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Navigation Assisted Endoscopic Drainage of a Frontal Mucopyocele and Mucocele

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# Abstract

# Introduction

Epithelial lined sac which contains mucus and pus both is known as mucopyocele. Although mucocele of paranasal sinuses is rare but among all paranasal sinuses frontal sinus is most commonly involved. In post traumatic cases where endoscopic surgical landmark are distorted role of image based navigation play compelling role to surgeons.

**Material and methods:** We are here reporting 3 cases of frontal mucopyocele who were presented with complaints of progressive asymmetry of the eye balls, diplopia and decreased vision with variable duration.

**Results:** Although so many procedures described in the literature to deal with the frontal mucopyocele but we perform intranasal endoscopic approach with the help of Medtronic S7 Stealth Station navigation system as intraoperative aid to localise frontal out flow tract with no complication and minimal morbidity. Patients who presented with decreased vision, regained their normal vision in the first post operative week and there was marked improvement in diplopia in all gazes in subsequent weeks. We could appreciate significant

correction in the asymmetry of the eye balls with near normal horizontal level of both the eye balls.

**Conclusion:** There are diverse number of procedures to deal with the mucocele of the paranasal sinuses but intranasal endoscopic approach with the help of image based navigation system has decisive role with minimal and less complications.

**Keywords:** Frontal, mucopyocele, navigation, out flow tract, proptosis.

# Introduction

Epithelial lined sac which contains mucus and pus both is known as mucopyocele. Although mucocele of paranasal sinuses is rare but among all paranasal sinuses frontal sinus is most commonly involved sinus. Mucoceles are having inherent capacity of expansion and ability to erode underlying bone. Langenbeck first described the mucocele of paranasal sinuses under the name of hyatides and then name mucocele was given by Rollet[1]. Mucocoeles having multifactorial etiology, which involve inflammation, allergy, trauma, anatomic abnormality, previous surgery, fibrous dysplasia. osteoma, or ossifying fibroma. In posttraumatic cases the anatomy of sinuses is grossly disturbed and there may be difficulty to locate the endoscopic surgical landmark during endoscopic drainage of the mucocele. Here navigation plays a vital role in locating the surgical landmark. Mucocele of frontal sinus usually presents in superomedial quadrant of the orbit(90%) and forehead(10%) as a cystic and nontender swelling and displaces the eyeball forward, downward and laterally. Patient usually presents with headache, diplopia and proptosis. Imaging(MRI & CT)of the sinuses have important role in diagnosis along with history and physical examination.

### **Classification of frontal mucocele**

Type 1: Limited to the frontal sinus (with or without orbital involvement).

Type 2: Frontoethmoidal mucocele (with or without extension into the orbit). Type3: Erosion of the posterior wall which may be minimal or without intracranial extension (type 3a), or with greater intracranial extension (type 3b).

Type 4: Erosion of the anterior wall.

Type 5: Erosion of the anterior and posterior walls with minimum or no intracranial extension (type 5a), or with greater intracranial extension (type 5b).

Informed written consent of the patient had been taken for reporting and publication of all types of data related to all cases.

#### Case 1

A 35-year-old male presented to department of otorhinolaryngology with complaints of progressive asymmetry of the eye balls, diplopia and decreased vision for last four months. Patient had history of road traffic accident six months back after which he was asymptomatic for two months before he developed above symptoms. On clinical examination there was gross asymmetry of both eye balls, left eye ball being pushed inferiorly.(figure1) Patient was having diplopia in all gazes and was having 6/18 vision in left eye although fundus examination showed normal optic disc with preserved disc margins. Contrast enhanced CT scan of Para nasal sinuses showed a large expansile bony cavity involving left frontal sinus with its communication with left orbital compartment. There was evidence of hypodense content filling the cavity and also occupying the superior compartment of the left orbit resulting in gross inferior displacement of the eye ball (figure 2). There was 5 cm breech in the outer table of left frontal sinus resulted in common frontoorbital cavity. On axial section the soft tissue density also found to occupy part of posterior compartment of the left eye ball and causing compression on the left optic nerve. Left ethmoid and frontal recess anatomy found completely distorted due to the previous trauma. So, depending upon the clinical and radiological findings, final diagnosis of post traumatic left frontal mucopyocele was made. Then the patient was planned for transnasal endoscopic drainage of the mucopyocele. There was a real concern about the intraoperative localization of the frontal ostea due to completely distorted anatomy of the frontal recess. Considering the possible intraoperative difficulty, decision was made to do this surgery with intraoperative help of Navigation system. We used Medtronic S7 Stealth Station navigation system as intraoperative aid to localise frontal out flow tract. After informed written consent, Patient was prepared for general anaesthesia. Proper nasal decongestion was done with the 1:5000 adrenaline. Then using navigation system as a localising tool, frontal recess area was approached and cells were opened step by step which were obstructing the frontal outflow tract. Then after locating the final bony cavity, face of mucopyocele was opened and the content were suctioned out both from the frontal and orbital compartments. The opening of cavity was widened to prevent any future recurrence. Complete clearance of the cavity was confirmed by the excellent frontal glow (figure3). Patient was followed up every two weeks to check the progress in eye symptoms. Patient regained his normal vision in the first post operative week and there was marked improvement in diplopia in all gazes in subsequent weeks. We could appreciate significant correction in the asymmetry of the eye balls with near normal horizontal level of both the eye balls.(figure3) There was no intraoperative complication and patient was discharged one day after surgery.



