Section: Otorhinolaryngology

Original Research Article

COMPARATIVE STUDY IN BETWEEN PARTIAL UNCINECTOMY AND TOTAL REMOVAL OF UNCINATE PROCESS IN PATIENTS WITH CHRONIC RHINOSINUSITIS

R Manaswini[1], M Naga Chaitanya[2]

[1]*Assistant Professor, Department of Otorhinolaryngology, Malla Reddy Institute of Medical Sciences, Suraram, Hyderabad, Telangana, India.*
[2]*Associate Professor, Department of Otorhinolaryngology, Malla Reddy Institute of Medical Sciences, Suraram, Hyderabad, Telangana, India.*

Received *: 30/04/2025*
Received in revised form *: 29/06/2025*
Accepted *: 22/07/2025*

Corresponding Author:
Dr. M Naga Chaitanya,
Associate Professor, Department of Otorhinolaryngology, Malla Reddy Institute of Medical Sciences, Suraram, Hyderabad, Telangana, India.
Email: drnagachaitanys234@gmail.com

DOI: 10.70034/ijmedph.2025.3.180

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 976-982

ABSTRACT

Background: Aims: It is a prospective comparative study to evaluate if partial uncinectomy is effective as much as total removal of uncinate process in patients with chronic rhinosinusitis.

Materials and Methods: This prospective comparative study included 60 patients diagnosed with chronic maxillary sinusitis, divided into two equal groups of 30 each. Group 1 underwent partial uncinectomy (PU), and Group 2 underwent total uncinectomy (TU), all performed via functional endoscopic sinus surgery (FESS). Patients were evaluated for demographic data, presenting symptoms, operative time, healing duration, postoperative complications, and symptom relief. Standard follow-up was conducted to assess surgical outcomes and effectiveness.

Results: The study compared partial (PU) and total uncinectomy (TU) in patients aged 20–50 years (mean: 33.56 ± 3 years). Group 1 (PU) had 20 males and 10 females; Group 2 (TU) had 16 males and 14 females. Presenting symptoms were similar in both groups, with anterior nasal discharge and nasal obstruction most common. All cases had chronic sinusitis limited to the maxillary sinus. Operative time was significantly shorter in the PU group (3–5 min vs 5–7 min). Healing time ranged from 1.5–3 weeks, with no significant group difference. Middle meatus synechiae occurred in 13.33% (PU) vs 20% (TU); other complications were similar. Postoperative symptoms improved in both groups with no significant difference overall. PU was more effective for post nasal discharge; TU slightly better for headache and obstruction. Both procedures were effective, but PU offered the advantage of shorter operative time.

Conclusion: Partial uncinectomy significantly reduced operative time with comparable healing and complication rates. Therefore, partial uncinectomy may be considered a safe, effective, and time-efficient alternative to total uncinectomy, especially in selected cases.

Keywords: Partial uncinectomy, Total uncinectomy, Chronic sinusitis, Functional endoscopic sinus surgery (FESS), Operative time, Healing time, Nasal obstruction, Anterior nasal discharge, Post nasal discharge, Endoscopic complications.

INTRODUCTION

Chronic sinusitis is one of the most common chronic diseases affecting different age groups. Interestingly, it had been reported that, people affected have lower life quality when compared to the people affected by congestive heart failure, chronic obstructive pulmonary disease and chronic low back pain.[1] Clinically, sinusitis is defined as the condition manifest by an inflammatory response of the mucous

membrane of the nasal cavity and para nasal sinuses, fluid within the cavity, and / or underlying bone. Also defined as a group of disorders characterised by inflammation of the mucosa of the nose and para nasal sinuses lasting for atleast 12weeks.[2] At present diagnostic nasal endoscopic evaluation of nose and para nasal sinuses is a routine component for evaluating patients with evidence of suspected nose and para nasal sinus disease. Arrival of endoscopes has helped us in many ways to recognize the lesion or changes that are hidden from the naked eye or even from inspection under microscopes. With this, provisional diagnosis may be confirmed, expanded or revised. Also it helps the Otorhinolayngologist in deciding the mode of treatment. All the patients who have significant findings in diagnostic nasal endoscopy are subject to CT scan para nasal sinus evaluation.

