



Relationship of Agger Nasi Cell and Uncinate Process Attachment: A Retrospective Study of Radiological Imaging in Indian Population

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Abstract

Frontal sinus drainage pathway (FSDP) is a difficult area to access in endoscopic surgery of paranasal sinus region. Anatomy of this region is influenced by presence of Agger nasi cells (AN) and type of Uncinate process (UP) attachment superiorly. This retrospective descriptive study attempted to measure frequency these two important anatomical features in Indian population.

Aim: the aim of this study was to measure the frequency of agger nasi cell and evaluate their relationship with superior attachment of uncinat process

Materials and Methods: Retrospective analysis of the Non contrast computed tomograms of nose and paranasal sinus region (NCCT PNS) involving 280 sides were performed. These scans were evaluated for presence of agger nasi cells and superior attachment of uncinat process.

Results: Agger nasi cells was present in 236 of 280 sides. Uncinate process can be delineated in 272 out of 280 sides; 112 reached Lamina Papyracea (LP), 57 reached Middle Turbinate (MT) and 67 reached Skull Base (SB). Agger nasi cells were present in 88.88% sides at lamina papyracea attachment, 80.28% sides at middle turbinate attachment and 89.33% sides at skull base attachment. Statistical analysis of data provided a chi-square value of 0.2556 and P-value of 0.880. Study results indicated that relationship between the presence of agger nasi and superior attachment of uncinat process is not significant statistically at P value of < 0.05.

Conclusion: The agger nasi cell was present 84.28% scans and superior attachment of uncinat process can be traced in 97.14% of scans. However relationship was not significant between presence of agger nasi cell and superior attachment of uncinat process.

Keywords: Agger nasi cell, Uncinate process, Frontal sinus drainage pathway, Lamina papyracea, Middle turbinate, Skull base.

Introduction

Frontal sinus drainage pathway (FSDP) is one of the most challenging areas to address during endoscopic sinus surgery. Angulations of this region and presence of frontal beak makes it difficult to visualise during diagnostic nasal endoscopy as a routine pre operative procedure and surgeons always require help of radiological imaging to understand anatomical details. Anatomy of FSDP is affected by presence of agger nasi cell (AN) & type of superior attachment of uncinate process (UP), which decides location of frontal drainage in nasal cavity. This region has a compact anatomy with close relation to vital structures in surrounding area like skull base, orbit and anterior ethmoid artery. Pneumatisation of lacrimal bone and frontonasal process of maxilla in form of agger nasi cells may influences the superior attachment of uncinate process and also may lead to chronic rhinosinusitis involving frontal sinus^[1,2]. This study was aimed to evaluate the relationship between presence of agger nasi cell and type of uncinate process attachment.

Materials and Methods

This retrospective, descriptive study was carried out between September 2016 and August 2017 in a tertiary care hospital. NCCT PNS of 140 consecutive patients were analysed for presence of

AN cell and superior attachment of UP [Three types were described by Stammberger et al – Lamina papyracea (LP), Middle turbinate (MT) and Skull base (SB)]. Computed tomogram (CT) scans were performed for patients of chronic rhinosinusitis resistant to medical management and candidate for functional endoscopic sinus surgery. CT scans in cases of trauma, sinonasal tumors, fungal sinusitis, nasal polyposis and previous surgery in sinonasal region were excluded from study as these conditions can alter normal anatomy. Each side of the individual scan was separately evaluated. NCCT was performed on a 16 slice multi detector CT machine (MDCT) (GE bright speed) with 3 mm axial sections. This volumetric data was used to reconstruct coronal sections and sagittal sections. All CT scans were evaluated on CT workstation with help of AW Volume Share 5 software. All scans were checked for presence of agger nasi cell and superior attachment of uncinate process on bone algorithm with magnification.

Record keeping, data compilation and statistical analysis was performed on Microsoft excel worksheet.

Results

Study group consist of total 140 individuals, 85 were males and 55 females. Complete demographic profile of study group is presented in Table1.

