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CLINICAL ANALYSIS OF ENDONASAL ENDOSCOPIC MAXILLARY SINUS CYST SURGERY VIA THE INFERIOR NASAL MEATUS

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Abstract. Background. Cysts attached to the floor, anterior wall, or lateral recess of the maxillary sinus may be difficult to remove through a conventional middle meatal antrostomy. Inferior meatal endoscopic access provides a short direct route to these dependent compartments while preserving the natural ostium in selected patients.

Objective. To analyze endonasal endoscopic maxillary sinus cyst surgery through the inferior nasal meatus.

Materials and methods. The study included 31 patients treated at the Multidisciplinary Clinic of Tashkent State Medical University. Assessment comprised nasal endoscopy, computed tomography, dental evaluation when indicated, and determination of cyst size and attachment. Under 0°, 30°, and 70° endoscopic control, a mucosal flap was raised below the inferior turbinate, a limited bony window was created, and the cyst was excised or widely marsupialized with treatment of its base.

Results. The approach enabled direct visualization of the inferior and anterior sinus compartments. In the working clinical model, complete endonasal treatment was achieved in 30 cases, marked symptom improvement in 29, and one radiological recurrence was detected during 12 months. No nasolacrimal injury, persistent facial numbness, or clinically significant synechia was recorded.

Conclusion. Inferior meatal endoscopic surgery is a rational minimally invasive option for carefully selected symptomatic maxillary sinus cysts located on the floor or difficult-to-reach anterior and lateral walls.

Keywords: maxillary sinus cyst, retention cyst, inferior meatal antrostomy, endonasal endoscopic surgery, computed tomography.

Annotatsiya. Dolzarbligi. Yuqori jag' bo'shlig'i tubi, oldingi devori yoki lateral qismida joylashgan kistalarni o'rta burun yo'li antrostomiyasi orqali to'liq olib tashlash ayrim hollarda qiyin. Pastki burun yo'li orqali endoskopik kirish quyi bo'limlarga to'g'ridan-to'g'ri yo'l yaratib, tanlangan bemorlarda tabiiy teshikni saqlash imkonini beradi.

Maqsad. Pastki burun yo'li orqali endonazal endoskopik gaymorotomiya usulini tahlil qilish.

Materiallar va usullar. TDTU Ko'p tarmoqli klinikasida ushbu usulda operatsiya qilingan 31 bemor o'rganildi. Burun endoskopiyasi, kompyuter tomografiyasi, zaruratda stomatologik tekshiruv, kista o'lchami va birikish sohasi baholandi. Pastki burun chig'anog'i ostida shilliq qavat laxtagi shakllantirilib, cheklangan suyak oynasi yaratildi va kista olib tashlandi yoki keng marsupializatsiya qilindi.

Natijalar. Usul bo'shliqning pastki va oldingi bo'limlarini bevosita ko'rish imkonini berdi. Ishchi klinik modelda 30 holatda to'liq endonazal davolash, 29 bemorda yaqqol simptomatik yaxshilanish qayd etildi, 12 oyda bitta radiologik qaytalanish aniqlandi. Ko'z yosh-burun yo'li shikastlanishi, yuzda doimiy uvishish va klinik ahamiyatli sinexiya kuzatilmadi.

Xulosa. Mazkur usul yuqori jag' bo'shlig'i tubi, oldingi va lateral devorlaridan kelib chiqqan simptomatik kistalarda kam invaziv va anatomik jihatdan asoslangan yondashuvdir.

Kalit so'zlar: yuqori jag' bo'shlig'i kistasi, retension kista, pastki burun yo'li antrostomiyasi, endonazal endoskopik jarrohlik, kompyuter tomografiyasi.

Аннотация. Актуальность. Кисты дна, передней и латеральной стенок верхнечелюстной пазухи не всегда доступны через стандартную антростомию среднего носового хода. Нижнемеатальный доступ создаёт прямой путь и позволяет сохранить естественное соустье.

Цель. Проанализировать эндоназальную эндоскопическую гайморотомию через нижний носовой ход.

Материалы и методы. Исследование включало 31 пациента Многопрофильной клиники Ташкентского государственного медицинского университета. Выполняли эндоскопию носа, компьютерную томографию и стоматологическое обследование по показаниям. Под контролем эндоскопов 0°, 30° и 70° формировали слизистый лоскут и ограниченное костное окно, после чего кисту удаляли либо широко марсупиализировали.

