International Journal of Otorhinolaryngology and Head and Neck Surgery
Shankar SS et al. Int J Otorhinolaryngol Head Neck Surg. 2023 May;9(5):376-382
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20231084

Original Research Article

Correlation between chronic suppurative otitis media and deviated nasal septum of the ipsilateral side

Swetha S. Shankar*, Nithin P. Shettigar

Shri B. M Institute of Medical Science and Research Centre, Vijayapura, Karnataka, India

Received: 29 January 2023
Revised: 20 March 2023
Accepted: 01 April 2023

***Correspondence:**
Dr. Swetha S. Shankar,
E-mail: swethashanks@yahoo.com

ABSTRACT

Background: Chronic suppurative otitis media (CSOM) is a long standing infection of middle ear with permanent defect in tympanic membrane with or without ear discharge, frequently have an underlying nasal pathology, which can worsen the middle ear disease secondary to Eustachian tube dysfunction, leading to negative middle ear pressure, tympanic membrane retraction, chronic otitis media with effusion and/or cholesteatoma. Present study was conducted to study the correlation of a etiopathogenesis, bacteriology of CSOM with the deviation of the nasal septum (DNS) of the ipsilateral side.

Methods: Study was conducted in ENT department, AJ institute of medical science, Mangalore, Karnataka. Study group included 120 patients having CSOM, selected randomly from outpatient department (Time bound cross-sectional study). Predesigned proforma was used. Detailed history taken, followed by a thorough ENT examination. Relevant investigations were performed.

Results: In this study, the prevalence of nasal disease (DNS) in patients with CSOM was 73.33%. Out of 120 CSOM patients, 88 patients had co-existent nasal disease (DNS). Among the 88 cases; 71 (59.2%) patients showed direct correlation with CSOM. Culture swabs showed similar bacterial isolates in aural and nasal swabs indicating, there may be retrograde spread of pathogens from nasopharynx to middle ear via Eustachian tube.

Conclusions: A significant correlation was established between CSOM and DNS of the ipsilateral side. DNS played a key role in persistence of CSOM. A conscientious evaluation of nose and paranasal sinuses diseases is essential and we thus endorse management of nasal disease prior to the surgical treatment of ear disease, for meritful postoperative results.

Keywords: CSOM, DNS, Eustachian tube

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as the chronic inflammation of the middle ear (ME) cleft mucosa, characterised by irreversible changes with a history of persistent ear discharge for more than three months through a permanent tympanic membrane defect.[1] The middle ear cleft constitutes the following namely, Eustachian tube, tympanic cavity, attic, aditus, antrum and the mastoid air cells which are found to be in continuity with the epithelium of nose and nasopharynx through a patent Eustachian tube (ET). Since the mucosa of the nose and paranasal sinuses are in continuity with the mucosa of the middle ear cleft, pathologies in the sinonasal region can influence the normal health of the middle ear & mastoid. The pathogenesis of CSOM has found to be related to the presence of prior or concurrent nasal disease. Chronic infections of the nose and paranasal sinuses (PNS) can lead to Eustachian tube dysfunction.[2] The presence of a DNS can transform the laminar airflow in the nasal cavity to that of a turbulent nature and further contribute to persistence of middle ear pathology. Other pathologies such as allergic rhinitis, nasal polyposis and nasopharyngeal pathologies namely,

adenoids & tumours of the nasopharynx can also cause chronic obstruction of ET, in turn leading to CSOM.[3] Patients who have CSOM secondary to nasal and/or PNS pathology need to have both problems addressed. Therefore, those in need of ear surgery should have nasal and PNS problems attended to first, if an ear operation is to be meritorious.

The present study was undertaken to establish correlation between CSOM and DNS of the ipsilateral side.

Objectives

Objectives of the study were to study the correlation between CSOM and deviation of the nasal septum to the ipsilateral side and to study its relation with CSOM in terms of aetiopathology and bacteriology.

METHODS

Source of data

The present study is to establish correlation between CSOM and DNS of the ipsilateral side. This study was conducted in the department of ENT, AJ institute of medical sciences and research centre, Mangalore from 1st August 2017 to 31st January 2019.