The initial treatment of chronic sinusitis is usually medical and those unresponsive to medical therapy are treated surgically.[3] In the last years, with improved imaging and surgical techniques in chronic rhinosinusitis, in patients who are unresponsive to medical treatment, functional endoscopic sinus surgery (FESS) has been performed. With this surgical treatment 75-90% success rates have been reported.[4,5]

Uncinectomy is the first step in functional endoscopic sinus surgery.[6,7] The uncinate is a curved bone with length between 19 and 32mm. Anteriorly, it is continuous with the ethmoid bone and superiorly may attach to the lamina papyracea, skull Base or middle turbinate. Posteroinferiorly, it articulates with the medial wall of maxillary Antrum via its maxillary process and with the ethmoid process of the inferior turbinate bone. The gap between the upper end of the uncinate and bulla ethmoidalis is the hiatus semilunaris. This opens into the ethmoid infundibulum, which contains the natural ostium of the maxillary sinus.8Uncinectomy and a middle meatal antrostomy are usually performed to eradicate the pathological condition in the affected maxillary sinus. Total uncinectomy usually performed. However, it may not necessary to perform total uncinectomy, as it may delay healing, cause injury to the lamina papyracea or nasolacrimal duct, or risk iatrogenic stenosis of the frontal recess. With the advancement of high resolution Computed Tomography [CT] it possible to show how close the surgeon can get to the orbital wall when addressing the uncinate process. The Lamina papyracea, which separates the orbital cavity from the nasal cavity, can itself be very thin and in some occasions touching the uncinate process. Entering the orbital cavity can cause damage to its vital contents including the medial rectus, the optic nerve and the eye itself causing blindness which is an extremely rare, but documented complication of endoscopic sinus surgery [ESS].[8] It is hypothesized that, the removal of the lower half of the uncinate may be sufficient to improve the entire maxillary sinus. In addition, partial uncinectomy is stated to be easier to perform and the associated mucosal injury is less severe. However, it is not practiced on a wide scale, as it is not sufficiently studied.

MATERIALS AND METHODS

The patients attending as outpatients in Govt. E.N.T. Hospital, Koti, Hyderabad, from July 2016 to October 2018 were taken up for study. All cases of chronic sinusitis were admitted and detailed study was carried out. Chronic rhinosinusitis patients were studied in detail and data of 30 patients collected was analyzed with respect to age of the patient, sex distribution, symptomatology and clinical features and response to treatment and follow up.

Relevant routine haematological, biochemical and radiological investigations including CT scan were done in all patients to supplement physical examination.

Patients preparation before CT Scan

A course of antibiotics, nasal decongesants and antihistaminics given for a period of 4 weeks. Nasal decongesants (xylometazoline) – 15 minutes prior to CT scan. Patient asked to blow the nose forcefully just prior to CT scan. CT scan was performed in a Toshiba CT scanner in Radiology department, government ENT Hospital Osmania Medical College, hyderabad.

Direct coronal sections were done in all patients. Limited axial scans parallel to the orbitomeatal line, with the patients in supine position, were also done whenever required. All films are taken without contrast. No intravenous contrast was used.

Inclusion Criteria

1. Patients with mucopurulent, purulent or watery rhinorrhea
2. Patients with unilateral, partial or total nasal obstruction
3. Anterior rhinoscopy and nasal endoscopic examination showing pus in the middle meatus.

Exclusion Criteria

1. Acute sinusitis
2. Oral corticosteroid treatment during the last two months prior to Surgery.
3. Previous sinus surgery
4. Benign or malignant tumour
5. Immune deficiency or immunosuppressed status

Treatment

Anesthesia: Local anesthesia was used in all cases. Pre-operative sedation was used one hour before surgery. Then topical surface anesthesia in the form of lignocaine 10% with adrenalin1/100000 was applied for 10 minutes. The infiltration anesthesia injected into the uncinate process, greater palatine nerve, shenoplatine nerve, middle turbinate and nasal septum was in the form of lignocaine 2% and adrenalin 1/100000.

