

Case Report

Beneficial Effects of Silastic Sheeting on the Remucosalization of Exposed Nasal Septal Cartilage Following Endoscopic Nasal Septal Flap Harvest for Skull Base Reconstruction - Technical Description

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Submitted: 10 September 2016

Accepted: 01 November 2016

Published: 03 November 2016

ISSN: 2379-948X

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Keywords

- Endoscopic skull base surgery
- Mucosal healing
- Remucosalization
- Nasoseptal flap
- Nasal stents
- Silastic sheeting

Abstract

The introduction of the nasoseptal flap (Hadad-Bassagaisteguy flap) was paramount in addressing the complications associated with endoscopic skull base surgery for anterior skull base lesions. This approach involves harvesting donor muco-perichondrium/periosteum from the nasal septum as a means to reestablish the barrier between the cranial compartment and sinonasal tract, and has reduced many of the complications of endoscopic skull base surgery including CSF leakage, meningitis, pneumocephalus and post-operative meningo(encephalo)celes. Despite its benefits, crusting of the exposed nasal septum, synechiae formation, and delayed recovery and repair of the donor site became notable concerns following nasoseptal flap harvest. Although studies have described the use of fascia lata grafts and/or biomaterials to minimize these issues, the alteration of the healing process that occurs with the simple use of Silastic applied on the exposed cartilaginous and/or bony nasal septum has not yet been examined. We describe a simple technique of positioning a Silastic sheet over the exposed nasal septum for 4 weeks after nasoseptal flap harvest. In our centre, this simple stenting procedure has led to reduced crusting, improved healing and accelerated re-mucosalization of the denuded septum. Additional advantages of this approach include its speed, cost-efficiency, absence of a secondary donor site and high customizability allowing adjustment based on the intra-nasal anatomy of the patient.

ABBREVIATIONS

CSF: Cerebrospinal Fluid; NSF: Nasoseptal Flap

INTRODUCTION

With advances in intraoperative image guidance and visualization, endoscopic skull base surgery has become a powerful technique in the management of skull base lesions [1,2]. This technique requires the creation of a skull base defect to access cranial base pathologies. Despite its advantages, this approach initially posed challenges due to the difficulty in reestablishing

a barrier between the cranial compartment and sinonasal tract; significant complications included CSF leakage, meningitis, and pneumocephalus [3,4]. The introduction of the nasoseptal flap (NSF/Hadad-Bassagaisteguy flap) in 2006 was paramount in reestablishing this barrier to reduce postoperative CSF leakage (from 50% to 5% in certain series) and prevent herniation of the brain into the nose [4-6]. As a result, the NSF quickly became a part of the workhorse for reconstruction in endoscopic skull base surgery. Harvesting a NSF requires donor muco-perichondrium/periosteum to be elevated from one side of the nasal septum. The flap is vascularized and pedicled on the ipsilateral posterior

nasoseptal artery [6]. Unfortunately, preservation of the pedicle often requires NSF harvesting to be planned preoperatively [4,6]; to address this limitation, techniques such as the harvesting of a 'nasoseptal rescue flap' have been described [4].

Despite the benefits of NSF, common complications of this procedure include substantial crusting of the exposed nasal septum, synechiae formation between the septum and lateral nasal wall, and delayed recovery and repair of the septal donor site [5,7]. Although it has been suggested that the use of materials such as fascia lata grafts and biomaterials can decrease the rate of these complication [8], studies have not yet examined the alteration in the healing process that occurs with the simple use of Silastic applied on the exposed cartilaginous and/or bony nasal septum. We propose that the procedure described below can be used in all settings that require or result in the nasal septum being denuded of mucosa. Further, we believe that the use of intra-nasal Silastic closely affixed to the septum post-operatively results in improved healing of the denuded area.

MATERIALS AND METHODS

Patient population

The procedure described below is intended for patients with a nasal septal mucosal defect. We specifically detail the situation of donor defects created during nasal septal flap harvest for reconstruction of a skull-base defect, but the same technique may be used in a variety of other situations resulting in an intra-nasal mucosal defect.