Method of collection of data

One hundred and twenty patients with CSOM, of both tubotympanic and atticoantral types attending the ENT OPD in the AJ institute of medical sciences, Mangalore, fulfilling the following criteria were selected randomly for the study.

Inclusion criteria

Patients of both sexes and aged more than 10 years presenting with: CSOM-Atticoantral type, CSOM-tubotympanic type and DNS.

Exclusion criteria

Patients with traumatic dislocations of ossicles, patients having fungal otitis externa, patients with traumatic tympanic membrane perforations, patients with acute infections of nose and paranasal sinuses, patients with sinonasal malignancies or malignancies of the middle ear, patients with associated medical comorbidities like diabetes mellitus, immunocompromised states and diagnosed cases of ciliary dyskinesia, patients less than 10 years of age, patients with acute suppurative otitis media/otitis media with effusion and patients not willing for the study.

Sample size

Sample size was calculated based on the proportion of CSOM in India determined by WHO.[4] Using estimation method with allowable error and level of significance (α) 5%, inflated sample size determined as 120.

Data analysis and interpretation

Data was entered into Microsoft excel (Windows 7; version 2007) and analysis was done using the statistical package for social sciences (SPSS) for Windows software (version 18.0; SPSS Inc, Chicago). Descriptive statistics such as frequencies and percentages were calculated for categorical variables and mean, standard deviation (SD) and range for continuous variables were determined. Simple bar charts and pie charts were used for representation of the analyzed data.

Methodology

Patients aged more than ten years of both sexes with CSOM, tubotympanic and atticoantral types of all stages were included in our study. Informed written consent was obtained from all the patients and by parents in case of minors after being informed about the aims and objectives of the study. The study design was that of a cross sectional one and was used to evaluate the correlation between CSOM and DNS of the ipsilateral side. The institutional ethical committee approval was taken prior to the commencement of the study.

A predesigned proforma was filled, documenting the age, sex, address and clinical information including chief complaints, duration of symptoms, predisposing factors and any previous history of treatment. All patients fulfilling the inclusion criteria were subjected to detailed examination which included general physical examination, careful examination of ear, nose and throat. Otoscopic and thorough microscopic examination of tympanic membrane was carried out. Tuning fork tests were also performed. A detailed nose and paranasal sinus examination was done. All cases were subjected to relevant blood investigations inclusive of complete hemogram and absolute eosinophil count. In patients with active CSOM, showing presence of discharge, the discharge was sent for culture and sensitivity using thin sterile cotton wool micro-swabs with full aseptic precautions using a microscope. Swab was then sent to microbiology laboratory for culture analysis. Pure tone Audiometry (PTA) also taken in all patients. Radiological imaging techniques like high resolution computed tomography (HRCT) of temporal bones was done in certain cases (CSOM-AA) to determine extent of disease. Rigid diagnostic nasal endoscopy (DNE) was performed in all patients to evaluate presence of DNS. During DNE, abnormal nasal and nasopharyngeal secretions were collected using thin sterile cotton wool micro-swabs with full aseptic precautions and immediately sent for culture.

RESULTS

In the present study, we studied 120 patients with CSOM-inclusive of tubotympanic and atticoantral types. The ear

pathology along with imaging of the temporal bone (in cases of atticoantral type of CSOM) was compared with the nasal pathology namely, DNS. Results so obtained were analysed using chi square/Fishers exact test. Following observations were made:

Table 1: Distribution of patients according to their age group, (n=120).

Age (Years)	Frequency	Percent (%)
11-20	38	31.7
21-30	25	20.8
31-40	23	19.2
41-50	19	15.8
51-60	15	12.5
Total	120	100
Mean ±SD	31.26±13.963	
Range	11-60	

In our study, the age of the patients ranged from 11 to 60 years. Mean age was 31.26±13.963 years. Majority belonged to the 11-20 years age group (31.7%) as given in Table 1.

In this study, out of 120 CSOM patients, 73 (60.8%) were males and 47 (39.2%) were females.

