Implantable Sinus Stents for Postoperative Use Following Endoscopic Sinus Surgery and for Recurrent Sinus Disease

Description

Sinus stents are devices used postoperatively following endoscopic sinus surgery (ESS). These devices are used to maintain patency of the sinus openings in the postoperative period, and/or to serve as a local drug delivery vehicle. Reducing postoperative inflammation and maintaining patency of the sinuses may be important in achieving optimal sinus drainage and may impact recovery from surgery.

Background

Endoscopic sinus surgery (ESS) is typically performed in patients with chronic rhinosinusitis unresponsive to conservative treatment. The surgery is associated with improvements in symptoms in up to 90% or more of appropriately selected patients. Because of the high success rates and minimally invasive approach, these procedures have rapidly increased in frequency, with an estimated 250,000 procedures performed annually in the U.S. They can be done either in the physician’s office under local anesthesia or in the hospital setting under general anesthesia.

ESS involves the removal of small pieces of bone, polyps, and debridement of tissue within the sinus cavities. There are a number of variations on the specific approach, depending on the disorders that are being treated and the preferences of the treating surgeon. For all procedures, there is a substantial amount of postoperative inflammation and swelling, and postoperative care is therefore a crucial component of ESS.

There are a number of postoperative treatment regimens, and the optimal regimen is uncertain. Options include saline irrigation, nasal packs, topical steroids, systemic steroids, topical decongestants, oral antibiotics, and/or sinus cavity débridement. A number of RCTs have evaluated various treatment options, but all different strategies have not been rigorously evaluated. A systematic review evaluated the evidence for these therapies. The authors of this review concluded that the evidence was not strong for any of these treatments but that some clinical trial evidence supported improvements in outcomes. The strongest evidence was for use of nasal saline irrigation, topical nasal steroid spray, and sinus cavity débridement.
Some form of sinus packing is generally performed postoperatively. Simple dressings moistened with saline can be inserted manually following surgery. Foam dressings are polysaccharide substances that form a gel when hydrated and can be used as nasal packs for a variety of indications. Middle meatal spacers are splint-like devices that prop open the sinus cavities post-ESS, but are not capable of drug delivery. There is some RCT evidence that middle meatal spacers may reduce the formation of synechiae following ESS, although the available studies have significant heterogeneity in this outcome.

Implantable sinus stents are another option for postoperative management following ESS. These implants are intended to stabilize the sinus openings and the turbinates, reduce edema, and/or prevent obstruction by adhesions. They can also be infused with medication delivered topically over an extended period of time, and this local delivery of medications may be superior to topical application in the postoperative setting.

**Regulatory Status**

The PROPEL™ system (Intersect ENT, Palo Alto, CA) was granted FDA approval under the premarketing approval (PMA) program in August 2011. This device is a self-expanding, bioabsorbable, steroid-eluting stent that is intended for use in the ethmoid sinus. It is placed via endoscopic guidance using a plunger that is included with the device. Steroids (mometasone furoate) are embedded in a polyethylene glycol polymer, which allows sustained release of the drug over an approximate duration of 30 days. The device is dissolvable over a period of several weeks, and therefore does not require removal. In September 2012, a shortened version of the Propel device, the Propel Mini Sinus Implant, was approved for use in patients older than age 18 years following ethmoid sinus surgery. FDA product code: OWO

The Relieva Stratus™ MicroFlow spacer, a balloon-based device that acts as a spacer and medication delivery system, was cleared for marketing under the 510(k) program in October 2011. It is indicated for use as a postoperative spacer to maintain an opening to the sinuses within the first 14 days postoperatively. It is placed via a catheter under endoscopic guidance. This device is temporary and requires manual removal after 30 days, with implantation of a new device if needed. It is approved for infusion with saline, but not for use with other medications such as steroids. This device is no longer marketed in the U.S.

**Related Policies**

7.01.105 Balloon Sinuplasty for Treatment of Chronic Sinusitis

**Policy**

*This policy statement applies to clinical review performed for pre-service (Prior Approval, Precertification, Advanced Benefit Determination, etc.) and/or post-service claims.*

The use of implantable sinus stents/spacers for postoperative treatment following endoscopic sinus surgery and for treatment of recurrent sinonasal polyposis is considered **not medically necessary**.
Benefit Application

The BCBS FEP contract stipulates that FDA-approved biologics, drugs and certain devices may not be considered investigational when used for their intended purpose and thus these products may only be assessed based on medical necessity.