Position: Each patient lay in the supine position with the head slightly elevated and turned towards the surgeon. In partial uncinectomy group [first group], the lower half of the uncinate process was incised

with a sharp elevator and the infundibular space was identified. Subsequently, half of the uncinate and lower portion of the uncinate attachment was removed using small, straight-cutting forceps. Care was taken not to damage the lamina papyracea or the mucosal surface of the ethmoid bulla. After identification and widening of the maxillary natural ostium, pathological mucosa, polyps, or fungal debris were removed using various forceps, and saline irrigation. It was performed under direct visionusing a rigid, straight, 4-mm-diameter with different degrees [0o, 30oand 70°] endoscope [Karl Storz, Tuttlingen, Germany]. In the second group [total uncinectomy], the surgical technique was similar; the only difference was removal of the entire uncinate process.

Postoperative care: Patients were seen on the 3rd day, after one week, weekly for one month and then monthly for 6 months.in every visit the patients were examined using nasal endoscopy. The 3rd day visit was to clear the ethmoid cavity and the widened maxillary ostium of the blood clot and to apply antibiotic ointment. The weekly visits were to remove any accumulated secretions inside the maxillary sinus and any scabs or dried secretions in the operative field. The monthly visits are to treat any localized edematous mucosa at the area of the antrostomy, until the mucosa inside the maxillary sinus, ethmoid cavity and around the antrostomy became healthy.

Outcome measures were: the time required for the uncinectomy, healing period for the uncinectomy site, incidence of the laminapapyracea and nasolacrimal duct injury, obstruction or stenosis of the frontal recess, and synechia formation in the middle meatus. Operation duration was defined as a time measured from the mucosal incision to the removal of uncinate process and healing period was defined as a complete covering of normal mucosa at the uncinectomy site. Patients were followed regularly – 1 month, 3 months, 6 months and 1 year intervals.

Outcome measures

Outcome measures were: the time required for the uncinectomy, healing period for the uncinectomy site, incidence of the lamina papyracea and nasolacrimal duct injury, obstruction or stenosis of the frontal recess, and synechia formation in the middle meatus. Operation duration was defined as a time measured from the mucosal incision to the removal of uncinate process and healing period was defined as a complete covering of normal mucosa at the uncinectomy site.

Statistical analysis of data: data were coded, tabulated and statistically analyzed using statistical package for social science [SPSS] computer package version 16 [SPSS Inc., USA]. Quantitative data were presented as mean and standard deviation, while categorical data were expressed as relative frequency and percent distribution. Independent samples [t] test was used for comparison between two means, while chi square test was used for comparison between both groups categorical variables. P value < 0.05 was considered significant. For calculation of effectiveness of uncinectomy in relieving symptoms; the number of relieved cases was divide by the original number of cases reporting the specific symptom; and multiplying the results by 100.

RESULTS

This study is the prospective study of surgical outcomes of FESS with partial and total uncinectomy. This study was conducted between the period from july 2016 to October 2018 in a tertiary referral centre. Institutes ethical committee approval was taken prior to conducting this study. We included 60 patients with chronic rhinosinusitis in our study who where subject to FESS in government ENT Hospital with the help of endoscopic evaluation and computed tomography of nose and para nasal sinuses.