In our study, majority of the patients belonged to the low socioeconomic status 62 (51.7%) followed by 57 (47.5%) and 1 (0.8%) in the middle and high group. Thus, showing a direct relationship between the surrounding environment and presence of CSOM.

In the present study, out of total 120 CSOM patients, 51 (43%) had right ear involvement, 46 (38%) had left ear involvement and 23 (19%) had bilateral ear involvement. Right ear was observed to be more involved as opposed to the left.

In this study, the longest duration of otorrhoea was more than 10 years seen in 25 (21%) patients. Majority of the patients i.e., 36 (30%) had otorrhoea between the range of 1-5 years.

In our study of 120 patients, 25 (20.8%), 23 (19.2%) and 6 (5%) had atticoantral type of CSOM on right, left and bilateral side respectively. Whereas, 26 (21.7%), 23 (19.2%) and 17 (14.2%) had tubotympanic type of CSOM on right, left and bilateral side respectively. 91 (75.8%) patients were observed to have active disease. Quiescent stage was seen in 6 (5%) patients. The 23 (19.2%) were observed to have inactive disease as analysed in Table 2

In the study carried out, 13 (32%), 38 (32%) and 37 (31%) patients had headache, nasal obstruction and headache with nasal obstruction respectively, whereas 32 (27%) patients were asymptomatic at presentation.

Table 2: Distribution of patients according to the type of CSOM and disease activity, (n=120).

Variables	N	%	P value (Chi square/ Fishers exact test)
Bilateral atticoantral	6	5.0	0.940
Bilateral tubotympanic	17	14.2	
Left atticoantral	23	19.2	
Left tubotympanic	23	19.2	
Right atticoantral	25	20.8	
Right tubotympanic	26	21.7	
Total	120	100.0	
Disease activity			
A (Active)	91	75.8	0.888
IA (Inactive)	23	19.2	
Q (Quiescent)	6	5	
Total	120	100	

Table 3: Distribution of CSOM patients based on their microscopic findings of tympanic membrane, (n=120).

Variables	N	%	P value (Fisher's exact test)
AP (Attic perforation)	1	0.8	0.305
ARP (Attic retraction pocket)-grade III	2	1.7	
ARP (Attic retraction pocket)-grade II	11	9.2	
ARP (Attic retraction Pocket)-grade III	7	5.8	
DM (Dimeric membrane)	1	0.8	
GP (Granulation polyp)	2	1.7	
KD (Keratin debris)	18	15	
LP (Large perforation)	14	11.7	
MP (Medium perforation)	22	18.3	
PM (Polypoidal mucosa)	2	1.7	
PSRP (Posterosuperior retraction pocket)	15	12.5	
SP (Small perforation)	17	14.2	
STP (Subtotal perforation)	4	3.3	
TP (Total perforation)	1	0.8	
TS (Tympanosclerosis)	3	2.5	
Total	120	100	

In the patients with atticoantral type of CSOM, 1 (0.8%) had attic perforation Tos grade II attic retraction pocket was seen in 11 (9.2%) patients. Tos grade III attic retraction pocket was seen in 2 (1.7%) and 7 (5.8%) patients had Tos grade I attic retraction pocket. The 15

(12.5%) ears showed the presence of posterosuperior retraction pocket. 1 (0.8%) patient had total perforation of tympanic membrane. In 18 (15%) ears keratin debris was observed. 2 (1.7%) had had granulation tissue polyp in the ear canal

In the patients with tubotympanic disease, 4 (3.3%) were observed to have subtotal perforation involving all the quadrants. The 14 (11.7%) had large central perforation, while medium perforation was present in 22 (18.3%) ears. Small central perforation was observed in 17 (14.2%) subjects. Through the perforation when ME mucosa was studied; it was observed that 2 (1.7%) showed presence of polypoidal mucosa. Tympanosclerosis was observed in 3 (2.5%) ears. Dimeric membrane was seen in 1 (0.8%) patient as analysed in Table 3.

