Supra Maxillary Cell (SMC): An Anatomical variant of Ethmoid Sinus

Nagalingeswaran Ahilasamy, Veerasigamani Narendrakumar & Dinesh Kumar Rajendran

Indian Journal of Otolaryngology and Head & Neck Surgery

ISSN 2231-3796

Indian J Otolaryngol Head Neck Surg
DOI 10.1007/s12070-020-01947-1

Springer

Indian J Otolaryngol Head Neck Surg
https://doi.org/10.1007/s12070-020-01947-1

CLINICAL REPORT

Supra Maxillary Cell (SMC): An Anatomical variant of Ethmoid Sinus

Nagalingeswaran Ahilasamy[1] · Veerasigamani Narendrakumar[2] · Dinesh Kumar Rajendran[3]

Received: 31 March 2020 / Accepted: 30 June 2020

Abstract 65 year old female presented with complaints of Right sided nasal obstruction of 1 year duration, intermittent nasal discharge for the past 6 months, without much significant improvement in medical management. Computerized tomography of paranasal sinuses revealed presence of supra maxillary cell (SMC) which was infected, along with sphenoid sinus (Heterodense lesion—suggestive of probable Fungal sinusitis). Patient underwent Functional Endoscopic Sinus Surgery with Septoplasty under local anesthesia. Among the paranasal sinuses, the ethmoid sinus has the largest number of anatomical variations. Important structures near the ethmoid sinus are usually in danger during the endoscopic sinus surgery due to its extreme anatomical variations. Posterior ethmoid cells can also expand towards and into the Maxillary sinus, which drains into the superior nasal meatus, referred to as the Ethmo maxillary sinus. This clinical report highlights about similar anatomical variation in the paranasal sinuses. We report a case of similar type of cell, only difference is it drains into middle meatus, situated mostly over the maxillary sinus alone along its entire width and the senior author has coined a term for it as supra maxillary cell (SMC).

✉ Nagalingeswaran Ahilasamy
nahilasamy@yahoo.com

Veerasigamani Narendrakumar
drnarenent@gmail.com

Dinesh Kumar Rajendran
dinuraj1186@gmail.com

[1] Ahilasamy ENT Centre, Chennai, Tamil Nadu 600 042, India

[2] Pragathi ENT Clinic, Chrompet, Chennai 600044, India

[3] Department of ENT and Head-Neck Surgery, Rajarajeshwari Medical College and Hospital, Bengaluru 560074, Karnataka, India

Keywords Posterior ethmoids · Supra maxillary cell · FESS

Introduction

Among the paranasal sinuses, the ethmoid sinus has the largest number of anatomical variations. Important structures near the ethmoid sinus are usually in danger during endoscopic sinus surgery due to its extreme anatomical variations. Posterior ethmoid cells (PE) can also expand towards the Maxillary sinus (MS) and can even enter into the Maxillary Sinus, which drains into the superior nasal meatus (SNM) which is referred to as the Ethmo maxillary sinus (EMS). The diagnosis of Ethmo maxillary sinus (EMS) is made when there is a posterior ethmoidal cell occupying the superior part of the maxillary sinus while draining into the superior meatus, which is located between the posterior part of the maxillary sinus and the orbital floor [1]. Incidence of Ethmo maxillary sinus (EMS) is variable in many studies as (7.1%) [1], (0.7%) [2] and (1.93%) [3] amongst patients. We report a case of similar type of cell, the only difference is it drains into middle meatus, which is situated mostly over the maxillary sinus alone along its entire width and the senior author has coined a term for it as Supra Maxillary Cell (SMC).

Case Report

65 year old female presented with complaints of Right sided nasal obstruction of 1 year duration, intermittent nasal discharge for the past 6 months. On examination, Diagnostic Nasal Endoscopy (DNE) was suggestive of

Published online: 07 July 2020

right side middle turbinate hypertrophy with purulent discharge from middle meatus with deviated nasal septum to left. After medical treatment, computerized tomography of paranasal sinuses was done, which confirmed the DNE findings along with presence of Supra Maxillary Cell (SMC) which was infected,along with sphenoid sinus (Hetero dense lesion—probably suggestive of Fungal sinusitis) (Figs. 1, 2). Functional Endoscopic Sinus Surgery with Septoplasty under local anesthesia was planned. Surgical steps include right side Conchaplasty, wide right sided middle meatal antrostomy followed by opening of the right supra maxillary cell, right sphenoidotomy and septoplasty. Intraoperative findings were suggestive of fungal material which were present in the Supra Maxillary Cell (SMC) (Fig. 3). Fungal material was removed in toto (Figs. 4, 5) and sent for fungal smear and culture which later revealed aspergillus growth. No postoperative nasal packing done. Patient was discharged after 6 hours from the hospital. Post operative period was uneventful.