Table 1: Demographic details in present study

Age group	**Group 1(PU)**	**Group 2(TU)**
20-30 years	14(46.66%)	10(33.3%)
31-40 years	8(26.66%)	14(46.66%)
41-50 years	8(26.66%)	6(20%)
Gender		
Male	20(66.66%)	16(53.33%)
female	10(33.33%)	14(46.66%)
Presenting complaint		
Nasal obstruction	24(80%)	26(86.66%)
Nasal discharge	26(86.66%)	28(93.33%)
Head ache	16(53.33%)	12(40%)
Post nasal discharge	14(46.66%)	18(60%)

In group 1(PU) maximum patients are in their 2nd decade with 46.66%,3rd and 4th decade 26.66% each. In group 2(TU) maximum patients are in their 3rd decade with 46.66%,2nd decade with 33.33%,5th decade with 20%. In group 1(PU) male to female ratio is 2:1, in group 2(TU)) male to female ratio is 1:1.4. In group 1(PU) 80% patients had nasal obstruction, 86.66% had anterior nasal discharge, 53.33% had headache, 46.66% had post nasal discharge where as in Group 2(TU) 86.66% had nasal obstruction ,93.33% had nasal discharge,40 % had headache and 60% had post nasal discharge as presenting complaints. T test value is 0.2166 and p value is 0.8394. Statistically non significant.

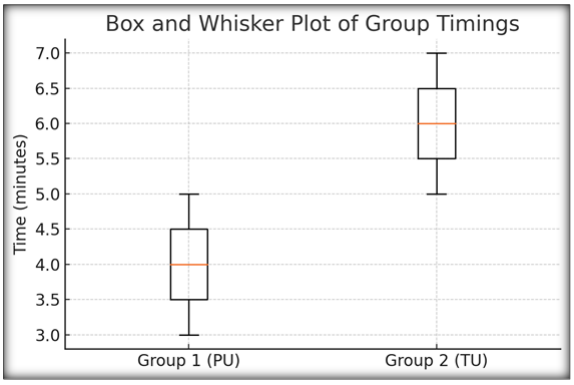

Figure 1: Operative time in both groups of study

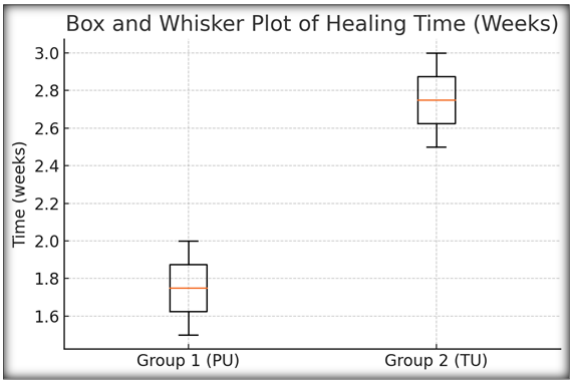

Figure 2: Healing time in both groups

Operative time for partial uncinectomy was around 3-5 min where as for group 2 that is for complete uncinectomy was around 5-7 min.

In partial uncinectomy group healing time was around 1.5- 2 weeks whereas in total uncinectomy group it was 2.5 -3 weeks.

Table 2: Complications in present study

Complications	Group 1(PU)	Group 2(TU)
Orbital injury	0	0
NLD injury	0	0
Synechiae	4(13.33%)	6(20%)

Synechia was the only complication that was seen post operatively in 13.33% of cases in Group 1(PU), whereas it is 20% in group 2 (TU).Improvement in symptoms in both the groups. T value is 0.2774 and p value is 0.7953. Statistically non significant.

Table 3: Pre and post operative in partial uncinectomy group

Symptoms	Pre operative	Post operative
Nasal obstruction	24(80%)	2(6%)
Nasal discharge	26(86.66%)	2(6%)
Head ache	16(53.33%)	4(13.33%)
Post nasal discharge	14(46.66%)	4(13.33%)

In group 1(PU) Persistence of nasal obstruction and nasal discharge was seen in 6% each . persistence of Head ache in 13.33% of cases and post nasal discharge in 13.33%. t =4.804 and p value is 0.0168. statistically significant paired t test.

Table 4: Pre and post operative in total uncinectomy

Symptoms	Pre operative	Post operative
Nasal obstruction	26(86.66%)	6(20%)
Nasal discharge	28(93.33%)	4(13.33%)
Head ache	12(40%)	2(6%)
Post nasal discharge	18(60%)	4(13.33%)

In group 2(TU) Persistence of nasal obstruction in 20% of cases and nasal discharge was seen in 13.33 % cases . persistence of Head ache in 6% of cases and post nasal discharge in 13.33%. t = 5.4678 and p value is 0.0120. statistically significant paired t test.