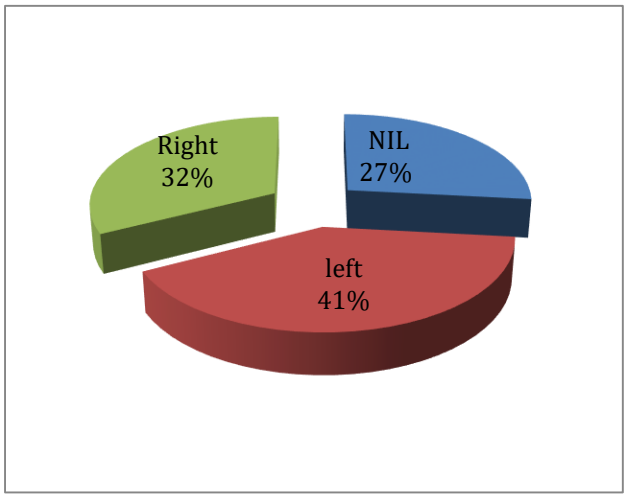

Figure 1: DNE findings.
P=(Chi square/Fishers exact test) 0.000 (Highly significant).

In our study, Diagnostic nasal endoscopy was performed in all patients and following findings were the findings observed: DNS was noted in 88 patients, of which right sided DNS was seen in 39 i.e., 32% patients while left sided DNS was noted in 49 i.e., 41% of the patients. Our study showed a preponderance towards left DNS. 32 i.e., 27% showed no deviation of the septum. Other findings noted during DNE were double/paradoxical middle turbinate, mucoid/mucopurulent discharge in the middle meatus/nasopharynx, ethmoidal/antrochoanal polyp, hypertrophied adenoids and congested ET but a representation of the same has not been made as our study focussed only on DNS as a nasal pathology as depicted in Figure 1.

In the study group, HRCT temporal was done for 54 (45%) patients. Majority of the patients, 25 (20.8%) showed hazy mastoid air cell system. Seven (5.80%) had sclerotic mastoid, 3 (2.5%) had soft tissue density in epitympanum. Eight (6.7%) and 2 (1.7%) had soft tissue density in attic and antrum respectively, 4 (3.3%) had soft tissue density in mesotymapnum. Partial scutum erosion was noted in 3 (2.5%) 2 (1.7%) patients had total scutum erosion as shown in Table 4.

Table 4: Distribution of CSOM patients according to their HRCT temporal bone findings, (n=120).

Variables	N	%	P value (Fisher's exact test)
HM (Hazy mastoid)	25	20.8	0.258
NA (Not applicable)	66	55	
PSE (Partial scutum erosion)	3	2.5	
SM (Sclerotic mastoid)	7	5.8	
STD in antrum (Soft tissue density)	2	1.7	
STD in attic (Soft tissue density)	8	6.7	
STD in epitymp (Soft tissue density)	3	2.5	
STD in mesotym (Soft tissue density)	4	3.3	
TSE (Total scutum erosion)	2	1.7	
Total	120	100	

Table 5: Distribution of CSOM patients according to their Aural swab culture isolates, (n=120).

Variables	N	%	P value (Chi square/ Fishers exact test)
Bacteroids	22	18.3	0.053
Gram negative cocci	33	27.5	
Pepto *streptococcus*	1	.8	
Pseudomonas aeruginosa	2	1.7	
Staphylococcus aureus	24	20	
Staphylococcus aureus* and *Streptococcus	11	9.2	
***Streptococcus* sp.**	27	22.5	
Total	120	100.0	

In the study conducted, the ears revealed the following bacterial isolates : Majority of the patients i.e. 33 (27.5%) showed infection by aerobes i.e. gram negative cocci, followed by *Streptococcus* sp 27(22.5%), staphylococcus aureus 24 (20%), bacteroids 22(18.3%), combined isolates of *Streptococcus* and *Staphylococcus* 11 (9.2%) respectively Minority of isolates was that of pseudomonas aeruginosa 2 (1.7%) and Pepto *streptococcus* 1(0.8%) respectively as in Table 5.