Description of the technique

During surgery, a septal flap to be used to reconstruct the skull base defect is harvested from the entire surface of one side of the septum. This leaves a donor site of exposed cartilaginous and bony septum with the mucosa and perichondrium/periosteum stripped off following harvest. A rectangular piece of Silastic is placed flat on the exposed nasal septum and used to cover the exposed portion. The shape of the piece can be altered/customized to the denuded area, based on the harvest. A nylon suture is then used to suture through the Silastic and remaining septum in order to keep it in place during the healing process. In our institution, the stent is kept in place for approximately 4 weeks post-surgery. They are simply removed by cutting the single suture, with a headlight for visualization, in the clinic at the 4 week post-operative visit.

This technique also has the advantage of modification when the situation dictates. An example of a simple modification is the creation of an L-shape of the Silastic stent in the setting of very large septal flap harvest which includes the ipsilateral nasal floor. Another modification is the creation of a U-shaped Silastic stent used in the setting of concomitant septoplasty. In this situation, or in the situation where significant trauma occurs to the contralateral nasal or septal mucosa, U-shaped silastic stents are placed in the bilateral nasal cavities. This U-shaped modification allows the stent to cover the denuded portion of the nasal septum and floor, presses laterally on the inferior turbinate to ensure a good postoperative nasal airway and compresses the remaining septum in a midline position after septal reconstruction. We frequently use this modification (Figures 1, 2).

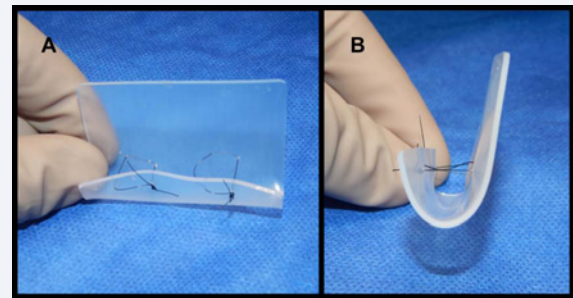


Figure 1 Silastic stent customization to cover the septum and nasal floor. A: Side view B: Front view.

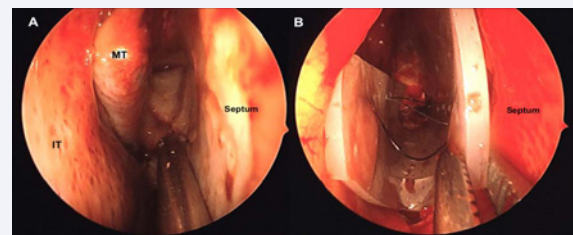


Figure 2 Endoscopic intra-operative view of A: right nasal cavity after nasoseptal flap elevation, showing exposed septal cartilage, and B: Silastic stent placement, covering the denuded cartilage, floor of the nose and pressing laterally on the ipsilateral inferior turbinate. MT: Middle Turbinate; IT: Inferior Turbinate.

Routinely, we do not place non-absorbable packing in the noses of patients having pituitary procedures. We bolster the NSF skull base reconstruction with dissolvable Gelfoam® placed beneath the flap and filling the sphenoid sinus. In some expanded endoscopic approaches to the anterior cranial base, we do use Merocele® packs to support the anterior cranial base reconstruction. We are able to place these superiorly within the bilateral nasal cavities without affecting the Silastic sheet placement. Removal of the Merocele packs has not resulted in displacement of the Silastic.

Infrequently, patients experience post-operative epistaxis requiring re-evaluation, cauterization or packing. Often, cauterization can be accomplished without Silastic stent removal. Should the patient's nose require more extensive endoscopic evaluation or formal packing, the Silastic can simply be removed by cutting the single suture affixing it to the anterior septum.

