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Anterior nasal packing: does it affect middle ear pressure?

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ABSTRACT

Background: Eustachian tube maintains middle ear pressure equal to that of atmosphere. Its function may be deranged due to variety of factors like adenoids, cleft palate, nasogastric tubes, allergy, nasopharyngeal intubations and also by nasal packing following septal surgery. Our aim was to evaluate the effect of anterior nasal packing protocol, on eustachian tube function, followed in our ENT Department for nasal surgeries.
Methods: A descriptive study was done on 60 patients undergoing nasal surgery from March to November 2018 was done in the ENT Department of a tertiary care hospital. All patients underwent pre-operative otoscopic examination followed by tympanometry. Tympanometry was repeated following nasal surgery with nasal pack in situ and again 24 hours after removal of pack. The results of all these 3 impedance audiometries were tabulated and analysed.
Results: Pre-operatively both ears in all the patients showed type a tympanometry, which implied normal eustachian tube function. Out of 60 patients who underwent nasal surgeries, 40 had abnormal impedance tympanograms immediately after surgery. 26 patients had abnormal impedance tympanogram after pack removal. These patients were treated with nasal decongestants and antibiotics which were routinely prescribed as a post-operative prophylaxis. These patients 1 week after pack removal recorded a normal tympanogram.
Conclusions: Changes in middle ear pressure following nasal packing associated with most nasal surgeries were transient but not severe. Hence, we conclude that anterior nasal packing for 24 hours is considered safe, if no other co-morbid factors for altering middle ear pressures are present.

Keywords: Eustachian tube, Anterior nasal packing, Tympanometry, Nasal surgery, Middle ear pressure

INTRODUCTION

Eustachian tube maintains middle ear pressure equal to that of atmosphere. Its function may be deranged due to variety of factors like adenoids, cleft palate, nasogastric tubes, allergy and nasopharyngeal intubations. It has been suggested that nasal packing following septal surgery is a frequent cause of short-term eustachian tube dysfunction.[1] The eustachian tube has two main functions-To maintain the middle ear pressure at atmospheric pressure and to allow the normal secretion of the respiratory mucosa to pass into the nasopharynx.

The normal middle ear air has an inherent tendency to lose gas to maintain the middle ear gas by diffusion into the surrounding tissues and circulation. This loss is compensated by eustachian tube, which admits just enough gas to maintain the middle ear pressure. When this system fails to function properly, a negative pressure develops in the middle ear.[2-6]

In a few cases of nasal surgeries where anterior nasal packing was done, these patients complained of ear ache.[7] On examination, there was a mild retraction of the ipsilateral tympanic membrane.[8] These cases were treated

with nasal decongestants and the pain was relieved. As nasal surgery is frequently required following nasal packing, the present study was undertaken to evaluate the effect of nasal packing on middle ear pressure.

Aims and objectives

The aims and objectives of the study were to evaluate the effect of anterior nasal packing protocol followed in our ENT department for nasal surgeries and to know the safe period to keep the nasal pack in situ.

METHODS

Duration of descriptive study was 8 months from March to November 2017. The place of study was at the ENT Department of a tertiary care hospital.

Informed consent

Participants were informed about the project in detail and their consent was obtained.

Approval from ethical committee

The project has been carried out after approval from the institutional ethics committee

Study population and sample size

60 patients undergoing nasal surgeries and willing for the study were recruited for the study.

Inclusion criteria

Patient undergoing nasal surgery, patient with otoscopically normal tympanic membrane and bilateral normal tympanogram were included.

Exclusion criteria

Patient with other than type A are excluded, patient having other middle ear or inner ear pathologies, patient having systemic diseases and acute upper respiratory tract infection were excluded.

All patients underwent otoscopic examination followed by tympanometry performed using an impedance audiometer prior to surgery. Tympanometry was repeated following nasal surgery with nasal pack in situ and again 24 hours after removal of pack. The results of all these 3 Impedance audiometries were tabulated and analysed. The reversion of Impedance audiometry was noted.

