

The effects of merocel and glove finger tampon applications on the nasal septum mucosa of rabbits*

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SUMMARY

Objective: The use of tampons after nasal septum surgery is important for both prevention of postoperative bleeding and stabilization of the nasal flaps and the septum. One of the most important factors in achieving rapid postoperative recovery is the choice of the nasal tampon material, among many, to produce minimal damage on the nasal mucosa. In this study, the histopathological effects of the glove finger and merocel tampons, which are commonly used in clinical applications, have been investigated on the nasal mucosa of rabbits.

Materials and Methods: In this study, merocel and glove finger tampons were used for nasal packing in one-sided nasal cavities of 16 adult New Zealand rabbits. The animals were randomized into two groups, each consisting of eight animals. The tampons were removed after 48 hours.

Results: Histological examination showed that if the merocel was in a glove finger, it did not create any damage to mucosal integrity and lamina propria. However, in the group where merocel was used directly, the epithelium of the nasal mucosa was shortened and demonstrated loss of cilia and in four of the eight specimens, it was partly from lamina propria.

Conclusion: It is concluded that the use of merocel in glove finger tampon leads to a lesser degree of damage in the lamina propria, and may facilitate rapid mucosal wound healing post-operatively.

Key words: nose, surgery, occlusive dressing, tampons

INTRODUCTION

Various types of nasal tampons have been used for the management of bleeding and stabilization of elevated mucosal flaps and septum after nasal septoplasty. However, the need for the use of nasal tampons is debatable as these have been associated with severe complications^(1,2). Several factors play a role in the selection and clinical use of these tampons. Among these factors are the comfort of the patient during the period between tampon application and its removal, easy application and removal, and minimal damage to the nasal mucosa allowing rapid wound healing in the postoperative period⁽³⁻⁶⁾. To this end, various types of nasal tampon materials have been used and novel materials continue to be added to the list^(3,4,7-11). Currently, the most commonly used tampon materials are ribbon-gause, glove finger, and merocel. The literature presents several studies on the clinical use of tampons; however, there are few experimental studies comparing the effects of these tampons on the nasal mucosa^(7,12).

In this study, the effects of merocel used either directly or

inside a glove finger as a nasal tampon on the nasal septum mucosa were evaluated histopathologically on rabbits.

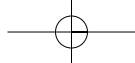
MATERIALS AND METHODS

Animals

The study protocol was approved by Ankara Numune Education and Research Hospital Ethics Committee (August 11, 2006/80). The study material consisted of 16 adult New Zealand albino rabbits weighing 1.5 kg- 2,4 kg.

Operation

The animals were randomized into two groups, each consisting of eight animals. After the rabbits were anesthetized with an intraperitoneal infusion of 50 mg/kg ketamin hydrochloride, the dorsum and the lateral parts of the nose were stained with povidone-iodine. Approximately 1-1.5 cc of local anesthetic (2% lidocaine chloride + 0.00125 epinephrin) was infused sub-mucosally to the lateral nasal wall. In the first group, a tampon of 20x3x2 mm in size prepared from an 8 cm merocel nasal tampon without airway (Merocel® Standard Nasal Dressing, 8



cm, without airway, Medtronic Xomed, Jacksonville, FL, USA) was placed inside a glove finger and inserted into one nostril of the animals. Before placing the tampons, the glove finger was punctured using a needle at multiple locations. In the second group, a merocel tampon of the same size was directly applied into one nostril of each animal. Both types of tampons were placed in the nose unilaterally in order not to prevent the nasal respiration of the animals. Then, 0.5 cc serum physiological salt solution was injected into both types of tampons to expand them.

One of the animals that had a glove finger tampon applied died on the second day after the placement of the tampon and was excluded from the study.

