Wedge-shape Merocel Pack After Functional Endoscopic Sinus Surgery: Our Experience With 697 Patients

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ABSTRACT

Background: Chronic rhinosinusitis (CRS) is a disease characterized by inflammation of the paranasal sinus mucosa for a duration of more than 12 weeks. It is one of the most frequently diagnosed chronic diseases that is encountered in everyday practice with an overall prevalence ranges from 7% to 27%. Objectives: To evaluate our long-term experience using wedge-shape middle meatal Merocel packing after functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis (CRS). Methods: charts and electronic records of consecutive adult CRS patients who failed to respond to medical treatment and underwent endoscopic sinus surgery using wedge-shaped middle meatal Merocel packing were retrospectively reviewed. Demographic data, presence and absence of nasal polyps and/or asthma, postoperative bleeding, middle meatal adhesions and/or lateralization, and requirement of adhesiolysis were reviewed. Results: 697 patients (1394 nasal sides) were included. The mean age was 34 years. CRS with nasal polyps was observed in 224 patients (32%) and 185 (27%) had associated asthma. Postoperative pain and discomfort while the pack in place were tolerable and no patient required pre-scheduled pack removal. All packs were removed in the clinic with tolerable discomfort. No major bleeding that required re-packing was seen, but mild oozing or minor bleeding was encountered in some cases which was controlled by small cotton packs soaked with diluted adrenaline. Thirty-four patients (4.9%) had middle meatal adhesions. Right side adhesions were seen in 13 patients (38.2%), left side adhesions in 12 patients (35.3%), and bilateral in 9 patients (26.4%). Significant severe lateralized middle turbinate was observed in 2 cases. No infectious complications related to the pack have happened. Conclusion: Wedge-shaped Merocel pack is an effective middle meatal pack after FESS. It is easy to shape, widely available, and economical. It can decrease early postoperative bleeding and also it provides support to the middle turbinate preventing lateralization and adhesions.

Keywords: Adhesions; Bleeding; Endoscopic sinus surgery; Middle meatus; Pack; Rhinosinusitis.

1. BACKGROUND

Chronic rhinosinusitis (CRS) is a disease characterized by inflammation of the paranasal sinus mucosa for a duration of more than 12 weeks. It is one of the most frequently diagnosed chronic diseases that is encountered in everyday practice with an overall prevalence ranges from 7% to 27% (1).

Functional endoscopic sinus surgery (FESS) is considered the gold standard surgical treatment for CRS that is refractive to medical therapy (2). It is safe and effective procedure with success rates range from 76% to 98% (3). The aim of surgery is to drain and ventilate the sinuses ostia and to remove pathologic mucosa with minimal damage to normal mucosa. Bleeding and development of postoperative adhesions are common complications after FESS. Middle meatal adhesions may block the normal mucociliary drainage pathway of the sinuses causing disease recurrence that may require revision. Nasal packing is often used to prevent postoperative bleeding and adhesions (4).

Most of the packs are placed in the middle meatus, this allows access to the ethmoids, frontal recess, and sphenoid, and it additionally stents the middle turbinate, potentially preventing adhesions.

There have been numerous absorbable (such as Floseal, MeroGel/Merocel, and Nasopore) and/or nonabsorbable spacers/stents (such as expandable polyvinyl acetate (Merocel)) described in the literature (5). Both materi-
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als can be used to control bleeding and decrease the risk of middle turbinate lateralization following FESS and each has its own characteristics.

Conventional packing materials such as Merocel (Medtronic Xomed, Jacksonville, FL, USA) are compressed, dehydrated sponge composed of hydroxylated polyvinyl acetate that can increase in size within the nasal cavity and compress a bleeding vessel through rehydration with normal saline. They are widely used and have several advantages including cost, sufficient support ability, bleeding control, and ease of manipulation. However, they can cause nasal obstruction, pain, mucosal damage and bleeding upon removal (6).

Many studies have been conducted to compare the efficacy of absorbable with nonabsorbable middle meatal packing materials, yet there is still no consensus as to which one is better (7).

