

Original Article

Effect of anterior nasal packing on middle ear pressure

Mohammad Rokanuddin Bhuiyan¹, Mohammad Idrish Ali², Fatema Johora³,
Sk. Nurul Fattah Rumi¹, Nazmul Huque⁴, M. Abdullah⁵

Abstract:

Objectives: To assess the effect of anterior nasal packing on middle ear pressure.

Methods: This cross-sectional study was carried out in the Department of Otolaryngology – Head & Neck surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka for the period of one year from July 2008 to June 2009. Thirty patients were selected purposively.

Results: Thirty patients were studied. Minimum age 14 and maximum age 48 years, 50% patients were 3rd decade, 66.66% were male, male female ratio was 2:1 nasal obstruction was 100% of the patients 30% patients were nasal septum deviation, 30% patients DNS with nasal deformity, 30% patients were underwent septoplasty, 36.66% patients had septoplasty with submucosal diathermy 26.66% were endoscopic sinus surgery and 6.66% were septorhinoplasty. The prepack middle ear pressure range from -50 daPa to 0 daPa were maximum followed by 0 daPa to +50 daPa, minimum -65 daPa 4 ears showed pressure -100 daPa. Three ears were middle ear pressure between -150 daPa to -100 daPa. 2nd post operatively just before pack removal abnormal middle ear pressure was seen in 26 ears (43.33%) after 5 days abnormal pressure was found in 30 ears. Three ears (75%) out of 4 ears having antrochoanal polyp showed no improvement even five days after pack removed.

Conclusion: Chronic nasal obstruction seems to have a detrimental effect on middle ear pressure, which may not return to normal even after removal of chronic obstruction. It appears from this study that there might be some permanent change in peritubal nasopharyngeal mucosa due to chronic nasal obstruction, which needs to be proved histopathologically. Lymphatic stasis at peritubal plexus of lymphatic channels and veins appears to be the causes of lymph oedema following nasal packing. Anterior nasal packing causes reversible negative middle ear pressure which return to normal 5 days after pack removal.

Key Words: Anterior nasal pack, middle ear pressure.

1. OSD, DGHS, BSMMU, Dhaka, Bangladesh.
2. Medical Officer, Department of Otolaryngology - Head & Neck Surgery, BSMMU, Dhaka, Bangladesh.
3. Assistant Professor, Department of Anatomy, Faridpur Medical College, Faridpur, Bangladesh.
4. OSD, DGHS, Mitford Hospital, Dhaka, Bangladesh.
5. Professor, Department of ENT, DMCH, Dhaka, Bangladesh.

Address for Correspondence: Dr. Mohammad Rokanuddin Bhuiyan, OSD, DGHS, BSMMU, Dhaka, Bangladesh.

Introduction:

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 on into the nasopharynx. The normal middle air has an inherent tendency to lose gas to maintain the middle ear gas by diffusion into the surrounding tissues and circulation. The 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.¹⁻⁵

The lymphatics of the middle ear and eustachian tube course along the posterior-inferior aspect of the eustachian tube, getting afferent from nasal cavity, paranasal sinuses, nasopharynx and adenoids. Efferent from plexus terminate in retropharyngeal lymph nodes. Inflammation and oedema in these areas cause obstruction to the flow, resulting in retrograde obstruction of tympanic and tubal lymphatics producing tubal dysfunction and middle ear effusion. Although tubal dysfunction and middle ear effusion may occur simultaneously, but effusion can occur in absence of frank obstruction of eustachian tube lumen and development of middle ear vacuum.^{6,9}

Lymphatics stasis in the peritubal plexus of lymphatic channels and vein has been believed to be possible aetiological factors in eustachian tube dysfunction in case of nasal obstruction, which results in oedema of nose, nasopharynx and paranasal sinuses. Thus nasal packing causes lymphatic stasis in nasopharynx and around the opening of eustachian tube, which ultimately results in middle ear dysfunction. A study noticed nasal packing following septal surgery is a frequent cause of short lasting Eustachian tube dysfunction.¹⁰⁻¹⁵

The middle ear pressure was determined by tympanometry on 46 patients (92 middle ears) before and after rhinoplasty. Another study noticed in first two days after the operation a high negative pressure developed in about 70%. The negative pressure was equalized after packed was removed and 5 days after rhinoplasty normal middle ear pressure in 94% of patients. Other series assessed Eustachian tube function by tympanometry in 47 patients (94 ears) with anterior nasal packing placed after nasal surgery and in 12 patients (24 ears) requiring anterior and posterior packing for epistaxis. Twenty-four of the 94 ears (25.5%) in patients with anterior packing exhibited reduction in middle ear pressure, whereas 12 of 13 ears (92.3%)

ipsilateral to and six of 11 ears (45.4%) contralateral to the posterior packed demonstrated comparable reductions in middle ear pressure. The observation that posterior packing associated with a greater incidence of eustachian tube dysfunction than anterior packing suggests that the mechanism of this dysfunction may be related to stasis in the peritubal lymphatic plexus rather than to nasal obstruction per se.¹⁶⁻¹⁸

This study has been intended to find out relationship between anterior nasal packing with middle ear pressure.

