Original Article

Nasosinus Mucoceles: Our Experiences at a Tertiary Care Teaching Hospital of Eastern India

Santosh Kumar Swain, Debasmita Dubey[1]

Department of Otorhinolaryngology and Head and Neck Surgery, All India Institute of Medical Sciences, [1]Medical Research Laboratory, IMS and SUM Hospital, Siksha "O" Anusandhan University, Bhubaneswar, Odisha, India

Abstract

Background: Nasosinus mucoceles are expansile cystic masses originating at the paranasal sinuses by chronic retention of the mucus in a sinus cavity due to ostial obstruction. **Aim:** This study aims to evaluate the risk factors, clinical presentations, and management of nasosinus mucoceles. **Materials and Methods:** This is a retrospective study carried out over 5 years from August 2017 to September 2022 at a tertiary care teaching hospital. The diagnosis of nasosinus mucoceles was done by the clinical presentations and imaging of the paranasal sinuses. **Results:** There were 38 cases of nasosinus mucoceles included in the study. This study included 20 males and 18 females and male-to-female ratio of 1.11:1, with a mean age of 52.6 years (age range from 16 to 78 years). Computed tomography (CT) scan and magnetic resonance imaging were the main imaging done among study patients. All patients underwent endoscopic sinus surgery with marsupialization. Out of 38 patients, 2 (5.26%) had recurrence during the follow-up period. **Conclusion:** Orbital symptoms were major manifestations found in this study. CT scan was an important imaging performed in preoperative assessment. Endoscopic endonasal surgery is currently the gold standard for the treatment of nasosinus mucoceles. A satisfactory outcome was achieved after endonasal endoscopic marsupialization.

Keywords: Computed tomography scan, endoscopic endonasal surgery, mucocele, nasosinus

Introduction

Nasosinus mucoceles are benign and slow-growing lesions found in the nasosinus region.[1] Nasosinus mucoceles are expansile and cystic masses developed by chronic retention of the mucus in the sinonasal tract due to ostial obstruction.[1] A mucocele is an epithelial-lined mucus-filled sac located in the nasosinus region and can expand by alternative bone resorption and bone formation.[2] These mucoceles can erode the surrounding bony walls and extend beyond the affected paranasal sinus cavity, leading to orbital and intracranial complications.[3] As the mucocele enlarges, the orbital contents may become displaced, leading to visual disturbance, ptosis, and limitation of mobility of the eyeball.[4] The diagnosis of nasosinus mucoceles is made on the basis of clinical symptoms and imaging such as computed tomography (CT) scans and magnetic resonance imaging (MRI).[5] In nasosinus mucoceles, the treatment of choice is surgical intervention and nowadays unanimously treated by endonasal endoscopic marsupialization.[6] The goal of this retrospective study is to evaluate the details of nasosinus mucoceles including its etiology, clinical presentations, diagnosis, treatment, and outcome at a tertiary care teaching hospital.

Access this article online

Quick Response Code:

Website: https://journals.lww.com/mtsm

DOI: 10.4103/mtsm.mtsm_6_23

Materials and Methods

This retrospective study was conducted at a tertiary care teaching hospital between August 2017 and December 2022. This retrospective study was approved by the Institutional Ethical Committee (IEC) with reference number IEC/IMS/SOA/18/22.03.2021. Thirty-eight patients with nasosinus mucoceles [Figure 1] were included in this study. The diagnosis of nasosinus mucoceles was suggested by the clinical presentations and CT scan of the paranasal sinus.

Address for correspondence: Dr. Santosh Kumar Swain, Professor, Department of Otorhinolaryngology and Head and Neck Surgery, All India Institute of Medical Sciences, Sijua, Patrapada, Bhubaneswar-751019, Odisha, India.
E-mail: santoshvoltaire@yahoo.co.in

How to cite this article: Swain SK, Dubey D. Nasosinus mucoceles: Our experiences at a tertiary care teaching hospital of Eastern India. Matrix Sci Med 2023;7:71-5.