The tampons were removed after 48 hours following administration of intraperitoneal ketamine and local anesthesia to the lateral nasal wall of the animals. Epistaxis did not appear in any of the animals in either group following removal of the tampons. Following the removal of the tampons, the lateral wall of the nasal cavity on the side of the tampon application was completely incised at one full layer under sterile condi-

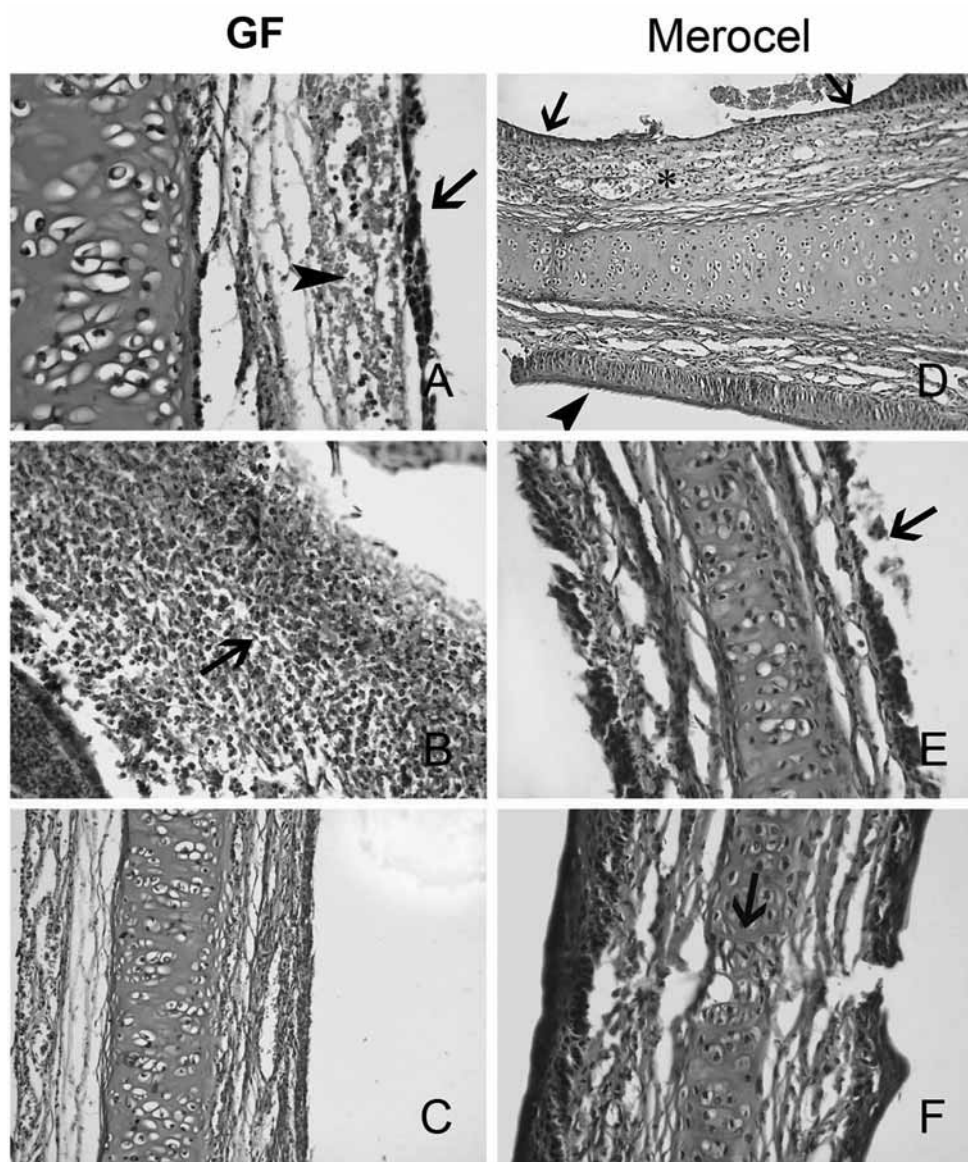
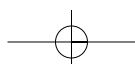


Figure 1. Histological findings of the glove finger tampon (GF) group (A, B and C) and Merocel group (D, E and F).

A) Glove Finger group showed a shortened pseudostratified epithelium with its cilia lost (arrow), while lamina propria was highly vascularized and congested (arrowhead). B) Eosinophilic infiltration (arrow) was observed more than the Merocel group. C) Perichondrium and hyaline cartilage appeared unharmed. D) Merocel group had also shortened epithelium and lost its cilia; arrows indicate the extent of compression. Mucosa was congested (asterisk). Meanwhile on the other side of the nasal septum, where nasal cavity was not packed, the epithelium and lamina propria appears normal (arrowhead). E) Epithelium was occasionally detached (arrow). F) One specimen showed degenerated septal cartilage (arrow). Hematoxylin-Eosin stain, A, B, E, F: x40, C, D: x20.



tions to obtain specimens from the septal mucosa and the cartilage. Approximately 1x1 cm of the septal mucosa with the underlying cartilage was removed from the nasal septum for histopathological evaluation. After the bleeding was controlled, the incision on the lateral wall of the nasal cavity was sutured with 3/0 atraumatic vicryl in a manner to match all the tissue layers. The animals were returned to the animal laboratory alive at the end of the study.