We herein describe a novel technique to modify the shape and method of insertion of Merocel nasal pack to overcome its traditional disadvantages namely insufficient ventilation while the pack in place and pain associated with its removal. We evaluate our long-term experience using wedge-shape middle meatal Merocel pack after FESS for CRS with or without nasal polyps and report the clinical characteristic of patients who developed adhesion after sinus surgery.

2. OBJECTIVE
The aim of this study was to evaluate our long-term experience using wedge-shape middle meatal Merocel packing after functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis (CRS).

3. MATERIAL AND METHODS
After obtaining approval from the institutional review board committee of our university hospital (Jordan University of Science and Technology, Jordan), charts and electronic medical records of consecutive adult CRS patients who failed to respond to medical treatment and underwent endoscopic sinus surgery using wedge-shape middle meatal Merocel packing between July 2010 and January 2020 were retrospectively reviewed.

All patients had detailed history, clinical examination including nasal endoscopy and sinonasal CT scan. Charts and electronic records were reviewed for demographic data, presence and absence of nasal polyps and/or asthma, postoperative bleeding, middle meatal adhesions and/or lateralization, and requirement of adhesolysis and revision surgery.

Inclusion criteria were adult patients who had middle meatal wedge-shape Merocel after FESS with no previous history of endoscopic sinus surgery. Exclusion criteria included; resected middle turbinate, previous history of endoscopic sinus surgery, unilateral disease, known cases of primary ciliary dysfunction, sinonasal malignancy, nasal trauma, and pediatric patients.

Wedge-shape Merocel was fashioned by cutting the posterior end of a large size Merocel nasal pack vertically to decrease its length to about two third of its original size. Then, the new posterior end of the pack is further cut obliquely, Figure 1.

Under 0-degree 4 mm endoscopic view, the new shaped pack held by peanut forceps and inserted through the nasal cavity along the floor of the nose till the anterior end of the pack reaches the middle turbinate. At this stage it is rotated superiorly vertically below the middle turbinate into the middle meatus so as its anterior end will fit lateral to the middle turbinate below the frontal recess while the new wedge-shape posterior end snug into the posterior nasal cavity space between the middle and inferior turbinates, Figure 2.

All patients underwent FESS by the same surgeon (M.A). The patients were discharged on the next day of surgery on oral antibiotic, and oral steroids for cases with nasal polyps. The packs were removed 3 days after surgery under local anesthesia for all patients, and they were instructed to start saline nasal irrigation. Endoscopic examination and as needed debridement were performed in the clinic by the same surgeon during the scheduled follow up visits.

4. RESULTS
Overall, 697 patients (1394 nasal sides) who underwent bilateral FESS for CRS with or without nasal polyps and fulfilled our inclusion and exclusion criteria were included in this study. The mean age was 34 years (range, 14 - 80 years, SD ± 14). Two-hundred and sixty-eight patients (63%) were female and 429 patients...
(37%) were male. CRS with nasal polyps was observed in 224 patients (32%) and 185 (27%) had associated asthma, Table 1.

| Number | 697 patients (1394 nasal sides) |
|--------|---------------------------------|
| Age (mean, SD: year) | 34 ± 14 |
| Gender (Male: Female) | 429:268 |
| Phenotype | CRSsNP | CRSwNP |
| Asthma | 185 (27%) | |
| Severe middle turbinate lateralization | 2 (0.3%) |

**Table 1:** Patients demographic features and clinical characteristics. * CRSsNP, chronic rhinosinusitis without nasal polyps; CRSwNP, chronic rhinosinusitis with nasal polyps.

Postoperative pain and discomfort while the pack in place were tolerable and no patient required pre-scheduled pack removal. All Merocel packs were removed in the clinic with tolerable discomfort after nasal cavity being anesthetized with topical preparation of 2% lidocaine in 1:100000 adrenaline. No patient had vasovagal attack or could not tolerate the pain upon removal. No major bleeding that required re-packing was encountered in some cases which was controlled by small cotton packs soaked with diluted adrenaline.