Methods:

This was cross-sectional study done during the period from July 2008 to June 2009, Department of Otolaryngology – Head & Neck surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka. All consecutive cases (30) of deviated nasal septum, nasal deformity or nasal polyposis undergoing nasal surgery followed by anterior nasal packing for 48 hours, data were collected in a pre-designed data collection sheet and analyzed by using standard statistical methods.

Objectives:

- To assess the effect of anterior nasal packing on middle ear pressure.
- To determine the range of middle ear pressure change following anterior nasal packing.

Results:

Table I
Age distribution (n=30)

Age group yrs	Number of Patients	Percentage
10-19	10	33.33
20-29	15	50.00
30-39	4	13.33
40-49	1	3.33

Table-II
Sex of the Patients (n=30)

Sex	Number of patients	Percentage
Male	20	66.66
Female	10	33.33

Table-III
Symptoms of the patients (n=30)

Symptoms	Number of Patients	Percentage
• Nasal obstruction	30	100.00
• Headache	17	56.66
• Nasal discharge	14	46.66
• Disorder of olfaction	10	33.33
• Epistaxis	4	13.33

Table-IV
Diagnosis of the patients (n=30)

Diagnosis	Number of Patients	Percentage
• DNS	9	30.00
• DNS with HIT	11	36.66
• Ethmoidal polyp	5	16.66
• Antrochoanal polyp	3	10.00
• DNS with Nasal deformity	2	6.66

Table-V
Surgical treatment (n=30)

Name of the operation	Number of Patients	Percentage
Septoplasty	9	30.00
Septoplasty with SMD	11	36.66
Endoscopic Sinus Surgery	8	26.66
Septo-rhinoplasty	2	6.66

Table-VI
Number of ears showing pre-pack middle ear pressure (n=60)

Middle ear pressure (daPa)	Number of Ears	Percentage
-300 to -250	0	0
-250 to -200	0	0
-200 to -150	1	1.66
-150 to -100	3	5.00
-100 to -50	2	3.33
-50 to 0	32	53.33
o to +50	18	30.00
+50 to +100	4	6.66
+100 to +150	0	0

Table-VII
Middle ear pressure after 48 hours of anterior nasal packing (n=60)

Middle ear pressure (daPa)	Number of Ears	Percentage
-300 to -250	5	8.33
-250 to -200	4	6.66
-200 to -150	10	16.66
-150 to -100	7	11.66
-100 to -50	6	10.00
-50 to 0	20	33.33
o to +50	5	8.33
+50 to +100	3	5.00
+100 to +150	0	0

Table-VIII
Middle ear pressure 5 days after pack removal (n=60).

Middle ear pressure (daPa)	Number of Ears	Percentage
-300 to -250	0	0
-250 to -200	0	0
-200 to -150	1	1.66
-150 to -100	2	3.33
-100 to -50	4	6.66
-50 to 0	27	45.00
o to +50	22	36.66
+50 to +100	3	5.00
+100 to +150	1	1.66



Figure-1: Impedance audiometry has been performed in a patient with anterior nasal packing at Audiology Unit of ENT – Head & Neck Surgery Department of SSMC & Mitford Hospital, Dhaka.

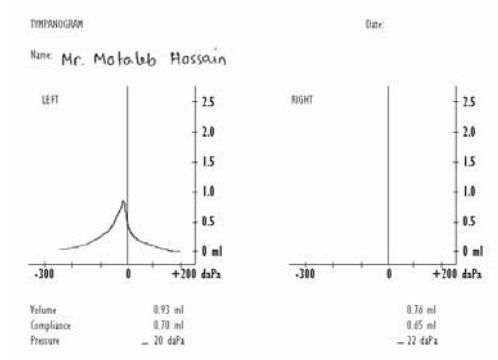


Figure-4: Middle pressure 5 days after pack removal

Discussion:

30 patients were included in this study. The patients of this series were of different age group. The minimum age was 14 years. The maximum age of the patients was 48 years and 50 percent of the patient was in third decade followed by second decade (33.33%) (Table-I). The average age was 26 years. This average is consistent with other study.¹⁹

In this series, two-third (66.66%) of the patient was male (Table-II). This is closed to that of Peacock who showed it at 77 percent.²⁰ Male to female ratio in the present series was 2:1.

Majority of the patients presented with multiple symptoms and commonest was nasal obstruction which was presented in 100 percent of patients (Table-III). This is consistent with finding of other study.^{20, 21} Headache, nasal discharge, disorder of olfaction were other complains.