Policy Guidelines

Sinus stents are defined as implantable devices specifically designed to improve patency and/or deliver local medication. These devices are inserted under endoscopic guidance and are distinguished from sinus packing and variations on packing devices routinely employed after sinus surgery.

Foam dressings, such as Sinu-Foam™, are used as nasal packs for a variety of conditions, including nosebleeds, and have also been used after endoscopic sinus surgery (ESS). These are considered different types of nasal packing.

Middle meatal spacers are related but separate devices intended to maintain sinus patency post-ESS. They are splint-like devices inserted directly rather than under endoscopic guidance, and do not have the capability of delivering local medication.

Rationale

Randomized controlled trials (RCTs) are important in the evaluation of sinus implants as an adjunct to endoscopic sinus surgery to adequately compare implantable stents with alternative treatment regimens and to minimize the effects of confounders on outcomes. Case series and trials without control groups offer little in the way of relevant evidence, as improvement in symptoms is expected post-endoscopic sinus surgery (ESS) and because there are multiple clinical and treatment variables which may confound outcomes.

The most relevant comparison for sinus stents is unclear because there is not a standardized optimal postoperative treatment regimen. Ideally, the “standard care” comparison group should include some form of packing, intranasal steroids, and irrigation. A concern with controlled trials is that the control arm may not be treated with optimal intensity, thereby leading to a bias in favor of the device. An example of this is a study design that compares a steroid-eluting stent with a non-steroid-eluting stent. This design will primarily evaluate the efficacy of steroids when delivered by the device, but will not evaluate the efficacy of a stent itself. If the control group does not receive topical or oral steroids postoperatively, then this might constitute undertreatment in the control group and result in a bias favoring the treatment group. Another concern is for the comparison of efficacy of a drug with the efficacy of a drug delivery system. For example, if a steroid-eluting spacer is compared with a control of saline irrigation alone, it will be difficult to separate the efficacy of the drug itself (steroids) from the drug delivery system (stent).
The literature consists of a few, small randomized trials, single-arm case series, and systematic reviews of these studies.

**Steroid-Eluting Stents as an Adjunct to ESS**

**Randomized Controlled Trials**

There are 2 RCTs of the PROPEL sinus implant. The 2 PROPEL trials have similar designs and both were sponsored by the device manufacturer (Intersect ENT™). Both compared an implant that is steroid-eluting and an identical implant that is not steroid-eluting. Thus these trials tested the value of drug delivery via a stent, but did not test the value of a stent itself versus treatment without a stent.

The first RCT of this implant was published in 2011 by Murr et al. A total of 38 patients with refractory chronic rhinosinusitis were included in the efficacy evaluation, and an additional 5 patients were enrolled for a safety evaluation. An intra-patient control design was used, meaning that each patient received a drug-eluting stent on one side and a non-drug-eluting stent on the other via random assignment. Patients were not permitted to use topical or oral steroids for 30 days following the procedure. A 14-day course of antibiotics was given to all patients. The primary endpoint was the degree of inflammation recorded on follow-up endoscopy at day 21 post-procedure, as scored by a 100-mm visual analogue scale (VAS). There were also semi-quantitative grading performed for polypoid changes, middle turbinate position, and adhesions/synechiae. The clinicians recording the outcomes were the same physicians who were treating the patients. One patient withdrew prior to study completion.

The difference in inflammation scores at 21 days was significant in favor of the steroid-eluting group. The estimated difference in scores from graphical representation was approximately 18 units on the 0-100 VAS scale. The percent of patients having polypoid changes was 18.4% in the steroid-eluting group versus 36.8% in the non-steroid-eluting group (p=0.039). Adhesions were also significantly less common in the steroid-eluting group (5.3% vs. 21.1%, p=0.03). There were no significant differences in the appearance or position of the middle turbinate.

