Preventing Lateral Synechia Formation After Endoscopic Sinus Surgery With a Silastic Sheet

Jae Yong Lee, MD, PhD; Seung Won Lee, MD

Objectives: To investigate whether the insertion of a Silastic sheet between the middle turbinate and lateral nasal wall can prevent lateral synechia formation when an unstable, floppy middle turbinate results from endoscopic sinus surgery (ESS).

Design: Prospective study.

Setting: University hospital.

Patients: Thirty patients who developed an unstable, floppy middle turbinate during ESS were allocated in order of occurrence as follows: group 1, 15 patients, 17 sides including 2 bilateral cases; group 2, 15 patients, 18 sides including 3 bilateral cases.

Interventions: In group 1, a fan-shaped Silastic sheet was inserted between the middle turbinate and lateral nasal wall and secured to the caudal septum. In group 2, no specific procedure was performed except for meticulous postoperative care to prevent lateralization of the middle turbinate.

Main Outcome Measure: We observed the patients for 5 months and compared the occurrence rate of synechia formation between the 2 groups.

Results: Synechiae developed in 1 of 17 sides (6%) in group 1 and 8 of 18 sides (44%) in group 2, for success rates of 94% and 56%, respectively. The success rates differed significantly. The middle turbinate was preserved in all patients in group 1.

Conclusion: The results of this study suggest that the insertion of a Silastic sheet in the middle meatus is a useful method for preventing lateral synechia formation and for preserving the middle turbinate.

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LATERALIZATION OF THE MIDDLE turbinate with scarring and obstruction of the middle meatus are the most common complications of endoscopic sinus surgery (ESS).1,2 An unstable, floppy middle turbinate occurs frequently, which can make meticulous postoperative dressing difficult during sinus healing. Consequently, the risk of synechia formation and the recurrence of sinusitis increase, necessitating further surgery.

Instability of the middle turbinate may result from excessive excision of the basal lamella or removal of the horizontal bony portion of the middle turbinate; from a lateral fracture of the middle turbinate to access the sphenoid recess or natural ostium of the sphenoid sinus; or from severe polyposis of the middle turbinate and superior meatus region necessitating wide trimming with a microdebrider. A congenitally weak and thin middle turbinate; a concha bullosa, which needs partial resection; and a paradoxical middle turbinate may also contribute to the instability of the middle turbinate after ESS.

Although different methods have been attempted to prevent lateral synechia formation after ESS, each procedure involves some disadvantages or difficulties, and no standard measure has been proposed. This study evaluated the efficacy of inserting a Silastic sheet (Dow Corning, Midland, Michigan) between the middle turbinate and lateral nasal wall, which is a relatively simple procedure to perform, for preventing lateral synechia formation when an unstable, floppy middle turbinate occurs during ESS.

METHODS

PATIENTS

Thirty patients (35 sides, including 5 bilateral cases) who developed an unstable, floppy middle turbinate during ESS were enrolled in this prospective study. These patients underwent ESS to treat persistent chronic rhinosinusitis or nasal...
polyposis that was resistant to medical therapy (antibiotics, mucolytics, and topical or systemic steroids). Patients who had previous ESS or polypectomy were excluded from the study.

Patients were assigned into 2 groups of 15 patients each in order of occurrence of unstable, floppy middle turbinates. All of the patients underwent bilateral ESS, and nasal polyps were present in 18 patients. The extent of the surgical procedures was determined according to the involved sinuses and included bilateral uncinctomy, anterior and posterior ethmoidectomy, and middle meatal antrostomy; frontal sinusotomy, sphenoidotomy, and middle turbinate plasty when indicated; and polypectomy in patients with accompanying nasal polyps. Septoplasty and inferior turbinateplasty were combined with ESS as indicated. We tried not to damage the lateral surface of the middle turbinate during the operation, and percentage of cases that involved trimming with the microdebrider (patient with a polypoid or hypertrophic middle turbinate) or partial lateral resection of the middle turbinate (patient with a concha bullosa) and the extent of the procedures was similar in both groups. The causes and proportions of the development of an unstable, floppy middle turbinate are listed in Table 1. The male-to-female ratios and mean patient ages were 10.5 and 37.4 years in group 1 and 9.6 and 39.6 years in group 2, respectively.

