

The effect of chitosan-based biodegradable nasal packs on Eustachian dysfunction after septoplasty

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ABSTRACT

Purpose: The aim of this study was to compare the effects of chitosan-based biodegradable nasal packs and silicone nasal septal splints with integral airway on the ventilation and the pressure of the middle ear after septoplasty in patients with normal otoscopic examination.

Methods: Patients who underwent septoplasty for nasal septal deviation with otoscopically normal tympanic membranes and bilateral normal type A pre-operative tympanograms were included. Following surgery patients were randomized into two groups (Group P: Chitosan-based biodegradable nasal packs. Group S: Silicone nasal septal splint group). Nasal packs and septal splints were removed at second day following surgery. The middle ear pressure (MEP) was measured using tympanometry pre-operatively. Following surgery, tympanometry was repeated at 24 hours and just before the removal of nasal packs on the second day, and finally on the 7th post-operative day.

Results: Both groups comprised of 30 patients each. Tympanometric pressures of all patients decreased in both groups, but more so in group S in the first 24 hours following surgery. After 24 hours, MEP started to increase in both groups furthermore, it reached almost preoperative values by the 48th hour in group P. All MEPs returned to preoperative values by the 7th postoperative day for both groups except 1 patient of group S.

Conclusion: Our study demonstrated that chitosan-based biodegradable nasal packs caused less eustachian dysfunction than silicone nasal splints with integral airway. Therefore, we think it would be a good alternative for nasal packing after septoplasty.

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INTRODUCTION

Following septoplasty, temporary eustachian tube dysfunction is a common problem due to nasal packing. The absence of nasal airflow and inflammatory mediator release is believed to cause eustachian tube dysfunction after septoplasty [1,2]. This problem is more common, especially when using packings that completely block the nasal passage. Studies have shown that commonly used silicone nasal septal splints with integral airway cause less nasal obstruction and less negative pressure in the middle ear [3]. This is because it allows nasal airflow through an integral airway and provides septal support.

Bio-Absorbable packs, which have been used frequently recently after nasal surgery, are thought to be more comfortable than removable packings. One of the absorbable packs is PosiSep[®]X which is a chitosan-based, non-synthetic nasal packings. It is a biologically inert and self-dissolved material that enhances wound healing and minimizes bleeding [4]. Recently, it began to be used after endoscopic sinus surgery and septoplasty in our clinic. Although it is used frequently, up to date, there is no study investigating its effect on middle ear ventilation and pressure following nasal surgery in literature. Therefore we aimed to compare the effects of PosiSep[®]X and silicone nasal septal splints with integral airway on the ventilation and the pressure of the middle ear after septoplasty in patients with normal otoscopic examination.

METHODS AND MATERIALS

The present study was conducted after the approval of The Ethics Committee of our institution. A signed informed consent was obtained from all participants. Patients who underwent septoplasty for nasal septal deviation with otoscopically normal tympanic membranes and bilateral normal type A pre-operative tympanograms were included. Patients aged under 18 and who had turbinate or paranasal sinus pathologies and allergic rhinitis were excluded. Following surgery patients were randomized into two groups. While one group comprised of patients who were applied silicone nasal septal splint with integral airway (Unosplint internal nasal splint, Izmir, Turkey) (group S) the other group comprised of patients who were applied PosiSep[®]X (Hemostat dressing intranasal splint, St. Paul Mn, USA) (group P) for nasal packings. Nasal packs and septal splints were removed at second day following surgery. The middle ear pressure (MEP) was measured using tympanometry pre- and postoperatively in patients who met inclusion criteria. The alteration in middle ear pressure (MEP) was measured with tympanometry using an Interacoustics AZ-26 impedance audiometer (Denmark) pre- and post-operatively. Following surgery, tympanometry was repeated at 24 hours and just before the removal of nasal packs on the second day, and finally on the 7th post-operative day. The results were separately analyzed for each ear. The tympanograms were classified as originally described by Jerger [5].

RESULTS

Twenty-eight of the 60 patients included in the study were female and 32 were male. Both groups comprised of 30 patients each. Tympanometric pressures of all patients decreased in both groups, but more so in group S in the first 24 hours following surgery. After 24 hours, MEP started to increase in both groups furthermore, it reached almost preoperative values by the 48th hour in patients with PosiSep[®]X. These pressure differences in the first 48 hours following surgery between the two groups were statistically significant. All MEPs returned to preoperative values by the 7th postoperative day for both groups except 1 patient of group S. All MEPs \leq -100 daPa (by definition classified as Type C tympanograms) was considered as pathological. Pathological decreases in the MEP of at least one ear was determined in 5 patients (16,6%) in group P compared to only 2 patients (6,6%) in group S at the postoperative 48th hour. This difference between the two groups wasn't statistically significant (Figures 1 and 2).

