



Frontoethmoid Mucocele – A Series Of Combined Approach Management

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Abstract

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Introduction

Mucocele is a collection of mucous into sinus cavities along with desquamated epithelium. They develop when the physiological sinus drainage is impaired [1]. This collection eventually forms a well-defined mass that over time grows beyond the bony limits of the sinus cavity. In addition, these expansile cysts have bony destruction properties.

Mucoceles are cysts that mimic space-occupying lesions and their proximity to vital structures such as orbit and cranium is significant enough to hasten the process of appropriate diagnosis and treatment. Varied factors can be associated with an ostial block such as allergy, infection, any surgical manipulation, and nasal mass such as polyps or tumors. They appear in sinuses in order of the following preference, the first being Frontal followed by Ethmoids. Mucoceles are rare in the Maxillary and sphenoid sinus [2,3]. Symptomatology of mucocele varies from milder symptoms like nasal blockage to locally advanced signs such as displacement of the eyeball and swelling around the eye. Their slow-growing nature conceals their clinical presentation at earlier stages. To add to this their varied presentation may delay diagnosis and treatment.

The presence of cytokines such as Interleukin-1, 6, and 8 which are potent osteolytic along with E selectin (Endothelial leukocyte adhesion molecule)

and ICAM (Intercellular adhesion molecule) in the mucocele tissue is said to be the possible hypothesis of bone erosion around the mucocele [4,5].

Lynch described stenting of the Frontal sinus outflow tract to avoid these complications. The placement of a stent connecting the nasofrontal area postoperatively helps mucosalisation of the outflow tract, formation of neo-ostium, and avoidance of scarring [6]. Various studies have been done to gauge the type of stent to be used, the material of the stent, the duration of the stent to be placed in situ, and approaches to frontal sinus pathology.

Management of frontal sinus pathologies remains a domain of concern despite the technical nuances of endoscopes. Surgical manipulation in cases of sinusitis, mucoceles, or space-occupying lesions despite good resection can lead to failure due to scarring and stenosis of the ostium.

In this series, we present 16 patients operated on in a span of 5 years for frontoethmoidal mucocele. The cases we came across even though diagnosed histopathologically as mucocele presented in varied fashion and their operative findings differed as well. We share our experience with dealing with frontoethmoidal mucocele and our experience with stenting the nasofrontal region.

Methods:

A retrospective analysis was done of the 16 cases of frontoethmoidal mucocele that were presented to us over 5 years. These cases were diagnosed and surgically managed with combined endoscopy and an external approach. This article overviews their demographic data, symptomatology, surgical findings, and postoperative complications if any.

All patients underwent preoperative contrast-enhanced CT scanning for better preoperative evaluation and understanding of the extent of the lesion. Also, for visualizing the bone erosion and involvement of orbit and cranial cavity if any. In certain cases, MRI was done to rule out any orbital or intracranial extension.

All surgeries were performed under general anesthesia. Surgical management with a combined approach was planned for the same. The external approach used was a classic Howarth lynch incision was taken. The endoscopic approach was done with a 4mm 0-degree scope.

Endoscopic approach:

In all cases, the nasal cavity was prepped with a nasal pack soaked in a nasal solution made of lignocaine 4% with 4cc of adrenaline. The solution was diluted in cases of hypertension. After diagnostic nasal endoscopy, uncinectomy was done and the bulla ethmoidalis was accessed. Anterior and Posterior ethmoidal cells were dissected and the area of the frontal recess was exposed. After external dissection, a lumen adequate to fit the stenting tube is created.

External approach:

A Howarth lynch incision was taken for the external approach was taken. Layers were dissected bluntly to access the orbicularis oculi muscle up to the orbital rim. Parallely a periosteal incision was taken to allow adequate exposure of the periosteum. The orbital periosteum was then elevated and the orbital roof is visualized. The frontal sinus floor is visualized. In some cases, the floor was already breached by long-standing mucocele. In any case of difficulty in identifying the ostium, the sinus was probed endoscopically. The frontoethmoidal mucocele after adequate surgical exposure was then cleared and an adequate opening was made for the accommodation of the stent for better drainage of the sinus.

Stenting: A silicone single lumen stent was used in all cases that were threaded externally from the floor of the frontal sinus via the external approach and guided into the nasal cavity. The stent was then pulled and fixed in position endoscopically and then secured with a 4-0 vicryl suture to the ala of the nose. The stent was kept in place for about 6 weeks for better drainage of the sinus and mucosalisation of the outflow tract.

The periosteum and skin were closed in layers. All patients were followed up postoperatively with a diagnostic nasal endoscopy at 6 weeks, 6 months, and 1 year and additionally as per their clinical course if necessary.