We explained to the patients the possibility of synchie formation when an unstable, floppy middle turbinate developed and the consequent need for additional surgery, such as division of the synchie or partial resection of the middle turbinate. Informed consent was obtained from all patients and the study was approved by the institutional review board of the College of Medicine, Soonchunhyang University.

### Surgical Techniques, Follow-up, and Assessment

All surgical procedures were performed by the same surgeon (J.Y.L.) under general anesthesia. In group 1, when a floppy middle turbinate occurred, a soft, pliable, 0.03-inch-thick polymeric Silastic sheet was shaped and placed in the nasal cavity between the middle turbinate and lateral nasal wall. The fan-shaped Silastic sheet was of sufficient size to cover the middle turbinate about 1.5 to 2.0 cm from the caudal margin (Figure 1). The Silastic sheet was measured and placed in the middle meatus under the direct vision of a straight, 4-mm, 0° endoscope (Karl Storz GmbH & Co KG, Tuttlingen, Germany). Then, the Silastic sheet was secured to the caudal portion of the nasal septum using a through-and-through mattress suture with 4-0 chromic catgut (Ethicon Inc, Somerville, New Jersey). This procedure provides adherence of the Silastic sheet to the septum, while leaving sufficient space to allow the patient to breathe comfortably through the nose (Figure 2). The Silastic sheet was easily removed in the office with biting forceps after cutting the suture with conchotomy scissors or a blade 10 to 14 days later, depending on the mucosal condition and healing process (Figure 4).

In group 2, we did not use any special material to help prevent synchie formation nor perform other procedures except for meticulous dressing to prevent lateralization of the middle turbinate during the postoperative healing period. The nasal packing was removed 2 days postoperatively, and the patient was discharged the next day. After surgery, we prescribed a single daily 20-mg dose of prednisolone for 7 days. Antibiotics, mucolytics, and topical steroid spray were also prescribed for 4 to 6 weeks after the operation. The patients were educated on the method of saline irrigation. Each patient visited our office twice a week for 2 weeks, then once a week for 4 weeks, and finally once a month for up to 5 months. Meticulous endoscopic dressing and saline irrigation were performed until the cavity was healed.

After the Silastic sheet had been removed from the group 1 patients, 1 of us (S.W.L.), blinded to whether a Silastic sheet had been used, simultaneously evaluated the postoperative results and monitored the endoscopic findings in both groups during the follow-up period. When both physicians agreed that there was no synchie formation in the middle meatus, the case was regarded as a surgical success.

### Table 1. Causes of Unstable, Floppy Middle Turbinates (MTs) in Groups 1 and 2

<table>
<thead>
<tr>
<th>Cause</th>
<th>Patients, No. (%)</th>
<th>Group 1 (n = 17)</th>
<th>Group 2 (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenitally weak and thin MT</td>
<td>7 (41)</td>
<td>5 (28)</td>
<td></td>
</tr>
<tr>
<td>Concha bullosa, requiring partial lateral resection of MT</td>
<td>4 (23)</td>
<td>5 (28)</td>
<td></td>
</tr>
<tr>
<td>Incidental removal of horizontal portion of MT</td>
<td>2 (12)</td>
<td>4 (22)</td>
<td></td>
</tr>
<tr>
<td>Severe polypoid change of MT, requiring wide trimming</td>
<td>2 (12)</td>
<td>3 (17)</td>
<td></td>
</tr>
<tr>
<td>Lateral fracture of MT to access the superior meatus</td>
<td>1 (6)</td>
<td>1 (6)</td>
<td></td>
</tr>
<tr>
<td>Sphenoidotomy, sphenethmoidal recess, or sphenoid ostium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medialization of MT owing to narrow middle meatus</td>
<td>1 (6)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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noted (2 months after the procedure). MT indicates middle turbinate.

of a patent middle meatus and ethmoid cavity without synechia formation are
removal of the Silastic sheet (Dow Corning, Midland, Michigan), preservation
the lateral nasal wall (LNW) and a clear ethmoid cavity are observed. B, After
perform postoperative sinus care through the remain-

Figure 3. Endoscopic view of the nasal cavity after fixing the Silastic sheet
(Dow Corning, Midland, Michigan) to the septum and providing sufficient space
for comfortable nasal breathing. A, Right nasal cavity; B, left nasal cavity.