The Advance II trial was an RCT of the Propel™ sinus implant for 105 patients with chronic rhinosinusitis refractory to medical management. This study also used an intra-patient control design with each patient receiving a drug-eluting stent on one side and a non-drug-eluting stent on the other via random assignment. Patients were not permitted to use topical or oral steroids for 30 days following the procedure. A 14-day course of antibiotics was given to all patients. The primary efficacy outcome was reduction in the need for postoperative interventions at day 30 following the procedure. A panel of 3 independent experts, who were blinded to treatment assignment and clinical information, viewed the endoscopy results and determined whether an intervention was indicated. The primary safety endpoint was the absence of clinically significant increased ocular pressure through day 90.

There were 3 patients lost to follow-up (2.9%), and 9 patients (8.6%) could not be evaluated because the video of the endoscopy could not be graded. Two patients had the device removed within 30 days.
of placement. Of the remaining patients, the need for postoperative intervention by expert judgment was found in 33.3% of patients in the steroid-eluting arm versus 46.9% in the non-steroid-eluting arm (p=0.028). According to the judgments of the clinical investigators, who were treating the patients, intervention was required in 21.9% of the steroid-eluting group and 31.4% of the non-steroid-eluting group (p=0.068). The reduction in interventions was primarily driven by a 52% reduction in lysis of adhesions (p=0.005). The primary safety hypothesis was met, as there were no cases of clinically significant increases in ocular pressure recorded over the 90-day period following the procedure.

**Nonrandomized Comparative Studies**

The largest nonrandomized study identified was reported by Xu et al in 2015. It evaluated post-ESS synechiae formation among 146 patients (252 nasal cavities) treated with a steroid-eluting absorbable spacer and 128 patients (233 nasal cavities) treated with a nonabsorbable spacer.10 Eligible patients included those who underwent ESS (at minimum, maxillary antrostomy and anterior ethmoidectomy) for chronic rhinosinusitis with or without nasal polyps and were treated with a sinus spacer. Synechiae-related outcomes were unavailable for 10 subjects in the absorbable spacer group (6.8%) and 9 subjects in the nonabsorbable spacer group (7.0%) due to lack of 1-month follow-up. Rates of synechiae formation at 1 month postoperatively did not differ significantly between groups (5 [2.0%] nasal cavities in the absorbable stent group vs 13 [5.6%] nasal cavities in the nonabsorbable spacer group).

**Noncomparative Studies**

In 2014, Matheny et al reported results from a single-arm case series evaluating the use of office-based placement of a mometasone-eluting absorbable stent (PROPEL device) within 7 days of ESS including bilateral ethmoidectomy.11 Eligible patients had chronic rhinosinusitis with or without nasal polyps and were treated by 1 of 3 surgeons. The surgical procedure was ESS with complete ethmoidectomy, followed by packing with a chitosan-polyethylene glycol absorbable dressing. At outpatient follow-up scheduled 5 to 7 days post-surgery, patients underwent debridement of the ethmoid cavity with placement of the steroid-eluting stent. Twenty patients who underwent 40 stent placements were included. Complications included acute sinusitis in 2 patients between 2 and 4 weeks post-surgery. Sinuses were evaluated based on video endoscopy by an independent reviewer using a 100-mm VAS and the standardized case report form described by Murr et al.8 Ethmoid sinus inflammation was reduced from 25.6 at baseline to 18.9 at week for (p=0.034). The mean total SNOT-20 score was reduced (improved) from 42.8 at baseline to 18.4 at week 2 and 8.9 at week 4. The procedure was generally well-tolerated.

The ADVANCE study was a prospective, multicenter, single-arm trial of placement of a mometasone-eluting absorbable stent in 50 patients who were scheduled to undergo ESS.12 The end points evaluated on follow-up endoscopies were the degree of inflammation scored on a 100-mm VAS and semiquantitative grading for polypoid changes, middle turbinate position, and adhesions. By day 7 postprocedure, the inflammation scores were in the “minimal” range and remained there for the rest of the time points. At 1 month, polypoid lesions were present in 10% of patients, adhesions in 1.1%,
middle turbinate lateralization in 4.4%. Scores on the SNOT-22 and the Rhinosinusitis Disability Index improved significantly in the first month postprocedure.

A case series was published of 23 patients with refractory rhinosinusitis who underwent ESS and were treated postoperatively with the Relieva Stratus MicroFlow Spacer Device infused with triamcinolone. Over 6 months, there were significant improvements on multiple sinus-related outcome measures such as the SNOT-20 and the Lund-Mackay CT (computed tomography) scan scores. No significant intraoperative or postoperative complications were reported.