In this study, nasal swabs of 23 (19.2%) patients showed pure aerobic infection and major isolate was *S. aureus*. Gram negative *Cocci* and *Streptococcus* species were

isolated in 21(17.5%) and 20(16.7%) patients. Minority was that of Pepto *Streptococcus* 2 (1.7%) and combined isolates of *Staphylococcus* aureus and *Streptococcus* 1(0.8%). It was observed that 40 (33.3%) had no isolates in the nasal swab as described in Table 6.

Table 6: Distribution of CSOM patients according to their nasal swab culture isolates, (n=120).

Variables	N	%	P value (Chi square/ Fishers exact test)
Nil	40	33.3	0.000 (Highly significant)
Bacteriods	13	10.8	
Gram negative cocci	21	17.5	
Pepto *Streptococcus*	2	1.7	
Staphylococcus aureus	23	19.2	
Staphylococcus aureus* and *streptococcus	1	0.8	
***Streptococcus* sp**	20	16.7	
Total	120	100.0	

Table 7: Number of patients showing co-existent CSOM and DNS **and number of patients showing direct correlation, (n=120).**

Variables	N	%	P value (Chi square/ Fishers exact test)
CSOM	120	100	0.000 (Highly significant)
CSOM + DNS	88	73.33	
Direct correlation	71	59.2	

In the present study, out of 120 CSOM patients studied; 88 (73.3%) had co-existent CSOM and DNS. Out of these 88 patients, 71 (59.2%) patients revealed direct correlation between CSOM and sinonasal disease. How these 46 patients had direct correlation between CSOM and sinonasal disease as observed in Table 7.

DISCUSSION

A clear understanding of the underlying pathology is the step of utmost importance in the diagnosis of CSOM. Identification nasal pathology predisposing to chronic ear disease, in this case DNS, helps in successful management of the ear condition.

In the present study, 120 cases of CSOM; 66 tubotympanic type and 54 atticoantral type were studied, of which, 23 patients had bilateral involvement and 97 had unilateral involvement. The etiopathology of the ear disease was compared with co-existing nasal pathology (DNS) to find out the direct correlation between the two (CSOM and DNS).

In our study, CSOM was more common in males (61%) as compared to females (39%). Male to female ratio was 1.56:1. Likewise, similar conclusion has been made by other researchers such as Chandra and Mishra, Mukherjee et al and Hossain et al.[5-7] The predominant cause of the disease in males being, their outdoor working habits exposing them to contamination and contagion.

The age group with highest percentage of presentation of CSOM was 11-20 years, the number being 38 (31.7%) These findings were consistent with the findings of Shreshtha and Sinha and Singh and Safaya.[8,9]

In the study sample of 120 CSOM cases, 62 (51.7%) patients belonged to the low socioeconomic class. According to literature, the incidence of CSOM is higher in low socioeconomic class population due to poor hygienic living conditions and overcrowding.[10]

In our study, 66 (55%) patients had tubotympanic disease while 54(45%) had atticoantral type of CSOM. The data so recorded, were consistent with the findings of Saurabh V, Ashutosh et al who reported similar proportion of tubotympanic and atticoantral types in their study. [11]

In the present study, out of 120 cases, 51 (42.5%) had disease of the right ear, 46 (38.3%) had left ear involvement and 23 (19.2%) had bilateral disease.

In the study conducted, 91 (75.8%) had active stage of disease i.e., ear discharge was present at the time of examination, 23 (19.2%) had inactive stage of disease i.e., no ear discharge during last six months, 6 (5%) had quiescent stage of disease i.e., intermittent history of ear discharge but at the time of examination there was no ear discharge.

In the present study, the most common tympanic membrane findings noted in cases of TT disease was medium sized perforation seen in 22 (18.3%) patients and in cases of AA disease, most common finding noted was keratin debris seen in 18 (15%) patients.

HRCT temporal bone was done in 54 patients i.e., those with AA type of CSOM and most common finding noted was hazy mastoid air cell 25 (20.8%) followed by soft tissue density in attic, which was seen in 8 (6.7%) patients.