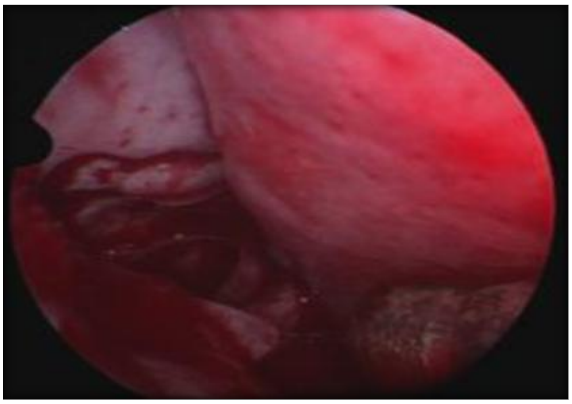

Figure 3: Maxillary osteium after partial uncinectomy

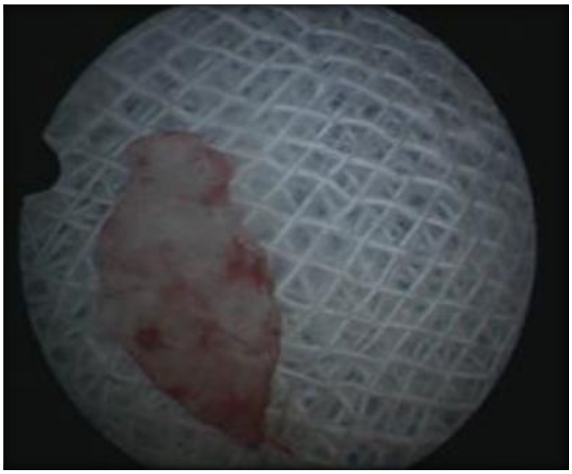

Figure 4: Partially excised uncinated

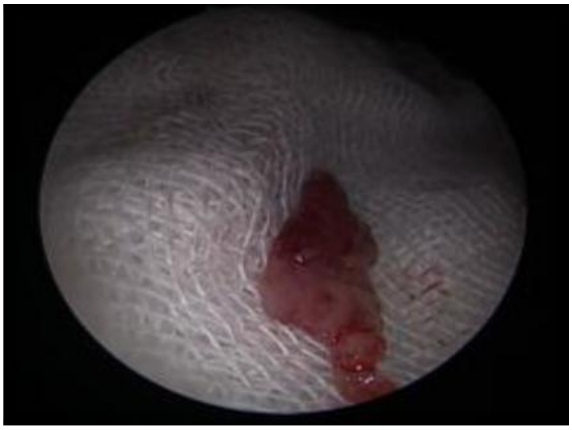

Figure 5: Totally excised uncinated

DISCUSSION

Clinically sinusitis is defined as the condition manifest by an inflammatory response of the following, the mucous membrane of the nasal cavity and para nasal sinuses, fluid within the cavity, and / or underlying bone. Also defined as group of disorders characterized by inflammation of the mucosa of the nose and para nasal sinuses lasting for atleast 12 weeks.

Its physical property (viscosity) is more important than its biochemical constituents. Normal mucous is 98% water and rest is composed of Ig A, lysozymes, mast cells, polymorphs, eosinophils, albumin and globulin. Ciliary activity is highly directional and independent of the body position. It moves the mucous at the rate of 1 cm / minute. In the maxillary sinus mucocilliary movement originates from the floor of the sinus and radiates along the walls of the sinus superiorly to reach the ostium. This upward movement is maintained even in the presence of the more inferior surgical nasoantral window.