Discussion

At different stages of the ethmoid labyrinth development, there are two main groups of normal variants: the intramural and extramural ethmoid cells. Extramural ethmoid cells are structures that pneumatize and develop protruding externally to the ethmoid labyrinth. This group is comprised of agger nasi cells, frontal cells, supraorbital ethmoid cells, Haller cell and Onodi cells. Intramural ethmoid cells are structures that pneumatize and remain intimately related to the ethmoid labyrinth, characterized by the frontal bulla cells, supra bullar cells and ethmoid bulla [4].

There are many variants from the anterior ethmoid sinuses. The most common ethmoid sinus variant is the Haller cell. The second variant is enlargement of agger nasi cells which arise from the agger mound in the region of the anterior ethmoid cells. The posterior ethmoid air cells can also extend laterally into the maxilla. This result in a variant called the ethmo maxillary sinus (EMS). An ethmo maxillary sinus (EMS) can sometimes be confused with a septated maxillary sinus. However, the ethmo maxillary sinus drains directly into the superior meatus, unlike the septated maxillary sinus, which drains into the ethmoid infundibulum [5] and supra maxillary cell (SMC) also drains into middle meatus. Other type of cells are Supraorbital cell, Retromaxillary cell, Onodi cell.

Computed tomography (CT) is considered the method of choice in the evaluation of uncomplicated paranasal sinuses inflammatory processes. Additionally, CT is extremely useful in the preoperative planning in cases of endonasal interventions for providing important details on the normal anatomy and its variants [4].

The ethmo maxillary sinus (EMS) and supra maxillary cell (SMC) are an anatomical variation formed by excessive pneumatization and extension of the posterior ethmoid

