



## Middle turbinate medialization with bovine serum albumin tissue adhesive (BioGlue)

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### KEYWORDS

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Whenever possible, the middle turbinate (MT) should be preserved during functional endoscopic sinus surgery. MT lateralization, however, can be a complication that occurs when opposing areas of denuded mucosa form a scar between them. This scar pulls the MT laterally and may cause obstruction of the outflow of the ethmoid infundibulum, which translates into subsequent failure of the initial procedure. In an attempt to prevent lateralization without the need for resection of the MT, techniques for medialization have been described. In this article, we present a quick-and-easy technique that involves using the microdebrider to create small areas of denuded mucosa on opposite surfaces of the middle turbinate and the nasal septum in a controlled fashion, followed by an application of biological tissue adhesive to facilitate and accelerate the formation of synechia, which stabilize the MT, prevent lateralization, and obviate the need for postoperative packing.

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Complete or partial resection of the middle turbinate (MT) as a component of functional endoscopic sinus surgery (FESS) is advocated for several reasons: ease of postoperative care, decreased lateralization secondary to synechia formation, higher middle meatal antrostomy patency rates, and ease of access to the anterior and posterior ethmoid cells.<sup>1</sup> Many authors, however, argue against MT resection because possible alteration in the nasal cycle and laminar airflow after resection, promotion of frontal sinusitis secondary to adhesion of the partially resected MT to the lateral nasal wall just below the frontal recess, loss of anatomic landmarks for potential revision procedures, development of anosmia, and formation of excessive scar tissue may be caused.<sup>2</sup> By preserving the MT, thus, functional anatomy also is preserved.

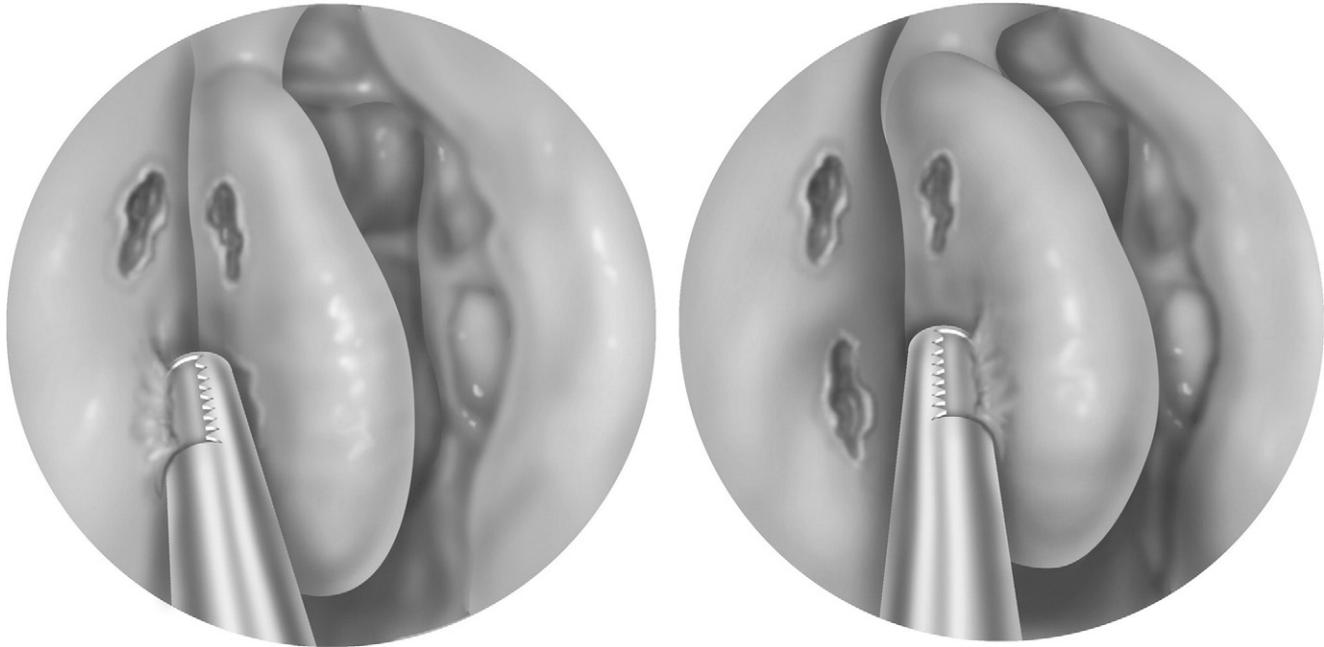
An alternative to MT resection is MT medialization without resection. This approach preserves the MT and may