In our study, out of 120 patients, the ears revealed the following bacterial isolates : Majority of the patients i.e. 33 (27.5%) showed infection by aerobes i.e. gram negative *Cocci*, followed by *Streptococcus* sp 27(22.5%), *Staphylococcus aureus* 24 (20%), bacteroids 22 (18.3%), combined isolates of *Streptococcus* and *Staphylococcus* 11 (9.2%) respectively minority of isolates was that of pseudomonas aeruginosa 2 (1.7%) and pepto *Streptococcus* 1 (0.8%) respectively. Poorey and Iyer and Kumar et al investigations also showed a lesser number of mixed isolates.[12,13] A decreased count of polymicrobial

isolates may perhaps be due to the changing pattern of the process of the disease, the increasing trend of using combined antimicrobials and some other unidentified factors that needs to be sought out and highlighted by further research.

In this study so conducted, we wanted to highlight the role of nasal disease (DNS) in the pathogenesis of CSOM. Diagnostic nasal endoscopy revealed that DNS was noted in 88 patients, of which right sided DNS was seen in 39 i.e., 32% patients while left sided DNS was noted in 49 i.e., 41% of the patients. Our study showed a preponderance towards left DNS. 32 i.e., 27% showed no deviation of the septum. Other findings noted during DNE were double/paradoxical middle turbinate, mucoid/mucopurulent discharge in the middle meatus/nasopharynx, ethmoidal/antrochoanal polyp, hypertrophied adenoids and congested ET but a representation of the same has not been made, as our study focussed only on DNS as a nasal pathology. These findings were consistent with findings noted by Sankaranarayanan et al and Prem et al.[14,15]

In the present study, we found that the prevalence of co-existing nasal disease (DNS) was 88 (73.33%). Out of these 88 cases; 71 (59.2%) patients showed direct correlation with CSOM. The culture report of these nasal swabs revealed presence of same pathogenic isolates as that in the corresponding affected ears. The most common aerobic isolates were *Staphylococcus aureus* and gram negative *Cocci*. Therefore, we propose that ascending retrograde spread of these microorganisms to the middle ear via the Eustachian tube leads to CSOM. The presence of mucopurulent on the ET orifice may cause inflammatory oedema of the ET mucosa leading to its dysfunction. The results obtained were comparable to that of Yeolekar et al.[16] Fujita et al reported in their study that 78% patients had abnormal sinuses and rhinosinusitis was present in 48% of cases of refractory otitis media and concluded that in cases of chronic otitis media refractory to treatment, the main focus of pathology/infection is in the paranasal sinuses.[17] In 1989 Bluestone and his colleagues studied 40 patients of chronic otitis media and found Eustachian tube dysfunction to be the reason for persistence of the disease. He concluded that diseases of the sinuses as the main cause for Eustachian tube dysfunction.[18] Miura and Takashi studied the influence of upper respiratory infection including rhinosinusitis on tubal compliance in children and adolescents with chronic otitis media and they concluded that 72% of patients with refractory tubal compliance due to chronicity of upper respiratory infection including rhinosinusitis, which often lead to the persistence of otitis media.[19]

Chronic nasal pathology, in our study that being DNS is a major factor contributing to ear disease and its persistence. The Eustachian tube possesses manifold functions facilitates the communication of the middle ear cavity with the nasopharynx, nasal cavity, nasal mucosa and indirectly also with the paranasal sinuses and plays an important role in the disorders of the middle ear, so does the nasal airflow which attains a turbulent flow as opposed to its usual laminar pattern in the presence of a nasal pathology.

Limitations

The study included only correlation between DNS and CSOM, other sinonasal patholgies like sinusitis, polyposis etc were excluded, the aural Swab for C/S was taken from the external auditory, direct middle ear mucosa swab was not taken.

