

Anatomical variations in the superior attachment of uncinete process and its association with frontal sinusitis

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Abstract

Introduction: The variation in any one of the component of Ostiomeatal complex causes improper drainage of these sinuses causing chronic sinusitis. **Aim:** To find out the association between the superior attachment of Uncinate process and frontal sinusitis. **Materials and Methods:** The CT paranasal sinuses of patients with frontal sinusitis were interpreted to find the superior attachment of uncinete process. The superior attachment of uncinete process is classified as **Type 1**-Insertion of Uncinate process into the lamina papyracea, **Type 2**- Insertion of Uncinate process into the roof of the ethmoid (the skull base) and **Type 3**- Insertion of Uncinate process into the middle turbinate. The association between the superior attachment of uncinete process and frontal sinusitis were analyzed by using chi square statistical test. **Results:** A statistically significant association between Type 1 Uncinate process and frontal sinusitis was found (P=0.0093). **Conclusion:** The superior attachment of uncinete process which alters the frontal sinus drainage may cause the frontal sinusitis.

Keywords: uncinete process, frontal sinusitis.

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INTRODUCTION

Ostiomeatal complex is the final common pathway for the drainage of frontal, maxillary and anterior ethmoid sinuses¹. The variation in any one of the component of Ostiomeatal complex causes improper drainage of these sinuses causing chronic sinusitis²⁻⁴, among that, uncinete process variation is the one of the common finding in routine CT scan evaluation of patients with sinusitis^{5,6}.

The superior attachment of the Uncinate process may alter the frontal sinus outflow tract which predispose to development of frontal sinusitis⁷. The aim of our present study is to find out the association between the superior attachment of Uncinate process and frontal sinusitis.

MATERIALS

The study was conducted in the Chennai Medical College Hospital and Research Centre, Irungalur, Trichirapalli, INDIA. The Patients with symptoms of sinusitis attending ENT Department were considered for the study after getting the informed consent. Totally 200 sides (right and left) of 100 consecutive patients who were willing to take CT scan for paranasal sinuses were included.

Exclusion criteria

Patients with previous nasal and paranasal sinus surgery, neoplastic diseases, history of nasal trauma, invasive fungal sinusitis, and pregnant women were excluded.

Brief methodology for the Study design

Study design Observational type of cross sectional study.

Methodology

The images were taken using Dual slice GE Hispeed CT Scanner with 2 to 3mm thickness coronal and axial images with scan time of 49.5 sec. The images were analyzed to see the superior attachment of uncinat process. The superior attachment of Uncinate process is classified as **Type 1**-Insertion of Uncinate process into the lamina papyracea, **Type 2**- Insertion of Uncinate process into the roof of the ethmoid (the skull base) and **Type 3**-Insertion of Uncinate process into the middle turbinate. The presence of frontal sinusitis and its association between these three types were analyzed.

STATISTICAL ANALYSIS

The data were interpreted by using the chi square statistical test with Statistical program for Social Science

(IBM SPSS) version 21. A p-Value < 0.05 was considered statistically significant.

RESULTS

The study group comprises of 71 men and 29 women (age 15 to 60years). In the total of 200 sides we could able to identify the superior attachment of uncinat process in 160 sides (80%), remaining 40 sides (28 sides in men and 12sides in women) (20%) we are not able to identify the superior attachment of uncinat process. Type 1 uncinat process was found in 94 sides (59%), Type 2 uncinat process was found in 38 sides (24%), Type 3 uncinat process was found in 28 sides (17.5%) of the total 160 sides. The percentage distribution of frontal sinusitis in association with superior attachment of Uncinate process is shown in Table 1and Fig 1.

Table 1: The percentage of distribution of frontal sinusitis in association with superior attachment of *Uncinate process

Type	Area of superior attachment of UP *	No(%) of sides Total	No(%) of Frontal sinusitis present	No(%) of Frontal sinusitis Absent
Type 1	Lamina papyracea	94(59)	39(72)	55(52)
Type 2	Skull base	38(24)	12(22)	26(25)
Type 3	Middle turbinate	28(17)	3(6)	25(23)
	Total	160(100)	54(100)	106(100)

Table 2: Type of superior attachment of *Uncinate process in frontal sinusitis

Type of UP *	Present study		Previous studies		
	Percentage of Distribution	Turgut S et al ⁷	Sagar et al ¹²	Isha preet Tuli et al ¹³	
Type 1	72%	76%	82%		79.8%
Type 2	22%	10%,	14%,		16.67%
Type 3	6%	4%	4%		3.57%

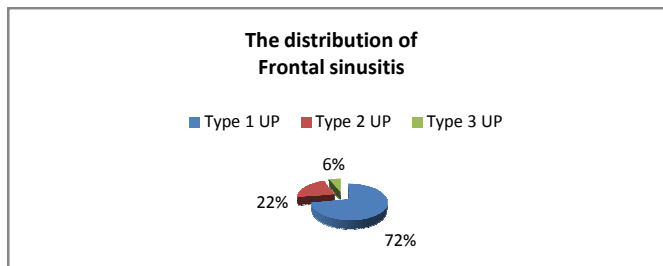


Figure 1: The distribution of frontal sinusitis in association with superior attachment of Uncinate process