Received: 10-02-2023, **Revised:** 15-02-2023,
Accepted: 21-02-2023, **Published:** 25-08-2023

CT was useful to analyze the regional anatomy and extent of the lesion. MRI was helpful for defining the limited unusual lesions found in the critical areas. CT scan was performed in all patients, whereas MRI report was found in 16 cases out of 38 study patients. Patients with sinonasal tumors or those with no medical histories/imaging were excluded from this study. The intraorbital extension was described as a disease with an orbital rim defect or an invasion of the orbit by the mucocele [Figure 2]. The intracranial extension was described as a disease with skull bone erosion, defect, or a breakthrough of the bone at the skull base region. The risk factors, clinical presentations, consultation timings imaging data, management, and outcome were analyzed. An ophthalmologic evaluation was done preoperatively in all cases and postoperatively if the initial assessment was abnormal. The surgical procedure was an endoscopic endonasal marsupialization in all cases under general anesthesia. All the patients underwent standard treatment by surgical marsupialization, although endonasal sinus surgery, provided a conservative, minimally invasive approach and respect the sinus architecture and natural drainage. A nasal packing was put in the nasal cavity for 48 h. Antibiotic (amoxycillin clavulanate) continued for one after postoperatively. After nasal pack removal, nasal wash with a saline solution was done for 1 month. Patients were reviewed postoperatively [Figure 3] with the endoscopic examination at days 14, 1 month, and 2 months until mucosal healing. Statistical package for the Social Science (SPSS) Statistics for Windows, version 20, was used for all statistical analyses (IBM-SPSS Inc., Chicago, IL, USA).

Results

Over 5 years, we have listed 38 cases of nasosinus mucoceles. Out of 38 patients with nasosinus mucoceles, 20 were male and 18 were female and male with female ratio of 1.11:1. The age of the patients ranged from 16 to 78 years (mean 52.6). In this study, the youngest patient was with 16 years of age, and the oldest with 78 years. Out of 38 patients, 17 had risk factors such as 9 (23.68%) had a history of chronic sinusitis, 4 (10.52%) had a history of craniofacial trauma, 3 (7.89%) had undergone nasal surgery previously, and 1 (2.63%) had cystic fibrosis [Table 1]. The location of the mucoceles was frontoethmoidal sinus (44.73%), ethmoidal sinus (28.94%), frontal sinus (18.42%), and maxillary sinus (7.89%) [Table 2]. The average consultations time was 8.6 weeks and 19 (50%) patients consulted after 3 months [Table 3]. Out of 38 patients, 24 presented with periorbital swelling, nine presented with ptosis, three presented with the blurring of the vision, and one presented with diplopia [Table 4]. Among them, 5 (13.15%) patients presented with nasal obstruction, 4 (10.52%) presented with nasal discharge, 2 (5.23%) presented with epistaxis, and 4 (10.52%) patients presented with neurological symptoms such as headache [Table 4]. CT scan [Figure 3] was performed in all patients, whereas MRI report was found in 16 (42.10%) cases out of 38 study patients. All of them underwent surgical intervention. Endoscopic sinus surgery with marsupialization was performed on 34 (89.47%) cases. Two (5.26%) patients underwent an external surgical procedure. Two (5.26%) patients were treated by a combination of both endoscopic and external approaches. All study patients with ophthalmologic

Figure 1: (a and b) A 18-year-old boy presented with left side frontoethmoidal mucocele: (a) Preoperative picture; (b) postoperative picture

Figure 2: (a and b): A 55-year-old man presenting with left frontoethmoidal mucocele: (a) Preoperative picture; (b) postoperative picture