RESULTS AND DISCUSSION

We utilized various modifications of these Silastic stents to cover septal donor sites in approximately 150 cases with NSF skull base reconstructions in the last 4 years. We have collected demographic data on the last 39 skull base procedures, from 01/09/2015 to 30/08/2016. This cohort had 20 female (51%) and 19 male (49%) patients with an average age of 55 years. 33 patients (84.6%) underwent endoscopic trans-nasal approaches for sellar and suprasellar pathologies (e.g., pituitary macroadenomas, craniopharyngiomas). 6 patients (15.3%) had expanded endoscopic skull base resections for sino-nasal tumors involving the cranial base and anterior skull base meningiomas.

In terms of complications, no evidence of overt infection was identified in any of our patients and there was no need to additional antibiotic prescription or early removal of the stents due to infection. One patient (2.5%) required early removal of the Silastic to address ongoing epistaxis coming from the anterior/superior septal donor incision. This bleeding point was successfully managed with cautery in the office. We did not re-insert a Silastic stent. Two patients had post-operative septal perforations (5%). This only occurred in patients who required a concurrent septoplasty to address a significant septal deviation, in order to gain appropriate binarial access to the skull base. One patient (2.5%) presented postoperatively with a CSF leak following an endoscopic Craniofacial resection (eCFR). He required a second endoscopic intervention and his skull base was successfully reconstructed with fascia lata. The use of Silastic did not appear to have any bearing on the CSF leak. Silastic was again inserted to cover the septal donor site after his second skull base reconstruction.

Our team has noted several advantages of using a Silastic sheeting in this manner. Through applying this practice in our patients, we have noted that the speed with which the denuded septum re-mucosalizes is substantially improved. Further, there appears to be significantly less crusting, compared to those patients without Silastic sheeting, at their 4 week post-operative appointment. This minimizes the amount of post-operative debridement required. An example of this can be seen in Figure (3). Furthermore, this technique is easy for any surgeon to employ and only takes a few minutes to customize, insert and suture the stent. The procedure is cost-efficient requiring only a Silastic sheet and a single nylon suture which are priced at \$138 CDN for a box of 10 Silastic sheets and \$1.57 CDN for a 4.0 nylon suture. Additionally, it is anecdotally comfortable for patients, does not seem to adhere to the native nasal tissue or allow tissue in-growth. Further, we propose that the inert nature of the Silastic minimizes its ability to serve as a medium for bacterial growth, as compared other porous packing material. The stent can be easily customized to the intra-nasal anatomy of the patient for easy insertion and can be easily slid out of the nostril after 1 month.

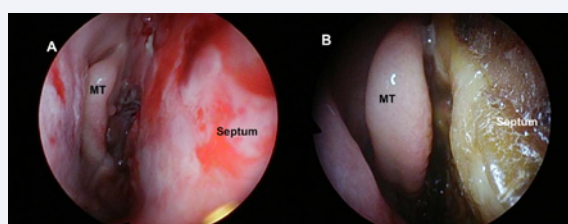


Figure 3 Endoscopic 4 weeks post-operative images. A: immediately after Silastic stent removal and B: in a patient without a Silastic stent used post-operatively.

We have used this technique in greater than 150 cases over approximately 4 years and report our anecdotal subjective findings after utilizing this technique. Further objective evaluation of the speed and quality of remucosalization, as well as a comparison of objective measures of post-operative sino-nasal complaints, in groups with and without post-operative Silastic stent use, should be conducted to further affirm these assertions.

CONCLUSIONS

Customization of a piece of Silastic sheeting to cover the donor site of the nasal septum after nasoseptal flap for skull base reconstruction, is a simple technique that seems to aid with the amount of crusting, speed of re-mucosalization and thus the global healing process of the denuded donor septum. This technique is simple and cost-effective.

Further objective evaluation of the speed and quality of remucosalization, as well as a comparison of objective measures of post-operative sino-nasal complaints, in randomized groups with and without post-operative Silastic stent use, should be conducted to further affirm these assertions.

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Cite this article

Sekhon S, Ospina J, Janjua A (2016) Beneficial Effects of Silastic Sheeting on the Remucosalization of Exposed Nasal Septal Cartilage Following Endoscopic Nasal Septal Flap Harvest for Skull Base Reconstruction - Technical Description. *Ann Otolaryngol Rhinol* 3(11): 1143.