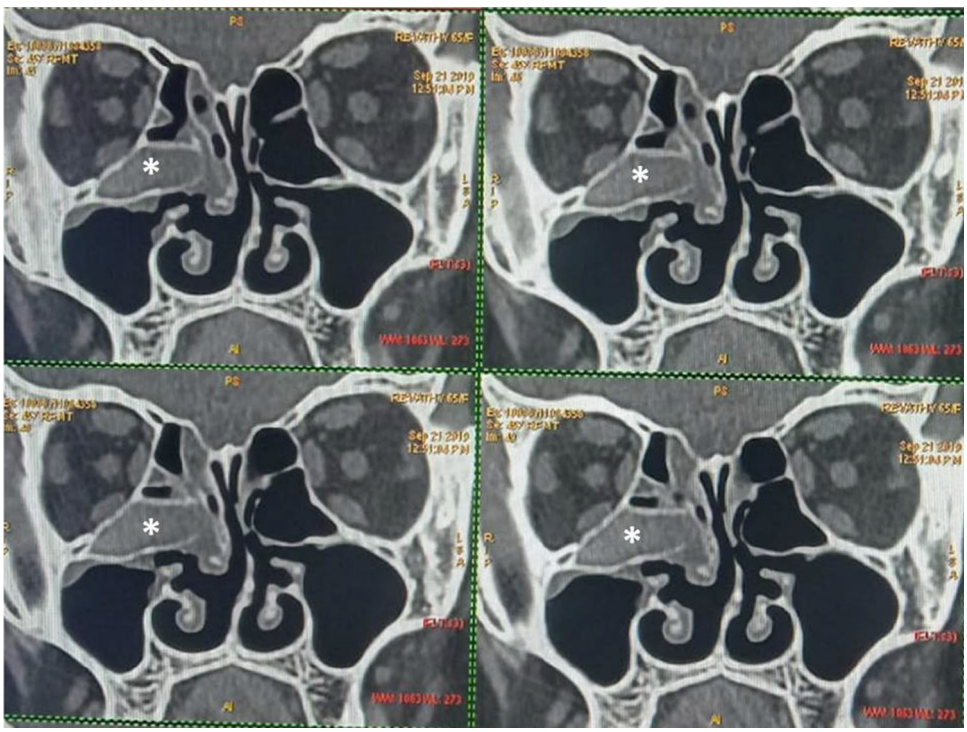

Fig. 1 CT Scan,
*Right supramaxillary cell

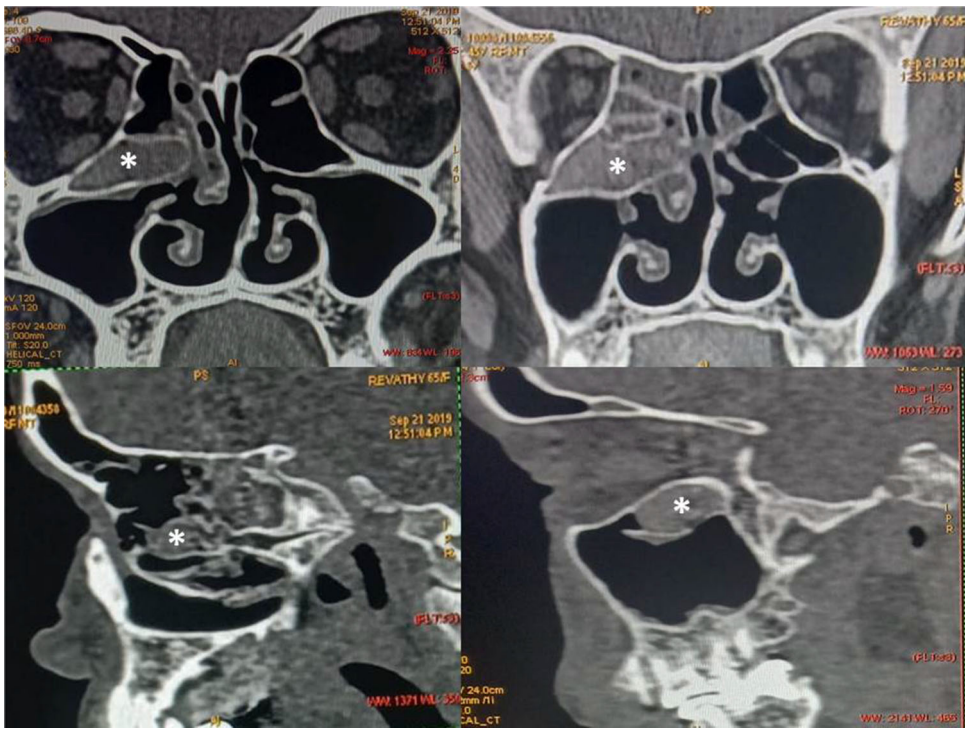

Fig. 2 CT Scan, *Right supra maxillary cell

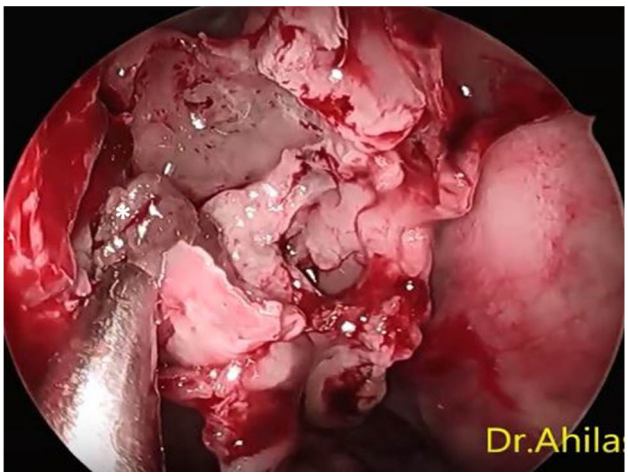

Fig. 3 *Fungus in Right supramaxillary cell

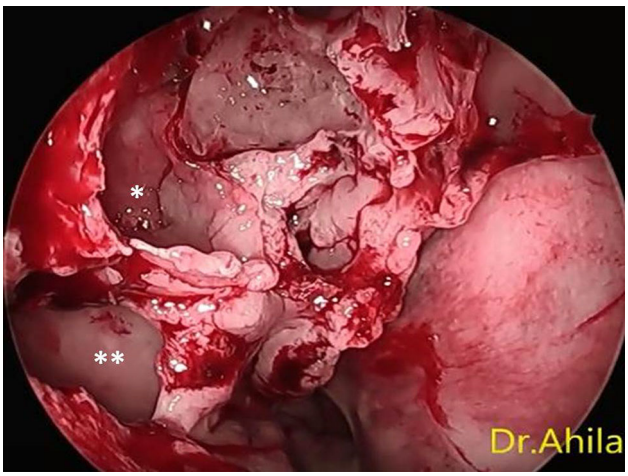

Fig. 4 *Supramaxillary cell after removal of fungus, **maxillary sinus

cells into the maxillary sinus. These can be septated and accompanied by other anatomical variations. The surgeon must be aware of possible maxillary sinus hypoplasia in patients with ethmo maxillary sinus (EMS) and supra maxillary cell (SMC).

Haller cells were first described by Albert Von Haller in 1743, also called infraorbital ethmoid cells and it is pneumatized ethmoid air cells.They project along the medial roof of the maxillary sinus and the most inferior portion of the lamina papyracea, below the ethmoid bulla, and lie lateral and posterior to the uncinate process. These cells contribute to the narrowing of the infundibulum and may compromise the ostium of the maxillary sinus, thus contributing to recurrent maxillary sinusitis [4, 6–8]. Haller cell is another anatomic variation that can be confused with supra maxillary cell (SMC). Haller cell is located more anterior to the supra maxillary cell and medially in the infraorbital wall [2].

An important variation that may accompany ethmo maxillary sinus is maxillary sinus hypoplasia characterized by decreased maxillary sinus volume. Khanobthamchai et al. [9] reported this co-existence as 14.1%, while Sirikci et al. [2] reported it as 20%, Ozcan et al. [3] as 22.2%.

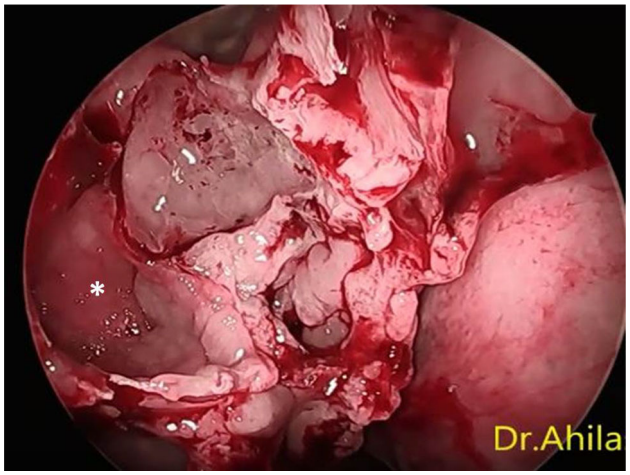

Fig. 5 *Close up view of Right supramaxillary cell