CONCLUSION

Chronic nasal disease like DNS is an important causative factor in cases of persistent CSOM as they convert the laminar airflow into a turbulent one, which results in ET dysfunction. A detailed evaluation of the diseases of nose and paranasal sinuses in all patients of CSOM is thus of utmost importance and necessity in comprehensive management of the ear disease. On the basis of the results we obtained in our study, we recommend detailed evaluation and treatment of nasal disease before surgical treatment of ear disease is undertaken for meritorious postoperative results and reduced chances of recurrences.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Browning GG, Scott-Brown's Otolaryngology, Head and Neck Surgery. Michael Gleeson (ed), 7th edition, vol 3, Great Britain by Hodder Arnold. In: Ch. Chronic otitis media. 2008;3395-434.
2. Sade J, Fuchs C. Secretory otitis media in adults: I. The role of mastoid pneumatization as a risk factor. Ann Otol Rhinol Laryngol. 1996;105:643-7.
3. Finkelstein Y, Ophir D, Talmi YP, Shabtai A, Strauss M, Sohar Y. Adult-onset otitis media with effusion. Arch Otolaryngol Head Neck Surg. 1994;120:517-27.
4. Acuin J. Chronic suppurative otitis media-Burden of Illness and Management Options. Geneva: World Health Organization. 2004.
5. Chandra R, Mishra RN. Some observations on the total and subtotal perforations of the tympanic membranes. Indian J Otolaryngol. 1964;16:3-20.
6. Mukherjee P, Saunders N, Liu R, Fagan P. long term outcome of modified radical mastoidectomy. J otolaryngol. 2004;118:612-6.
7. Hossain MM, Kundu SC, Haque MR, Shamsuzzaman AK. Extracranial complications of chronic suppurative otitis media. Mymensingh Med J. 2006;15:4-9.

8. Shreshtha S, Sinha BK. Hearing results after myringoplasty. Kathmandu Univ Med J. 2006;4:455-9.
9. Singh RK, Safaya A. Middle ear hearing restoration using autologous cartilage graft in canal wall down mastoidectomy. Indian J Otol. 2005;11:10-4.
10. Browning GG, Scott-Brown's Otolaryngology, Head and Neck Surgery. Michael Gleeson (ed), 7th edition, vol. 3; Great Britain by Hodder Arnold. In: Ch. Chronic otitis media. 2008;3395-434.
11. Saurabh V, Ashutosh N, Bist SS, Singh RK, Gupta N, Bhagat S. Ossicular chain status in chronic suppurative otitis media in adults. Indian J Otolaryngol Head Neck Surg. 2010;62(4):421-6.
12. Poorey VK, Iyer A. Study of bacterial flora in CSOM and its clinical significance. Indian J Otolaryngol Head Neck Surg. 2002;54:91-5.
13. Kumar S, Sharma R, Saxena AK, Pandey A. A study of bacterial flora and sensitivity to antibiotics in cases of CSOM in western UP. Indian J Otol. 2008;14:20-4.
14. Sankaranarayanan G, Satheesh K. A study of chronic suppurative otitis media active mucosal type with sinusitis as focal sepsis. Otol Online J. 2012;2(4):2250-359.
15. Prem PS, Vaibhav K, Jaideep B. Study of sinonasal Disease in cases of chronic suppurative otitis media. J Evolution Med Dental Sci. 2014;3(13):3330-8.
16. Yeolekar AM, Dasgupta KS, Otitis Media: Does the onus lie on sinonasal pathology. Indian J Otol. 2011;16
17. Fujita A, Honjo I, Kuzeta K. Refractory Otitis Media, Organic Abnormalities of Eustachian tube dysfunction. Am J Oto Laryngol. 1993;14(3):187-90.
18. Bluestone CD. Assessment of Eustachian tube function. In Jerger J (Ed): Handbook of clinical impedance Audiometry, New York, American Electromedics Corporation. 1975;127-48.
19. M. Miura and Takashi influence of URTI on tubal complaints and otitis media. Acta Oto-Laryngologica. 1997;117(4):574-7.

Cite this article as: Shankar SS, Shettigar NP. Correlation between chronic suppurative otitis media and deviated nasal septum of the ipsilateral side. Int J Otorhinolaryngol Head Neck Surg 2023;9:376-82.