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Original Research Article

Impact of septoplasty on hearing and middle ear function

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ABSTRACT

Background: Deviated nasal septum affects hearing and middle ear ventilation by altering eustachain tube function. It leads to ear fullness, affects middle ear ventilation and impacts hearing. Septoplasty is commonly done for deviated septum. So, this study aims to find out if Septoplasty can lead to improvement of hearing and middle ear function and reduce patients ear complaints.
Methods: Patients with Deviated nasal septum requiring septoplasty surgery were assessed for ear symptoms, hearing and middle ear pressure by detailed history taking, pure tone audiometry and tympanometry. They then underwent septoplasty and were again assessed post operatively after 2days, 4weeks, 8weeks and 12weeks of surgery. The pre- and post-operative results were compared and analysed.
Results: The most common symptom in patients at pre-operative visit was ear fullness and hearing loss was of conductive type. Post operatively there was worsening of symptoms, hearing and middle ear functions after 2days but marked improvement was seen in symptom of ear fullness, conductive hearing and normalisation of middle ear pressure at 8-12weeks after surgery.
Conclusions: Septoplasty improves hearing and middle ear function in patients with deviated nasal septum and the improvement is seen 8 to 12weeks after surgery.

Keywords: Conductive hearing loss, Deviated nasal septum, Eustachian tube, Pure tone audiometry, Septoplasty, Tympanometry

INTRODUCTION

Nasal obstruction due to septal deviation is one of the common ENT complaints. It can affect hearing and middle ear ventilation by altering the Eustachian Tube (ET) function.[1] Eustachian tube is a communication between middle ear and the nasal cavity first described by Bartolommeus Eustachus in 1563.[2] The role of ET is to ventilate the middle ear to equilibrate air pressure in middle ear.[3] Air enters when ET opens during swallowing and equalizes the pressure between internal and external segments of tympanic membrane.[4] ET dysfunction can occur due to obstruction of ET orifice in patients with Deviated Nasal Septum (DNS) due to nasal inflammation and increased secretion from nasal glands which accumulate and block the tube.[3] This can lead to reduced middle ear ventilation leading to negative middle ear pressure and can impact hearing. This leads to fullness of ears, ear ache and tinnitus.

So, the question arises that can treatment for DNS improve patient's hearing by improving ET function and middle ear ventilation? Few studies are available in literature regarding this and they have obtained varied result. Some studies have reported improvement, but few have reported no change.[5,6] Not much research has been

done regarding this topic in our country yet. Septoplasty is the most common surgery done in ENT practice for DNS. Pure tone audiometry (PTA) and tympanometry are commonly used for assessment of hearing and middle ear ventilation. So, we had taken up this study to assess the improvement in patient's hearing and middle ear function by means of PTA and Tympanometry and improvement in patient's ear complaints after septoplasty.

METHODS

This study was conducted in Department of ENT of our Medical College and Hospital from January 2017 to September 2017 and patients were followed up for 12 weeks. 40 patients aged between 18 to 60years with Deviated Nasal Septum requiring Septoplasty surgery were included in this study after taking written consent from the patients. The approval of the Institutional Ethics Committee was taken. Patients with perforated tympanic membrane, active middle ear disease, external ear disease, history of ear discharge, history of trauma to ear, history of ear or nasal surgeries in the past and other causes of nasal obstruction like nasal polyps and allergic rhinitis were excluded from the study. Patients who were found unfit for General Anaesthesia were also excluded from the study.

40 patients included in this study underwent detailed history taking, nasal and ear examination, Diagnostic Nasal Endoscopy (DNE), Examination under microscope. Patients preoperatively were evaluated for otological symptoms like fullness of ears, pain in ears and tinnitus. All these patients underwent pure tone audiometry (PTA) for hearing assessment and tympanometry for assessment of middle ear function. These patients then underwent Septoplasty under General Anaesthesia and anterior nasal pack was placed for 2days post operatively. Patients were again assessed after 2days (after pack removal) and the assessment was repeated 4weeks, 8weeks and 12weeks post operatively. The assessment points were

- Otological symptoms of fullness of ears, pain in ears and tinnitus at each post-operative evaluation. Evaluated by history taking,
- Middle ear function at each post-operative evaluation. Evaluated by tympanometry,
- Hearing assessment at each post-operative evaluation. Evaluated by Pure tone audiometry.

The pre and post-operative results were compared and analysed.

RESULTS

40 patients between age group 18 to 60years were included in this study. The majority of the patients were of younger age group. There was no major difference between males and females (Table 1).

Table 1: Age and sex distribution.

Age group	Male	Female	Total	%
18-30 years	10	12	22	55
31-45 years	7	8	15	38
46-60 years	2	1	3	7
Total	19	21	40	

The majority of patients (93%) at initial visit had symptoms of fullness of ears. In 26% of patient ears at initial visit the findings of conductive hearing loss were obtained on pure tone audiometry. In 36% of patient ears Type C tympanogram was obtained on tympanometry.

Post operatively there was increase in symptoms of ear fullness, ear ache and tinnitus at initial post-operative evaluation after 2days of surgery. There was marked improvement in ear fullness at 8 weeks post operatively and even more at 12weeks post operatively. Not much improvement was achieved for earache and tinnitus though it recovered later as compared to 1st assessment 2days after surgery (Table 2).

Table 2: Major otological symptoms of the patients.

