

PROFESSIONAL PAPER

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

doi: 10.5455/medarch.2021.75.229-233

MED ARCH. 2021 APR; 75(2): 229-233

RECEIVED: MAR 20, 2021

ACCEPTED: APR 20, 2021

¹Division of Otolaryngology, Department of Special Surgery. Jordan University of Science and Technology, King Abdullah University Hospital. Irbid, Jordan

Corresponding author: Haitham Odat, MD. Associate professor, Division of Otolaryngology, Department of Special Surgery. Jordan University of Science and Technology, King Abdullah University Hospital. PO Box 3030, Irbid, Jordan. E-mail: dr.haithamodat@gmail.com, haallaodat@just.edu.jo Tel: 00962 798201825, Fax: 00962 27095123 96. ORCID: <https://orcid.org/0000-0002-5148-7600>

Haitham Odat, Mohannad Al-Qudah, Wisam al-Gargaz

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% **Objective:** To evaluate our long-term experience using wedge-shape middle meatal Merocele 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 Merocele 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 Merocele 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 refractory 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/Meropak, and Nasopore) and/or nonabsorbable spacers/stents (such as expandable polyvinyl acetate (Merocele)) described in the literature (5). Both materi-

© 2021 Haitham Odat, Mohannad Al-Qudah, Wisam al-Gargaz

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

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 Merocele (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 Merocele nasal pack to overcome its traditional disadvantages namely insufficient ventilation while the pack is in place and pain associated with its removal. We evaluate our long-term experience using wedge-shape middle meatal Merocele pack after FESS for CRS with or without nasal polyposis 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 Merocele 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 Merocele 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 adhesiolysis and revision surgery.

Inclusion criteria were adult patients who had middle meatal wedge-shape Merocele after FESS with no previous history of endo-

scopic 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 Merocele was fashioned by cutting the posterior end of a large size Merocele 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 \pm 14). Two-hundred and sixty-eight patients (63%) were female and 429 patients



Figure 1: A. The original size of the Merocele, B. Vertical cut to about two third of its original size, C. Final wedge-shape Merocele.

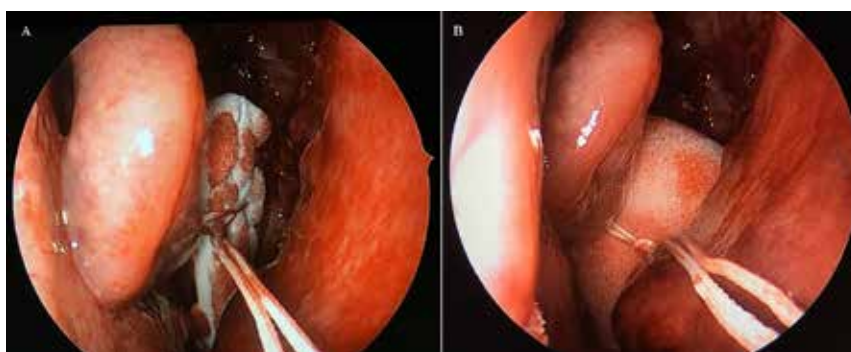


Figure 2: A. & B. Wedge-shape Merocele pack filling the middle meatus and posterior part of the nasal cavity after completion of functional endoscopic sinus surgery.

(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	473 (68%)
CRSwNP	224 (32%)
Asthma	185 (27%)
Severe middle turbinate lateralization	2 (0.3%)
Side of synechiae (n, %)	
Right side	13
Left side	12
Bilateral	9

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 seen, but mild oozing or minor bleeding 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

Age/ year (mean, range)	35.4 (18-69)
Gender (Male: Female)	17:17
Smokers	12 (35.3%)
Allergy	21 (61.8%)
Concha Bullosa	14 (41.2%)
Right	7 (20.6%)
Left	4 (11.8%)
Bilateral	3 (8.8%)
Paradoxical middle turbinate	7 (20.6%)
Right	4 (11.8%)
Left	2 (5.9%)
Bilateral	1 (2.9%)
Septoplasty	
Yes	11 (32.4%)
No	23 (67.6%)
Phenotype	
CRSsNP	14 (41.2%)
CRSwNP	20 (58.8%)
Asthma	16 (47%)

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.

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.

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 synechia formation. The pack acts as 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-

eratively. 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 Merocele with Nasopore as a nasal packing material after nasal surgery, preliminary evidence suggests that Nasopore is superior to Merocele in regard to pain upon removal, bleeding, in situ pain, pressure, and general satisfaction and equal to Merocele in regard to nasal obstruction, tissue adhesion, and mucosal healing (7). A randomized, prospective, multi-institutional study comparing Merogel (absorbable) to Merocele (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 synechia, edema, or infection. The percentage of patients requiring lysis of synechia was slightly higher in the Merogel group (14% vs. 8%), but this was not significant. The overall incidence of synechia at last follow-up was 8% in each group.

Merocele 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 Merocele in middle meatus after bilateral FESS. Six-hundred and ninety-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 medialization, 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 Merocele removal were managed successfully with temporary cotton packs soaked with diluted adrenaline. We do not use the wedge- Merocele 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 Merocele pack with glove finger after FESS. They found gloved-Merocele has advantageous in terms of pain, bleeding upon packing removal, and postoperative wound healing compared with non-gloved-Mero-

cel. Manji et al (18) compared, in a prospective control study, gloved-Merocele 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-Merocele 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 - Merocele 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 Merocele in the middle meatus for 5 days with 28 controls with daily saline irrigations postoperatively. Their results showed that the patients receiving a Merocele pack reported no additional symptoms of facial pain, headaches, or discomfort compared with controls. Furthermore, the patients did not find removal of the Merocele troublesome with rarely occurred bleeding upon pack removal. They also found that synechia in patient who received middle meatal Merocele 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 synechia 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 synechia 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 Merocele pack increase the validity and quality of the data.

