Adverse events associated with corticosteroid-eluting sinus stents: a MAUDE database analysis

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Introduction

The efficacy of endoscopic sinus surgery (ESS) in treating chronic rhinosinusitis (CRS) is well established. ESS revision rates are reported to range from 4% to over 15%.[1] Sustained improvement in symptoms post-intervention is often based upon patency of the sinus, which can be compromised by synechiae development, turbinate lateralization, and stenosis

This spurred the creation of a corticosteroid-eluting stent (CES) – the 'Propel' stent (Intersect ENT, Inc., Menlo Park, CA) in 2011. These bioabsorbable stents physically prop open the ethmoid sinus while maintaining the position of the turbinate, simultaneously delivering mometasone furoate, with the intent to reduce mucosal edema and synechiae formation. Many randomized controlled trials have shown their effectiveness in reducing inflammation, the need for oral steroids, and the requirement for further surgical interventions.[2,3] With a large, seemingly increasing number of CES being implanted, continually reviewing safety data is critical to ensure adequate patient education and consent, as well as to inform surgeons of preventable, device-related complications. The objective of this study is to describe adverse events related to CES, to improve patient counselling during the consenting process and help surgeons in their surgical decision making.

Methods and Materials

The FDA's Manufacturer and User Facility Device Experience (MAUDE) database was queried for reports of adverse events involving the use of FDA-approved corticosteroid-eluting sinus stents (CES) including 'Propel', 'Propel Mini', 'Propel Contour' and 'Sinuva' (Intersect ENT, Menlo Park, CA) in brand name, and product class system 'OWO' for drug-eluting sinus stents, from report date August 1, 2011 (month of first Propel FDA approval), to December 1, 2020. Data on report date, complication type, and adverse event narrative were collected

Results

There were 28 reported adverse events related to CES. All adverse events were related to the Propel family of stents, and none related to Sinuva stents. Of these, 23 (82%) were specifically associated with Propel stents, 3 (11%) with Propel Mini, and 2 (7%) with Propel Contour. Overall, 22 events were categorized as patient-related adverse events and 6 events were categorized as device-related events

The most common adverse event was related to post-operative infection, accounting for 39% (n=11) of all complications (Table 1). Four of these patients developed periorbital cellulitis, on average, on post-operative day 18, requiring oral antibiotics. Another five patients who had developed an infection were culture or tissue proven fungal infections; one of these patients had a history of chronic lymphocytic leukemia and had biopsy-proven invasive fungal sinusitis 21 days after the initial surgery.

The second most common adverse event was migration of the stent, representing 21% of all complications (n=6), with the majority (83% of such events) being displaced to the oropharynx. Two patients (7%) had a cerebrospinal fluid (CSF) leak; another 2 patients (7%) developed granulation tissue, one of which was complicated by epistaxis.

Overall, eight patients (29%) in our cohort required re-intervention in the operating room. Five patients required debridement and removal of the stent in the operating room secondary to the development of a fungal infection; two patients required re-intervention for closure of a CSF leak and stent removal; and one patient developed epistaxis secondary to the development of granulation tissue around the stents requiring debridement of granulation tissue and hemostasis in the operating room.

Table 1. Adverse events related CES based on report narrative (n=28)

Adverse event	n (%)	Requiring surgical re-intervention (%)*
Infection	11 (39)	5 (45)
Stent migration	6 (21)	0 (0)
Granulation tissue	2 (7)	1 (50)
CSF leak	2 (7)	2 (100)
Allergic reaction	1 (4)	0 (0)
Device malfunction	1 (4)	0 (0)
Post-operative pain	1 (4)	0 (0)
Septal perforation	1 (4)	0 (0)
Increased IOP	1 (4)	0 (0)
Middle turbinate lateralization	1 (4)	0 (0)
Vasovagal syncope	1 (4)	0 (0)

*percentage based on individual adverse event

Discussion

To our knowledge, this is the first study to report patient and device-related adverse events of CES using a nationwide database. A total of 28 events were reported from 2011 to 2020 associated with the Propel family of stents, with post-operative infection being the most reported adverse event, accounting for 39% of all cases A considerable proportion of sinusitis was caused by fungal species (45% of all infections), and there were several cases of periorbital cellulitis. No adverse events were associated with the Sinuva stent, likely related to the later FDA approval and introduction to the market compared to the Propel stent (2017 vs. 2011).

Although the incidence of post-operative infection after endoscopic sinus surgery is not infrequent, ranging from 2.5 to 14.9%, few of the first clinical trials studying the safety of CES reported any post-operative infections.[4] The ADVANCE and ADVANCE 2 RCTs studied the safety and effectiveness of CES in a pooled total of 155 patients and over 300 implants. Only one patient was reported to experience mucopurulent discharge in a post-operative visit.[2]

Overall, it is not possible to establish from the database alone whether the reported cases of post-operative infections are directly caused by CES, or they are independent from the stents.

Regarding the cases of periorbital cellulitis in our cohort, it is unclear whether CES increases the risk of complicated acute sinusitis, leading to periorbital or orbital cellulitis in the post-operative period. There is no literature describing such events with the use of CES

Limitations should be acknowledged in this study. The MAUDE database has an inherent reporting bias due to the self-reporting nature of the database. Despite that over 277,900 stents have been used from 2012 to 2016 alone, only 28 adverse events were reported.[5] Due the passive surveillance nature of the database, which relies on mandatory and voluntary reporters, adverse events are most likely underreported. In addition, since adverse events are self-reported, reports may contain incomplete, inaccurate or biased data; contents of the reports are not externally validated. Without a standardized root cause analysis, we cannot infer a causal relationship between the adverse event and the medical device using the MAUDE database. For example, in our study, two cases of CSF leak were identified as an adverse event associated with Propel stents. These cases are likely iatrogenic and unrelated to the CES, but the database identified CSF leak as a possible adverse event directly linked to the stents.

Conclusions

CES are increasingly used after ESS to reduce the need for revision surgery, but its use is not without risks. An increased awareness of the complications associated with CES can be used to better inform patients during the consenting process as well as surgeons in their surgical decision making. More consistent and frequent reporting of adverse events by physicians, can greatly improve the utility of the MAUDE database to improve patient safety.

Disclosures: None

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