Figure 4. Postoperative endoscopic evaluation. A, Healed mucosal surface of
the lateral nasal wall (LNW) and a clear ethmoid cavity are observed. B, After
removal of the Silastic sheet (Dow Corning, Midland, Michigan), preservation
of a patent middle meatus and ethmoid cavity without synechia formation are
noted (2 months after the procedure). MT indicates middle turbinate.

STATISTICAL ANALYSIS

The synechia formation rates in groups 1 and 2 were compared with the \( \chi^2 \) test using SPSS Software, version 11.0 (Chicago, Illinois). A \( P \) value of less than .05 was considered statistically significant.

In group 1, a synecchia developed on 1 of 17 sides (6%),
for a success rate of 94%. The synecchia was found within
2 months of the procedure, and complete obstruction of
the middle meatus did not occur. Along the upper third
to half of the middle turbinate, scar tissue formed and
attached to the lateral nasal wall. It was not difficult to
perform postoperative sinus care through the remaining
space, and the synecchia was divided 3 months post-
operatively. In 2 patients, focal synecchiae were found
between the middle turbinate and nasal septum after the
Silastic sheet was removed, although the patients did not
complain of any olfactory symptoms.

In group 2, synecchiae formed on 8 of 18 sides (44%),
for a success rate of 56%. Five sides developed partial syn-
ecchiae, as with the patient in group 1, while 3 sides de-
veloped total obstruction of the middle meatus. These
patients underwent division of the synecchia or partial
or near-total resection of the middle turbinate and revi-
sion polypectomy when polyps recurred 3 to 4 months
after the initial operation.

No synecchia recurrence took place in a patient in group
1, while 3 patients in group 2 developed partial syn-
ecchia formation after the second procedure. The rate of
lateral synecchia formation was significantly lower in group
1 (\( P = .02 \)) (Table 2). Additional lateral synecchia for-
motion did not occur in any patient during the follow-
up period of 5 months.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
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<tbody>
<tr>
<td>Patients, No. (sides)</td>
<td>15 (17)</td>
<td>15 (18)</td>
</tr>
<tr>
<td>Occurrence of synecchia, sides</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Synecchia formation rate, %</td>
<td>6(^a)</td>
<td>44</td>
</tr>
</tbody>
</table>

\(^a\) Statistically significant (\( P = .02 \)).

The most common complication of ESS, occurring in as
many as 43% of patients, is lateralization of the middle
turbinate.\(^1,2\) The formation of scar tissue between
the middle turbinate and lateral nasal wall can obstruct
the outflow of the ethmoid, maxillary, and frontal sinuses,
leading to recurrent symptoms and necessitating at-
ttempts of synecchia division in the office or further sur-
gery. Proper handling of the middle turbinate and the pre-
vention of lateralization appear to be the keys to avoiding
postoperative problems and ensuring a successful out-
come for the patient undergoing ESS.

