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Original Article

Is Middle Ear Pressure Effected by Nasal Packings after Septoplasty?

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OBJECTIVE: To investigate the effects of different types of nasal packings on middle ear pressure in patients undergoing septoplasty.

MATERIALS and METHODS: Sixty patients who were suffering from nasal obstruction and who had to undergo septoplasty because of nasal septal deviation were included in the study. After the septoplasty, Merocel packings and internal nasal splints were intraoperatively applied in thirty patients each. Middle ear pressure was evaluated by tympanometry. Tympanometric peak pressures were used for this aim. Acoustic impedance measurements were performed in both ears, and the average values of the two ears were calculated. Tympanometric measurements were performed for patients during the preoperative period and on the 2nd and 5th postoperative days.

RESULTS: There were 30 (5 females, 25 males; average age 23 years) patients in the internal nasal splint group and 30 (8 females, 22 males; average age 26 years) patients in the anterior Merocel packing group. When the values obtained by acoustic impedancemetry before the operation and on the postoperative 5th day were compared, there was no statistically significant difference between the groups. The middle ear pressure significantly decreased in the anterior Merocel packing group compared with that in the internal nasal splint group. The intragroup comparison of the acoustic impedance measurements of the internal nasal splint group revealed no significant difference between the preoperative acoustic impedance values and the values obtained on the postoperative 2nd day.

CONCLUSION: Cannulated silicone intranasal splints are better in terms of patient comfort after an intranasal surgery without effecting eustachian tube function.

KEYWORDS: Middle ear pressure, nasal packing, septoplasty

INTRODUCTION

The eustachian tube is a passage between the middle ear and nasopharynx, and its main function is ventilation of the middle ear. A negative middle ear tube pressure measured by tympanometry shows dysfunction of the eustachian tube [1]. Septoplasty is performed in patients having nasal obstruction and associated symptoms caused by a deviated nasal septum. Septoplasty is one of the most frequently performed surgeries in ear, nose and throat procedures [2]. Intranasal packings are used to control bleeding, stabilize the nose bones, help the settlement of septal mucosal flaps, and prevent adhesions and septal hematomain septoplasty [3]. Today, various nasal packing materials are used, and there is no standard for packing selection. The most frequently used packings are internal nasal splint, Merocel packing, gauze pack, and glove finger pack [3-5]. Using a nasal packing after septoplasty may lead to eustachian tube dysfunction and cause temporary nasal complaints such as ear fullness and mild pain [1, 6, 7]. While many intranasal packings completely block the nasal passage and cause more disturbance for patients, silicone nasal splints with an integral airway cause less disturbance and increase the postoperative comfort, which is thought to be associated with less eustachian dysfunction [1]. The present study was conducted to evaluate the effects of nasal Merocel packings and internal nasal splints on eustachian dysfunction after septoplasty.

MATERIALS and METHODS

The study was designed as a prospective and randomized study; ethics approval for the study was received from the Clinical Research Ethics Committee of Abant İzzet Baysal University (2014/80-154). Written informed consent was obtained from all patients. A total of 60 patients who were admitted to the otorhinolaryngology department of our tertiary center, who were suffering from nasal obstruction, and who then underwent septoplasty under general anesthesia and who had no history of middle ear trouble and normal otoscopic findings on both sides before the surgery between August 2014 and December 2014 were included in the present study. Patients having any abnormal otoscopic findings were not included in the study. Following the septoplasty, the patients were divided into two groups: those (n=30; 5 females, 25 males; average age 23 years) having an internal nasal splint (Invotec;

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Jacksonville, FI, USA) and those (n=30; 8 females, 22 males; average age 26 years) having a Merocel packing (Medtronic Xomed; Jacksonville, FI, USA) in both nasal cavities. In terms of gender and average age, there was no significant difference between the groups. In all patients, septoplasty was performed by elevating the mucosal flaps after hemitransfixion incision.

