Trends in the Use of Stents and Drug-Eluting Stents in Sinus Surgery

Leah J. Hauser, MD, Justin H. Turner, MD, PhD,
Rakesh K. Chandra, MD*

KEYWORDS

• Sinus surgery • Chronic rhinosinusitis • Chronic sinusitis • Stents
• Drug-eluting stents • Steroid releasing stents

KEY POINTS

- Steroid-impregnated dressings and implants appear to be safe, although likely have increased systemic absorption compared with topical nasal steroid sprays and rinses.
- There is evidence to support the use of steroid-releasing implants in the ethmoid cavity; however, more study is needed to truly define the role of these implants.
- Slow resorbing steroid-releasing implants may be a promising option for the treatment of recurrent nasal polyposis in select patients.
- Maintaining patency of the frontal sinus outflow tract has unique challenges, where stenting and drug delivery may have benefit.

INTRODUCTION

The success rate of endoscopic sinus surgery (ESS) is high. However, a subset of patients has continued disease requiring further medical therapy and/or revision surgery.[1,2] Failures and suboptimal postoperative outcomes may be due to recurrent inflammatory disease, scarring/synechiae, ostial stenosis, or middle turbinate lateralization. Postoperative care, including steroids and middle meatal stents or spacers, can minimize some of these failures to optimize outcomes after sinus surgery.[3]

Stenting has long been used in the paranasal sinuses with the goals of maintaining a patent sinus cavity during the postoperative healing process and preventing restenosis from inflammation or scarring. Although the practice of stenting may be a mainstay in other settings of luminal surgery, use in ESS continues to evolve with scientific

Disclosure Statement: L.J. Hauser has nothing to disclose. J.H. Turner is a Consultant for IntersectENT. R.K. Chandra is a Consultant for Meda, J&J, Olympus, and IntersectENT.

Department of Otolaryngology, Division of Rhinology, Sinus & Skull Base Surgery, Vanderbilt University, 1215 21st Avenue South, #7209 MCE South Tower, Nashville, TN 37232-8605, USA
* Corresponding author.
E-mail address: Rakesh.Chandra@vanderbilt.edu

Otolaryngol Clin N Am ■ (2017) ■–■
http://dx.doi.org/10.1016/j.otc.2017.01.007 **oto.theclinics.com**

advances and clinical experience, and the exact indications for use of stents are still currently debated. Options include a wide array of both rigid and pliable absorbable and nonabsorbable materials. More recently, drug-eluting stents have been introduced and have been well studied.

Clinical experience supports the use of steroids postoperatively, although the ideal delivery system continues to be debated. Systemic steroids are very effective at decreasing postoperative edema and promoting healing postoperatively; however, there is the potential for significant side effects, including aseptic necrosis of the femoral head, uncontrolled hyperglycemia in diabetics, and orbital and psychiatric complications.[4] Topical steroid delivery systems have therefore been preferred when feasible. Nasal steroid sprays are safe and effective, but have limited penetration into the paranasal sinuses.[5] High-volume budesonide irrigations have been shown to be effective,[6] but possible concerns exist over the safety profile when these are used over extended periods, particularly with regard to hypothalamic-pituitary-adrenal suppression.[7,8] Recent trends have included targeted steroid placement, using topical steroid combined with existing (usually bioabsorbable) dressings, and also the application of manufactured drug-eluting stents engineered specifically to achieve this end. The present report focuses on materials that have been used for targeted steroid delivery, and stents specifically manufactured to achieve this purpose.

Steroid-Impregnated Dressings

Steroid impregnation of existing biomaterial dressings was a strategy developed to combine the potential advantages of stenting the middle turbinate medially with improved healing via controlled local drug delivery, with minimal systemic absorption.

Two randomized, double-blind, placebo controlled trials have evaluated steroid-impregnated dressings with conflicting results. Cote and Wright[9] studied 19 patients using a triamcinolone- versus saline-impregnated bioabsorbable proprietary polyurethane foam dressing (Nasopore; Stryker, Kalamazoo, MI, USA) and found statistically improved nasal endoscopy scores at 3 and 6 months after surgery in the triamcinolone group. Rudmik and colleagues[10] found no statistical difference in endoscopy scores among 36 patients in a randomized placebo controlled trial where the cavities in one arm were treated with dexamethasone-containing carboxyethyl cellulose foam (Stammberger Sinu-Foam; Smith & Nephew, London, UK), while the others received foam mixed with saline. It should be noted, however, that the study protocol included a course of oral steroids for all participants. More and colleagues[11] found that triamcinolone-impregnated matrix (Nasopore) was equivalent to a short course of oral steroids in combating the early return of edema in polyp patients, showing that steroid dressings can be used effectively outside the perioperative period.

Another study on safety of this triamcinolone-impregnated matrix (Nasopore) found a transient decrease in serum cortisol that normalized by postoperative day 10.[12] The investigators concluded that this change was likely not clinically significant, although the data imply that systemic steroid absorption from a saturated dressing may be higher than other topical steroid applications. A systematic review subsequently showed a trend toward decreased adhesions among steroid-impregnated versus placebo spacers, but data were unable to be pooled and analyzed given significant heterogeneity among studies.[13]

Manufactured Drug-Eluting Stents

A steroid-eluting stent composed of a polylactide-*co*-glycolide scaffold impregnated with 370 μg of mometasone furoate was designed by Intersect ENT (Propel, Menlo Park, CA, USA) in 2011 (**Fig. 1**).[14,15] It is meant to slowly release steroid by diffusion