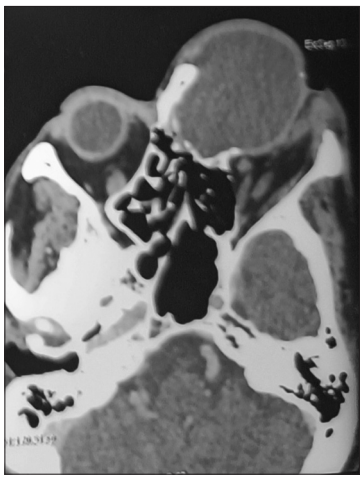

Figure 3: CT scan of the paranasal sinus showing left side frontoethmoidal mucocele with proptosis of the left eye. CT: Computed tomography

Table 1: Demographic details of the study patients (*n*=38)

	Number of patients, *n* (%)
Age of the patients (years)	
10-30	9 (23.68)
31-50	16 (42.10)
51-70	10 (26.31)
71-90	3 (7.89)
Sex	
Male	20 (52.63)
Female	18 (47.36)
Risk factors	
Chronic sinusitis	9 (23.68)
Craniofacial trauma	4 (10.52)
Previous nasal surgery	3 (7.89)
Cystic fibrosis	1 (2.63)

Table 2: Topography of the nasosinus mucoceles

Sites of involvement	*n* (%)
Frontoethmoidal sinus	17 (44.73)
Ethmoidal sinus	11 (28.94)
Frontal sinus	7 (18.42)
Maxillary sinus	3 (7.89)

Table 3: Time of consultations (*n*=38)

Consultation time (months)	Number of patients, *n* (%)
<1	5 (13.15)
1-3	14 (36.84)
>3	19 (50)

Table 4: Clinical presentations of the nasosinus mucoceles

Clinical presentations	Number of patients (*n*=38), *n* (%)
Ophthalmological symptoms	
Periorbital swelling	24 (63.15)
Ptosis	9 (23.68)
Blurring of vision	3 (7.89)
Exophthalmos	21 (55.26)
Orbital pain	3 (7.89)
Diplopia	1 (2.63)
Rhinological symptoms	
Nasal obstruction	5 (13.15)
Rhinorrhea	4 (10.52)
Epistaxis	2 (5.23)
Neurological symptoms	
Headache	4 (10.52)

complaints related to mucocele were free of trouble after the surgical procedure. No complications were identified in this study intraoperatively and postoperatively. There were 2 (5.26%) patients who showed recurrence of nasosinus mucoceles postoperatively and they underwent a second surgery. During the follow-up period of these cases during the past 2 years, no recurrences were observed.

Discussion

Sinonasal mucocele is an expansile, benign cystic lesion that contains mucus and is lined with epithelium.[7] The nasosinus mucocele was first described by Lengenbeck in the 19th century, although their history goes further back.[8] In the third century, BC Cannabis described a cranium with changes in the frontal sinus, indicating that the specimen probably had a mucocele.[9] The term mucocele was first used by Rollet in 1896.[8] Before the term mucocele, it was known as hydatid cysts, from the Greek hydatis "drop of water."[9] The nasosinus mucoceles are equally occur in males and females with the highest incidence during the third and fourth decades of life.[8] In this study, male-to-female ratio of 1.11:1, and the age of the patients in this study ranged from 16 to 78 years (mean 52.6). These lesions can be classified into two types such as primary and secondary. In the case of primary mucoceles, the inflammatory obstruction of the mucus drainage, mucus secretory duct blockage, cystic dilatation of the mucosal glands, and cystic degeneration of the sinonasal polyps are thought to be the possible causes.[10,11] In the case of secondary mucoceles, the intranasal injury, prior sinus surgery, or external injury is thought to contribute to their development.[10] It has been suggested that nasosinus mucoceles occur predominantly in children with cystic fibrosis.[12] Both primary and secondary nasosinus mucoceles are slowly progressive and may erode the surrounding bony structures.[13] The pressure exerted by the mucocele causes thinning of the bony walls of the paranasal sinus and finally expansion at the point of least resistance near vital structures, such as the orbit and cranial cavity. If the mucoceles are allowed to grow, it results in significant morbidity and potential mortality.[14]