Table-1: Demographic profile of study group

Sex	Number/Total	Mean Age (Year)	Standard Deviation	Standard Variance	Standard Error of The Mean
Male	85/140	33.45	12.99	168.91	1.40
Female	55/140	37.36	10.35	107.19	1.39

Table-2: Frequency of agger nasi cell and uncinate process (superior attachment)

Type of superior attachment	Number of uncinate process superior attachment (272 sides)	Number of Agger nasi cells (236 sides)
Lamina Papyracea	126 (46.32%)	112 (88.88%)
Middle Turbinate	71 (26.10%)	57 (80.28%)
Skull Base	75 (27.57%)	67 (89.33%)

Figure-1: Bilateral agger nasi cell (white star mark inside)



Figure-2: Superior attachment of uncinete process reaching lamina papyracea (white arrow) with agger nasi cell (white star mark) situated below bilaterally.

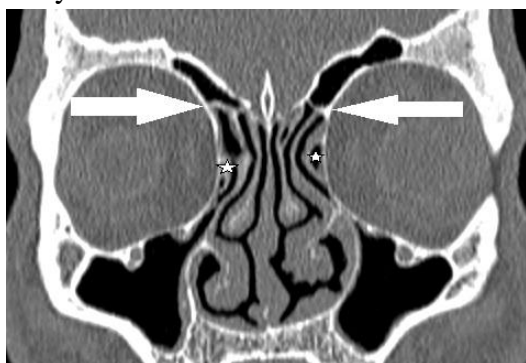


Figure-3: Superior attachment of uncinete process reaching middle turbinate on left side (inside white circle mark)

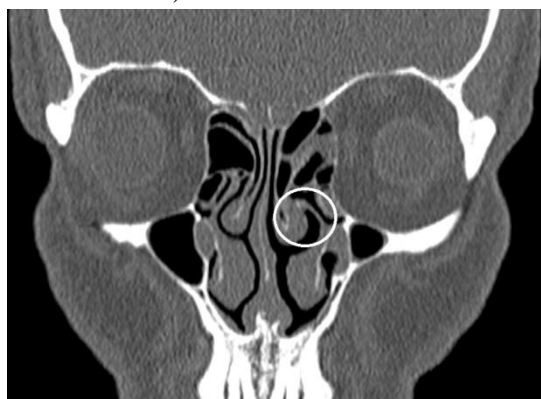


Figure-4: Superior attachment of uncinete process reaching higher up in skull base on right side (big white arrow without fill) and reaching skull base at level of cribriform plate on left side (small white arrow)

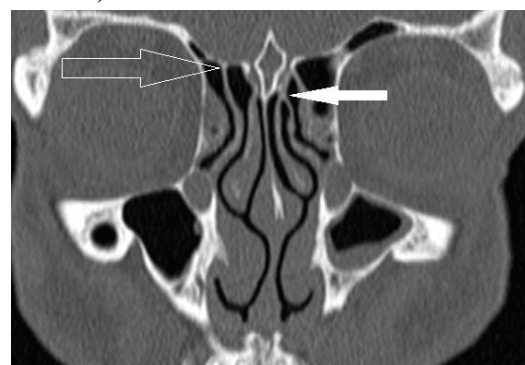
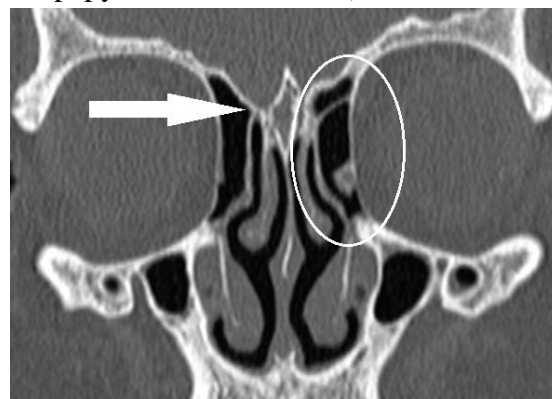


Figure-5: Superior attachment of uncinete process reaching skull base on right side (white arrow) and lamina papyracea on left side (white oval mark)



Total 280 sides were evaluated and superior attachment of uncinete process were identified in 272 (97.14 %) sides. Superior attachment of the uncinete process traced upwards reaching lamina papyracea in 126 (46.32%) sides, middle turbinate in 71 (26.10%) sides and skull base in 75 (27.57%) sides.

