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Original Article

Effect of Anterior Nasal Packing on Middle Ear Pressure

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Abstract:

Background: *Bilateral anterior nasal packing is often done after septal surgery for hemostatic reasons and mechanical splinting. It has been suggested that nasal packing following septal surgery is a frequent cause of short term eustachian tube dysfunction such as ear fullness and mild pain.*

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

Methods: *For this prospective, longitudinal study, ninety-two (92) patients admitted for routine septal surgeries were selected according to inclusion and exclusion criteria from the in-patient Department of ENT and Head &Neck Surgery, Dhaka Medical College and Hospital, Dhaka during 1st January 2020 to 31st July 2021. Following informed written consent, the patients were interviewed three times: preoperative, after 24 hours of ANS pack and 6 days after pack removal. During each time, middle ear pressure was measured by an impedance audiometer. Any otological symptoms produced when ANS pack was in place for 24 hours and 6 days after pack removal were also observed and recorded.*

Results: *Among 92 patients in this study, mean preoperative middle ear pressure was -5.5 (± 30.14) daPa. After 24 hours of anterior nasal packing, 70 ears (38%) showed abnormal middle ear pressure among 184 ears. Mean middle ear pressure after 24 hours of ANS pack was -76.5 (± 58.8) daPa. Middle ear pressure again measured after 6 days of removal of ANS pack and showed that the middle ear pressure of all the patients were within normal range. Mean middle ear pressure was -12.4(± 36.5) daPa after 6 days of pack removal. Some otological symptoms developed due to change in middle ear pressure following ANS pack like ear fullness, earache and tinnitus. All these symptoms subsided after 6 days of pack removal.*

Conclusion: *Anterior nasal packing decreases middle ear pressure which is reversible and returns to normal 6 days after pack removal. Some otological symptoms developed due to change in middle ear pressure which were transient and all came to normal after 6 days of pack removal.*

Key words: *ANS packing, middle ear pressure, otological symptom.*

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Introduction:

Nasal packs are frequently used after nasal surgery for hemostasis and internal stabilization of bony and cartilaginous structures and are considered to have an impact on Eustachian tube function[1]. Eustachian tube maintains middle ear pressure equal to that of atmosphere. It has at least three physiologic functions with respect to the middle ear: ventilation of the middle ear to equilibrate air pressure in the middle ear with atmospheric pressure, drainage and clearance into the nasopharynx of secretions produced within the middle ear, and protection from nasopharyngeal sound pressure and secretions[2]. When the tube opens during swallowing, air reaches the middle ear, equalizing the pressure between the external and internal surfaces of the tympanic membrane. 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[3].

Sonotubometry, manometry and tympanometry can assess the ventilatory function of the eustachian tube. Tympanometry and ETF tests (Valsalva and Toynbee maneuvers) have been widely used in clinical and basic research investigations. The potential interactions between middle ear mucosa, eustachian tube, pharynx and nasal cavities have been studied by several authors. Most inflammatory disorders of the middle ear are thought to be related to inadequate ventilation through the eustachian tube. The tube is frequently involved in the pathological processes of the nasal, paranasal and rhinopharynx cavities. Patients with tubal dysfunction often complain of a sensation of ear fullness, which is a consequence of the functional impairment of the eustachian tube resulting from a ventilatory disturbance. However, despite the sensation of ear fullness, most subjects show normal middle ear pressure as measured by tympanometry[4].

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[5].

A negative middle ear tube pressure measured by tympanometry shows dysfunction of the eustachian tube. Nasal surgeries were performed in patients having nasal obstruction and associated symptoms caused by a deviated nasal septum. Intranasal packings are used to control bleeding, stabilize the nose bones, help the settlement of septal mucosal flaps, and prevent adhesions and septal hematoma in septoplasty[6]. However, nasal packing also increases the risks of infection, pain and nasal obstruction and may affect the mucociliary activity and olfaction function. 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[7].