In case of eustachian tube dysfunction in the 3rd impedance audiometry the patients underwent repeat impedance on follow up and the safe period was calculated.

Statistical analysis

Data was entered into a Microsoft Excel work sheet and the data was analyzed using SPSS software.

RESULTS

In our study out of 60 patients 40 were male, 20 were female. The male to female ratio was 2:1. The minimum age was 19 years. The maximum age of the patients was 49 years and the average age was 33 years.

Table 1: Frequency table for gender.

Gender	Frequency	%
Male	40	66.7
Female	20	33.3
Total	60	100.0

Pre-operatively both ears in all the patients showed type A tympanometry, which implies that eustachian tube function was normal for all (Table 2).

Table 2: Frequency table for pre-operative tympanometry.

Ear	Tympanometry type	Frequency	%
Right side	Type A	60	100
Left side	Type A	60	100

Post-operatively, tympanometries were performed for all the patients with the nasal pack insitu within 24 hours. The tympanogram type A, type B and type C were seen in 45%, 26.7% and 28.3% patients respectively on the right side. Whereas on the left side majority had normal eustachian tube function with 88.3% patients showing type A tympanometry and 11.7% showing abnormal tympanometries, i.e. type B-6 patients and type C-1 patient (Table 3).

Table 3: Frequency table for post operative tympanometry with nasal packs in situ on both sides.

Tympanometry	Right ear	%	Left ear	%
Type A	27	45.0	53	88.3
Type B	16	26.7	6	10.0
Type C	17	28.3	1	1.7

The tympanometries performed after nasal pack removal slightly differed from the reading taken during the immediate post-operative period. The eustachian tube returned back to normal in more patients (Table 4). Type A tympanogram was seen in 36 patients, type B tympanogram in 16 patients and type C tympanogram in 8 patients on the right side, 24 hours following pack removal. While on the left side type A tympanogram was seen in 58 patients, type B tympanogram in 1 patient and

type C tympanogram in 1 patient following pack removal.

Table 4: Frequency table for post operative tympanometry following nasal packs removal on both sides.

Typmpanometry	Right ear	%	Left ear	%
Type A	36	60.0	58	96.7
Type B	16	26.7	1	1.7
Type C	8	13.3	1	1.7
Total	60	100.0	60	100

Table 5 shows type A tympanogram in all 60 patients, 7 days after pack removal in both sides.

Table 5: Frequency table for post operative tympanometry - 7 days after pack removal in both sides.

Typmpanometry	Right ear	%	Left ear	%
Type A	60	100	60	100
Type B	-	-	-	-
Type C	-	-	-	-
Total	60	100.0	60	100

Out of 60 patients who underwent nasal surgeries,40/60 patients had abnormal impedance tympanograms.16 patients had type B and 17 patients had type C tymapnograms in right side while 6 patients had type B and 1 patient type C in left side.

26 patients had abnormal impedance tympanogram after the pack removal. These patients were treated with nasal decongestants and antibiotics which were routinely prescribed as a post-operative porphylaxis.

No special measures were taken for these patients, even though they recorded abnormal impedance tympanogram. These patients, during post operative follow up, 1 week after pack removal, recorded a normal tympanogram (type A).

DISCUSSION

A total of 60 patients were involved in this study. The patients of this series were of different age groups. The minimum age was 19 years. The maximum age of the patients was 49 years and the average age was 33 years. In this, two-third (67%) of the patients was male. Male to female ratio in the present series was 2:1.

Majority of the patients presented with multiple symptoms and the commonest was nasal obstruction which was present in 100% of patients. This is consistent with other studies.[9,10] Headache, nasal discharge and disorders of olfaction were the other complaints.

Among 60 patients, 17 patients were diagnosed as chronic sinusitis, 14 patients as deviated nasal septum (DNS), 13 patients as ethmoidal polyps,14 patients as nasal bone fracture and 2 patients as septal haematoma. In this study 30 patients underwent functional endoscopic sinus surgery (FESS), 14 patients underwent septoplasty, 14 patients underwent nasal bone fracture reduction and 2 patients underwent incision and drainage.

