

Influence of Superior Attachment of Uncinate Process on Presence of Agger Nasi

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ABSTRACT

Objective: The superior attachment of uncinat e process and agger nasi (AN) cell are important landmark in frontal sinus surgery, and are in close relation to each other. The aim of the study is to investigate the relationship between the superior attachment of uncinat e process (UP) and presence of AN cell.

Study design: A retrospective radiological study.

Materials and methods: Fifty patients with features of chronic sinusitis were evaluated radiographically, i.e. computed tomography (CT), 100 sides, i.e. 50 scans were evaluated for superior attachment of UP and presence of AN. Chi-square test was used as statistical tool for eliciting the relationship between the two.

Results: The AN cell was found in 68 (68%) of 100 sides. The prevalence of AN cell according to superior attachment of UP types were 64.1% for lamina papyracea, 79.41% for skull base, 53.84% for middle turbinate. The presence of AN cell according to superior attachment types of UP was not statistically significant ($\chi^2 = 3.5925$, $p = 0.16592$).

Conclusion: The AN cell found in 68 sides (68%), and there was no statistical significance between the superior attachment of UP and presence of AN cell.

Keywords: Agger nasi, Frontal sinus, Superior attachment of uncinat e process.

How to cite this article: Shivaraj R, Dsouza C, Pinto G. Influence of Superior Attachment of Uncinate Process on Presence of Agger Nasi. Clin Rhinol An Int J 2015;8(3):104-106.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Since the discourses of Messerklinger and Wigand in late 1970s, the sinus surgery have undergone a tremendous expansion with the advanced imaging, increased understanding of anatomy and pathophysiology of chronic sinusitis. With all this endoscopic frontal sinus

surgery is still considered difficult with increased risk and high chances of failure rate. The endonasal approach to frontal sinus and frontal recess for frontal sinusitis is challenging and most difficult part. A thorough knowledge about the regional anatomy is required due the compact nature of this region, high anatomic variability or surrounding structures, and close relation with the vital organs like orbit and anterior skull base.¹ The position of superior attachment of uncinat e process (UP) and the extensive pneumatization of the surrounding ethmoid air cells including the agger nasi (AN) may all limit the shape and width of frontal recess and lead to frontal sinus disease.² Wormald proposed that pneumatization of the AN cell effect the superior attachment of UP. In our study, our aim was to determine a statistical relationship between the AN and superior attachment of UP.

MATERIALS AND METHODS

Patients between aged group 20 and 80 with chronic sinusitis were evaluated radiologically using coronal computed tomography (CT) or paranasal sinuses. A retrospective descriptive radiological study was carried out between September 2012 and 2014. Patient with history of facial trauma, previous history of surgery, and tumors were excluded. Fifty consecutive coronal CT, 100 sides were evaluated for the superior attachment of UP and the presence of AN.

RESULTS

In our study of 50 cases (100 sides), the superior attachment of UP to lamina papyracea was found in 53 sides, to skull base was seen in 34 sides and to middle turbinate was seen in 13 sides (Figs 1 to 3). Agger nasi was present in 68 sides out of 100, 33 were bilateral and two were unilateral (Fig. 4). Thirty-four AN was found in association with superior attachment of uncinat e to lamina papyracea, 27 with attachment to skull base, and seven with attachment to middle turbinate. The prevalence of AN according to the superior attachment of UP was 64.1% to lamina papyracea, 79.41% to skull base, and 53.84% to middle turbinate (Table 1). Statistically, a Chi-square value of 3.5925, with p-value of 0.16592 was obtained. Thereby indicating that relationship between

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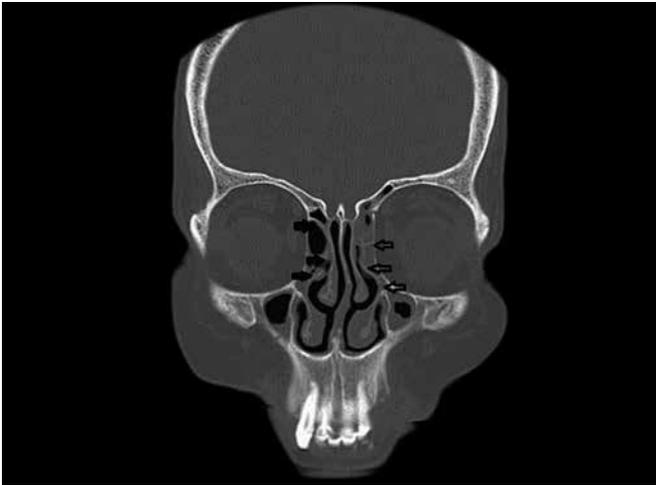