There was a well-demarcated and almost flat septum between the supra maxillary cell/ethmo maxillary sinus and maxillary sinus. It is crucial to understand the supra maxillary cell in order to differentiate it from the other anatomic variations of the paranasal sinuses such as maxillary sinus hypoplasia or septate maxillary sinus. A diminished maxillary sinus volume due to the supra maxillary cell may be interpreted as hypoplastic maxillary sinus by mistake, however, the hypoplasia of the maxillary sinus usually coexists with the anomalies of the uncinate process. When there is a bony or fibrous septum that divides the maxillary sinus into compartments, this condition may be misdiagnosed as supra maxillary cell/ethmo maxillary sinus [2].

The supra maxillary cell/ethmo maxillary sinus usually is surrounded by five walls.

The supra maxillary cell/ethmo maxillary sinus usually is surrounded by five walls.

1. The superior wall of Supra Maxillary Cell is the posterior part of the inferior orbital wall, which continues with the superior wall of the Maxillary Sinus.
2. The anterior–inferior wall is the ethmomaxillary plate (EMP), which is the bony septum between the supra maxillary cell and maxillary sinus.
3. The posterior wall of supra maxillary cell is the inward posterior wall of the maxillary sinus, which are occupied by the ethmo maxillary sinus.
4. The lateral wall of our cell supra maxillary cell is a blind end, which is the inward posterolateral wall of the maxillary sinus, whose size depends on the depth of supra maxillary cell/ethmo maxillary sinus pneumatization.
5. The medial wall of Supra Maxillary Cell is the aperture/opening which connect with Middle meatus.

