, Han JK, et al. In-office placement of mometasone furoate sinus implants for recurrent nasal polyps: a pooled analysis. Am J Rhinol Allergy. 2019;33(5):545–558. doi:10.1177/1945892419853518

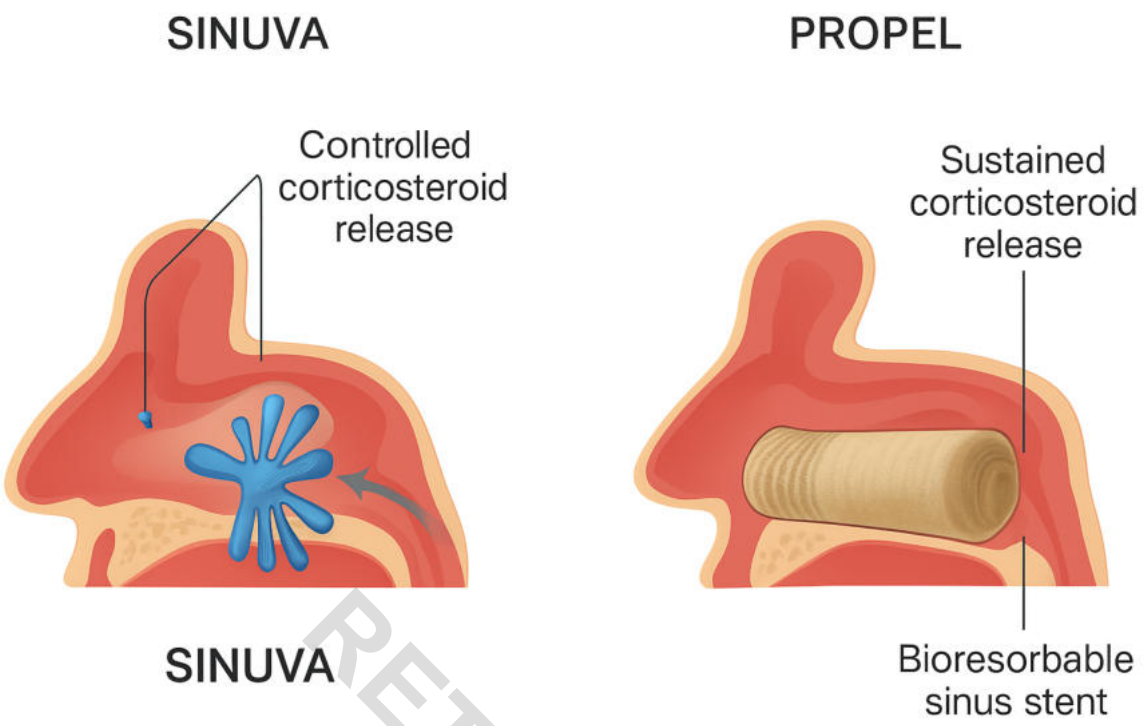
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Figures and Tables



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Figure 1. Flowchart illustrating the literature screening and study selection process.



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Figure 2. Approved anatomical placement and structural variants for PROPEL family and SINUVA implants.

