CASE REPORT

TYPE 3 FRONTAL CELL, AN ANATOMICAL VARIATION & ITS CORRELATION WITH FRONTAL SINUSITIS: A CASE REPORT
Prabhjot Kaur Chhabra¹, Sudha Shrivastava², Annapurna Bose³, Baljeet Singh Khanduja⁴

HOW TO CITE THIS ARTICLE:

ABSTRACT: Frontal cells are anterior ethmoidal cells that pneumatise frontal sinus outflow tract, obstructing the naso-frontal pathway. Type 3 frontal cell is a single cell that extends well into the frontal sinus upto 50 % of the sinus height in coronal CT Scan. While doing Functional Endoscopic Sinus Surgery (FESS) for frontal sinusitis, it gives false impression that one has reached the frontal sinus. In reality the surgeon may be in frontal cell, the cell mimics frontal sinus itself. A frequent cause of unsuccessful surgery for frontal sinusitis is failure to identify and remove cells that block frontal sinus outflow tract. Type 3 Frontal Cell is one such variant reported either singly or in combination with other frontal cells reported in several cases of chronic frontal sinusitis yet difficult to be identified. Thorough study of CT Scan PNS is must before doing any surgery for frontal sinus disease.

KEYWORDS: Frontal recess, Frontal sinusitis, Type 3 frontal cell, FESS.

INTRODUCTION: Frontal sinusitis is a common clinical condition occurring due to inflammation of mucoperiosteam lining the frontal sinus. The condition presents with nasal obstruction, anterior and posterior nasal discharge and vacuum headache in frontal region. Prolonged obstruction to the natural ostium of frontal sinus causes inadequate ventilation and drainage of frontal sinus outflow tract which leads to chronic sinusitis. One should have clear understanding of anatomy of frontal sinus outflow tract while doing functional endoscopic sinus surgery for chronic frontal sinusitis to operate without complications. The widespread adoption of Functional Endoscopic Sinus Surgery (FESS) has improved the understanding of the anatomy of the nose and the paranasal sinuses. However, the area which still causes confusion to surgeons is frontal recess.¹

Frontal sinus outflow tract has an hour glass shape consisting of (a) frontal sinus proper (b) frontal ostea and (c) frontal recess. Successful surgery for frontal sinusitis depends critically on knowledge of detailed anatomy of frontal recess. Surgery in this area is challenging due to its narrow confines and variable anatomy.

Frontal recess is like an inverted funnel which connects frontal ostea to the frontal sinus. Anatomically, frontal recess is bounded medially by the middle turbinate and laterally by the lamina papyracea.² The posterior wall of the frontal recess is the bulla lamella. The anterior wall is formed by the frontal process of maxilla and the frontal bone, which thickens anterosuperiorly to form the frontal beak. In the posteromedial and superior region of the frontal recess lies the lateral wall of olfactory fossa, which is the thinnest part of the anterior skull base.¹

Frontal recess can be narrowed by various anatomical variants like (a) Agger nasi cell (b) Uncinate process (c) Ethmoidal Bulla (d) Fronto-ethmoidal Cell.³
CASE REPORT

There are 4 anatomical variants of Frontal (fronto- ethmoidal) cells as described by F. Kuhn:

**Type 1 Frontal cell**: Single cell in frontal recess above an agger nasi.

**Type 2 Frontal cell**: Multiple cells in frontal recess above an agger nasi cell.

**Type 3 Frontal cell**: Single cell in the frontal recess with pneumatisation in the frontal sinus. Extends well into the frontal sinus but no more 50% of the sinus height (coronal CT scan), superior part inserts on the anterior wall of frontal sinus; posterior wall is not the skull base but part of frontal recess.

**Type 4 Frontal cell**: Rare, isolated cell in the frontal sinus. Extends far into the frontal sinus by more than 50 % of the sinus height (coronal CT scan).