Chart 1. Middle ear pressures of the right ear

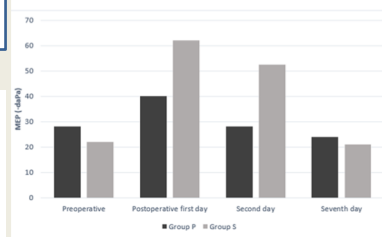
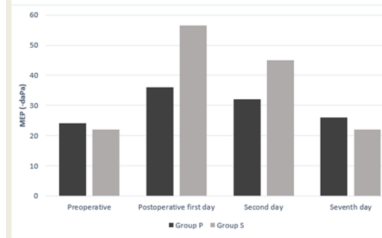


Chart 2. Middle ear pressures of the left ear



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DISCUSSION

The Eustachian tube (ET) is a functional passage between the middle ear and nasopharynx and provides ventilation of the middle ear. It is frequently involved in pathological processes affecting the nasal, paranasal and nasopharyngeal cavities [6]. Salvinelli et al. reported that chronic nasal obstruction is a frequent cause of Eustachian tube dysfunction which can lead to middle ear hypoventilation [7]. The inflammatory reaction and edema in the nasopharyngeal mucosa due to surgical trauma and packing is believed to cause Eustachian tube dysfunction. It is expected from nasal packing that it does not cause pain when inserting and removing it. Furthermore it should be easily removable and cause less nasal fullness. Negative middle ear pressure measured by tympanometry is a sign of Eustachian tube dysfunction which is usually a reversible complication caused by nasal packings after septoplasty. However, it causes patients discomfort and dissatisfaction following surgery. In a study using bilateral anterior nasal gauze packs following septoplasty, Thompson and Crowther found 46% of patients with a negative MEP lower than -50 daPa [8]. Besides, Mc Curdy reported a negative pressure \leq 100 daPa in 25 percent of 99 ears 3 days after applying bilateral anterior nasal packing [1]. In our study, a type C tympanogram was obtained in at least one ear in 16,6% of patients with PosiSep[®]X and 6,6% of patients with silicone nasal septal splint with integral airway within 48 hours after septoplasty. Several studies comparing Merselce and silicone splints after septoplasty have shown that silicone splints with integral airway cause less Eustachian dysfunction and aural fullness than Merselce postoperatively [3, 9, 10]. Due to patients' stress and fear of packing removal, bio-absorbable materials that do not require removal have been used as packings after nasal surgery recently. Among them the most preferred packs are Nasopore, a synthetic polyurethane pack and PosiSep[®]X, a chitosan-based non-synthetic nasal pack. Both are self-dissolved and biologically inert materials. They also enhance wound healing and minimize bleeding. Previous studies showed that absorbable packs which reduced pain and discomfort during packing and removal following nasal surgery are efficient and safe [11, 12]. Khafagy and Maarouf reported that both packs are efficient and safe regarding mucosal healing, bleeding control. PosiSep[®]X showed a higher advantage in the first two weeks regarding the amount of the retained material crusting as well as bleeding in their study [13]. Although there are some studies investigating the effectiveness of absorbable packs used after nasal surgery there is no study investigating their effects on ET function following nasal surgery in literature. Our results showed that PosiSep[®]X causes less decrease in MEP in the first 48 hour following surgery compared to silicone splint. Although it decreased in the first 24 hours, it was observed that MEP of group P tended to increase to normal values afterwards immediately. But our results showed that the return to normal MEP value in the splint group took up to 1 week following surgery. We think that it is because PosiSep[®]X causes less pressure in the nasal cavity, although a silicone nasal splint with an integral airway allows the nasal breathing.

CONCLUSIONS

Temporary aural fullness and eustachian dysfunction which leads to patients discomfort and dissatisfaction due to nasal packings after septoplasty is a common problem. Our study demonstrated that PosiSep[®]X caused less eustachian dysfunction than silicone nasal splint with integral airway. As well as leading to less eustachian dysfunction, PosiSep[®]X does not require removal. Therefore, we think it would be a good alternative for nasal packing after septoplasty.