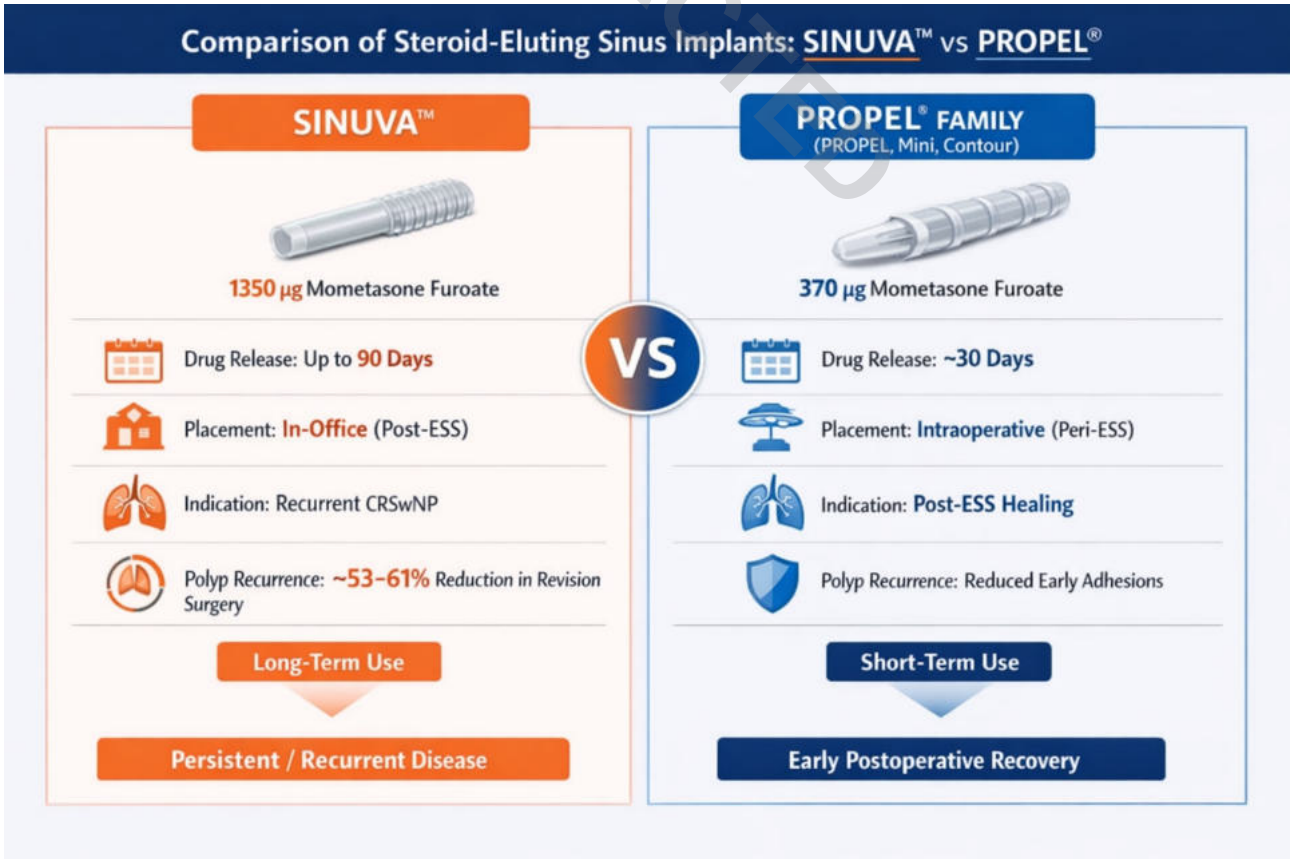


Figure 3. Conceptual comparison of cumulative drug-release profiles and corticosteroid load between PROPEL and SINUVA implants over time.

Table 1. Summary of Key Clinical Studies on SINUVA and PROPEL Steroid-Eluting Implants

Study	Study Type	Sample Size	Population / Setting	Key Outcomes	Main Conclusions
Lavigne et al., 2014 [15]	Prospective, multicenter	50	Recurrent nasal polyposis; in-office SINUVA insertion	Improved obstruction scores; reduced need for revision ESS	SINUVA is effective for office-based management of recurrent polyposis.
Ow et al., 2014 [17]	Pharmacokinetic study	30	Recurrent polyposis	Demonstrated sustained systemic absorption of mometasone; 100% drug detected in plasma	Confirms predictable and continuous drug release from SINUVA.
Forwith et al., 2016 [19]	RCT, double-blind (RESOLVE)	300	Recurrent polyposis post-ESS	Reduced polyp grade; improved symptoms; decreased need for surgery	SINUVA significantly improves sinonasal outcomes vs. control.
Kern et al., 2018 [20]	Phase 3 RCT	300	Chronic sinusitis with recurrent nasal polyps	Significant reduction in obstruction, polyp size, and symptom burden	Strong evidence supporting SINUVA effectiveness in recurrent CRSwNP.
Han et al., 2014 [21]	RCT, blinded (RESOLVE)	105	Recurrent sinonasal polyposis	Polyp reduction; improved airflow	Supports efficacy of steroid-eluting implants as adjunctive therapy.
Murr et al., 2011 [27]	Prospective trial	38	Post-ESS patients with CRS	Reduced inflammation, adhesions, and stenosis	Established early safety and efficacy of PROPEL.
Forwith et al., 2011 [28]	Multisite RCT (ADVANCE)	105	CRS undergoing ESS	Reduced postoperative interventions; decreased scarring	PROPEL decreases postoperative complications and improves healing.
Smith et al., 2016 [23]	RCT	80	Frontal sinus opening	Lower restenosis rates; improved patency	PROPEL Mini beneficial for frontal sinus disease.
Luong et al., 2018 [25]	RCT	160	Paranasal sinus ostia	Improved patency; reduced adhesions; fewer postoperative interventions	Confirms safety and effectiveness of steroid-eluting implants.
Matheny et al., 2014 [30]	Prospective case series	20	Office placement of PROPEL	Safe, feasible, effective in-office	Demonstrates feasibility of PROPEL outside the OR.
Shah et al., 2022 [32]	MAUDE database analysis	— (database)	National device complication database	Reported complications including migration, infection, incomplete absorption	Highlights the need for careful selection and post-placement monitoring.
Douglas et al., 2019 [33]	Phase 1 clinical study	24	Novel long-term delivery system	Demonstrated long-term steroid delivery with acceptable safety	Supports future direction toward extended-release devices.