prevent lateralization by promoting synechia formation, thus avoiding the obstruction of the outflow of the ethmoid, maxillary, and frontal sinuses. Several techniques for medialization have been previously described to create adhesions between the medial aspect of the MT and the nasal septum, such as abrading their surfaces using a sickle knife.<sup>3</sup> With the help of the microdebrider, small adhesions between opposing surfaces of the middle turbinate and the nasal septum can be created. Adhesion formation, however, may not occur quickly enough to prevent lateralization. Adhesions can form only if the turbinate position can be maintained for several days, which means that nasal packing needs to be used, at least initially. We use a bovine serum albumin tissue adhesive (BioGlue; Cryolife, Inc, Kennesaw, GA) as a temporary measure after abrading the mucosa of the middle turbinate and septum to accelerate synechia formation, thus eliminating the need for packing together with the problems it causes in post-FESS patients.<sup>4</sup>

BioGlue is a 2-component surgical adhesive composed of 45% weight per volume (w/v) purified bovine serum albumin and 10% w/v glutaraldehyde solution. The solutions are mixed in a 4:1 volume ratio within the applicator tip of a

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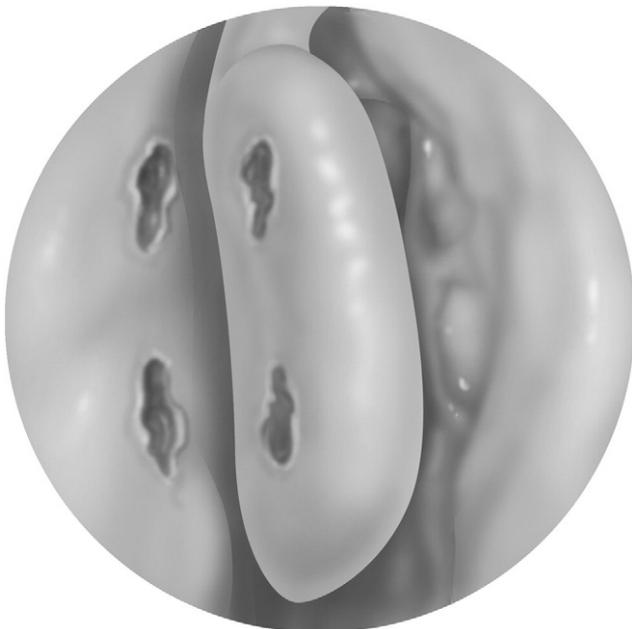
**Figure 1** The left middle turbinate and septal mucosae are abraded in 2 sites, superiorly and inferiorly.

dual-chambered syringe delivery device during application to the targeted tissue. The glutaraldehyde cross-links to the bovine serum albumin and to the targeted tissue to form a mechanical seal at the site of application. Polymerization of the surgical adhesive begins immediately on application, reaching full bonding strength within 2 minutes.

**Operative technique**

After completing the planned FESS procedure, the MT is gently displaced medially with a Freer elevator, taking care not to fracture it. It is essential to avoid abrading the mucosa

laterally (over the anterosuperior attachment of the MT to the lateral nasal wall), and as the maxillary ostium is partially enlarged, to take good care not to create an excessively large area of raw mucosa over the lateral nasal wall, which entails a greater potential for lateral synechiae formation. The mucosa just posterior to the leading edge of the MT, and the septal mucosa just opposite of this are then abraded with the straight-blade microdebrider in two sites, superiorly and inferiorly (Figure 1).<sup>5</sup> The result are 2 circumscribed areas of denuded mucosa on both surfaces (Figure 2), over which the tissue surgical adhesive is then applied with the help of a 10 cm tip extender attached to the dual-chambered syringe (Figure 3), before displacing the MT medially with the Freer elevator and bringing these 2 surfaces together (Figure 4). Temporary nasal



**Figure 2** Two circumscribed areas of denuded mucosa on the septal and left middle turbinate surfaces.



**Figure 3** The tissue adhesive is applied over the abraded surfaces.

packing with cotton pledgets is used for 2 to 3 minutes, until the tissue adhesive is fully polymerized. No nasal packing is then needed to keep the MT medialized until the synechia is formed, for the tissue adhesive keeps the MT in place. Controlled synechia quickly form (Figure 5), which stabilize the MT, and keep the maxillary antrostomy open and the ethmoid cells widely exposed.

