

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

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ABSTRACT

Objective: The superior attachment of the uncinat process and the agger nasi cell are important landmarks in frontal sinus surgery and are in close relation with each other. The aim of this study is to investigate the relationship between the two.

Study design: A retrospective radiological study.

Materials and methods: A total of 50 patients with features of chronic sinusitis were evaluated radiographically, i.e., by computed tomography. Hundred sides, i.e., 50 scans, were evaluated for superior attachment of the uncinat process and the presence of agger nasi. Chi-square test was used as a statistical tool for eliciting the relationship between the two.

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

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

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

How to cite this article: Shivaraj R, Dsouza C, Pinto G. Influence of Superior Attachment of the Uncinate Process on the Presence of Agger Nasi. *Clin Rhinol An Int J* 2016;9(1):21-23.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Since the discourses of Messerklinger and Wigand in the late 1970s, sinus surgery has undergone a tremendous expansion with advanced imaging and 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 the most difficult part. A thorough knowledge about the regional anatomy is required due to the compact nature of this region, high anatomic variability of surrounding structures, and close relation with the vital organs like orbit and anterior skull base.¹ The position of the superior attachment of the uncinat process and the extensive pneumatization of the surrounding ethmoid air cells including the agger nasi may all limit the shape and width of frontal recess and lead to frontal sinus disease.² Wormald proposed that pneumatization of the agger nasi cell affects the superior attachment of the uncinat process. In our study, our aim was to determine a statistical relationship between the agger nasi and the superior attachment of the uncinat process.

MATERIALS AND METHODS

Patients between 20 and 80 years 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 September 2014. Patients with a history of facial trauma, surgery, and tumors were excluded. Fifty consecutive coronal CT scans, i.e., 100 sides, were evaluated for the superior attachment of uncinat process and the presence of agger nasi.

RESULTS

In our study of 50 cases (100 sides), the superior attachment of the uncinat process to lamina papyracea was found in 53 sides, to skull base in 34 sides, and to middle turbinate in 13 sides (Figs 1 to 3). Agger nasi was present in 68 sides out of 100; 33 were bilateral and 2 were unilateral (Fig. 4). A total of 34 agger nasi were found in association with the superior attachment of the uncinat process to lamina papyracea, 27 with attachment to skull base, and 7 with attachment to middle turbinate. The prevalence of agger nasi according to the superior attachment of the uncinat process 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

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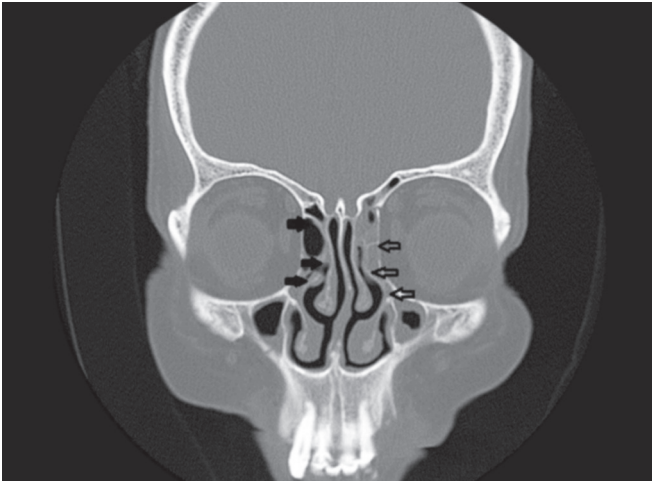


Fig. 1: Bilateral superior attachment of uncinata process to lamina papyracea. Solid black arrow on right side; transparent black arrow on left side

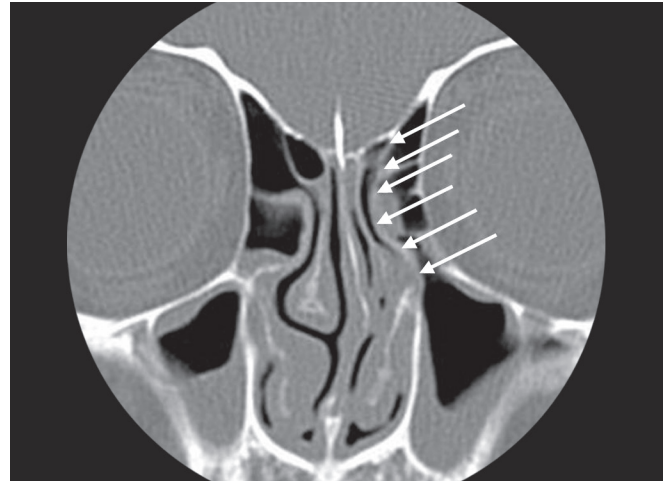


Fig. 2: Superior attachment of uncinata process to skull base (white arrows)