Sinusitis of the ethmo maxillary sinus is also reported. Supra maxillary cell/ethmo maxillary sinus and retromaxillary cell, is an area that has received poor attention in the rhinology literature as compared with other anatomic variations. These cells are partly located in relation to the orbit floor, these should be differentiated from Haller cells given the different anatomic location that makes each of them of particular importance during Endoscopic Sinus Surgery [10].

Supra maxillary cell differ from Ethmo maxillary sinus by:

1. Drainage channels appear in the coronal plane of the CT scan; most Ethmo maxillary sinus has clear drainage channels into Superior Meatus but supra maxillary cell drains into Middle Meatus.
2. Relation with the Maxillary Sinus; Supra maxillary cell enters the maxillary sinus through the maxillary hiatus, rather than spreading from outside of the maxillary sinus.

The recognition of different anatomical variants is of utmost importance for the rhinologist. Because of their proximity with the main drainage pathways of the paranasal sinuses, some cells may reduce the mucociliary clearance thus predisposing to inflammatory processes and leading to revision endonasal endoscopic surgery. Anatomical variants arising from ethmoidal cells development process are most common, frequently associated with inflammatory processes, which may not be properly understood by primary surgeon and this finding can be missed out which may lead to revision endonasal endoscopic surgery [4].

Conclusion

A thorough knowledge of paranasal sinus anatomy and associated anatomical variations of ethmoid sinus is necessary to avoid incomplete dissection and complications when operating on the paranasal sinuses via the endoscopic approach. It should be really a stressful condition during endonasal endoscopic surgery if the surgeon is unaware of the presence of Supra maxillary Cell (SMC). It may even lead to loss of anatomic orientation to the operating surgeon unless it is recognized preoperatively by CT scan. Indeed, owing to our limited surgical experiences with Supra maxillary Cell, we do not know whether surgical opening of the Supra maxillary Cell would affect the surgical outcome, or what would happen if it were left unopened. Here an ethmoid sinus anatomical variation is presented which the senior author has named it as Supra maxillary Cell.

Funding None.

Compliance with Ethical Standards

Conflict of interests All authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from individual participant included in the study.

References

1. Liu J, Dai J, Wen X, Wang Y, Zhang Y, Wang N (2018) Imaging and anatomical features of ethmomaxillary sinus and its differentiation from surrounding air cells. Surg Radiol Anat 40(2):207–215
2. Sirikçi A, Bayazit YA, Bayram M, Kanlikama M (2004) Ethmomaxillary sinus: a particular anatomic variation of the paranasal sinuses. Eur Radiol 14(2):281–285
3. Ozcan KM, Selcuk A, Oruk V, Sarikaya Y, Dere H (2008) Ethmomaxillary sinus. Eur Arch Otorhinolaryngol 265(2):185–188
4. Gonçalves FG, Jovem CL, Moura LO (2011) Computed tomography of intra and extramural ethmoid cells: iconographic essay. Radiol Bras 44(5):321–326
5. Sarna A, Hayman LA, Laine FJ, Taber KH. Coronal imaging of the osteomeatal unit: anatomy of 24 variants. J Comput Assist Tomogr 26(1):153–157
6. Reddy UD, Dev B (2012) Pictorial essay: anatomical variations of paranasal sinuses on multidetector computed tomography—How does it help FESS surgeons? Indian J Radiol Imaging 22(4):317–324
7. Gore MR (2019) The supraseptal ethmoid sinus cell: a previously unreported ethmoid sinus variant. Clin Case Rep 7:1306–1308.
8. Narendrakumar V, Subramanian V (2016) Anatomical variations in ostiomeatal complex among patient undergoing functional endoscopic sinus surgery. Clin Rhinol Int J 9(1):28–32
9. Khanobthamchai K, Shankar L, Hawke M, Bingham B (1991) Ethmomaxillary sinus and hypoplasia of maxillary sinus. J Otolaryngol 20:425–427
10. Herzallah IR, Saati FA, Marglani OA, Simsim RF (2016) Retromaxillary pneumatization of posterior ethmoid air cells: novel description and surgical implications. Otolaryngol Head Neck Surg 155(2):340–346