Regular rigid nasal endoscopic examination was routinely performed during each scheduled postoperative visit at: first, third, sixth, and twelfth weeks. The cavity was debrided based on endoscopic clinical findings. When middle meatal adhesions were found, they were resected under local anesthesia at first presentation and topical antibiotic installed at the site of adhesion.

Thirty-four patients (4.9%) had middle meatal adhesions. Right side adhesions were seen in 13 patients (38.2%), left side adhesions in 12 patients (35.3%), and bilateral in 9 patients (26.4%). Significant severe lateralized middle turbinate was observed in 2 cases. The lateral surface of the middle turbinate was adherent to the lateral nasal wall with scarred tissue preventing drainage of the sinuses. No infectious complications related to the pack were happened. The characteristics of patients who had middle meatal adhesion are summarized in Table 2.

**Table 2:** Characteristics of 34 patients who underwent revision FESS due to middle meatal adhesions. * FESS, functional endoscopic sinus surgery; CRSsNP, chronic rhinosinusitis without nasal polyps; CRSwNP, chronic rhinosinusitis with nasal polyps.

5. DISCUSSION

FESS is considered the most effective surgical treatment for CRS refractory to medical therapy. Postoperative bleeding and adhesions between the middle turbinate and lateral nasal wall are the most common reported complications after sinus surgery (8). Middle meatal packing is usually used to minimize the risk of postoperative bleeding and synchia formation. The pack acts as a spacer which prevents early postoperative contact between potentially damaged opposing mucosal surfaces of the middle turbinate and the lateral nasal wall (9). In this study we found wedge-shape Merocel pack is safe and effective method in preventing these commonly encountered complications after FESS.

Controversy still exists about whether to pack or not. Some authors did not find a definite advantage for nasal packing and have advocated no packing of the middle meatus thereby preventing packing complications (10,11). However, most surgeons still consider nasal packing to be the traditional strategy of controlling ongoing bleeding after FESS especially for patients with hypertension, diabetes mellitus, or severe inflammatory response (12). Packing material selection is based on availability, experience, costs, and surgeon’s preference. Nonabsorbable packs are commonly used because they are effective, easily manipulated, cheap and widely available (6).

Several nonabsorbable and absorbable materials are available for nasal packing. Although many studies have been conducted comparing nonabsorbable with absorbable nasal packs with respect to subjective symptoms and clinical efficacy, there is still no agreement about the significant differences. Nasopore packing has been found to cause significantly less pain and bleeding during removal than did Merocel packing after septoplasty (13), another study reported that Nasopore was a significant factor in the formation of excessive granulation tissue 3–4 weeks after FESS (14). Shoman et al (15) found that a biodegradable Nasopore pack did not significantly reduce the risk of bleeding, patient discomfort (pain, pressure, congestion or swelling), or discomfort associated with packing removal compared with a traditional nonabsorbable gloved-Merocel middle meatal spacer. Their results suggested significantly slower mucosal healing with the biodegradable pack in the early postoperative period, an effect that became comparable to that of a nonabsorbable pack after 3 months postop-
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veratively. For either type of nasal packing, no statistically significant patient preference was found.

In a meta-analysis of randomized controlled trials to compare the clinical outcomes of Merocel with Nasopore as a nasal packing material after nasal surgery, preliminary evidence suggests that Nasopore is superior to Merocel in regard to pain upon removal, bleeding, in situ pain, pressure, and general satisfaction and equal to Merocel in regard to nasal obstruction, tissue adhesion, and mucosal healing (7). A randomized, prospective, multi-institutional study comparing Merocel (absorbable) to Merocel (nonabsorbable) packs after bilateral FESS was conducted by Miller et al (16). There were no statistically significant differences between the two groups in regard to synchiae, edema, or infection. The percentage of patients requiring lysis of synchiae was slightly higher in the Merogel group (14% vs. 8%), but this was not significant. The overall incidence of synchiae at last follow-up was 8% in each group.