Although mucoceles can develop in any paranasal sinus, however, frontal and ethmoid mucoceles are commonly affected due to their complex and variable drainage of the sinuses.[15] It is vital to identify the site, size, and invaded structures from the imaging preoperatively.[16] The location of the nasosinus mucoceles may result in different clinical manifestations and a tailored surgical plan may be required to obviate the need for more extensive surgery.[17] In this study, the most common sinuses affected by the mucoceles include frontoethmoidal sinus (44.73%), followed by ethmoidal sinus (28.94%), frontal sinus (18.42%), and maxillary sinus (7.89%).

As the sinonasal mucoceles enlarge, the orbital contents may become displaced, leading to visual disturbances, ptosis, and limitation of extraocular mobility.[18] In this study, orbital symptoms were periorbital swelling (63.15%), ptosis (23.68%), blurring of vision (7.89%), exophthalmos (55.26%), orbital pain (7.89%), and diplopia (2.63%). Sometimes, intracranial invasion by mucoceles leads to headaches, meningitis, or cerebrospinal fluid leakage.[11] In this study, 10.52% of the cases of nasosinus mucoceles were presented with headaches. The clinical manifestations of the sinonasal area depend based on the involvement of vital structures such as the orbit and brain.[19] There may be nasal symptoms associated with

nasosinus mucoceles. In this present study, nasal symptoms were nasal obstruction (13.15%), rhinorrhea (10.52%), and epistaxis (5.23%). Both intraorbital and intracranial expansion of the mucoceles can lead to symptoms that occurred from either direct extension to the orbit or optic nerve compression.[20] Direct orbital compression or inflammation of the mucoceles through orbital defect manifests orbital symptoms.[21]

The primary investigation of choice is a CT scan of the paranasal sinus.[22] MRI can provide a choice. Both CT scans and MRIs are considered diagnostic tools for nasosinus mucoceles. CT scan of the mucoceles appears as homogeneous isodense lesions that do not enhance with contrast if not infected.[23] CT scan leads to a diagnosis of the nasosinus mucocele, demonstrating a bony erosion of the paranasal sinus wall with smooth outward displacement.[24] MRI of the nasosinus mucoceles shows variable signal intensity in both T1- and T2-weighted images.[25] The signal intensity of T1- and T2-weighted images of MRI is based on the content and viscosity of the fluid in the mucocele or the degree of dehydration.[13] The benefit of CT in comparison to MRI is its ability to reveal bony details which are required before surgery.[13,26] In this study, a CT scan was performed in all patients, whereas MRI report was found in 16 cases out of 38 study patients.

Treatment of the mucoceles requires addressing the sinus obstruction. Surgery is the treatment of choice for nasosinus mucoceles.[27] The surgical approach should be used to restore a pat for drainage. The mainstay of the treatment of the paranasal sinus mucocele or pyomucocele is surgery, which ranges from endoscopic sinus surgery to craniotomy, and craniofacial exposure, with or without obliteration of the sinuses.[27] Previously, surgical treatment involved an external approach either through a Caldwell-Luc operation or Lynch–Howarth incision, paranasal sinus obliteration, and osteoplastic procedure.[13] The external approaches for nasosinus mucoceles are relatively associated with a high rate of morbidity and significant cosmetic deformity. Recently, endoscopic sinus surgery proved as a successful technique for nasosinus mucoceles. The use of the endoscopic approach has also been helpful for the treatment of different skull base lesions and sinonasal tumors.[28] The endoscopic approach for nasosinus mucoceles is also considered a successful technique for low morbidity and low recurrence rate.[29] One study showed a total of 24 mucoceles with 15 of them orbital showed involvement, all of them were treated by endoscopic approach successfully.[30] Wormald *et al*. treated 16 cases of nasosinus mucoceles by modified Lothrop procedure and osteoplastic flap obliteration of the frontal sinus.[31] Shah *et al*. documented five patients with nasosinus mucoceles with orbital extension managed endoscopically without the requirement of orbital reconstruction.[32] Microdebrider is used in endonasal surgery with great easiness and good results.[33,34] In this study, all cases of nasosinus mucoceles underwent surgical intervention. Endoscopic sinus surgery with marsupialization was performed on 34 (89.47%) cases, 2 (5.26%) patients underwent an external surgical procedure and 2 (5.26%) patients were treated by a combination of both endoscopic and external approaches.