In Eustachian tube dysfunction in case of nasal obstruction, lymphatics stasis in the peritubal plexus of lymphatic channels and vein has been believed to be possible etiological factors which results in edema 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[8].

Methods:

Study design: This was a prospective, longitudinal study to evaluate the effect of anterior nasal packing on middle ear pressure.

Study place: The study was conducted in Department of ENT and Head & Neck surgery in Dhaka Medical College & Hospital (DMCH).

Study period: A prospective, longitudinal study was continued over a period of one and half year from 1st January 2020 to 31st July 2021.

Sample size: 92 patients admitted for routine septal surgeries and correction of nasal deformities.

Sampling technique: Non probability consecutive sampling.

Inclusion Criteria: Any patients admitted for routine septal surgeries and correction of nasal deformities who required bilateral anterior nasalpacking with a preoperative normal tympanogram.

Exclusion Criteria: a) Anytraumatic injurytoear and nose.b) Patientwith history of ear disease. c)Any patients with upper respiratory tract infection. d) Patients other than type A tympanogram.

Data collection technique: The study participants was explained about the study and written informed consent was obtained. Face to face interview was done by the researchers using semi structured questionnaire among the population who fulfill the selection criteria. Following informed written consent, the respondents were interviewed three times: preoperative, after 24 hours of ANS pack and 6 days after pack removal. During each time, otoscopic examination was done and middle ear pressure was measured by an Inventis Flute" impedance audiometer. Bilateral anterior nasal packing was done following septal surgeries using an antibiotic impregnated half ribbon gauze for 24 hours. Any otological symptoms produced when ANS pack was in place for 24 hours and 6 days after pack removal were also observed and recorded.

Statistical analysis: Quantitative data was expressed as frequency tables. T-test was done to see the effect of ANS pack on middle ear pressure. P value less than 0.05 was considered significant.

Results:

Maximum number of patients had preoperative middle ear pressure in between "-50 to 0" daPa in both ears. Mean middle ear pressure was - 5.5(± 30.14) daPa. (Table I)

Table I :
*Pre-pack middle ear pressure: (n=92*2=184)*

Middle ear pressure (daPa)	Right (%)	Left (%)
-300 to -251	0	0
-250 to -201	0	0
-200 to -151	0	0
-150 to -101	0	0
-100 to -51	9 (9.7)	7(7.6)
-50 to 0	42 (45.6)	59 (64.1)
0 to 50	35 (38)	24 (26.1)
51 to 100	6 (6.5)	2 (2.1)
101 to 150	0	0
Mean (±SD)	- 5.5 (± 30.14)	

Among 184 ears, 44.5% of right ears and 31.4% of left ears showed middle ear pressure between "-100 to -200" daPa. Mean pressure was -76.5 (± 58.8) daPa. Thus, out of 184 ears, 70 ears (38%) showed abnormal middle ear pressure. (Table II)

Table II :
*Middle ear pressure after 24 hours of anterior nasal pack: (n=92*2=184 ears)*

Middle ear pressure (daPa)	Right (%)	Left (%)
-300 to -251	0	0
-250 to -201	0	0
-200 to -151	14 (15.2)	13 (14.1)
-150 to -101	27 (29.3)	16 (17.3)
-100 to -51	16 (17.3)	14 (15.2)
-50 to 0	29 (31.5)	29 (31.5)
0 to 50	4 (4.3)	16 (17.3)
51 to 100	0	2 (2.1)
101 to 150	0	0
Mean (±SD)	-76.5 (± 58.8)	

Table III :
*Middle ear pressure after 6 days of removal of anterior nasal pack: (n=92*2=184 ears)*

Middle ear pressure (daPa)	Right (%)	Left (%)
-300 to -251	0	0
-250 to -201	0	0
-200 to -151	0	0
-150 to -101	0	0
-100 to -51	16(17.3)	13(14.1)
-50 to 0	42(45.6)	60(65.2)
0 to 50	28(30.4)	19(20.6)
51 to 100	6(6.5)	0
101 to 150	0	0
Mean (±SD)	-12.4 (± 36.5)	