The mucous blanket normally contains mast cells, polymorphs, eosinophils, lysozyme, and immunoglobulin A. the upper layer (gel layer) is highly viscous, which enables the cilia to move the blanket forward. The system captures 80 % of the inspired particles larger than 3-5 microns and 60% of those larger than 2 microns and exposes them to mast cells, polymorphs, etc., while sweeping them into the pharynx to be swallowed. In the frontal sinus ciliary clearance proceeds along the septal wall to the roof and medially along the floor to reach the ostium. There is also some recirculation in the frontal recess. Ciliary activity in sphenoid and ethmoid air cells is towards their respective ostium.

Maharani & Putri,[9] analyzed 128 chronic rhinosinusitis patients and found 96% had anatomical variations (e.g., septal deviation, concha bullosa) that significantly correlated with drainage impairment and maxillary sinusitis. A systematic review (6,999 patients) showed that certain anatomical variants—such as concha bullosa, uncinate process variations, and paradoxical turbinate—can obstruct ostiomeatal drainage and contribute to sinus pathology.[10]

A review highlighted that CRS is associated with impaired mucociliary clearance, including reduced ciliary beat frequency and epithelial dysfunction exacerbated by inflammation and microbial toxins.[11] Literatures described the relation between sinonasal dysfunction and impaired mucociliary clearance. Anatomical variations can compromise the ostia and drainage channels of the para nasal sinuses. When there is superadded inflammation it leads to mucosal swelling and apposition, which causes ostial occlusion. This impairs the ventilation and drainage of the sinus leading to decreased pO2, increased pCO2, increased PH and retained secretions. This environment decreases ciliary motility and bacterial over growth resulting in viscid secretions, bacterial exotoxins are also released, further decreasing the ciliary activity resulting in a vicious cycle, which ends in sinusitis. Hence come the basic concept of preserving normal ventilation and drainage of sinuses, to assist the diseased mucosa to recover and regenerate.[12]

Thickening and congestion of the nasal mucosa is a cyclical phenomenon occurring normally. Cycle may repeat in every 50 minutes – 6-hour period. It is controlled by the suprachiasmatic nucleus in the hypothalamus and this control decrease with age. Thickening is seen along the nasal septum, turbinates, and ethmoid sinus, sparing the maxillary, frontal and sphenoid sinuses. Hence during interpretation of CT scan, unilateral thickening upto 3mm in those areas should be considered as physiological and not misinterpreted as pathological thickening. According to Mackay and Lund the osteomeatal complex acts a drainage pathway for maxillary, anterior ethmoids and frontal sinuses.[13]

Posterior osteomeatal unit was considered as part of the sphenoid sinus. In several areas of the osteomeatal complex over crowding due to anatomical variation, two mucosal layers contact each other, thus increasing the likelihood of local impairment of mucociliary clearance. Secretions may then be retained at the site, creating the potential for infection even without ostial closure. Anatomically, the most likely areas of mucosal contact are in the

narrow mucosa lined channels of the middle meatus and the ethmoidal infundibulum.

Chronic rhinosinusitis is defined as an inflammation of the nose and paranasal sinuses lasting more than 12 weeks. Diagnosis was done by typical symptoms and/or computed tomography [CT] scan and/or endoscopic changes26. When conservative treatment failed, endoscopic sinus surgery [ESS] aims to restore mucociliary clearance and ventilation through the natural ostia.

Endoscopic sinus surgery is based on the theory that the maxillary sinus ostium is the most important area in the pathogenesis of chronic and recurrent rhinosinusitis. Obstruction of the ostium is believed to lead to chronic inflammation and eventually to pathologic alterations of the maxillary sinus mucosa. Therefore, surgical opening of the ostium and thus improved drainage and ventilation of the sinus might restore the normal mucosa. There are different opinions concerning the extent of surgery of the ostiomeatal complex. It is considered that removal of the uncinate process alone would be enough to restore the ventilation of the maxillary sinus. In addition, partial uncinectomy was hypothesized to provide the same results as the total uncinectomy without complications associated with total uncinectomy.[14]