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Table 2. Stratified Key Findings of Studies Evaluating SINUVA vs PROPEL Steroid-Eluting Sinus Implants

Implant	Study (Type)	Sample Size	Duration	Outcomes (Efficacy)	Safety	Notes
SINUVA	Kern et al., 2018 (Phase 3 RCT, sham-controlled) [20]	300 (treatment:control 201:99)	90 days	61% reduction in revision ESS	1 significant bleeding event	In-office placement; primary endpoint: reduction in revision ESS
	Forwith et al., 2016 (RESOLVE RCT, blinded) [19]	100	90 days	53% reduction in revision ESS	No adverse events reported	Assessed via endoscopy and SNOT-22 scores
	Lavigne et al., 2014 (Prospective, single-centre) [15]	5	90 days	Significant improvement in polyp grade and ethmoid sinus obstruction	No adverse events	Pharmacokinetic analysis; in-office placement
PROPEL	Smith et al., 2016 (RCT, frontal sinus) [23]	40	30 days	Reduced polyp formation; improved wound healing	No serious adverse events	Bioabsorbable, drug-eluting stent
	Santarelli et al., 2016 (Prospective) [24]	20	30 days	Decreased adhesions; improved sinus patency	None significant	PROPEL Mini in frontal sinus
	Marple et al., 2012 (Advance II, RCT) [31]	60	30 days	Reduction in postoperative interventions; reduced inflammation	No major complications	PROPEL family; endoscopic verification of bioabsorption
	Murr et al., 2011 (Prospective) [27]	25	30 days	Reduced need for revision ESS; improved SNOT-22 scores	Minor events resolved without complications	Multiple sinus sites evaluated

Table 3. Oxford Levels of Evidence for Key Conclusions on Steroid-Eluting Sinus Implants in CRSwNP

Clinical Domain	Key Evidence / Conclusion	Study Design(s)	Oxford Level*	References
Postoperative efficacy (reduced inflammation, restenosis, interventions)	Steroid-eluting implants reduce postoperative inflammation, synechiae, and need for postoperative interventions following ESS	Randomized controlled trials	Level 1b	[23, 25, 27, 28, 31]
Recurrent nasal polyposis (in-office treatment)	In-office placement of steroid-eluting implants improves symptoms and reduces need for revision ESS in recurrent CRSwNP	Randomized controlled trials; pooled analyses	Level 1b	[19–21, 35]
Pharmacokinetics and localized steroid delivery	Sustained local delivery achieves high sinonasal tissue concentrations with minimal systemic exposure	Prospective pharmacokinetic studies	Level 2b	[17, 22]
Long-term outcomes and durability	Benefits persist beyond the active drug-release period, though recurrence remains possible	Prospective cohort studies	Level 2b	[11, 29]
Real-world effectiveness and healthcare utilization	Implant use is associated with reduced healthcare resource utilization and postoperative care needs	Retrospective real-world evidence analyses	Level 2b	[12]
Safety and adverse events	Overall favorable safety profile; complications are uncommon but may be underreported	Post-marketing surveillance; database analyses	Level 3b	[10, 32]
Patient selection and clinical indications	Expert consensus supports use based on anatomy, timing post-ESS, and disease severity	Delphi consensus; expert opinion	Level 5	[13, 26]

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