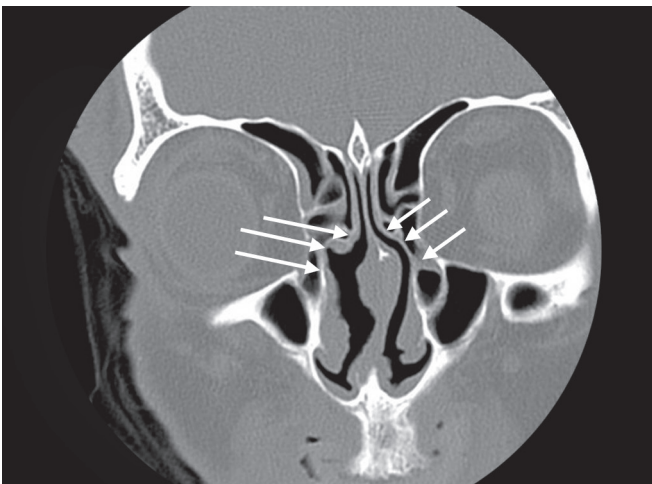


Fig. 3: Superior attachment of uncinata process to middle turbinate (white arrows)

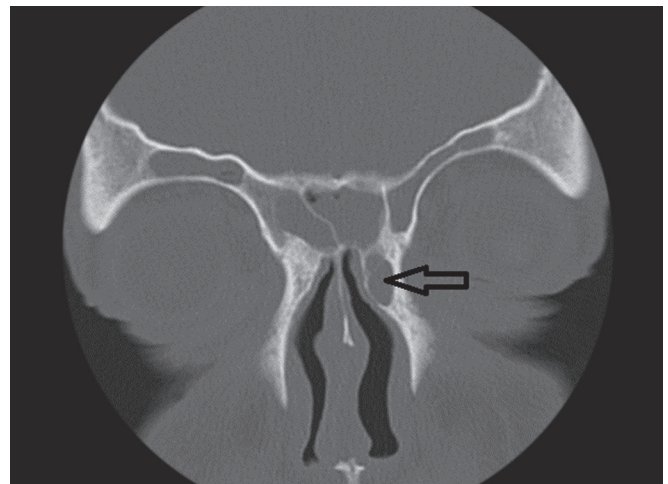


Fig. 4: Agger nasi cell on left side (black arrow)

Table 1: Frequency distribution of agger nasi cell according to the superior attachment of uncinata process

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

3.5925, with p-value of 0.16592, was obtained, thereby indicating that the relationship between the superior attachment of the uncinata process and agger nasi is not statistically significant.

DISCUSSION

Frontal sinus drains into the nasal cavity via frontal ostium. The frontal ostium region on the 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 the 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 the 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 the posterior and inferior direction.²⁻⁴

The superior attachment of the uncinata process was first referred by Stammberger et al⁵ 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 six types. In our study, we considered Stammberger and Hawke's classification for the superior attachment of the uncinata process.

The superior attachment of the uncinat process 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 uncinat process.⁷ When the uncinat process 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 the middle meatus in the case of recessus terminalis. Here it is limited laterally by the uncinat process and medially by the lateral side of the middle turbinate, or the junction of the middle turbinate and the cribriform plate. The frontal recess drains via the ethmoidal infundibulum into the middle meatus when the uncinat process is attached medially to the skull base of the middle turbinate.⁶ These findings emphasized that the uncinat process determines the drainage pattern of frontal sinus.

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

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

Liu et al¹² studied 132 Taiwanese patients and found no significant relationship between the presence of agger nasi cell and the superior attachment types of the uncinat process. A similar study done by Ercan et al¹³ including 243 patients found in 237 sides the uncinat process was attached to the lamina papyracea, out of which 180 (80.3%) had agger nasi, 94 had attachment to skull base and 75 had agger nasi cells, 30 cases had attachment to middle turbinate and 25 had agger nasi 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 the uncinat process to lamina papyracea was the most common. Agger nasi was found to be present in 79.41% cases of uncinat process attachment to skull base, a rate that varies from that noted in the literature. However, we found no statistically significant relation between the superior attachment of the uncinat process and agger nasi. Further studies are needed to investigate the relationship between the degree of pneumatization of agger nasi and the superior attachment of the uncinat process, and their influence in causing frontal sinusitis.

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