The biopsy specimens obtained from the nasal mucosa of seven animals with glove finger application and eight animals with direct merocel application were histopathologically evaluated.

Histopathology

For histopathological examination, 15 nasal biopsy materials were fixed in buffered (pH=7.4) 10% formaldehyde solution for 2 days at room temperature. Tissue samples were then prepared routinely for light microscopy. The procedure was as follows: specimens were dehydrated in increasing concentrations of ethanol and immersed in xylene until they were clear, followed by incubation in 3 changes of liquid paraffin at 60°C and embedded in paraffin blocks. Sections of 3 µm were stained with hematoxylin and eosin. Specimens were evaluated for their respiratory epithelium, presence of congestion and inflammatory infiltration, properties of perichondrium and hyaline cartilage. Sections were examined under a Nikon Eclipse E600 (Nikon, Tokyo, Japan) bright field microscope and images were captured using a Nikon Coolpix 5000 (Nikon) digital camera attachment.

Statistics

Statistical analysis was performed by using the Chi-square test between two percentages using SPSS 13.0, and $p < 0.05$ was regarded as statistically significant.

RESULTS

Histological examination of the glove finger tampon group revealed that pseudostratified columnar epithelium became shorter and lost its cilia, though the epithelium was intact in all specimens (Figure 1A). Three out of seven specimens had mucosal inflammatory cell infiltration composed of mostly eosinophil granulocytes (Figure 1B), vascularization and congestion. Perichondrium and hyaline cartilage were normal (Figure 1C).

Epithelium of the Merocel group was also shortened and had lost its cilia (Figure 1D). In four of the eight specimens, the epithelium was occasionally separated from the lamina propria (Figure 1E). One out of eight specimens had minor eosinophilic infiltration. Four of the eight specimens had increased vascularization and congestion (Figure 1D). The perichondrium and cartilage were normal, except that the septal cartilage was mildly degenerated in one specimen (Figure 1F).

The statistical comparison of the affected mucosa rates of the two groups showed that glove finger tampons inflicted less damage on the lamina propria than merocel tampons ($p < 0.05$).

DISCUSSION

Various types of injury may be inflicted upon the mucosa of the nasal septum during nasal septum surgery involving mucoperichondrial elevation or surgical trauma. The damage may be minimized depending on the experience and carefulness of the surgeon as well as by increasing the knowledge of various nasal septal deviations⁽¹³⁾. Several nasal tampons and septal suturing techniques that have been used in order to control bleeding and stabilize the newly re-aligned septum after surgery may also damage the nasal mucosa, however, to various degrees. To minimise mucosal damage, we aim to use tampons or suturing techniques that will cause the least degree of trauma to the nasal mucosa. This will contribute to rapid wound healing postoperatively and enables the patient to return to his/her daily activities in a shorter period.

In choosing between different types of nasal tampons, the preference and practice of the surgeon play important roles. Nevertheless, rapid and uneventful clinical improvement after tampon removal is one of the major factors that determines the choice of a specific nasal dressing. In an animal study, Genc et al.⁽⁷⁾ reported that inflammation in the septal cartilage was similar between the group where the nasal tampon prepared from ribbon gauze was immersed in a mixture of Vaseline-nitrofurazone and the transseptal suturing group. Robinson et al.⁽¹²⁾ emphasized that rapid postoperative healing of the nasal mucosa would affect the surgical outcome more favorably. However, they found that the prednisolone-soaked tampon application did not result in a more rapid mucosal healing.

In our study, the two types of tampons compared led to similar degrees of cilia loss in the mucosa. Half of the animals in which merocel tampons were applied suffered damage to the lamina propria, while the animals in which glove finger tampons were applied sustained no such damage. In addition, one of the animals in the merocel group showed mild septal cartilage degeneration (Figure 1F).