Fig. 1: Bilateral superior attachment of UP to lamina papyracea (Solid black arrow on right side, transparent black arrow on left side)

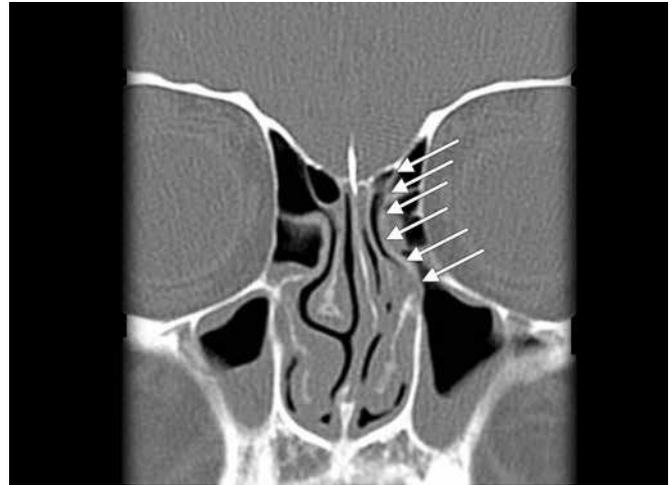


Fig. 2: Attachment of UP to skull base (white arrows)



Fig. 3: Superior attachment of UP to middle turbinate (white arrows)



Fig. 4: Agger nasi cell on left side (arrow)

Table 1: Frequency distribution of AN cell according to the superior attachment of UP

| UP superior attachment | Number (%) of sides | Number (%) of AN cell |
|------------------------|---------------------|-----------------------|
| Lamina papyracea | 53 (53) | 34 (64.1) |
| Skull base | 34 (34) | 27 (79.41) |
| Middle turbinate | 13 (13) | 7 (53.84) |

superior attachment of UP and AN is not statistically significant.

DISCUSSION

Frontal sinus drains into nasal cavity via frontal ostium. Frontal ostium region on sagittal section is an hour glass shaped structure with the narrowest part located at the frontal ostium. The frontal ostium widens superiorly into the frontal sinus and inferiorly into frontal recess. Although frontal ostium is the narrowest part, it is rarely a direct source of frontal sinus outflow tract obstruction. The inferior third part of frontal sinus pathway formed by the frontal recess is the anatomical location responsible

for most cases of frontal sinusitis. The frontal recess is a narrow inverted funnel shaped cleft within the anterior ethmoid complex, that widens in posterior and inferior direction.²⁻⁴

The superior attachment of UP was first referred by Stammberger and Hawke⁵ in 1991, and described three possible extensions, i.e. to the lamina papyracea, skull base and middle turbinate (Figs 1 to 3). Recently, a more detailed classification was given by Landsberg and Friedman⁶ classifying the variation of superior attachment into 6 types. In our study, we considered Stammberger and Hawke’s classification for the superior attachment of UP. The superior attachment of UP is an important anatomical structure for the frontal recess region. Landsberg and Friedman⁶ defined two types of frontal sinus outflow tracts depending on the superior attachment of the UP.⁷ When the UP inserts into the lamina papyracea, the ethmoidal infundibulum is closed superiorly to form a blind pouch called recessus terminalis.⁸ In this case, the frontal recess directly

communicates with the middle meatus or the suprabullar recess⁹ and this communication was only 1%,¹⁰ thus, practically it opens into middle meatus in case of recessus terminalis. Here, it is limited laterally by UP and medially by the laterally side of middle turbinate, or the junction of middle turbinate to the cribriform plate. The frontal recess drains via the ethmoidal infundibulum into the middle meatus when the UP is attached medially to skull base of middle turbinate.⁶ These findings emphasized that UP determines the drainage pattern of frontal sinus.