Ear symptom	Pre-operative N=40 (%)	1st post OP assessment (after 2 days) N=40 (%)	2nd post OP assessment (after 4 weeks) n=40 (%)	3rd post OP assessment (after 8 weeks) n=40 (%)	4th post OP assessment (after 12 weeks) n=40 (%)
Ear fullness	37(92)	40 (100)	32 (80)	19 (48)	10 (25)
Earache	6 (15)	12 (30)	7 (18)	5 (12)	5 (12)
Tinnitus	9 (23)	13 (33)	10 (25)	8 (20)	8 (20)

N = Number of patients, % = Percentage of patients

Regarding PTA findings there was initial worsening of hearing loss at 2days post operatively with more number of patient ears suffering from conductive hearing loss.

There was improvement thereafter with marked improvement at the end of 12weeks post operatively with only 9% of patient ears suffering from conductive hearing loss. The conductive hearing loss obtained was of mild to modetate type with hearing threshold between 25 to 55 decibel. Only 6% of patient ears had sensori neural hearing loss (SNHL) with no worsening or improvement post operatively (Table 3).

Table 3: Pure tone audiometry findings of patient ears.

Hearing	Pre-operative N=80 (%)	1st post OP assessment (after 2days) N=80 (%)	2nd post OP assessment (after 4weeks) n=80 (%)	3rd post OP assessment (after 8weeks) n=80 (%)	4th post OP assessment (after 12weeks) n=80 (%)
Normal (up to 25 decibel threshold)	53 (66)	47 (59)	52 (65)	60 (74)	68 (85)
Mild-moderate conductive hearing loss	22 (28)	28 (35)	23 (28)	15 (20)	7 (9)
Sensori neural hearing loss	5 (6)	5 (6)	5 (6)	5 (6)	5 (6)

N = Number of patient ears, % = Percentage of patient ears

Normal hearing was defined on PTA as average pure tone threshold within 25 decibels. Conductive hearing loss was stated if air bone gap on audiogram is greater than 15 decibels. SNHL was stated if bone threshold was greater than 20 decibels. Regarding tympanometry findings, Type C tympanogram indicative of negative middle ear pressure was obtained in 36% of patient ears at pre-operative visit which worsened to 44% of patient ears at 2days post operatively and thereby improved significantly with only 12% of patient ears had type C tympanogram at end of 12weeks post operatively (Table 4).

Table 4: Tympanometry findings of patient ears.

Tympanogram	Pre-operative N=80 (%)	1st post op assessment (after 2days) N=80 (%)	2nd post op assessment (after 4weeks) n=80 (%)	3rd post op assessment (after 8weeks) n=80 (%)	4th post op assessment (after 12weeks) n=80 (%)
Type a	51(64%)	45 (56%)	50 (62%)	61 (76%)	70 (88%)
Type c	29 (36%)	35 (44%)	30(38%)	19 (24%)	10 (12%)

N = Number of patient ears, % = Percentage of patient ears

DISCUSSION

The majority of our patients at pre-operative assessment had complaints of ear fullness (Table 2). Abdel-Naby Awad OG et al also found similar results with ear fullness in most of their patients pre-operatively.[7] Pre-operatively we found mild to moderate degree of conductive hearing loss in 28% of our patient ears which shows DNS leads to conductive hearing loss in significant number of patients (Table 3). Similar results were obtained by Gray et al that DNS affects hearing.[8] Pre-operatively a significant 36% of our patient ears had negative middle ear pressure shown as type C tympanogram on tympanometry (Table 4). This suggest that DNS leading to ET blockage affects the middle ear function. It has been reported in literature that septal deviation can lead to tubal dysfunction leading to negative middle ear pressure.[9]

Regarding post-operative findings, there is increase in symptoms of earche, fullness of ears and tinnitus at first post-operative assessment done immediately after removal of nasal pack after 2days of surgery. There was also increase in percentage of patient ears with conductive hearing loss and type C tympanogram. This could be attributed to mucosal oedema and inflammation as a result of surgery. Similar results were obtained by Eyigor et al 1week post nasal septal surgery.[10] At 2nd post-operative visit after 4weeks, there was not much difference from the pre-operative findings regarding hearing or middle ear pressure. Similar results were obtained by Salvinelli et al who found tympanometry results almost same after one month as compared to pre-operative results.[11]

But at the end of 8weeks post operatively and more markedly at end of 12weeks after surgery, there was marked decrease in symptoms of ear fullness. Ear fullness which was present in 92% of patients at pre-operative assessment was reduced to only 25% of patients at end of 12weeks (Table 2). Similar results were obtained in another study by Abdel-Naby Awad OG et al where there was improvement in ear fullness.[7] Abnormal type C tymapanogram indicative of poor middle ear function which was seen initially in 36% of patient ears was reduced to 12% after 12weeks post operatively. Similar results were obtained by Bonding et al in 1981 and Grady D et al who showed 70% patients had improvement after septoplasty.[3,12] Some studies showed no improvement as one by Sahin M et al which showed septoplasty didn't affect the middle ear pressure.[6] There was marked decrease in conductive hearing loss from 28% of patient ears to 9% of patient ears in our study (Table 3). This proves that surgical correction of DNS improves hearing and reduces incidence of conductive

hearing loss. Fewer studies are available in the literature regarding this theory and found similar results.

CONCLUSION

As a conclusion in our study we found improvement in ear fullness, decrease in incidence of conductive hearing loss and improvement in middle ear pressure after 8-12weeks post operatively. Not much improvement was seen before 8weeks which shows that septoplasty improves hearing and middle ear function after 8-12weeks of surgery which could be because inflammation and oedema of nasal mucosa due to surgery takes time to heal. If we refer to literature, we found similar results by Maier W et al who showed normalization of tubal function 6-8weeks after surgery whereas Kamal NP et al got favourable results after 4weeks of nasal obstruction surgery contrary to our findings.[13,14]

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