



ANATOMICAL VARIATIONS IN SUPERIOR ATTACHMENT OF UNCINATE PROCESS AND THEIR CLINICAL IMPORTANCE

Dr. Seema Dhuria*

Assistant professor, Department of Anatomy, Swaminarayan Institute of Medical Sciences & Research, Gandhinagar. *Corresponding Author

ABSTRACT

Introduction: Uncinate process (UP) is a thin sickle shaped projection on the lateral wall of nose which is a part of ethmoid bone and it extends inferiorly from the ethmoid process of inferior turbinate and superiorly to towards the frontal recess. Various studies have shown that superior attachment of uncinat process (SAUP) is the key to frontal recess region in functional endoscopic sinus surgeries (FESS). Hence this study was conducted to observe and classify the superior attachment of uncinat process and ascertain their clinical importance. **Methods:** A Prospective cross sectional study, on 175 patients with clinically diagnosed chronic rhino sinusitis disease (CRS) who underwent CT scan of paranasal sinuses for various regions, including both sexes, above the age of 20 years. Patients with history of previous nasal surgery, sinonasal malignancy or tumor, pregnant ladies were excluded. **Results:** It was observed that Type I SAUP in 48.6% (n=85) cases, Type II SAUP in 13.7% (n=24), Type III attachment in 20.0% (n=35) and Type IV in 17.1% (n=30). **Conclusions:** The site of SAUP is highly variable. The most common type of SAUP is Type I (48.6%). As the first step of Endoscopic sinus surgeries start with an uncinectomy, so poorly performed uncinectomy can result in failure of the entire procedure and may leads to orbital and lacrimal complications.

KEYWORDS : Frontal recess, Uncinate Process, FESS, CRS

INTRODUCTION

Uncinate process (UP) is a thin sickle shaped projection on the lateral wall of nose which is a part of ethmoid bone and it extends inferiorly from the ethmoid process of inferior turbinate and superiorly to towards the frontal recess. The frontal recess is a three-dimensional space connecting the frontal sinus superiorly with the nasal cavity inferiorly. Based on the SAUP, the frontal sinus outflow is of two types – medial to UP and lateral to UP.¹ Various studies have shown that superior attachment of uncinat process is the key to frontal recess region in endoscopic sinus surgeries (ESS).² But these studies have yielded conflicting results, showing multiple patterns and classifications of superior attachment of uncinat process. Hence this study was conducted to observe and classify the superior attachment of uncinat process and ascertain clinical importance.

METHODS

A Prospective cross sectional study, on 175 patients with clinically diagnosed chronic rhino sinusitis disease (CRS) who underwent CT scan of paranasal sinuses for various regions, including both sexes, above the age of 20 years. Patients with history of previous nasal surgery, sinonasal malignancy or tumor, pregnant ladies were excluded. CT scan was performed in a Philips ingenuity CT scanner with 128 slice (Phillips Medical Systems) with 120 kV, 1.5 second scans time, 201mA in Soni hospital CT & MRI Centre, S.M.S medical College and hospital, Jaipur. The images were obtained in coronal and axial sections with 0.9mm with 3mm incrementation thickness. Anatomical variations of UP were studied using both soft part window and bony density window.

RESULTS

The anatomical variations of SAUP were classified as

- Type I – Insertion of UP into Lamina papyracea (LP)
- Type II – Insertion of UP into the skull base (SB)
- Type III – Insertion of UP into middle turbinate (MT)
- Type IV – UP lying free in the middle meatus (Free type).

In present study, the most common pattern of SAUP was Type I, accounts for 48.6% (n=85) cases. Type II SAUP in 20.0% (n=35), Type III SAUP observed in 13.7% (n=24) and Type IV in 17.1% (n=30). These observations are tabulated in Table 1.