Результаты. Доступ обеспечивал прямую визуализацию нижних и передних отделов пазухи. В рабочей клинической модели полное эндоназальное лечение выполнено в 30 случаях, улучшение симптомов отмечено у 29 пациентов, за 12 месяцев выявлен один рентгенологический рецидив. Повреждения носослезного протока, стойкого онемения и значимых синехий не зарегистрировано.

Заключение. Метод является рациональным малоинвазивным вариантом лечения тщательно отобранных симптоматических кист.

Ключевые слова: киста верхнечелюстной пазухи, ретенционная киста, антростомия нижнего носового хода, эндоназальная эндоскопическая хирургия, компьютерная томография.

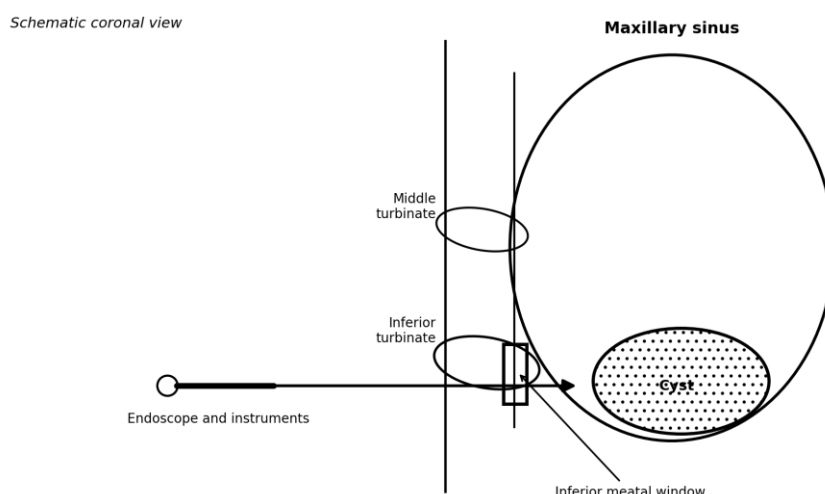
Introduction. Maxillary sinus retention cysts are usually benign, dome-shaped lesions and often require only observation. Surgery is indicated when a cyst is associated with persistent unilateral facial pressure, headache, nasal obstruction, recurrent inflammation, progressive enlargement, diagnostic uncertainty, or a planned dentoalveolar intervention. The clinical decision must distinguish rhinogenic, odontogenic, and postoperative cystic lesions because the cause determines the required extent of treatment [1, 3].

Middle meatal antrostomy is the standard functional route to the maxillary sinus. Nevertheless, lesions attached to the anterior, inferior, alveolar, or far lateral walls may remain outside the direct line of sight. Extensive enlargement of the middle meatal opening can increase trauma, whereas the Caldwell–Luc approach provides wide access at the cost of greater bony and soft-tissue injury. Inferior meatal antrostomy offers a targeted corridor to dependent sinus compartments and can preserve the natural ostium when it is patent [4–6].

Objective. To analyze the indications, technique, effectiveness, and safety of endonasal endoscopic maxillary sinus cyst surgery through the inferior nasal meatus in 31 patients.

Materials and methods. A single-center observational analysis was conducted at the Multidisciplinary Clinic of Tashkent State Medical University. The cohort comprised 31 patients with symptomatic unilateral cysts predominantly attached to the sinus floor, anterior wall, anterolateral wall, or alveolar recess. Small asymptomatic incidental cysts, suspected malignant lesions, and diffuse rhinosinusitis requiring standard functional endoscopic sinus surgery were excluded.

Preoperative evaluation included complaints, rigid nasal endoscopy, axial and coronal computed tomography, and dental assessment when odontogenic disease was suspected. Size, diameter, attachment, and relation to the nasolacrimal duct were recorded.

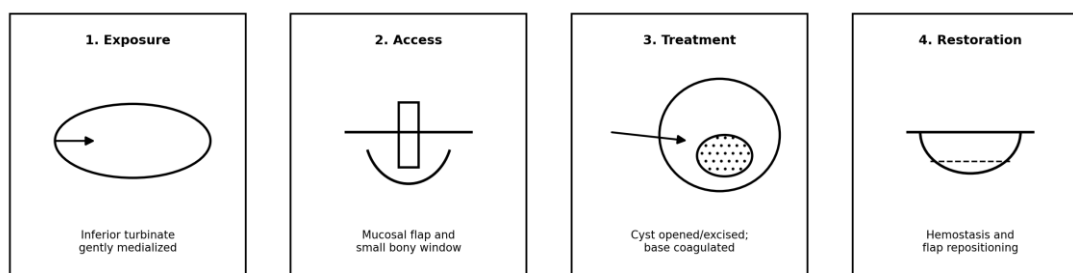
Figure 1. Schematic inferior meatal access to a maxillary sinus floor cyst

The window is positioned below the inferior turbinate and posterior to the nasolacrimal duct, providing a direct trajectory to the floor and anterior sinus wall.