DISCUSSION

The removal of disease in the ostiomeatal complex is the basic principle of Functional Endoscopic Sinus Surgery⁸.The complexity in the anatomy of the frontal sinus outflow (frontal recess) needs proper anatomical knowledge about this area to perform nasosinusal endoscopic surgery in case of frontal sinusitis to get a good post operative result⁹. The Uncinate process is the main anatomical structure which causes the difficulty in identification of frontal sinus ostium¹⁰. CT scan of

paranasal sinuses gives the proper detail about the presence of any anatomic abnormalities, location and severity of disease and exact location of obstruction¹¹. In our present study, 54 (34%) out of total 160 sides were presented with frontal sinusitis, among that *Type 1* uncinat process was found in 39 sides (72%), *Type 2* Uncinate process was found in 12 sides (22%), *Type 3* uncinat process was found in 3 sides (6%) of the total 54 sides with frontal sinusitis, this is similar to the previous studies by Suat Turgut et al⁷ reported *Type 1* -76%,*Type2*

-10%, Type 3 -4%, Sagar *et al*¹² reported Type 1 - 82%, Type 2 -14%, Type 3 -4%, and Isha preet Tuli *et al*¹³ reported Type 1 -79.8%, Type 2 -16.67%, Type 3 -3.57% (Ref Table. 2). When we analyze the association between these three types of Uncinate process and frontal sinusitis, Type 1 had a statistically significant association (P=0.0093), but we couldn't find a statistically significant association in Type 2 (P=0.3085) and Type 3 (P=0.5805). In type 1, the Uncinate process attaches superiorly with lamina papyracea and form a blind pouch called terminal recess (recesses terminalis)^{14, 15}, in this frontal recess opens in to middle meatus (medial to the superior attachment of Uncinate process). In type 2 and 3, frontal recess drains in to the middle meatus via the ethmoid infundibulum (lateral to the superior attachment of uncinat process). These findings shows that the superior attachment of uncinat process changes the pattern of drainage of frontal sinus in to middle meatus which may be the factor determine the development of frontal sinusitis.

CONCLUSIONS

Anatomical variation in any one of the component of Ostiomeatal complex causes improper drainage of paranasal sinuses causing sinusitis. In our present study, the superior part of uncinat process which alters the frontal sinus drainage commonly attaches with the lamina papyracea (Type 1) and this type shows statistically significant association with frontal sinusitis.

REFERENCES

- Freitas AP and Boasquevisque EM. Anatomical variants of the ostiomeatal complex: tomographic findings in 200 patients. *Radiol Bras. J.* 2008; 41(3).
- Kennedy DW, Zenreich J, Rosenbaum AE, Johns ME. Functional endoscopic sinus surgery: Theory and diagnostic evaluation. *Arch Otolaryngol Head Neck Surg.* 1985; 111:576-582.
- Rice DH, Basic surgical techniques and variations of endoscopic sinus surgery. *Otolaryngol Clin North Am.* 1989; 22:713-726.
- Zinreich SJ, Kennedy DW, Rosenbaum AE, Gayler BW, Kumar Aj, Stammberger H. Paranasal sinuses: CT imaging requirements for endoscopic surgery. *Radiology.* 1987; 163:709-775.
- Mamatha H, Shamasundar Nm, Bharathi MB and Prasanna LC. Variations of ostiomeatal complex and its applied anatomy: a CT scan study. 2010; 3(8):904-907.
- Tessema B, Brown SM (2011) Nasal cavity anatomy, physiology and anomalies on CT scan. (Internet) (Updated 2011 Mar 29; cited 2012 Oct 17). <http://emedicine.medscape.com/article/875126-overview#aw2aab6b4>
- Turgut S, Ercan I, Sayin I, Basak M. The Relationship between Frontal Sinusitis and Localization of the frontal Sinus Outflow Tract. *Arch otolaryngol head neck surg.* 2005; 131:518-522.
- Dua K, Chopra H, Khurana AS and Munjal M. CT scan variations in chronic sinusitis. *Ind. J. Radiol. Imag.* 2005; 15(3):315-320.
- Stammberger H, Kennedy D, Bolger W, *et al.* Paranasal sinuses: Anatomic terminology and nomenclature. *Ann Otol Rhinol Laryngol.* 1995; 104(suppl 167):7-16.
- Marcus Miranda Lessa, Richards Louis Voegels, Bernardo Cunha Filho, Flavio Sakae, Ossamu Butugan and Gerad Wolf. Frontal recess anatomy study by endoscopic dissection in cadavers. 2007; 73(2):204-209.
- Stammberger H and Hawke M. Essentials of endoscopic sinus surgery 1st ed. St. Louis: Mosby. pp:43.
- Sagar G R S, Bhal Chandra Jha, Meghanadh. A study of Anatomy of Frontal Recess in Patients suffering from 'Chronic Frontal Sinus Disease'. *Indian J Otolaryngol Head Neck Surg.* 2013; 65(Suppl 2):S435-S439.
- Isha preet Tuli, Subhabrata sengupta, Sudeep Munjal, Santosh Prasad Kesari, Suvamoy Chakraborty. Anatomic Variations of Uncinate process Observed in Chronic Sinusitis. *Indian J Otolaryngol Head Neck Surg.* DOI 10.1007/s12070-012-0612-8.
- McLaughlin RB, Rehl RM, Lanza D. Clinically relevant frontal sinus anatomy and physiology. *Otolaryngol Clin North Am.* 2001; 34:1-22.
- Kennedy DW, Senior BA. Endoscopic sinus surgery: a review. *Otolaryngol Clin North Am.* 1997; 30:313-330.

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