Table 1: Percentage Distribution Of Uncinate Process Attachment

SAUP Attachment Type		Percentage
Type 1	To Lamina Papyracea	48.6%
Type 2	To skull Base	20.0%
Type 3	To Middle Turbinate	13.7%
Type 4	Free	17.1%

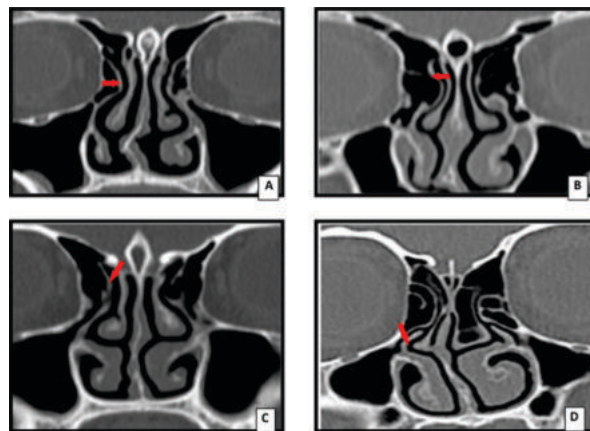


Figure 1: Superior Attachment Of Uncinate Process [a]-to Lamina Papyracea, [b]- Middle Turbinate, [c]-to Skull Base, [d]- Free

DISCUSSION

In the developed and developing world sinusitis is a very common health care challenge in now days. The obstruction of the ostiomeatal complex, is regarded the most important in the pathophysiology of chronic rhinosinusitis.³ The uncinat process, being one of the first structures encountered intra-operatively, is now given immense surgical importance.^[4-6] Due to complex, unpredictable and confusing anatomy, frontal sinus and the frontal recess still challenge for the Surgon.^[7-9] Because of frontal recess crowded by many bony plates and these bony plates determines the limits, shape and width of recess.¹⁰ Among the bony plates, the superior attachment of uncinat process is the most important.¹¹ Zinereich et al.¹² first observed that the uncinat process may be curved or bent, which impair the sinus ventilation.

According to Stammberger and Hawke uncinat process superiorly attached into three patterns, that is to lamina papyracea, skull base and middle turbinate.² In 2001, Landsberg and Friedman classified the superior attachment of uncinat process into six patterns.² In the present study, SAUP was studied based on Stammberger and Hawke's classification. Out of 175 slides studied, the most common pattern of SAUP was to the lamina papyracea, i.e. Type I (48.6%, n=85). This was almost similar to that of Min et al.¹⁴ (54 %) and Landsberg and Friedman² (52 %). This was higher than that reported by Krzeski et al.¹⁵ (17.83 %) Second most common pattern was type II, observed in (20.0%, n=35) cases and Type III SAUP observed in 13.7%, n=24). This result was closer to that of Krzeski et al.¹⁵ (33.12 %) and Type III 14.33% respectively. Free type (Type IV) SAUP was reported in (17.1%, n=30) cases. Our finding was higher than that reported by Kumar et al.¹⁶ (11%).

According to Landsberg and Friedman frontal sinus drainage classified into two types which is based on the SAUP, i.e. medial to Uncinate process or lateral to Uncinate process. When the uncinate process is attached to the skull base or middle turbinate, the frontal recess opens into the ethmoidal infundibulum and can be involved in infundibular disease. When the superior attachment is to the lamina papyracea, the frontal sinus opens into the middle meatus directly and can be spared from infundibular disease. Further, during surgery this attachment needs to be cleared before gaining access to frontal recess.

Table 2: Variations In Saup Among Different Populations

Year	Author's	Type 1	Type2	Type 3	Type 4
2013	Tuli et al17	79.8%	16.67%	3.57%	-
2015	Kumar et al16	55%	8%	20%	11%
2016	Arun et al18	67.5%	18.5%	9.5%	4.5%
2017	Omar Adnan Hasan et al19	29.5%	13.5%	36.4%	-
2021	Present study	48.6%	20.0%	13.7%	17.1%

Limitations Of Our Study

Anatomical variations of uncinate process and its role in pathogenesis of chronic rhinosinusitis. Still not clear in our knowledge. The cause of the variations in SAUP not yet clearly known. Further studies are needed to identify factors causing and their significance in causing chronic rhinosinusitis.

CONCLUSION

The inferior attachment of UP is easily recognizable and is clearly visible even with a 00 Hopkins nasal endoscope. But the superior attachment of uncinate process is difficult to visualize either via endoscope or with a tomogram. Knowing the anatomic variations of SAUP will help the surgeon to plan the endoscopic sinus surgery and to avoid the unwanted complications. As the first step of Endoscopic sinus surgeries start with an uncinectomy, so poorly performed uncinectomy can result in failure of the entire procedure and may leads to orbital and lacrimal complications. Hence it is mandatory for the operating surgeon to know about the normal anatomy and the variations of uncinate process. As Superior attachment of uncinate process is most important variation seen in uncinate process. The most common type of SAUP was Type I (48.6%).