Figure1: Pre operative picture showing inferiorly placed left eye ball (left side) and significant correction in the asymmetry of the eye balls with near normal horizontal level of both the eye balls on right side of the figure( post op.)



Figure 2: Contrast enhanced CT scan of Para nasal sinuses showing a large expansile bony cavity

involving left frontal sinus with its communication with left orbital compartment. Also hypodense content filling the cavity and also occupying the superior compartment of the left orbit resulting in gross inferior displacement of the eye ball.



Figure3: Frontal glow after complete clearance of mucocele.

Case2: A 54-year-old female presented to OPD of our hospital with chief complaints of diplopia along with intermittent right supraorbital swelling for last 1 year. There was no history of decreased vision, nasal discharge, nasal obstruction. On physical or examination, there was fluctuant swelling present in superomedial region above the right eye. Vision was normal in right eye with full extraocular movements in all directions. Pupillary reaction to light and accommodation were normal. Fundus examination was normal. On anterior rhinoscopy, nose was normal. On contrast-enhanced CT, there was large expansile cystic lesion present involving right frontal sinus containing hypodense contents. Left frontal sinus was normal. Diagnostic nasal endoscopy was unremarkable. The patient was planned for endoscopic drainage of the mucocele with the help of image guided navigation system. The mucocele sac was incised and the mucus was sucked out. The opening of cavity was widened to prevent any future recurrence. Complete clearance of the cavity was confirmed by the excellent frontal glow. The patient is on regular follow-up from last 4 months and is completely asymptomatic till date.

Case 3: A 45-year-old male presented to our department with complaints of diplopia and decreased vision for last 6 months. Patient had history of treatment of sinusitis from last 1 year back after which he was asymptomatic for four months before he developed above symptoms. On clinical examination there was gross asymmetry of both eye balls, right eye ball being pushed inferiorly. Patient was having diplopia in all gazes and vision 6/12. Contrast enhanced CT scan of Para nasal sinuses showed a large expansile bony cavity involving right frontal sinus with its communication with right orbital compartment. There was evidence of hypodense content filling the cavity and also occupying the superior compartment of the right orbit resulting in gross inferior displacement of the eye ball. There was 2.5 cm breech in the outer table of right frontal sinus resulted in common frontoorbital cavity. On axial section the soft tissue density also causing compression on the right optic nerve. So, depending upon the clinical and radiological findings, final diagnosis of right frontal mucocele was made. Then the patient was planned for transnasal endoscopic drainage of the mucocele with the help of navigation under general anaesthesia. Then after locating the final bony cavity, mucocele was opened and the content were suctioned out both from the frontal and orbital compartments. Complete clearance of the cavity was confirmed by the excellent frontal glow. Patient was followed up every two weeks to check the progress in eye symptoms. Patient regained his normal vision in the first post operative week and there was marked

improvement in diplopia in all gazes in subsequent weeks. We could appreciate significant correction in the asymmetry of the eye balls. There was no intraoperative complication and patient was discharged one day after surgery.

#### Discussion

Mucopyocele of paranasal sinuses after trauma is rare but if it occurs then is difficult to manage because surgical landmarks are often found distorted by the trauma. So, in such situation where surgical anatomy is distorted, to make the functional endoscopic sinus surgery safer, surgeons are now using image guided navigation systems that register a patient to his/her CT scan and track the position of tools intraoperatively in real time. However current navigation system suffer from greater than 1mm tracking error, still the role of navigation is decisive in such situation. Regarding etiology of mucocele there is some discrepancy[2,3]. Some authors suggested that pathophysiology behind this is blockage of the sinus ostium where as others advocated that mucocele formation occurs due to the obstruction of minor salivary gland which are located within the lining of the paranasal sinuses[3]. There are so many drives for blockage of the ostia of paranasal sinuses including inflammatory mucosal thickening, nasal polyps, scarring from previous surgery, trauma, cystic fibrosis, neoplasm such as nasopharyngeal angiofibroma and osteoma.Lund in 1987 showed that among all mucocele approximately 71% were having definitive predisposing factors whereas one third of the cases did not have clear etiology[4]. Chief complaints of mucopyocele are frontal headache, facial asymmetry, diplopia, proptosis and may be reduced ocular movements. Radiological imaging for diagnosis are computed tomography(CT) and magnetic resonance

imaging(MRI). CT of sinuses having mucopyocele shows homogenous isodense mass, margins are clearly defined and osteolysis around the mass[5,1]. Erosion of the bone can also be seen. In MRI T1W images show mucocele brighter than brain and T2W images are isohyperintense. Surgical drainage is mainstay of treatment, and the surgical approach depends upon the size, location, and extent of the mucocele. Aim of surgery is to drain the mucocele and to restore the ventilation of sinus with eradication of the pathology with minimal morbidity and deterrence of recurrence[6]. In mucopyocele antibiotics should be considered after drainage. External approach includes Lynch Howarth frontoethmoidectomy and Osteoplastic flaps with sinus cavity obliteration. Main goals of endoscopic drainage are to maintain the patency of frontal recess and preserve the mucosa of sinus [6]. Previously external approach was considered as ideal treatment modality for mucoceles, but endoscopic nasal procedures have proven to be very safe, effective and successful in the drainage of the mucocele with low rates of morbidity, recurrence, and complications in most cases [7]. After evolution of image guided navigation system, endoscopic procedures have becomes safest and effective treatment modality. A approach (craniofacial resection combined and endoscopic) is used whenever there is intracranial extension present [8].

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