Conclusion

The management of the nasosinus mucoceles with orbital or intracranial involvement needs coordination between otolaryngology, ophthalmology, and neurosurgery subspecialties. Ophthalmologic evaluation has to be systematically done preoperatively. Imaging plays an important role in diagnosis and even in the management of the nasosinus mucoceles. Imaging allows the surgeon to have a positive diagnosis and exactly show the extension of the lesion. Currently, endonasal endoscopic marsupialization is considered the accepted mode of treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initial s will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Bouatay R, Aouf L, Hmida B, El Korbi A, Kolsi N, Harrathi K, *et al.* The role of imaging in the management of sinonasal mucoceles. Pan Afr Med J 2019;34:3.
2. Miller C, Berens A, Patel SA, Humphreys IM, Moe KS. Transorbital approach for improved access in the management of paranasal sinus mucoceles. J Neurol Surg B Skull Base 2019;80:593-8.
3. Sreedharan S, Kamath MP, Hegde MC, Bhojwani K, Alva A, Waheeda C. Giant mucocoele of the maxillary antrum: A case report. Indian J Otolaryngol Head Neck Surg 2011;63:87-8.
4. Swain SK, Sahu MC. An unusual complication of nasal foreign body in a pediatric patient: A case report. Pediatr Pol 2017;92:111-3.
5. Aderdour L, Fakiri MM, Nouri H, Hassani R, Raji A. Sinus infections: Diagnostic and therapeutic aspects apropos of 16 cases J Morocco Medical Sciences 2010;17:16-20.
6. Jorissen MB, De Boeck K, Cuppens H. Genotype-phenotype correlations for the paranasal sinuses in cystic fibrosis. Am J Respir Crit Care Med 1999;159:1412-6.
7. Busaba NY, Salman SD. Ethmoid mucocele as a late complication of endoscopic ethmoidectomy. Otolaryngol Head Neck Surg 2003;128:517-22.
8. Voegels RL, Balbani AP, Santos Júnior RC, Butugan O. Frontoethmoidal mucocele with intracranial extension: A case report. Ear Nose Throat J 1998;77:117-20.
9. Jaswal A, Jana AK, Sikder B, Jana U, Nandi TK. Paranasal sinus mucoceles: A comprehensive retroprospective study in Indian perspective. Indian J Otolaryngol Head Neck Surg 2008;60:117-22.
10. Fu CH, Chang KP, Lee TJ. The difference in anatomical and invasive characteristics between primary and secondary paranasal sinus mucoceles. Otolaryngol Head Neck Surg 2007;136:621-5.
11. Swain SK, Lenka S, Das SR. Rhino-orbital mucormycosis – A dreaded clinical entity. Int J Curr Res Rev 2020;12:197-203.