Agger nasi cells were present in majority of cases (236 sides out of total 280; 84.28%) and most of them were present bilaterally (232 sides out of 236 sides; 98.30%) (Figure1). Prevalence of agger nasi according to the type of uncinete process attachment is 112 (88.88%) for lamina papyracea, 57 (80.28%) for middle turbinate and 67 (89.33%) skull base as presented in Table 2.

Statistical analysis of data provided a chi-square value of 0.2556 and P-value of 0.880. Study

results indicated that relationship between the presence of agger nasi and superior attachment of uncinata process is not significant statistically at P value of < 0.05 .

Discussion

FSDP is a narrow tubular structure draining frontal sinus in nasal cavity. Three dimensional anatomy of FSDP can be affected by variation in surrounding structures which may lead to obstruction of this narrow area. Dimensions of FSDP depend on location of anterior ethmoid cells, their migration pattern in surrounding bones like lacrimal bone and presence of frontal cells. Superior attachment of uncinata process type and its importance in drainage pattern of frontal sinus was described by Stammberger et al in 1991, they also divided superior attachment in three types - lamina papyracea, middle turbinate and skull base^[3]. Landsberg and Friedman classification describe UP attachment in 6 types with few variations from classification we used in our study^[4].

When UP attach to lamina papyracea, ethmoid infundibulum terminates as recesses terminalis which is a blind pouch and FSDP drains in middle meatus directly in majority of cases or in suprabullar recess rarely^[5,6]. In such scenario medial boundary of FSDP is lateral side of middle turbinate and lateral boundary is uncinata process. In other two types of UP attachments (skull base and MT) FSDP opens in middle meatus via ethmoid infundibulum. Ultimately Superior attachment of UP determines the drainage pattern of FSDP. The agger nasi cell is the anterior most ethmoid cells and their presence and pneumatization affect size of FSDP and frontal beak, agger nasi cell if involved can lead to chronic frontal sinusitis on affected side too^[7].

In this study most common attachment type was to lamina papyracea in 46.32 % sides, other two types were approximately equal in percentage middle turbinate in 26.10% and skull base in 27.57% sides. Literature in other parts of world mentions lamina papyracea attachment between

60-70%, skull base 20-25% and middle turbinate 5-10%^[8,9,10]. Indian studies describe lamina papyracea attachment within range of 50% - 55%, followed by skull base attachment at 30-40 % and middle turbinate attachment at 10-15%^[11]. Prevalence of agger nasi cells were reported in a wide range of 40 to 100% in different studies; these cells are very commonly found during endoscopic surgery as experienced by author. In our study agger nasi were found in 84.28% and 98.30% of these were bilateral. This is on higher side of the spectrum but well within the range described in literature.

This study was designed with help of ENT & Radiology Department to provide accurate results by use of latest available technology for imaging in our hospital (Minimum 16 slice MDCT for scanning and AW Volume Share 5 Software for reconstruction) and evaluating all CT scans in all three sections (axial, coronal and sagittal) on workstation only. In our study all 140 NCCT scans were evaluated by same team of ENT surgeon and Radiologist to eliminate any inter-observer bias too; which can be a factor for divergence in results from previous studies.

These differences between Indian and foreign studies can be due to different racial profile of study groups. Also variations are fairly common in para nasal sinus region where exception is the rule.

Conclusion

FSDP is related to many structures of which presence of agger nasi cell and attachment of uncinata process clearly are most important relations for development of frontal sinus pathology. However in our study no statistically significant relation was found between agger nasi and superior attachment of uncinata process.

Logically, increasing pneumatization in lateral wall of nasal cavity should influence the migration of uncinata from lamina papyracea towards skull base and middle turbinate. Still "what is the exact nature of relation between these two structures and how presence of AN affect superior

attachment of uncinat process?" is not clearly answered in medical literature. This will be an interesting area of future researches in understanding the migration of anterior ethmoid air cells in lateral nasal wall, their influence on attachment of uncinat process and development of frontal sinus pathology if any.

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Conflict of interest-None

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