At the end of septoplasty, the hemitransfixion incision was sutured using 3/0 vicryl. Internal nasal splints were placed between the inferior concha and nasal septum in both nasal cavities and were sutured over the columella. In each patient, the internal nasal splints were kept for 3 days, and the nasal cavities were washed using saline solution to keep the valves of the packings open during the said term. In the other group, a Merocel packing was placed between the inferior concha and nasal septum and was inflated (swollen) with a 10 cc saline solution. The Merocel packings were kept in the nasal passages for 3 days. Middle ear pressure was evaluated with acoustic impedance measurements using a tympanometric device (Interacoustics; Impedance Audiometer AZ26, DK-5610 Assens, Denmark) in both ears, and the average values were calculated.

Statistical Analysis

In both groups, acoustic impedance measurements were performed again on the postoperative 2nd day when the nasal packs were present and on the postoperative 5th day, after the packs were removed. All statistical analyses were performed using the SPSS software package 16.0 (SPSS Inc.; Chicago, IL, USA). In both the internal nasal splint and Merocel packing groups, intragroup comparisons of the acoustic impedance measurements on the postoperative 2nd day and postoperative 5th day were conducted using the Friedman test, and $p<0.05$ was considered as significant. Significant group differences were determined by Wilcoxon signed-ranks test. The middle ear pressures of the patients with internal nasal splints and Merocel packings were compared using Mann–Whitney U or independent sample tests, and $p<0.05$ was considered as significant.

RESULTS

Sixty patients undergoing septoplasty were included in the study. There were 30 (5 females, 25 males; average age 23 years) patients in the internal nasal splint group and 30 (8 females, 22 males; average age 26 years) patients in the anterior Merocel packing group. Nasal obstruction complaints noticeably improved in all the patients after the surgery, and no significant complications were observed. When the values obtained by acoustic impedancemetry before the operation and on the postoperative 5th day were compared, there was no statistically significant difference between the groups (preoperative $p=0.482$; postoperative 5th day $p=0.455$). The acoustic impedance measurement values are shown in Figure 1.

However, in terms of the values of the acoustic impedance measurements performed on the postoperative 2nd day when the packings were present, there was a statistically significant difference between the groups. The middle ear pressure significantly decreased in the anterior Merocel group compared with that in the internal nasal splint group ($p=0.024$). Moreover, the intragroup comparison of the acoustic impedance measurements of the internal nasal splint group revealed no significant difference between the preoperative acoustic impedance values and the values obtained on the postoperative 2nd day ($p=0.133$). In the anterior Merocel packing group, there was a statistically significant difference between the preoperative acoustic impedance measurement values and the values obtained on the postoperative 2nd day ($p=0.001$). Although there was a significant impairment in the eustachian function after using the intranasal Merocel packing following the surgery, there was no significant impairment when the internal nasal splint was used.

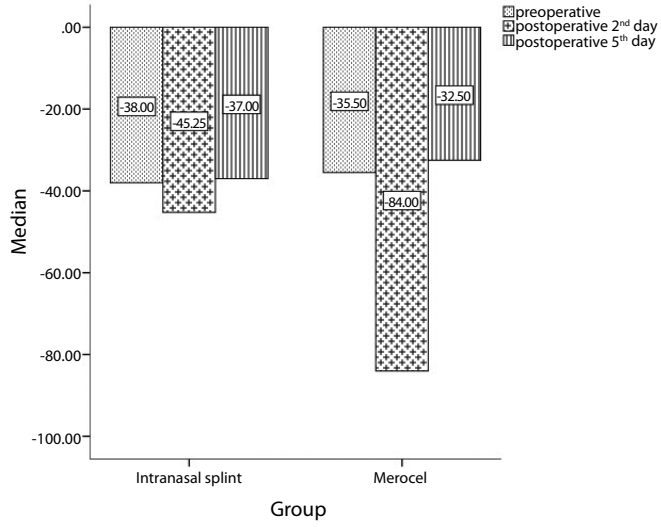

Figure 1. A graphical analysis of the acoustic impedance measurement values are shown in this figure

DISCUSSION

The eustachian tube, located between the nasopharynx and the middle ear, is a functional passage ensuring ventilation of the middle ear [1]. It opens during swallowing. Air is allowed into the middle ear, and the air from the outer ear is equalized to the air in the middle ear on both sides of the tympanic membrane [1,8,9]. Eustachian tube dysfunction results in a more negative middle ear pressure, and although it may be higher than the exact pressure, tympanometry is a common and practical method that is used for the measurement of middle ear pressure. It has been frequently reported that the functions of the eustachian tube are affected from the pathological conditions in the nasal, paranasal and nasopharyngeal cavities [10].