12. Sciarretta V, Pasquini E, Farneti G, Ceroni AR. Endoscopic treatment of paranasal sinus mucoceles in children. Int J Pediatr Otorhinolaryngol 2004;68:955-60.
13. Lund VJ, Milroy CM. Fronto-ethmoidal mucocoeles: A histopathological analysis. J Laryngol Otol 1991;105:921-3.
14. Moriyama H, Hesaka H, Tachibana T, Honda Y. Mucoceles of ethmoid and sphenoid sinus with visual disturbance. Arch Otolaryngol Head Neck Surg 1992;118:142-6.
15. Swain SK, Dattatreya K. A giant nasal septal schwannoma – A case report. Int J Curr Res Rev 2021;13:70-2.
16. Swain SK, Sahu MC. An unusual giant isolated mucosal malignant melanoma of nasal cavity – A case report. Egypt J Ear Nose Throat Allied Sci 2017;18:151-3.
17. Ramalingam N, Ganesan S, Venkatesan SK, Saxena SK. Emergency management of an isolated sphenoidal mucopyocele with vision loss: A case report. Egypt J Otolaryngol 2019;35:122-5.
18. Swain SK, Das A, Samal R, Behera IC, Sahu MC. An unusually giant frontoethmoidal mucopyocele in a child – A case report. Pediatr Pol 2015;90:511-4.
19. Swain SK, Sahu MC, Banerjee A. Non-sinonasal isolated facio-orbital mucormycosis – A case report. J Mycol Med 2018;28:538-41.
20. Swain SK. Scuba diver presenting with a giant sphenoid sinus mucocele. J Marine Med Soc 2022;24:208-10.
21. Aydin E, Akkuzu G, Akkuzu B, Bilezikci B. Frontal mucocele with an accompanying orbital abscess mimicking a fronto-orbital mucocele: Case report. BMC Ear Nose Throat Disord 2006;6:6.
22. Arantes E, Sartoretto S, Corrêa R, Silva F, Caetano D, Louro R, *et al*. Management of mucopyocele as late complication a frontal sinus fracture. Int J Oral Maxillofac Surg 2019;48:203.
23. Swain SK. Middle turbinate concha bullosa and its relationship with chronic sinusitis: A review. Int J Otorhinolaryngol Head Neck Surg 2021;7:1062-7.
24. Swain SK, Behera IC, Sahu MC. Primary sinonasal tuberculosis: Our experiences in a tertiary care hospital of eastern India. Egypt J Ear Nose Throat Allied Sci 2017;18:237-40.
25. Swain SK. Sphenoid sinus mucocele: A review. Int J Otorhinolaryngol Head Neck Surg 2022;8:431-6.
26. Swain SK, Behera IC, Mohanty JN. Mucormycosis in head-and-neck region – Our experiences at a tertiary care teaching hospital of Eastern India. Ann Indian Acad Otorhinolaryngol Head Neck Surg 2019;3:58-62.
27. Swain SK, Sahu A. Rhinogenic contact point headache in pediatric age: Our experiences at a tertiary care teaching hospital of eastern India. Amrita J Med 2021;17:127-32.
28. Thaler ER, Kotapka M, Lanza DC, Kennedy DW. Endoscopically assisted anterior cranial skull base resection of sinonasal tumors. Am J Rhinol 1999;13:303-10.
29. Conboy PJ, Jones NS. The place of endoscopic sinus surgery in the treatment of paranasal sinus mucocoeles. Clin Otolaryngol Allied Sci 2003;28:207-10.
30. Khong JJ, Malhotra R, Wormald PJ, Selva D. Endoscopic sinus surgery for paranasal sinus mucocoele with orbital involvement. Eye (Lond) 2004;18:877-81.
31. Wormald PJ, Ananda A, Nair S. Modified endoscopic lothrop as a salvage for the failed osteoplastic flap with obliteration. Laryngoscope 2003;113:1988-92.
32. Shah A, Meyer DR, Parnes S. Management of frontoethmoidal mucoceles with orbital extension: Is primary orbital reconstruction necessary? Ophthalmic Plast Reconstr Surg 2007;23:267-71.
33. Li E, Howard MA, Vining EM, Becker RD, Silbert J, Lesser RL. Visual prognosis in compressive optic neuropathy secondary to sphenoid sinus mucocele: A systematic review. Orbit 2018;37:280-6.
34. Plantier DB, Neto DB, Pinna FR, Voegels RL. Mucocele: Clinical characteristics and outcomes in 46 operated patients. Int Arch Otorhinolaryngol 2019;23:88-91.