Many methods have been proposed to prevent syn-
ecchiae and to handle the unstable middle turbinate. Fried-
man et al\(^3\) recommended middle turbinate medializa-
tion by inducing a controlled synecchia between the caudal
end of the middle turbinate and the septum using mi-
crodebrider-assisted mucosal abrasion. However, this
method may compromise airflow to the olfactory neu-
roepithelium and can affect the sense of smell. In addi-
tion, controlled synecchiae might not be created, leading
to lateralization of the middle turbinate. Thornton\(^6\)
introduced the suture stabilization technique of the middle
turbinate. Although this method may effectively pre-
vent synecchiae, the suture technique is difficult to per-
form in a narrow posterior nasal cavity, and it is also dif-
ficult to pass a needle through the solid bone of the middle
turbinates and ethmoid plate, especially when a septo-
plasty has not been performed. Placing a Silastic sheet
with an inverted U-shape in the ethmoid cavity or a middle
meatal stent also has been tried.\(^5\) However, the Silastic sheet
is easily displaced during the follow-up period, and
fixing the Silastic sheet with ethmoid packing over a pro-
longed period might induce infection or even fatal toxic
shock syndrome. Partial resection of the middle turbi-
nate also has been performed, but this method does not
completely eliminate the possibility of a synecchia.\(^4\) The
superior aspect of the turbinate, which is often pre-
served, may lateralize and cause iatrogenic frontal sinus
obliteration.\(^6\) In addition, this would increase the heal-
ning period and might alter the normal nasal physiologic
structure, especially when the middle turbinate is to-
tally resected. Recently, platelet gel packing and sodium
hyaluronate–carboxymethylcellulose (HA-CMC), which

STATISTICAL ANALYSIS

The synechia formation rates in groups 1 and 2 were compared with the \( \chi^2 \) test using SPSS Software, version 11.0 (Chicago, Illinois). A \( P \) value of less than .05 was considered statistically significant.
prevent adhesions, have been used, but the efficacy of these materials remains unclear.\textsuperscript{7-10}

Compared with the method described by Thornton,\textsuperscript{4} our technique is relatively simple to perform because fixation of the Silastic sheet is generally performed at the anterior to middle portion of septal cartilage. Our procedures also provide little difficulty in the postoperative care of the ethmoid sinus and frontal recess area, compared with inserting an inverted U-shaped Silastic sheet. A synchiae between the middle turbinate and septum rarely occurs, unless mucosal injury occurs at the same location between the 2 structures, which would result in little possibility of olfactory disturbance. In addition, the cost to the patient is reduced because our method does not require materials such as platelet gel packing or HA-CMC.

The key to our method is using a Silastic sheet of the proper size. If the height of the Silastic sheet is excessive, it may induce irritation and mucosal injury to the root and dome of the middle turbinate during packing or postoperative dressing, while if the Silastic sheet is too long, it may induce mucosal injury or bleeding at the horizontal portion of the middle turbinate or entrance of the ethmoid sinus. Conversely, a Silastic sheet that is too small may be displaced or extruded from the middle meatus during packing removal or postoperative care at the office. Therefore, the size of the Silastic sheet is the most important factor in our technique. In addition, a floppy middle turbinate has a generally weak nature, thus a Silastic sheet of 0.03-inch thickness provides sufficient strength to prevent the lateralization of the middle turbinate during the healing period. Crust and synchiae formation between injured mucosa usually occurs in the first 10 to 14 days after surgery. A Silastic sheet can effectively prevent these events by serving as a barrier between the middle turbinate and lateral nasal wall.

This method also can be helpful when septoplasty and turbinate surgery are combined with ESS. The Silastic sheet can also prevent synchiae formation between the septum and inferior turbinate. If septal mucosal injury occurs during the septoplasty, it can accelerate the healing process by moistening and humidifying the injured site and by avoiding possible trauma during postoperative care. When insertion of the Silastic sheet was combined with turbinate surgery, some patients complained of nasal obstruction due to crust formation and nasal discharge; however, this could be relieved with saline irrigation and meticulous postoperative care. Crusting at the suture site can also be prevented by applying an ointment or emollient.

The middle turbinate is an important surgical landmark in primary or revision ESS and contributes to the normal nasal physiologic structure.\textsuperscript{11} Therefore, it should be preserved as much as possible. We were able to preserve the middle turbinate in all of our patients using our Silastic sheet method.

In conclusion, we achieved a favorable success rate with the insertion of a Silastic sheet between the middle turbinate and lateral nasal wall in cases in which an unstable, floppy middle turbinate occurred. Moreover, the middle turbinate, an important surgical landmark contributing to normal nasal physiologic structure, was preserved in all cases. We present this technique as a useful, effective measure for preventing lateral synchiae formation in ESS. However, we emphasize that our method is not a substitute for a meticulous surgical technique in an attempt to avoid causing an unstable, floppy middle turbinate.

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REFERENCES