In earlier clinical studies, Ruddy et al.⁽⁸⁾ evaluated merocel and glove finger for nasal obstruction, patient comfort, postoperative bleeding, nasal crusting, and postoperative adhesions. They found no statistically significant difference between two tampons. Similarly, Illum et al.⁽⁹⁾ compared the discomfort experienced by patients during the removal of merocel, glove finger, and hydrocortisone-terramycine gauze tampons and found no significant differences between these three tampons. Garth et al.⁽³⁾, in their series of 48 patients, compared the effects of four different nasal tampons: merocel, Telfa, paraffin

gauze (jellonet) and BIPP (bismuth iodiform paraffin soaked strip gauze). The authors evaluated patient comfort during the insertion and removal of the tampons, facility in use of the tampons by the surgeon, and postoperative pain. The results of their study showed that Telfa and paraffin gauze, routinely used after surgery, were slightly superior to merocel and BIPP which both had a potential for mucosal adhesion. Von Schoenberg et al. ⁽⁴⁾ applied transseptal suture, Telfa or BIPP on 95 patients and based on visual analog scale, they found that Telfa was superior to BIPP tampon with respect to pain. As can be seen, in clinical studies, the superiority of the tampons over each other was not great. However, the slight differences are still important in establishing selection criteria. The mucosal disruption in our experimental animals may have been produced by the same mechanism as Garth et al. ⁽³⁾ emphasized clinically that the merocel tampons have a tendency to cause mucosal adhesions.

In our study, merocel used in glove finger did not create any damage to mucosal integrity and lamina propria and proved to be superior to the direct use of merocel with a statistically significant difference. We believe that glove finger tampons are associated with less damage on the nasal mucosa and as a result may be considered as a first line choice in nasal surgery.

REFERENCES

1. Jones JA. Bipp: A case of toxicity? *Oral Surg Oral Med Oral Pathol.* 1990; 69: 668-671.
2. Fairbanks DNF. Complications of nasal packing. *Otolaryngol Head and Neck Surg.* 1986; 94: 412-415.
3. Garth RJN, Brightwell AP. A comparison of packing materials used in nasal surgery. *J Laryngol Otol.* 1994; 108: 564-566.
4. Schoenberg MV, Robinson P, Ryan R. Nasal packing after routine nasal surgery - is it justified? *J Laryngol Otol.* 1993; 107: 902-905.
5. Sariguney Y, Demir Y, Kandal S, Ozmen S, Latifoglu O. Vertically split merocel tampon has advantages in nasal packing. *Plast Reconstr Surg.* 2006; 117: 1646-1647.
6. Hajioannou JK, Bizaki A, Fragiadakis G, Bourolas C, Spanakis I, Chlouverakis G, Bizakis J. Optimal time for nasal packing removal after septoplasty. A comparative study. *Rhinology.* 2007; 45: 68-71.
7. Genc E, Ergin NT, Bilezikçi B. Comparison of suture and nasal packing in rabbit noses. *Laryngoscope.* 2004; 114: 639-645.
8. Ruddy J, Brain D, Sudesh RR, Anand VT. A prospective trial of merocel packs. *Rhinology.* 1991; 29: 281-285.
9. İllum P, Grymer L, Hilberg O. Nasal packing after septoplasty. *Clin Otolaryngol.* 1992; 17: 158-162.
10. Corbridge RJ, Djazaeri B, Hellier WP, Hadley J. Prospective randomized controlled trial comparing the use of merocel nasal tampons and BIPP in the control of acute epistaxis. *Clin Otolaryngol Allied Sci.* 1995; 20: 305-307.
11. Chevillard C, Rugina M, Bonfils P et al. Evaluation of calcium alginate nasal packing (Algosteril) versus Polyvinyl acetal (Merocel) for nasal packing after inferior turbinate resection. *Rhinology.* 2006; 44: 58-61.
12. Robinson S, Adams D, Wormald PJ. The effect of nasal packing and prednisolone on mucosal healing and reciliation in a sheep model. *Rhinology.* 2004; 42: 68-72.
13. Baumann I, Baumann H. A new classification of septal deviations. *Rhinology.* 2007; 45: 220-223.

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