REFERENCES

- Peter-John W. Endoscopic Sinus Surgery Anatomy, Three-Dimensional Reconstruction, and Surgical technique. 3rd edition. 2013: 468.
- Landsberg R, Friedman M. A computer-assisted anatomical study of the nasofrontal region. *Laryngoscope*. 2001;111:2125-30.
- Aiyer RG, Pandya VK, Soni GB, Dhameja PJ, Gupta R, Patel M (2010) Etiopathogenesis of rhinosinusitis in relation to ethmoid anatomy. *Clin Rhinol Int J*. 2010; 3(1):17-21
- Tessema B, Brown SM. Nasal cavity anatomy, physiology, and anomalies on CT scan. 2012 Oct.
- Bolger WE, Woodruff WW Jr, Morehead J, Parsons DS (1990) Maxillary sinus hypoplasia: classification and description of associated uncinate process hypoplasia. *Otolaryngol Head Neck Surg*. 1990; 103(1):759-765.
- Isobe M, Murakami G, Kataura A. Variations of the uncinate process of the lateral nasal wall with clinical implications. *Clin Anat* 1998; 11(5):295-303
- Moideen SP, Khizer Hussain Afroze M, Mohan M, Regina M, Moideen CP. Incidence of frontal sinus aplasia in Indian population. *Int J Otorhinolaryngol Head Neck Surg*. 2017;3:108-11
- Kaliner MA, Osguthorpe JD, Fireman P, Anon J, Georgitis J, Davis ML, et al. Sinusitis: bench to bedside: current findings, future directions. *J Allerg Clin Immunol*. 1997;99(6):829-48.
- Kennedy DW, Senior BA. Endoscopic Sinus Surgery. A review. *Otolaryngol Clin North Am*. 1997;30(3):313-30.
- Stammberger HR, Kennedy DW. Anatomic Terminology Group. Paranasal sinuses: anatomic terminology and nomenclature. *Ann Otol Rhinol Laryngol Suppl*. 1995;167:7-16
- Peter JW. The agger nasi cell: the key to understanding the anatomy of the frontal recess. *Otolaryngol Head Neck Surg*. 2003;129(5):497-507.
- Zinreich SJ, Kennedy DW, Rosenbaum AE, Gayler BW, Kumar AJ, Stammberger H. Paranasal sinuses: CT imaging requirements for endoscopic surgery. *Radiology* 1987;163(3):769-775
- Stammberger H. Functional Endoscopic Sinus Surgery: The Messerklinger Technique. Philadelphia: BC Decker; 1991: 60-87.
- Min Y, Koh T, Rhee C, Han M (1995) Clinical implications of the uncinate process in paranasal sinusitis: radiological evaluation. *Am J Rhinol* 9(3):131-135
- Krzeski A, Tomaszewska E, Jakubczyk I, Galewicz-Zielinska A (2001) Anatomic variations of the lateral nasal wall in the computed tomography scans of patients with chronic rhinosinusitis. *Am J Rhinol* 15(6):371-375
- Kumar NV, Kamala E, Priya TG, Nalinakumari SD. A computerized tomographic study of uncinate process of ethmoid bone. *Int J Anat Res*. 2015;3(1):917-21.
- Tuli JP, Sengupta S, Munjal S, Kesari SP, Chakraborty S. Anatomical variations of uncinate process observed in chronic sinusitis. *Indian J Otolaryngol Head Neck Surg*. 2013;65(2):157-61. 14.
- Arun G., Sanu P, Moideen, Mohan M., Khizer Hussain Afroze M., Aparna S. Thampy. Anatomical variations in superior attachment of uncinate process and localization of frontal sinus outflow tract. *Int J Otorhinolaryngol Head Neck Surg*. 2017 Apr; 3(2):176-179
- Omar Adnan Hasan, Mohamed Amir Hassan, Ehab Kamal Fawzy, Ahmed Mahmoud Maarouf. Anatomical Variations of Nasal Structures in Chronic Rhinosinusitis as Detected by Computed Tomography Scan. *The Egyptian Journal of Hospital Medicine* 2017; 68 (3):1390-1394.