Among 184 ears, the majority of patients middle ear pressure was between “-50 to 0” daPa in both ears. Mean middle ear pressure was -12.4(± 36.5). (Table III)

Table IV :
*Type of tympanogram: (n=92*2=184 ears)*

Types of tympanogram	Preoperative		24 hours of ANS pack		6 days after pack removal	
	Right	Left	Right	Left	Right	Left
Type A	92	92	51	63	92	92
Type B	0	0	0	0	0	0
Type C	0	0	41	29	0	0

Table V :
Comparison among prepack mean MEP, mean MEP with ANS pack for 24 hours and Mean MEP 6 days after pack removal: (n=92)

	Mean MEP(daPa)	T test	P- value
Prepack mean MEP	-5.5	10.89	<0.001
Mean MEP with ANS pack for 24 hours	-76.5		
Mean MEP with ANS pack for 24 hours	-76.5		
Mean MEP 6 days after pack removal	-12.4	6.51	<0.001
Prepack mean MEP	-5.5		
Mean MEP 6 days after pack removal	-12.4	0.96	0.337

Table VI :
Otological symptoms after 24 hours of ANS packing and 6 days after pack removal: (n=multiple response)

Otological symptoms	24 hours of ANS pack		6 days after pack removal	
Earache	25(27.1)	20(21.7)	92	92
Ear fullness	35(38)	24(26.1)	0	0
Tinnitus	4(4.3	3(3.3)	0	0

Discussion:

A total of 92 patients of any age and sex were selected fulfilling the inclusion and exclusion criteria. The present study findings were discussed and compared with previously published relevant studies.

Middle ear pressure of each ear was recorded 3 times: prior operation, after 24 hours of anterior nasal pack and after 6 days of removal of anterior nasal pack. Middle ear pressure -100 to +100 daPa has been considered to be normal middle ear pressure. Prior operation, maximum number of patients had preoperative middle ear pressure in between "-50 to 0" daPa in both ears. Mean middle ear pressure is -5.5 daPa. In other studies, more than two third of the patient had middle ear pressure between "0 to -99" daPa and rest of them between "0 to +100" daPa[3]. Another study showed that the prior operation middle ear pressure were maximum between the range "-50 daPa to 0 daPa". The mean prior operation middle ear pressure was -24 daPa[8]. Middle ear pressure range between "-50 daPa to 0 daPa" were maximum (53.33%) preoperatively in another Bangladeshi study[9].

Middle ear pressure after 24 hours of ANS pack showed that highest percentage of middle ear pressure of right ears was in between "-50 to 0" daPa (31.5%). On the left ears, the most founded middle ear pressure was also in between "-50 to 0" daPa (31.5%). 44.5% of right ears and 31.4% of left ears showed middle ear pressure between "-100 to -200" daPa. Mean pressure is -76.5 (± 58.8) daPa. Thus, out of 184 ears, 70 ears (38%) showed abnormal middle ear pressure. To find out any statistically significant difference between preoperative mean middle ear pressure and mean middle ear pressure after 24 hours of ANS pack, t-test was done and it was found significant ($p < 0.001$). This result is similar to another study which showed 43.33% of ears had abnormal middle ear pressure[9].

Middle ear pressure again measured after 6 days of removal of ANS pack and showed that all the patients middle ear pressure are within normal range and showed type A tympanogram. Maximum number of patients middle ear pressure was in between "-50-0" daPa. Mean middle ear pressure is -12.4(± 36.5) daPa. This result corresponds to another study where middle ear pressure after 3 weeks of septoplasty range between "-50-0" daPa[10]. To find out any statistically significant difference between mean middle ear pressure after 24 hours of ANS pack and mean middle ear pressure after 6 days of pack removal, t-test was done and it was found significant ($p < 0.001$).T test was also done to find out the difference between pre pack mean middle ear pressure and postoperative mean middle ear pressure 6 days after pack removal and it was found insignificant ($p=0.337$).