6. CONCLUSION

Wedge-shape Merocele 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 Merocele 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.

- **Ethical disclosure:** This research was approved by Jordan University of Science and Technology IRB committee. IRB number: 23/131/2020
- **Acknowledgements:** The authors would like to acknowledge patients who participated in this study.
- **Patient Consent Form:** Informed consents were waved because it is a retrospective study..
- **Author's contribution:** Each author gave a substantial contribution in study design, data collection, draft writing and revision. Each author gave the final approval of the version to be published.
- **Conflict of interest:** There are no conflicts of interest.
- **Financial support and sponsorship:** Nil.

REFERENCES:

1. Fokkens WJ, Lund VJ, Hopkins C, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. *Rhinology*. 2020; 58(Suppl S29):1-464.
2. Khalid AN, Quraishi SA, Kennedy DW. Long-term quality of life measures after functional endoscopic sinus surgery. *Am J Rhinol*. 2004; 18(3):131-136.
3. Musy PY, Kountakis SE. Anatomic findings in patients undergoing revision endoscopic sinus surgery. *Am J Otolaryngol*. 2004; 25(6):418-422.
4. Toffel PH. Secure endoscopic sinus surgery with middle meatal stenting. *Oper Tech Otolaryngol Head Neck Surg*. 1995; 6(3): 157-162.
5. Orlandi RR, Lanza DC. Is nasal packing necessary following endoscopic sinus surgery? *Laryngoscope*. 2004; 114(9):1541-1544.
6. Yan M, Zheng D, Li Y, Zheng Q, Chen J, Yang B. Biodegradable nasal packings for endoscopic sinonasal surgery: a systematic review and meta-analysis. *PLoS One*. 2014; 9(12): e115458.
7. Wang J, Cai C, Wang S. MeroceI versus Nasopore for nasal packing: a meta-analysis of randomized controlled trials. *PLoS One*. 2014; 9(4): e 93959.
8. Lee JM, Grewal A. Middle meatal spacers for the prevention of synechia following endoscopic sinus surgery: a systematic review and meta-analysis of randomized controlled trials. *Int Forum Allergy Rhinol*. 2012; 2(6):477-486.
9. Bugten V, Nordgard S, Skogvoll E, Steinsvag S. Effects of non-absorbable packing in middle meatus after sinus surgery. *Laryngoscope*. 2006; 116(1): 83-88.
10. Kastl KG, Betz CS, Siedek V, Leunig A. Effect of carboxymethylcellulose nasal packing on wound healing after functional endoscopic sinus surgery. *Am J Rhinol Allergy*. 2009; 23(1):80-84.
11. Stern-Shavit S, Nachalon Y, Leshno M, Soudry E. Middle meatal packing in endoscopic sinus surgery-to pack or not to pack?-a decision-analysis model. *Laryngoscope*. 2017; 127(7):1506-1512.
12. Kennedy DW. Middle turbinate resection: evaluating the issues--should we resect normal middle turbinates?. *Arch Otolaryngol Head Neck Surg*. 1998; 124(1): 107.
13. Yilmaz MS, Guven M, Elicora SS, Kaymaz R. An evaluation of biodegradable synthetic polyurethane foam in patients following septoplasty: a prospective randomized trial. *Otolaryngol Head Neck Surg*. 2013; 148(1): 140-144.
14. Wang YP, Wang MC, Chen YC, Leu YS, Lin HC, Lee KS. The effects of Vaseline gauze strip, MeroceI, and Nasopore on the formation of synechia and excessive granulation tissue in the middle meatus and the incidence of major postoperative bleeding after endoscopic sinus surgery. *J Chin Med Assoc*. 2011; 74(1):16-21.
15. Shoman N, Gheriani H, Flamer D, Javer A. Prospective, double-blind, randomized trial evaluating patient satisfaction, bleeding, and wound healing using biodegradable synthetic polyurethane foam (NasoPore) as a middle meatal spacer in functional endoscopic sinus surgery. *J Otolaryngol Head Neck Surg*. 2009; 38(1):112-118.
16. Miller RS, Steward DL, Tami TA, Sillars MJ, Seiden AM, Shete M, et al. The clinical effects of hyaluronic acid ester nasal dressing (Merogel) on intranasal wound healing after functional endoscopic sinus surgery. *Otolaryngol Head Neck Surg*. 2003; 128(6):862-869.
17. Kim DW, Lee EJ, Kim SW, Jeon SY. Advantages of glove finger-coated polyvinyl acetate pack in endoscopic sinus surgery. *Am J Rhinol Allergy*. 2012; 26(5); e147-e149.
18. Manji J, Habib AR, Macias-Valle L, et al. Comparing the efficacy of Silastic and gloved-MeroceI middle meatal spacers for functional endoscopic sinus surgery: a randomized controlled trial. *Int Forum Allergy Rhinol*. 2018; 8(8): 948-954.
19. Chen PG, Bassiouni A, Wormald PJ. Incidence of middle turbinate lateralization after axillary flap approach to the frontal recess. *Int Forum Allergy Rhinol*. 2014; 4(4): 333-338.