Among 30 patients, 9 patients diagnosed as deviated nasal septum (30.00%), 11 patients deviated nasal with hypertrophy inferior turbinate (36.66%), 5 patients ethmoidal polyp (16.00%), 3 patients antrochoanal polyp (10.00%) and 2 patients as deviated nasal septum with nasal deformity (6.66%) (Table-IV).

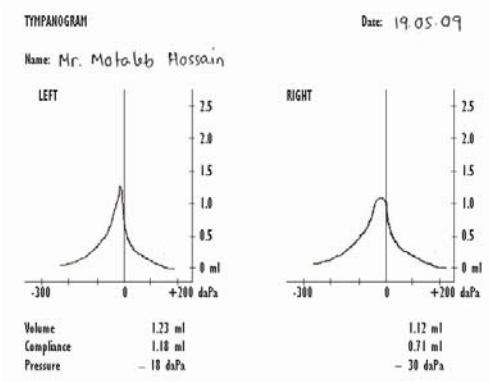


Figure-2: Pre-pack middle ear pressure

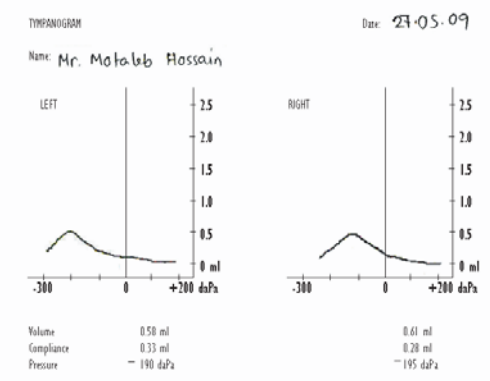


Figure-3: Middle ear pressure 48 hours after nasal packing

In this study 9 patients underwent septoplasty (30.00%), 11 patients had septoplasty with submucosal diathermy (36.66%), 8 patients had Endoscopic sinus surgery (26.66%) and septorhinoplasty in 2 patients (6.66%) (Table-V).

Middle ear pressure -100 daPa to +100 daPa has been considered to be normal middle ear pressure. The prepack middle ear pressure range between -50 daPa to 0 daPa were maximum (55.33%) (Table-VI) followed by 0 daPa to +50 daPa. The maximum prepack middle ear was +25 daPa, minimum was -65 daPa. The mean prepack middle ear pressure was -24 daPa. Out of 60 ears only 4 ears showed abnormal middle ear pressure that mean below -100 daPa. The middle ear pressure ranges between -150 daPa to -100 daPa in 3 ears in patients having unilateral nasal obstruction more than 1 year.

After 48 hours of anterior nasal packing (2nd post operative day) just before pack removal abnormal middle ear pressure was seen in 26 ears (43.33%) (Table-VII). Middle ear pressure 5 days after pack removal (7th post operative day) was found abnormal in 3 ears (Table-VIII). This results inconsistent with the finding of other series.²² Another study examined 15 patients with anterior nasal packing and found that 7 (46%) developed significant negative middle ear pressure which resolved on removal of the packs.²⁰ Other observation showed 126 ears of 63 patients, 55 of 126 ears tested (46%) developed a reduction of middle ear pressure of at least <-100 daPa. Finding of present study is similar to the result of others. They found 40 ears out of 80 (50%) had below -100 daPa middle ear pressure 48 hours after anterior nasal packing which was reversible in nature.^{5,6,8}

A significant finding was that 3 ears (75%) out of 4 ears having antrochoanal polyp

showed no improvement even five days after pack removal.²³ Chronic nasal obstruction appears to have detrimental effect on middle ear ventilation.²⁴

A study of 27 patients with anterior nasal packing left in situ for at least five days.²⁵ They attributed the subsequent abnormal middle ear pressure due to Eustachian tube dysfunction from edema of the nasopharyngeal mucosa. Because the middle ear pressure revert to normal prior to pack removal. They suggested that Eustachian tube dysfunction after septal surgery with anterior nasal packing was due to post surgical oedema since negative middle ear pressure returned to normal prior to removal of pack at five or seven days.

Deficiency of surfactant may be related to tubal dysfunction which is thought to facilitate opening of the tube.²⁶ 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.²⁷ Nasal packing causes complete nasal obstruction which results in edema of nose, nasopharynx and paranasal sinuses.^{28,29} Thus nasal packing causes lymphatic stasis in nasopharynx and around the opening of Eustachian tube which ultimately results in middle ear dysfunction.

Conclusion:

Anterior nasal packing cause's reversible negative middle ear pressure which return to normal 5 days after pack removal. Chronic nasal obstruction seems to have a detrimental effect on middle ear pressure, which may not return to normal even after removal of chronic obstruction. It appears from this study that there might be some permanent change in

peritubal nasopharyngeal mucosa due to chronic nasal obstruction, which needs to be proved histopathologically. Lymphatic stasis at peritubal plexus of lymphatic channels and veins appears to be the causes of lymph oedema following nasal packing.

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