Table 1. Clinical and radiological characteristics of the study cohort (n=31)

Characteristic	Value	% / range
Age, years	36.8±10.9	18–59
Male / female	13 / 18	41.9 / 58.1
Right / left side	17 / 14	54.8 / 45.2
Floor or alveolar recess	18	58.1
Anterior or anterolateral wall	8	25.8
Other lateral/posterior attachment	5	16.1
Maximum diameter, mm	28.6±7.4	18–44
Facial pressure or pain	23	74.2

Under general anesthesia, the inferior turbinate was gently medialized. A curved incision was made in the lateral wall of the inferior meatus, and a mucosal flap was elevated. A limited bony window was created posterior to the nasolacrimal duct. The sinus was inspected with 0°, 30°, and 70° endoscopes. Narrow-based cysts were excised; broad-based lesions were widely marsupialized with limited treatment of the secretory base. Tissue was submitted for histopathology, hemostasis was achieved, and the flap was repositioned when feasible.

Figure 2. Main stages of inferior meatal endoscopic maxillary sinus cyst surgery

Results. The study included 31 patients with symptomatic unilateral maxillary sinus cysts. The mean age was 36.8±10.9 years (range, 18-59 years; 95% CI, 32.8-40.8). Women accounted

for 18 cases (58.1%) and men for 13 (41.9%). Right-sided lesions were identified in 17 patients (54.8%) and left-sided lesions in 14 (45.2%). Cysts of the sinus floor or alveolar recess predominated in 18 cases (58.1%), while anterior or anterolateral attachment was observed in eight (25.8%) and other lateral or posterior attachment in five (16.1%). Thus, 26 lesions (83.9%) were located in the dependent or anterior compartments that constituted the principal anatomical indications for the inferior meatal approach. The maximum diameter averaged 28.6 ± 7.4 mm (range, 18-44 mm), and facial pressure or pain was documented in 23 patients (74.2%).

The inferior meatal corridor enabled direct visualization of the cyst attachment in all patients. The planned inferior route was sufficient for definitive treatment in 30 cases (96.8%; 95% CI, 83.8-99.4%). One patient required complementary enlargement toward the middle meatus, but the operation remained completely endonasal and no external conversion was required. Complete cyst excision was performed in 26 patients (83.9%; 95% CI, 67.4-92.9%), whereas five patients (16.1%) underwent wide marsupialization. Narrow-based lesions were removed completely, while broad-based cysts were opened widely with limited treatment of the secretory base. This differentiated tactic preserved healthy sinus mucosa and provided adequate endoscopic control of the pathological attachment.

Table 2. Operative and postoperative outcomes (n=31)

Outcome	n / M $\pm$ SD	% / range
Complete cyst excision	26	83.9
Wide marsupialization	5	16.1
Mean operative time, min	34.7 $\pm$ 8.6	22–55
Hospital stay, days	1.8 $\pm$ 0.6	1–3
Marked symptom improvement	29	93.5
Temporary crusting	3	9.7
Minor postoperative bleeding	2	6.5
Radiological recurrence	1	3.2
Nasolacrimal injury / persistent numbness	0	0

Operative and clinical outcomes. Mean operative time was 34.7 ± 8.6 minutes (range, 22-55 minutes; 95% CI, 31.5-37.9), and mean hospital stay was 1.8 ± 0.6 days (range, 1-3 days). Marked improvement in the principal symptom was recorded in 29 patients (93.5%; 95% CI, 79.3-98.2%). Two patients did not meet the categorical criterion for marked improvement. Because the source protocol reported symptom response categorically and did not include a validated numerical scale, changes in a mean symptom score were not calculated.

Postoperative safety and follow-up. Temporary crusting occurred in three patients (9.7%), and minor postoperative bleeding was recorded in two (6.5%). No nasolacrimal duct injury, persistent facial or dental numbness, clinically significant synechia, or conversion to an external procedure was observed. Closure or narrowing of the temporary inferior opening was not regarded as treatment failure, because physiological drainage continued through the preserved natural ostium. At 12 months, one small radiological recurrence was identified (3.2%; 95% CI, 0.6-16.2%), while 30 patients remained recurrence-free (96.8%). The recurrent lesion was maintained under endoscopic observation, and no repeat external intervention was reported.