During ANS pack in situ there were some symptoms developed. Ear fullness was the main symptoms, right ear 38 % and left ear 26.1%. Earache was present in 27.1% of right ear and 21.7% of the left ear.4.3% in right ears and 3.3% in left ears had symptom of tinnitus. All patients came to clinically normal after 6 days of pack removal. Similar kind of

result was found in another study where all the affected ears were asymptomatic and no patients had evidence of middle ear effusion[11]. In another Indian study, there was increase in symptoms of ear fullness, earache and tinnitus at initial postoperative evaluation after 2 days of surgery. There was marked improvement in ear fullness at 8 weeks postoperatively and even more at 12 weeks postoperatively. Not much improvement was achieved for earache and tinnitus though it recovered later[12].

Conclusion:

Anterior nasal packing decreases middle ear pressure which is reversible and returns to normal 6 days after pack removal. Some otological symptoms developed due to change in middle ear pressure which were transient and all came to normal after 6 days of pack removal.

References:

1. Keluskar PJ and Burse K. Nasal Packing using Merocel pack and Merocel pack with tube to study its effects on middle ear pressure and hearing threshold.MVP Journal of Medical Sciences, 2019; Vol 6(2): 189-192.
2. Awad OGAN, Salama, YM, El-Badry M. Effect of nasal obstruction surgery on middle ear ventilation. The Egyptian Journal of Otolaryngology, 2014; 30(3): 191.
3. Jasser H, Abbas H, Sachdeva A, David, B. Effect of anterior nasal packing on middle ear pressure and hearing threshold. Kuwait Medical Journal, 2009; 41(1): 37-38.
4. Salvinelli F, Casale M, Greco F, D'ascanio L, Petitti T, Di Peco V. Nasal surgery and eustachian tube function: effects on middle ear ventilation. Clinical Otolaryngology, 2005; 30(5): 409-413.
5. Pragadeeswaran K, Yadavkrishnan RP, Raja RV. Anterior nasal packing: does it affect middle ear pressure? International Journal of Otorhinolaryngology and Head Neck Surg, 2020; 6(7): 1316-1319.
6. Þereflican M, Yurttaþ V, Oral M, Yýlmaz B, Daðlý M. Is middle ear pressure affected by nasal packings after septoplasty?. J IntAdvOtol, 2015; 11(1): 63-65.
7. Dalgic A, MD, Is A, MD, Dinc ME, MD, Ulusoy S, MD, Avincsal MO, MD, Kulekci M, MD. The effects of nasal packing and transseptal suturing after septoplasty on olfactory function, patient comfort, and mucociliary clearance. The Journal of Craniofacial Surgery, 2016; 27(5): e487-e489.
8. Bhuiyan MR, Ali M, Johora F, Rumi SNF, Haque N, Abdullah M . Effect of anterior nasal packing on middle ear pressure. Bangladesh Journal of Otorhinolaryngology, 2011; 17(2): 125-131.
9. Rahim MM, Taous A, Zafar MH, Islam M, Asad K, Ali MT. Effect of Anterior Nasal Packing on Eustachian Tube Function and Middle Ear Pressure. Bangladesh Journal of Otorhinolaryngology, 2017; *23*(1): 27-31.
10. Duran K, MD, Fatih Y, MD, Dogan M, MD. Middle ear pressure after septoplasty. The Journal of Craniofacial Surgery, 2014; 25(1): e19- e21.
11. Gupta M, Singh S, Chauhan B. Comparative study of complete nasal packing with and without airways. B-ENT; 2011: *7*(2), 91.
12. Nanda MS, Kaur M, Bhatia, S. Impact of septoplasty on hearing and middle ear function. International Journal of Research in Medical Sciences, 2018; *6*(1):1