The AN cell is anterior most ethmoid cell, and is believed to originate from pneumatized superior remnant of first ethmoturbinal. Pneumatization of AN cell is a significant cause of chronic frontal sinusitis as it encroaches on the nasofrontal duct.¹¹

Both, the superior attachment of UP and AN are important anatomical structures in for the frontal recess, and individually are significant factors in causation of chronic frontal sinusitis. These two structures are anatomically related, the UP fuses with the posteromedial wall of the AN cell and the posteromedial wall of the nasolacrimal duct. In our study, we assessed the presence of AN cell according to the types of superior attachment of UP.

Liu et al¹² studied 132 Taiwanese patients and found no significant relationship between the presence of AN cell and the superior attachment types of UP. A similar study done by Ercan et al¹³ including 243 patients, they found in 237 sides the UP was attached to lamina papyracea out of which 180 (80.3%) had AN, 94 cases had attachment to skull base and 75 had AN cells, 30 cases had attachment to middle turbinate and 25 had AN cells. In this study, also no significant relationship was found. Similarly, in our study of 100 sides, we found no significant statistical relationship between the two structures.

CONCLUSION

Superior attachment of UP to lamina papyracea was most common. Agger Nasi was found to be present in 79.41% cases of UP attachment to skull base, a rate that varies

from that of literature. However, we found no statistically significant relation between the superior attachment of UP and AN. Further studies are needed to investigate the relationship between the degree of pneumatization of AN and superior attachment of UP, and their influence in causation of frontal sinusitis.

REFERENCES

1. Jacobs JB. One hundred years of frontal sinus surgery. *Laryngoscope* 1997;107(Suppl 83):11.
2. Wormald PJ. The agger nasi cell: the key to understanding the anatomy of the frontal recess. *Otolaryngol Head Neck Surg* 2003. p. 497-507.
3. Bent JP, Cuijty-Silver CC, Kuhn FA. The frontal cell as a cause of frontal sinus obstruction. *Am J Rhinol* 1994;8:185-191.
4. Owen GR, Kuhn FA. Supraorbital ethmoid cell. *Otolaryngol Head Neck Surg* 1997;116:2540-2561.
5. Stammberger H, Kopp W, Dekornfeld TJ, et al. Special endoscopic anatomy. In: Stammberger H, Hawke M, editors. *Functional endoscopic sinus surgery: the Messerklinger technique*. Philadelphia: BC Decker Publishers; 1991. p. 61-90.
6. Landsberg R, Friedman M. A computer-assisted anatomical study of the nasofrontal region. *Laryngoscope* 2001;111:2125-2130.
7. McLaughlin RB, Rehl RM, Lanza D. Clinically relevant frontal sinus anatomy and physiology. *Otolaryngol Clin North Am* 2001;34:1-22.
8. Kennedy DW, Senior BA. Endoscopic sinus surgery: a review. *Otolaryngol Clin North Am* 1997;30:313-330.
9. Jacobs JB, Lebowitz RA, Sorin A, et al. Preoperative sagittal CT evaluation of the frontal recess. *Am J Rhinol* 2000;14:33-37.
10. Kim KS, Kim HU, Chung IH, et al. Surgical anatomy of the nasofrontal duct: anatomical and computed tomographic analysis. *Laryngoscope* 2001;111:603-608.
11. Brunner E, Jacobs JB, Shpizner BA, Lebowitz RA, Holliday RA. Role of the agger nasi cell in chronic frontal sinusitis. *Ann Otol Rhinol Laryngol* 1996 Sep;105(9):694-700.
12. Liu SC, Wang CH, Wang HW. Prevalence of the uncinat process, agger nasi cell and their relationship in a Taiwanese population. *Rhinol* 2010 Jun;48(2):239-244.
13. Ercan I, Cakir BO, Sayin I, Başak M, Turgut S. Relationship between the superior attachment type of uncinat process and presence of agger nasi cell: a computer-assisted anatomic study. *Otolaryngol Head Neck Surg* 2006 Jun;134(6): 1010-1014.