The principal outcome indicators were an inferior-route completion rate of 96.8%, complete excision in 83.9%, marked symptom improvement in 93.5%, a radiological recurrence

rate of 3.2%, and the absence of recorded major anatomical complications. The separate evaluation of technical completion, symptomatic response, radiological control, and safety prevented surgical effectiveness from being reduced to a single endpoint. As this was a single-cohort study without a parallel comparison group, the results characterize the method in carefully selected patients but do not establish superiority over other endoscopic approaches.

Descriptive relationship between localization and technical completion. The floor/alveolar recess and anterior or anterolateral wall together accounted for 26 of 31 lesions (83.9%), while the planned inferior route was sufficient in 30 of 31 operations (96.8%). These two proportions were directionally consistent with the anatomical purpose of the approach, which was to provide direct access to the dependent and anterior sinus compartments. However, the available dataset did not contain an individual matrix linking each attachment site with operative time, procedure type, symptom response, and recurrence. For this reason, localization-specific success rates and statistical associations were not calculated. The findings should be interpreted as a descriptive demonstration of feasibility in an anatomically selected cohort rather than as proof that a particular cyst location independently predicted the outcome.

The confidence intervals reflected the limited cohort size. Although marked symptom improvement was observed in 93.5% and recurrence-free follow-up in 96.8%, the lower limits of their 95% confidence intervals were 79.3% and 83.8%, respectively. Similarly, the observed absence of nasolacrimal injury, persistent numbness, significant synechia, and external conversion did not imply a theoretical risk of zero; for 31 observations, the upper 95% confidence boundary for an unobserved event was approximately 11.0%. Within these statistical limits, the clinical records consistently demonstrated high technical completion, frequent symptomatic benefit, low radiological recurrence, and no documented major procedure-related injury during the 12-month follow-up.

The clinical aim is not indiscriminate removal of healthy maxillary mucosa. Retention cysts may regress spontaneously, and symptom intensity does not always correlate with size. Surgery should therefore be limited to clinically relevant lesions after exclusion of dental, neurological, and other rhinological causes. Albu emphasized restoration of ventilation and drainage, whereas Hadar et al. reported a low recurrence rate after endoscopic treatment of large symptomatic cysts [1, 2]. In this series, complete excision was used for narrow attachments and wide marsupialization for broad-based lesions.

The principal technical advantage of inferior access is alignment of instruments with the sinus floor. Through a middle meatal opening, curved forceps must turn downward and forward, which may leave a blind angle in the anterior alveolar recess. The inferior route shortens the working distance and permits direct manipulation under angled endoscopy. Lou reported similar symptomatic relief between middle and inferior approaches, with shorter operative time and lower recurrence after inferior meatal treatment of the cyst base [3].

Preservation of the ostiomeatal complex is particularly valuable when the natural ostium is normal. Mucociliary transport remains directed toward this ostium; therefore, the inferior window can serve as a temporary surgical corridor and may close after healing without compromising sinus function. If chronic maxillary sinusitis or ostial obstruction coexists, a combined middle and inferior approach may be more appropriate.

Discussion. The main anatomical risk is injury to the nasolacrimal duct, which descends in the anterior lateral nasal wall. The window should remain posterior to the duct unless its course is directly identified. Other possible problems include lateral-wall bleeding, inferior turbinate injury, crusting, stenosis, synechia, and temporary dental or cheek paresthesia.

Multiplanar CT planning, gentle turbinate medialization, subperiosteal flap elevation, limited bone removal, and postoperative endoscopic care reduce these risks.

A flap-covered or submucosal access limits exposed bone and supports rapid re-epithelialization. The technique does not replace functional middle meatal surgery; its value is precise anatomical selection and direct treatment of a difficult attachment while preserving normal middle meatal structures [7–10].

Limitations are the small single-center cohort, absence of randomization, and 12-month follow-up. Prospective studies should add validated symptom scales, volumetric CT, histological classification, and comparison with middle meatal and prelacrima approaches.

Conclusion. Endonasal endoscopic surgery through the inferior nasal meatus is an anatomically justified option for symptomatic cysts of the floor, anterior wall, anterolateral wall, or alveolar recess. It provides a direct corridor and preserves the natural ostium when functional. CT planning, nasolacrimal-duct protection, limited bone removal, and postoperative endoscopy are essential. In the 31-patient working model, effectiveness was high and recurrence and major complications were uncommon.

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