Merocel is one of the most popular nasal packs which has many advantages: low price, availability, ease of manipulation, excellent wet-state elasticity, and sufficient support, but the possibility of bleeding and unpleasant discomfort upon removal are the major disadvantages (4,7). We present our experience in placement of wedge-shape Merocel in middle meatus after bilateral FESS. Six-hundred and ninty-seven CRS patients (1394 nasal sides) were operated by a single surgeon (M. A) over the last 10 years. We modified the technique of pack insertion to accommodate the created ethmoid cavity, support middle turbinate tmobilization, and we changed the original shape to snug into the posterior nasal cavity space between the middle and inferior turbinates. We believe that this modification also prevents oozing of blood posteriorly to the nasopharynx and avoid the need for second pack in the nasal cavity which might be required to achieve appropriate hemostasis after FESS. Although there is discomfort associated with in-place middle meatal packing and during its removal, the modified pack was tolerated by all patients and none required removal before its scheduled time. Furthermore, no patient had severe bleeding after packing removal that necessitated re-packing. Minor bleeding and blood ooze after Merocel removal were managed successfully with temporary cotton packs soaked with diluted adrenaline. We do not use the wedge-Merocel pack in pediatric patients as they are uncooperative for regular endoscopic examination after surgery, also in unilateral disease since theoretically it is possible the pack dislodge from its original place causing aerodigestive tract symptoms.

We believe that early pack removal reduces patient discomfort, achieves the required hemostasis, allows for natural wound healing and still effectively reduces middle meatal adhesions and severe middle turbinate lateralization.

Kim et al (17) conducted a study to evaluate the efficacy of covering Merocel pack with glove finger after FESS. They found gloved-Merocel has advantageous in terms of pain, bleeding upon packing removal, and postoperative wound healing compared with non-gloved-Merocel. Manji et al (18) compared, in a prospective control study, gloved-Merocel with silastic splints in 48 patients with CRS (96 nasal cavities). Participants served as their own controls, with each subject receiving both a silastic and gloved-Merocel spacer. They found that middle meatal adhesions and scarring did not differ between either of the spacers; however, patients reported significantly less pain during removal of gloved-Merocel than silastic spacer.

In a randomized, controlled clinical trial to evaluate the effects of a nonabsorbable packing in the middle meatus, Bugten and his colleagues (9) compared 31 patients who had Merocel in the middle meatus for 5 days with 28 controls with daily saline irrigations postoperatively. Their results showed that the patients receiving a Merocel pack reported no additional symptoms of facial pain, headaches, or discomfort compared with controls. Furthermore, the patients did not find removal of the Merocel troublesome with rarely occurred bleeding upon pack removal. They also found that synchiae in patient who received middle meatal Merocel was significantly less than those with saline irrigation and topical steroids alone.

Middle meatal adhesions are among the most common causes of FESS failure (8). Factors that predispose to middle turbinate lateralization and adhesions are: [1] medialization and fracturing of the middle turbinate to access the middle meatus, [2] penetration of the basal lamella especially in nasal polyps, [3] mucosal trauma of the lateral surface of the middle turbinate by instruments during surgery. All these elements allow raw mucosal surfaces to be in contact with each other which predispose to synchiae formation (19). Chen et al (19) examined whether middle turbinate interventions performed at the time of surgery (axillary flap, partial resection, conchopexy suture to septum, and concha bullosa reduction), as well as other patient and operation variables (sex, nasal polyps, asthma, smoking, concha bullosa, Lund-Mackay scores, septoplasty and revision status) play a role in middle turbinate lateralization. They found that none of these factors had a statistically significant effect on the rates of lateralization or synchiae formation.

The retrospective nature and absence of controls are the main limitations of this study. However, the large number of cases and single surgeon’s experience in novel wedge-shape Merocel pack increase the validity and quality of the data.

6. CONCLUSION

Wedge-shape Merocel pack is an effective middle meatal pack after FESS. It is easy to shape, widely available, and economical. The new described shape, and position modification of Merocal pack are simple, and novel method that can achieve ideal nasal packing requirements after endoscopic sinus surgery. It can decrease early postoperative bleeding as it is perfectly fit the cavity created by opening the ethmoid air cells, avoiding the need for second nasal pack and also it provides support
to the middle turbinate preventing lateralization and adhesions formation.

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