**Systematic Reviews**

A 2015 Cochrane review addressed steroid-eluting sinus stents for improving chronic rhinosinusitis symptoms in individuals undergoing ESS. Study eligibility criteria were RCTs that compared the effects of steroid-eluting sinus stents with non-steroid-eluting sinus stents, nasal packing, or no treatment in adults with chronic rhinosinusitis who underwent ESS. After an initial search, 21 RCTs were identified, including the RCTs reported by Murr (2011) and Marple (2012) described above. None of the studies met authors’ inclusion criteria. The authors concluded that there is no evidence from high-quality RCTs to demonstrate the benefits of steroid-eluting stents.

A systematic review of early postoperative care following ESS was published in 2011. This review evaluated a number of different postoperative regimens, including stents. The review included 1 RCT by Cote et al and 2 non-randomized studies. Some of the devices included in these studies are considered middle meatal spacers and not included in the review of evidence for this policy. The overall level of evidence was judged as B (RCT with limitations). The authors concluded that topical steroids delivered by the “non-standard” route required further study and that the results of current studies could not be extrapolated to larger populations. Based on this evidence, they did not recommend use of stents/spacers but considered them an “option” for postoperative care.

Han et al performed a meta-analysis of the 2 published RCTs of the Propel™ implant, both of which compared a steroid-eluting stent with a non-steroid-eluting stent. The results of the 2 RCTs were combined at the patient level, with re-analysis of the endoscopy videos by a panel of 3 independent ear, nose, and throat experts. The combined results were that the steroid-eluting device reduced postoperative interventions by 35% (p<0.001), reduced lysis of adhesions by 51% (p=0.001), and reduced the need for oral steroids by 46% (p<0.001).

**Section Summary: Steroid-Eluting Stents as an Adjunct to ESS**

The most direct evidence relating to the use of steroid-eluting nasal stents as an adjunct to ESS comes from 2 RCTs comparing steroid-eluting stents with a non-steroid-eluting stent. One study used blinded assessors to evaluate postimplantation sinus changes, an important strength, but the trials had potentials for bias. In addition, to most accurately evaluate the benefit from the PROPEL device, ensuring that the comparison group is not undertreated (ie, receives some form of packing, intranasal steroids, and irrigation) is important.
Steroid-Eluting Stents for In-Office Treatment of Polyposis

A relatively small body of literature has addressed outcomes after placement of steroid-eluting absorbable sinus stents in the office setting as a planned procedure post-ESS or due to persistent/recurrent nasal polyposis after ESS.

Han et al (2014) reported results of the RESOLVE trial, a sham-controlled RCT evaluating the use of office-based placement of a mometasone-eluting nasal stent for patients with recurrence of nasal polyposis after ESS. Eligible patients had chronic rhinosinusitis, had undergone prior bilateral total ethmoidectomy more than 3 months earlier, had endoscopically confirmed recurrent bilateral ethmoid sinus obstruction due to polyposis that was refractory to medical therapy, and were considered candidates for repeat surgery based on the judgment of the surgeon and patient. Patients and those who administered symptom questionnaires at follow-up visits were blinding to treatment group. The study was powered to detect a between-group difference of at least a 0.6-point change in polyp grade from baseline, and at least a 1.0-point change in nasal obstruction/congestion score. One hundred subjects were randomized to treatment (n=53) or control (n=47). For endoscopically measured outcomes, at 90 days of follow-up, the treatment group had a greater reduction in polyp grade than the control group (-1.0 vs -0.1; p=0.016) and a greater reduction in percent ethmoid obstruction on a 100-mm VAS (-21.5 mm vs 1.3 mm; p=0.001). For patient-reported outcomes, there were no significant differences in change in nasal obstruction/congestion score between groups. Compared with controls, fewer treatment-group patients required oral steroids for ethmoid obstruction (11% vs 26%) and fewer treatment-group patients were indicated for sinus surgery at 3 months based on established criteria (47% vs 77%), although statistical comparisons were not reported.