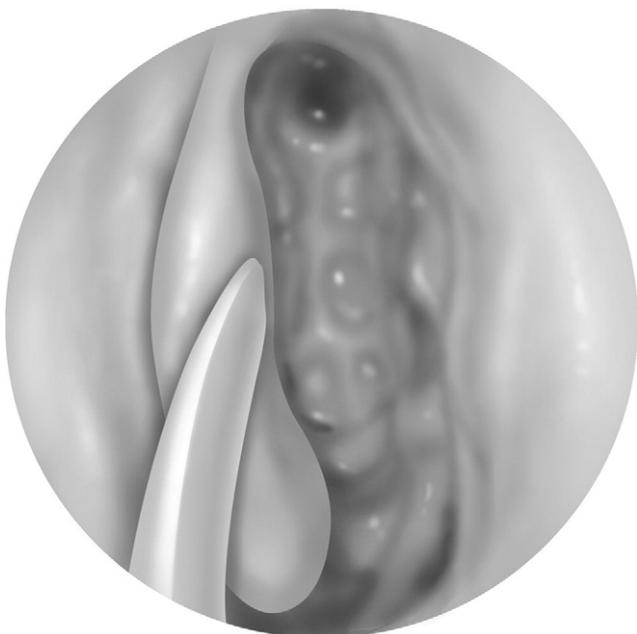
### Postoperative management and complications

High rates of MT medialization have been achieved by using the aforementioned described technique (93%). We performed microdebrider-assisted MT medializations with BioGlue in a total of 212 patients between January 2006 and January 2007. We have followed these patients for an average of 6 months and, in this period, we have only observed 6 lateralizations.<sup>6</sup> Follow-up is scheduled at regular intervals, following the standard schedule for post-FESS patients. Rigid endoscopy and debridement are performed as needed.

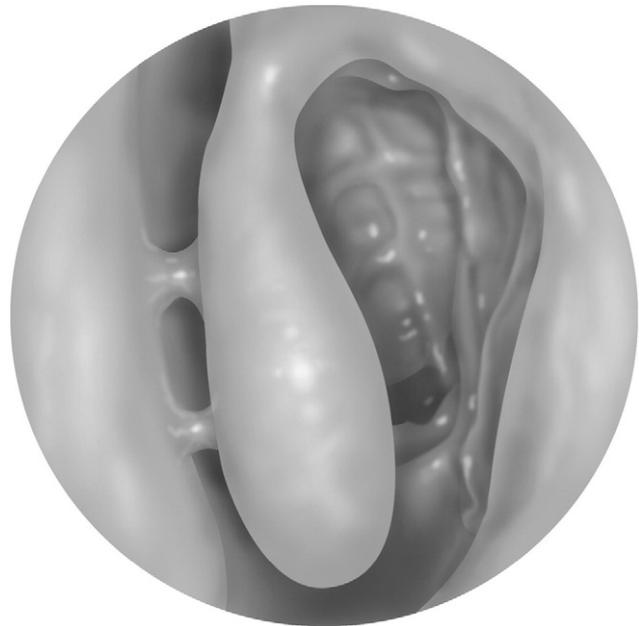
The most common complication is failure of medialization of the MT. The synechia might sometimes not hold or not form at all, which may happen if the abraded surfaces are not precisely aligned. If the abraded surfaces are posterior to the leading edge of the MT, the synechia actually acts as a fulcrum that brings the anterior surface of the MT closer to the lateral nasal wall. When lateral synechia are found on endoscopy, they can be incised, after topically anesthetizing and decongesting the nasal cavity. This procedure is sometimes associated with further trauma and scarring, so great care must be taken to minimize trauma to the mucosa on the lateral nasal wall and the septum.

### Conclusion

MT medialization with the use of BioGlue is a simple and quick step that has very low potential for complications



**Figure 4** The left middle turbinate is displaced medially, which brings the 2 surfaces together.



**Figure 5** Controlled synechiae subsequently form.

during FESS. The idea of adding tissue adhesive to the controlled synechia formation after abrading MT and septal mucosa comes from previous experience with cases in which MT medialization was not achieved. The advantage of the BioGlue delivery system is that it allows for a precise and controlled application in the desired location, which minimizes these technical errors. Another advantage is that the use of the fast-acting tissue adhesive makes the need for nasal packing for MT medialization unnecessary, thus avoiding the discomfort and potential morbidity of nasal packing after FESS. Meticulous technique should be followed at all times during the procedure, to avoid inadvertently abrading the mucosa of the lateral nasal wall. Careful preoperative evaluation and inspection during the procedure will enable the surgeon to determine if the MT in question is not extensively inflamed or has polypoid changes, or even if a large concha bullosa is obstructing access to the middle meatus, in which case partial or even complete MT resection should be performed.

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