There is no consensus on the indications, intranasal duration, and intranasal packing material used to control bleeding, fix the cartilage and bone skeleton, and prevent adhesions after septoplasty and concha and paranasal sinus surgeries [11]. There are opposing views on whether intranasal packings used after nasal surgeries affect the functions of the eustachian tube or not [9].

Yıldırım et al. [12] compared the effects of Merocel packings and internal nasal splints on eustachian function in nasal septoplasty. Acoustic impedance measurements were made during the preoperative period and on the postoperative 2nd and 5th days. The measurements revealed that the Merocel packings cause a significant eustachian tube dysfunction, whereas the internal nasal splints do not cause any difference in eustachian tube function. In a study on 51 patients undergoing septoplasty, Yılmaz et al. [1] found a higher decrease in the acoustic impedance values of the Merocel nasal pack group com-

pared with the internal nasal splint group and stated that the Merocel nasal packings cause eustachian dysfunction by preventing air flow. There are different opinions on the etiopathogenesis of eustachian tube dysfunction caused by intranasal packings after nasal surgery.

McCurdy [6] stated that anterior and posterior intranasal packings after nasal surgery cause a decrease in middle ear pressure and added that this could be related to stasis in the peritubal lymphatic plexus due to nasal obstruction. In a study conducted on 27 patients with nasal packings following nasal surgery, Johannessen and Poulsen [13] indicated that the negative pressure occurring in the middle ear returns to normal values after the nasal packings were removed, and they associated this to edema in the nasopharyngeal mucosa. In another study, eustachian dysfunction has been claimed to occur as a result of excessive secretion of the seromucous glands at the pharyngeal section of the eustachian tube [14].

The more negative pressure after surgery could be explained by the reduction of deglutition caused by dehydration after surgery, packing, or medications; however, all patients were given the same medications including analgesics and antibiotic treatment (amoxicillin clavulanate) after surgery, and all of them were ordered to take oral hydration after the surgery. Therefore, we thought that the negative pressure was most probably related to the nasal packing and that our study supports the mechanical obstruction theory brought forward by Bonding and Tos [10]. In our study, the preoperative middle ear pressure values kept on decreasing until the postoperative 48th hour, and the acoustic impedance measurements returned to the normal value after the packing was removed in the intranasal Merocel packing group. This was thought to be associated with an obstruction in the eustachian tube orifice caused by the Merocel packing. No significant differences were found in the middle ear pressures of the internal nasal silicone packing group.

Despite these studies, Morgan et al. [15] found that cannulated and non-cannulated nasal packings cause no significant difference in middle ear pressure. Similarly, Karahay et al. [9] detected in a study conducted on 43 patients in 2006 that non-cannulated intranasal packings do not cause any significant difference in eustachian tube function. In a study by Thompson et al. [7] on 63 patients, nasal packings decrease the middle ear pressure in 55 (46%) of 126 ears, whereas the middle ear pressure becomes normal within 24 h of removing the nasal packs in 42 (76%) of the said 55 ears. They reported that eustachian tube dysfunction is associated with both mucosal edema and the direct effect of the nasal packing.

Following our prospective and randomized study, it was thought that the Merocel packing placed in the nasal cavities after nasal surgery caused a higher decrease in the middle ear pressure compared with the silicone intranasal splint, which led to eustachian dysfunction due to a mechanical obstruction caused by the Merocel packing extending to the nasopharynx. It can be said that cannulated silicone intranasal splints are better in terms of patient comfort after intranasal surgery.

Ethics Committee Approval: Ethics committee approval was received for this study at local ethics committee (2014/80-154).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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