Middle ear pressure -100 daPa to +100 daPa has been considered to be normal middle ear pressure.[11] The study group underwent pre-operative impedance tympanometry which was normal in all. Patients with infective etiology like chronic suppurative otitis media and abnormal pre-operative tympanometry were excluded because they had other factors which played a role for abnormal impedance tympanogram.[12]

Clinically if the anterior nasal pack was long enough as to touch the post-pharyngeal wall, gag reflex was elicited, so corrective measures were taken during nasal packing. But if the anterior nasal packing is short of touching the post-pharyngeal wall but long enough to impinge on the pharyngeal opening of the eustachian tube, then the middle ear pressures was altered leading to retraction of the tympanic membrane without eliciting gag reflex. We monitored such incidents by doing an impedance tympanometry immediately after anterior nasal packing.[13] When the impedance tympanometry showed an abnormal graph, we removed the anterior nasal pack and repacked the nose and impedance tympanometry was rechecked, so that there was no abnormality arising out of anterior nasal packing.

Out of 60 patients, who underwent nasal surgeries, 40/60 patients had abnormal impedance tympanograms. Among the 40 patients, 16 patients had type B and 17 patients had type C tympanograms on the right side whereas 5 patients had type B and 1 patient had type C on left side. 26 patients had abnormal impedance tympanogram after the pack removal. These patients were treated with nasal decongestants and antibiotics which were routinely prescribed as a post-operative prophylaxis. No special measures were taken for these patients, even though they recorded abnormal impedance tympanogram. These patients, during post operative follow up, 1 week after pack removal, recorded a normal tympanogram (type A).

Nasal packing following surgery was a frequent cause of short-term eustachian tube dysfunction but rarely severe enough to cause symptoms of middle ear effusion. Tubal dysfunction is most likely due to a combination of surgical edema and a direct effect of the nasal packing.[6] Inflammatory edema of nasopharyngeal mucosa as a result of packing may lead to eustachian tube dysfunction possibly by causing peritubal inflammation or stasis of peritubal lymphatics.[14]

Reduced swallowing in the postoperative period, due to pain, leads to restrictive opening of eustachian tube. This transient change in middle ear pressure is unlikely due to anaesthesia as middle ear pressure studies prior to general

anaesthesia were not statistically different from middle ear status under anesthesia.[15] Deficiency of surfactant may be related to tubal dysfunction which is thought to facilitate opening of the tube.[16,]This material is inactive by inflammation and may be that edema secondary to nasal packing impair the function of this substance.

Lymphatic stasis in the peritubal plexus of lymphatic channels and vein has been believed to be a possible aetiological factor in eustachian tube dysfunction in case of nasal obstruction.[17] Nasal packing causes complete nasal obstruction which results in edema of nose, nasopharynx and paranasal sinuses.[1,11] Thus nasal packing causes lymphatic stasis in nasopharynx and around the opening of eustachian tube which ultimately results in middle ear dysfunction.

A study of 27 patients with anterior nasal packing left in situ for at least five days attributed the abnormal middle ear pressure due to eustachian tube dysfunction from edema of the nasopharyngeal mucosa.[18] Because the middle ear pressure reverts to normal prior to pack removal.

CONCLUSION

Changes in middle ear pressure following nasal packing associated with most nasal surgeries were transient but not severe. Anterior nasal packing produces reversible negative middle ear pressure which returns to normal 5 days after pack removal.

From this study we understood that anterior nasal packing for 24 hours is considered safe, if no other co-morbid factors for altering middle ear pressures are present. It is advised to monitor middle ear pressure in all cases of nasal pack removal.

If any infective aetiology in the ear, nose and throat pathology requires anterior nasal packing, then the nasal packing has to be removed in a shorter time or better if the anterior nasal pack is totally avoided.

The length of anterior nasal pack has to be ascertained by impedance tympanometry so that the pack in the nose is not obstructing the eustachian tube opening in case if the anterior nasal pack is essential.

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