Also in 2014, Lavigne et al reported results from a case series of 12 patients who underwent placement of an investigational mometasone-eluting absorbable stent described as similar to the PROPEL device, but with differences in stent structure to target obstructed sinuses, for recurrent nasal polyposis after ESS. Eligible patients had chronic sinusitis and had undergone bilateral ethmoidectomy more than 90 days before enrollment, but had refractory polyposis on at least 1 side that was at least grade 2 on a 0 to 4 point scale. All implants were placed in the office setting. Average SNOT-22 scores (reported as a normalized value with a total possible score that could range from 0-5) changed from 2.19 at baseline to 1.48 at day 7 (p<0.027), and continued to demonstrate improvements by the 6-month follow-up. Mean bilateral polyp grade (clinician-assessed) improved from 4.5 at baseline to 2.8 at day 7 (p<0.003), with continued improvements through 6-month follow-up. No significant adverse events were reported.

Ow et al reported plasma mometasone and cortisol concentrations for 5 patients with recurrent polyposis after bilateral total ethmoidectomy who underwent placement of the same investigational device described by Lavigne et al. Plasma mometasone concentrations were in the undetectable range in 26 of 32 samples at 3, 7, 14, 21, and 30 days postimplant and undetectable in all samples at 21 and 30 days postimplant.
Section Summary: Steroid-Eluting Stents for In-Office Treatment of Polyposis

One RCT was identified evaluating the use of steroid-eluting nasal stents for recurrent/persistent nasal polyposis after ESS, which demonstrated improvements in polyp grade and ethmoid obstruction. Strengths of this trial included use of a sham control and adequate power for its primary outcome. However, the trial is at high risk of bias due to unblinded outcome assessment. Although avoidance of repeat ESS and oral steroids may be relevant outcomes for this indication, it would be important for decisions about repeat ESS or other treatments to be standardized and prespecified or be made by a clinician blinded to treatment group. Sinus stents may prove to have a role in nasal polyposis; however, additional positive results from well-designed RCTs are needed to confirm the results of the single available RCT.

Practice Guidelines and Position Statements
No guidelines or statements were identified.

U.S. Preventive Services Task Force Recommendations
Placement of implantable sinus stents is not a preventive service.

Summary of Evidence
The evidence for implantable steroid-eluting sinus stents in individuals who have chronic rhinosinusitis who have undergone endoscopic sinus surgery (ESS) includes 2 randomized controlled trials (RCTs), a number of observational studies, and systematic reviews of these studies. Relevant outcomes include symptoms, change in disease status, morbid events, and treatment-related morbidity. The most direct evidence comes from the 2 available RCTs comparing steroid-eluting sinus stents with non-steroid-eluting stents, both of which showed some benefit with steroid-eluting stents. However, the studies had some limitations, including risk of bias. In addition, because of the comparison group used in both, these trials primarily evaluate the efficacy of topical steroids when delivered by an implanted device, but do not evaluate the efficacy of the device versus standard care. The evidence is insufficient to determine the effects of the technology on health outcomes.

The evidence for implantable steroid-eluting sinus stents in individuals who have recurrent sinonasal polyposis includes 1 RCT and 1 single-arm study. Relevant outcomes include symptoms, change in disease status, morbid events, and treatment-related morbidity. The most direct evidence comes from the available RCT, which compared steroid-eluting stents plus topical steroids with steroids alone for individuals with recurrent polyposis after ESS. This trial is at high risk of bias due to unblinded outcome assessment. Although avoidance of repeat ESS and oral steroids may be a relevant outcome for this indication, it would be important for decisions about repeat ESS or other treatments to be standardized and prespecified or be made by a clinician blinded to treatment group. The evidence is insufficient to determine the effects of the technology on health outcomes.

Medicare National Coverage
There is no national coverage determination (NCD).
References


### Policy History

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<tr>
<th>Date</th>
<th>Action</th>
<th>Reason</th>
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<tr>
<td>March 2014</td>
<td>New Policy</td>
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<tr>
<td>March 2017</td>
<td>Update Policy</td>
<td>Policy updated with literature review references 9, 13, and 16 added. “And for Recurrent Sinus Disease” added to title and not medically necessary policy statement was expanded to include the use of sinus stents for recurrent sinonasal polyposis.</td>
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### Keywords

Nasal sinus implant
Propel
Relieva Stratus MicroFlow

This policy was approved by the FEP® Pharmacy and Medical Policy Committee on March 17, 2017 and is effective April 15, 2017.

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