Out of these variants, identification of Type 3 & Type 4 Frontal cells becomes technically demanding while doing Functional Endoscopic Sinus Surgery (FESS), if the surgeon is not well versed with the anatomy of frontal recess. This requires thorough study of CT Scan Paranasal Sinus in coronal & sagittal sections pre-operatively. Frontal cells have been reported to occur in 20 - 41% of paranasal sinuses.

---

**Case report**: A 35 year old male patient presented with complaints of headache in frontal region, nasal congestion and postnasal discharge since four months and fever for 5 days. CT Scan PNS (coronal and sagittal) was done which was suggestive of left frontoethmoidal sinusitis with Type 3 frontal cell on left side (Fig 1 &2). Symptomatic treatment and aggressive course of antibiotics was given for two weeks, but there was no significant symptomatic relief.

Repeat CT Scan PNS was done which showed exaggerated fluid levels in frontal sinus as compared to the previous CT scans (Fig 3 & 4). Functional endoscopic sinus surgery (FESS) was done. Type 3 frontal cell was found obstructing frontal recess and blocking drainage of pus from frontal sinus intraoperatively.

Frontal cell was removed, frontal recess opened wide and mucopurulent pus completely evacuated out from frontal sinus. Patient had significant symptomatic relief postoperatively after FESS. Nasal endoscopy was done 6 weeks after surgery; it showed widely opened frontal recess with healthy mucosa and no evidence of any disease in frontal sinus.
Fig. 1 and 2: (initial CT Scan PNS – coronal and sagittal) showing Type 3 frontal cell and air fluid levels.

Fig. 3 and 4: (CT PNS - coronal & sagittal) of the same patient after 3 weeks of medical treatment preoperative, showing exaggerated fluid level in left frontal sinus & Type 3 frontal cell obstructing frontal sinus outflow tract.

Endoscopic view (left) frontal recess region of the same patient (post op after 6 weeks)
DISCUSSION: The drainage pathway of frontal sinus is influenced by presence of various types of frontal (Kuhn) cells. Presence of ethmoidal cells in frontal sinus can be explained by studying the embryological development of frontal sinus. Frontal sinuses are rudimentary or absent at birth.\(^5\)

During the age of 2 to 6 years anterior ethmoidal cells migrate to frontal bone and become frontal (fronto-ethmoidal) cells. Different pneumatisation patterns of frontal recess area are formed due to variant migration of ethmoidal cells. Type 3 frontal cell is one such variant which mimics frontal sinus itself while doing endoscopic surgery for frontal sinus disease. In our case despite of aggressive antibiotic treatment, patient showed no improvement symptomatically and radiologically.

This can be attributed to Type 3 frontal cell, causing narrowing of left frontal recess. Hence, a clinician should have precise knowledge of these pneumatisation patterns of frontal bone to identify these cells in CT scan as well as intraoperatively while doing FESS. If unnoticed on CT scan preoperatively can lead to incomplete clearance of sinus disease thereby leading to recurrent frontal sinus disease.

REFERENCES:
## CASE REPORT

### AUTHORS:
1. Prabhjot Kaur Chhabra
2. Sudha Shrivastava
3. Annapurna Bose
4. Baljeet Singh Khanduja

### PARTICULARS OF CONTRIBUTORS:
1. 2nd Year Post Graduate Student, Department of Anatomy, MGM Medical College, Indore.
2. Professor and HOD, Department of Anatomy, MGM Medical College, Indore.
3. Professor, Department of Anatomy, MGM Medical College, Indore.
4. Consultant ENT Surgeon, Bombay Hospital, Indore.

### NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Prabhjot Kaur Chhabra, Flat No. 302, Land Mark Pride, EG-13, Scheme No. 54, Vijay Nagar, Indore, Madhya Pradesh. Email: pkkjaipur@gmail.com

Date of Submission: 07/06/2014.
Date of Peer Review: 08/06/2014.
Date of Acceptance: 26/06/2014.
Date of Publishing: 03/07/2014.