The present study was designed to evaluate if partial uncinectomy is effective as much as total removal of the uncinate process in patients with localized maxillary sinus disease. Results of the present study revealed that, both partial and total uncinectomy were comparable as both safety and effectiveness. However, partial uncinectomy had significantly shorter operative time. In addition, partial uncinectomy had low complications when compared to total uncinectomy. However, the difference was statistically non-significant. Also, partial uncinectomy was more effective in relieving anterior nasal discharge, nasal obstruction while total uncinectomy was more effective in relieving headache, anterior nasal discharge and nasal obstruction. The difference was statistically significant. These results are comparable to those reported by Byun et al,[15] who reported that, operation durations and healing periods were statistically significantly shorter than for a total uncinectomy. Injury to the lamina papyracea occurred in one patient who underwent total uncinectomy, but it was minimal and there were no sequelae. Partial uncinectomy removes only a small portion of the uncinate process and has a lower probability of lamina injury than a total uncinectomy. In addition, partial uncinectomy may be helpful to reduce the incidence of synechia between the lateral nasal wall and the middle turbinate. A significant finding of this study was the shorter operative time in the partial uncinectomy group (3–5 minutes) compared to the total uncinectomy group (5–7 minutes), highlighting the time-saving advantage of a limited approach. This is consistent with the findings of Setliff and Parsons,[16] who emphasized that minimal intervention techniques not only reduce surgical time but also limit tissue trauma, thereby potentially improving postoperative recovery [Setliff and Parsons].[16,17] Despite the surgical extent differing between groups, healing time did not vary significantly, with both groups showing mucosal recovery within 1.5–3 weeks. This aligns with the outcomes reported by Dinis and Gomes, who observed comparable recovery rates regardless of the extent of uncinectomy in cases limited to the maxillary sinus [Dinis et al].[18]

Six patients in group 2 showed partial synechia formations. Although the synechiae were divided in the office, such a procedure may cause discomfort, inconvenience, and additional medical cost to the patients. In the present study, nasolacrimal duct obstruction was not reported in both the groups, while stenosis of frontal recess was not reported in any case. These results are comparable to those reported by Friedman et al,[19] 28 who reported that, Nasolacrimal duct obstruction or stenosis of the frontal recess is theoretically possible, but it is also an uncommon side effect. Complication rates were low and similar in both groups. Middle meatal synechiae were observed in 13.33% of PU and 20% of TU cases, requiring minor outpatient interventions. No cases of nasolacrimal duct injury or frontal recess stenosis were reported in either group, supporting findings by Friedman et al., who noted such complications are uncommon when proper technique is followed [Friedman]. In terms of postoperative symptom relief, both procedures were effective. Group 2 (TU) showed slightly better outcomes in relieving anterior nasal discharge, nasal obstruction, and headache, while Group 1 (PU) was more effective in resolving post nasal discharge. However, these differences were not statistically significant, indicating that both techniques offer comparable clinical benefits in selected cases. The choice between partial and total uncinectomy should therefore be tailored to individual anatomy, disease extent, and surgeon preference. As Stammberger,[20] emphasized, preservation of mucosa and natural drainage pathways is critical, and a less invasive approach may be sufficient in localized disease

Finally, it was reported that, partial uncinectomy is applicable in cases of pathological conditions localized within the maxillary sinus. Common disease entities include chronic maxillary sinusitis, fungal sinusitis, antrochoanal polyp and odontogenic sinusitis.[30,31] These data are comparable to surgical indications in the present study which is only chronic sinusitis.

CONCLUSION

Computed Tomography of the para nasal sinuses has improved the visualization of para nasal sinus anatomy and has allowed greater accuracy in evaluating para nasal sinus disease. It evaluates the osteomeatal complex anatomy which is not possible

to such an extent with plain radiographs. Diagnostic nasal endoscopy also helps in better visualization of the middle meatus area and any discharge from the ostium. The surgical technique of partial uncinectomy is not widely used. However, the method can be useful in patients with pathological conditions within the maxillary sinus. In short, partial uncinectomy had shorter operative time, more rapid healing, and lower possibility of complications when compared to total uncinectomy. Both are effective in resolving symptoms with slight better effectiveness in this regard for complete uncinectomy.

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