A Radiological Study of Anatomical Variations of Uncinate Process

ABSTRACT

Aim: (a) To study the variations in the superior attachment of uncinate process. (b) Incidence of pneumatization of uncinate process was also studied.

Materials and methods: A total 200 sides of 100 CT scans of paranasal sinuses coronal section were studied for variations in the superior insertion of uncinate process using Landsberg and Friedman classification. Incidence of pneumatization of uncinate process was also studied.

Results: In our study out of 200 sides, type 6 attachment was commonest (41%) followed by types 1 and 2. Pneumatization of the uncinate was seen in very small percentage of cases.

Conclusion: Lateral insertion of uncinate (lamina papyracea + aggar nassi) is the commonest variant followed by the insertion into the skullbase. Pneumatization of uncinate is rare.

Clinical significance: Though the inferior attachment of the uncinate is almost constant the superior attachment has several variations, the knowledge of which is very important for the endoscopic surgeon to avoid intraoperative complications.

Keywords: Aggar nasi, Cribriform plate, Lamina papyracea, Middle turbinate, Pneumatization, Uncinate process.

INTRODUCTION

Osteomeatal unit is the key area in lateral wall of the nasal cavity, and uncinate process is one of the components of osteomeatal unit. It is a thin, almost sagitally oriented bony leaflet that runs from an anterosuperior position posteroinferiorly. The uppermost segment of the uncinate process is no longer visible behind the insertion of middle turbinate resulting in a blind spot for surgeons during endoscopic sinus surgery. This uppermost portion can extend to the base of the skull, or it may turn laterally and insert into the lamina papyracea, or may turn frontally and fuse with the middle turbinate. Uncinate process is a key landmark during functional endoscopic sinus surgery and is the first structure removed. Preoperative detection of anatomic variations of the uncinate in the CT scan of paranasal sinuses (PNS) helps avoid intraoperative damage to the nasolacrimal duct, medial orbital wall, sphenopalatine artery, and anterior skull base, and therefore it is important surgically. This study was conducted at the Department of ENT, KS Hegde Medical Academy, Manglore, India, with the aim of determining the prevalence of variations in the superior attachment of the uncinate process and pneumatization of the uncinate process.

RESULTS

The study included 61 males and 39 females, with mean age of 34.5 years (15–65 years). Two-hundred sides (n) of 100 CT scans of PNS were analyzed according to the Landsberg and Friedman classification system. In our study, out of 200 sides, type 6 attachment was commonest (41%) followed by type 1 (34.5%), type 2 (16.5%), and type 5 (7%). Types 3 and 4 were seen in only in 0.5% of the cases each (Table 1).

Pneumatization of the uncinate process was found in 8 of the 200 uncinate processes studied (4%), 7 of which were on the left side and 1 on the right side.
DISCUSSION

Uncinate process is the most important and constant landmark in the osteomeatal complex of middle meatus of the nasal cavity, which is the key area for functional endoscopic sinus surgery. Landsberg and Friedman, classified the superior attachment of uncinate process as follows5:

Type 1: Insertion into the lamina papyracea (LP).
Type 2: Insertion into the posterior wall of agger nasi cell (ANC).
Type 3: Insertion into the lamina papyracea and junction of the middle turbinate with the cribriform plate (MTCP).
Type 4: Insertion in to junction of the middle turbinate with the cribriform plate.
Type 5: Insertion into the ethmoid skull base (ESB).
Type 6: Insertion into the middle turbinate (MT).

In this study, we aimed to study the variations of superior attachments of uncinate process according to the classification by Landsberg and Friedman. In the present study of 200 sides, 82 (41%) uncinates had type 6 attachments, 69 (34.5%) had type 1, 33 (16.5%) had type 2, 14 (7%) had type 5 attachments, and 0.5% cases showed types 3 and 4 attachments each.

Turgut et al6 reported types 1 and 2 uncinate process attachment to be 63%, type 3 to be 3%, type 4 to be 12%, type 5 to be 14%, and type 6 to be 8%. In a study conducted by Tuli et al7 and Min et al,8 lateral attachment of uncinate process (types 1 and 2) was most common, that is, 79.8 and 54% respectively, followed by attachment to skull base (type 5), that is, 16.67 and 24.5% respectively. In our study type 6 (insertion to middle turbinate) was found to be the commonest. This could be because we have subclassified lateral attachments of uncinate process (types 1 and 2). Krzeski et al9 reported type 5 to be commonest (33.12%), followed by type 1 (17.83). Study by Kumar et al10 reported type 2 to be the commonest (36%) followed by type 6 (20%) and type 1 (19%).

Most of the studies, including our study, show types 1 and 6 are the commonest variations of uncinate insertion followed by type 5 except for one study which shows type 5 is the commonest variation. Types 3 and 4 are found to be very rare.

Superior insertion type of the uncinate process may also affect the drainage pattern of the sinuses. When the uncinate process inserts into the lamina papyracea, maxillary sinus drainage may be affected. If insertion is made into the middle turbinate, a mechanism of sinus mucus recirculation appears, which may also affect drainage of the maxillary or frontal sinus.11,12

**Pneumatization of Uncinate Process**

Hyperpneumatization of agger nasi cells posterosuperiorly results in development of pneumatized uncinate process which may cause narrowing of the hiatus semilunaris and the ethmoid infundibulum. It could also act as a predisposing factor for impaired ventilation of the anterior group of sinuses and frontal sinus.13

Pneumatization of the uncinate process, with a reported prevalence of 0.4 to 13% is a rare variation. When present, it may occupy the infundibular free regions resulting in areas of mucosal thickening.13

In the present study the uncinate process was pneumatized in 8 of the 200 sides (3.5%), 6 of which were left sided and one of them was bilateral. None of them showed any mucosal changes.

In a study by Bolger et al,14 uncinate pneumatization was found to be 2.5% in 202 patients which is consistent with our result. Arslan et al15 reported uncinate pneumatization in 4% of 200 patients. In one of the studies by Earwaker11, involving a large study group of 800 patients, 9.1% had uncinate pneumatization.

Kumar et al10 found uncinate pneumatization in 3.41% of cases, left forms being predominant are consistent with our study.

**CONCLUSION**

Uncinate process can have different types of attachment superiorly. Though most of the studies show lateral insertion of uncinate (lamina papyracea + aggar nasi) is the commonest variant, the insertion into the skullbase is not uncommon. Therefore, careful evaluation of CT scan of PNS preoperatively is a must to minimize the complications during endoscopic sinus surgery.

Pneumatization of the uncinate process is a very rare entity, but when present, it may cause obstruction to the sinus ostia if associated with the mucosal thickening.

**REFERENCES**