Figure : Post-Operative Resolved Swelling Around The Left Eye



Figure : Minimal Post Operative Lid Scarring Around Left Eye



Figure: 35-Year Female With Swelling Around Medial Canthus Region



Figure: Pre And Post Operative Images Of Left Frontoethmoidal Mucocele



Figure: Pre And Post Operative Images Of 54 Year Old Male With Right Frontoethmoidal Mucocele



Figure: Intra Operative Removal Of Mucocele

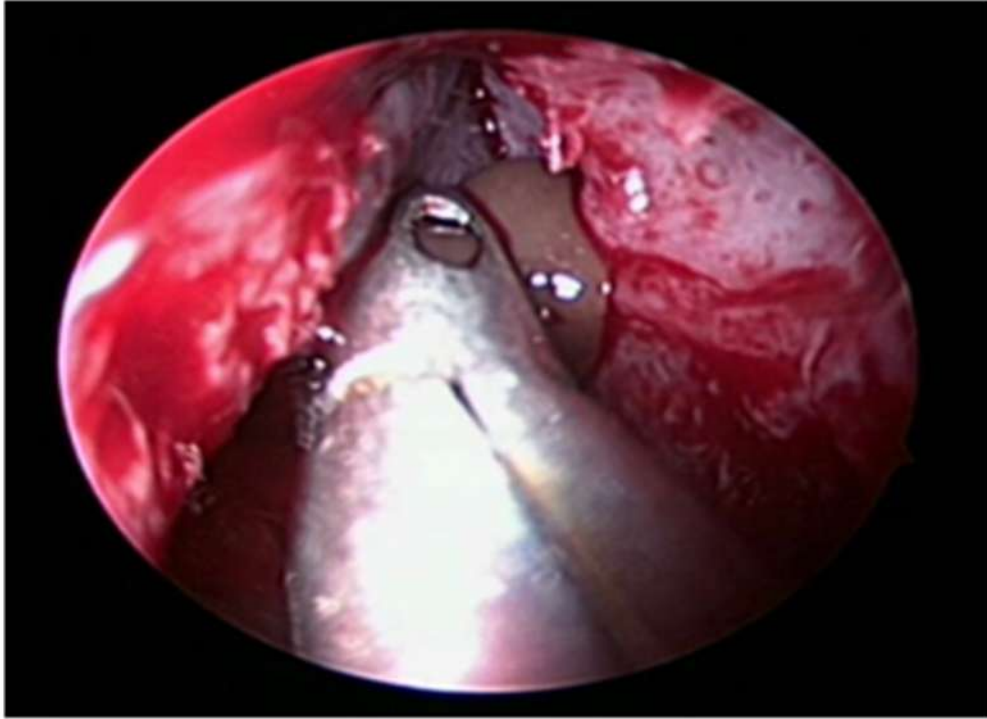


Figure: Placement Of Stent Around The Frontal Recess Region

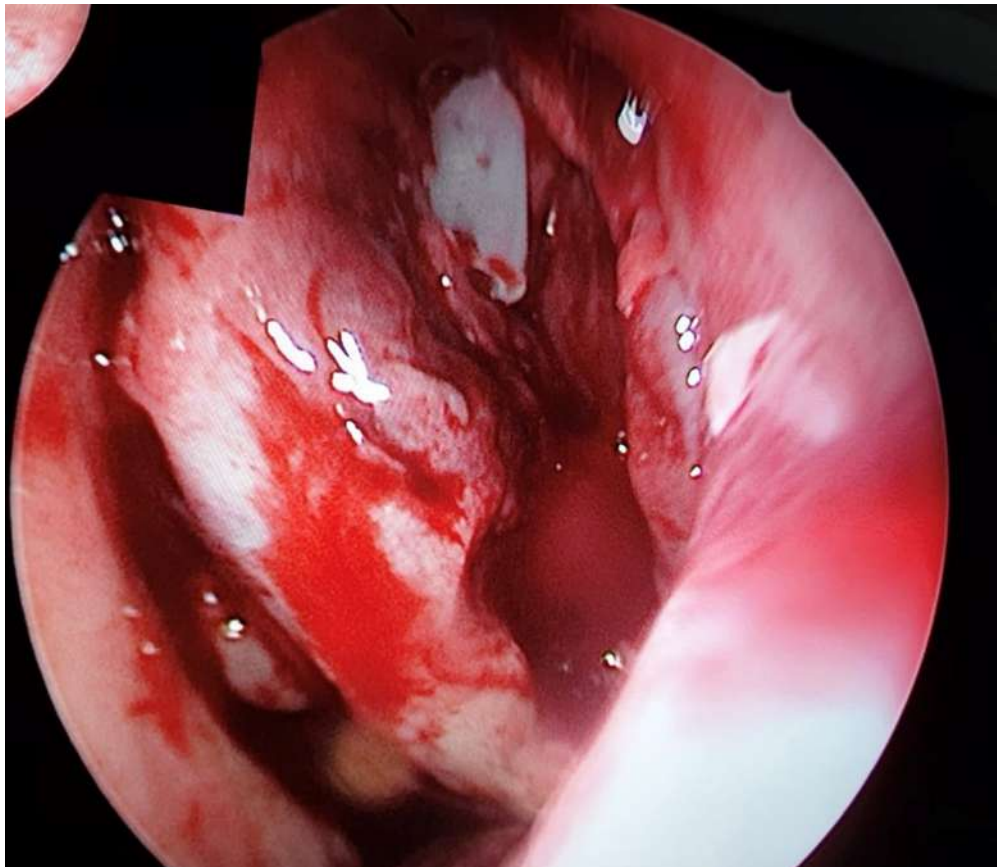


Figure: Howarth Incision Taken For External Approach

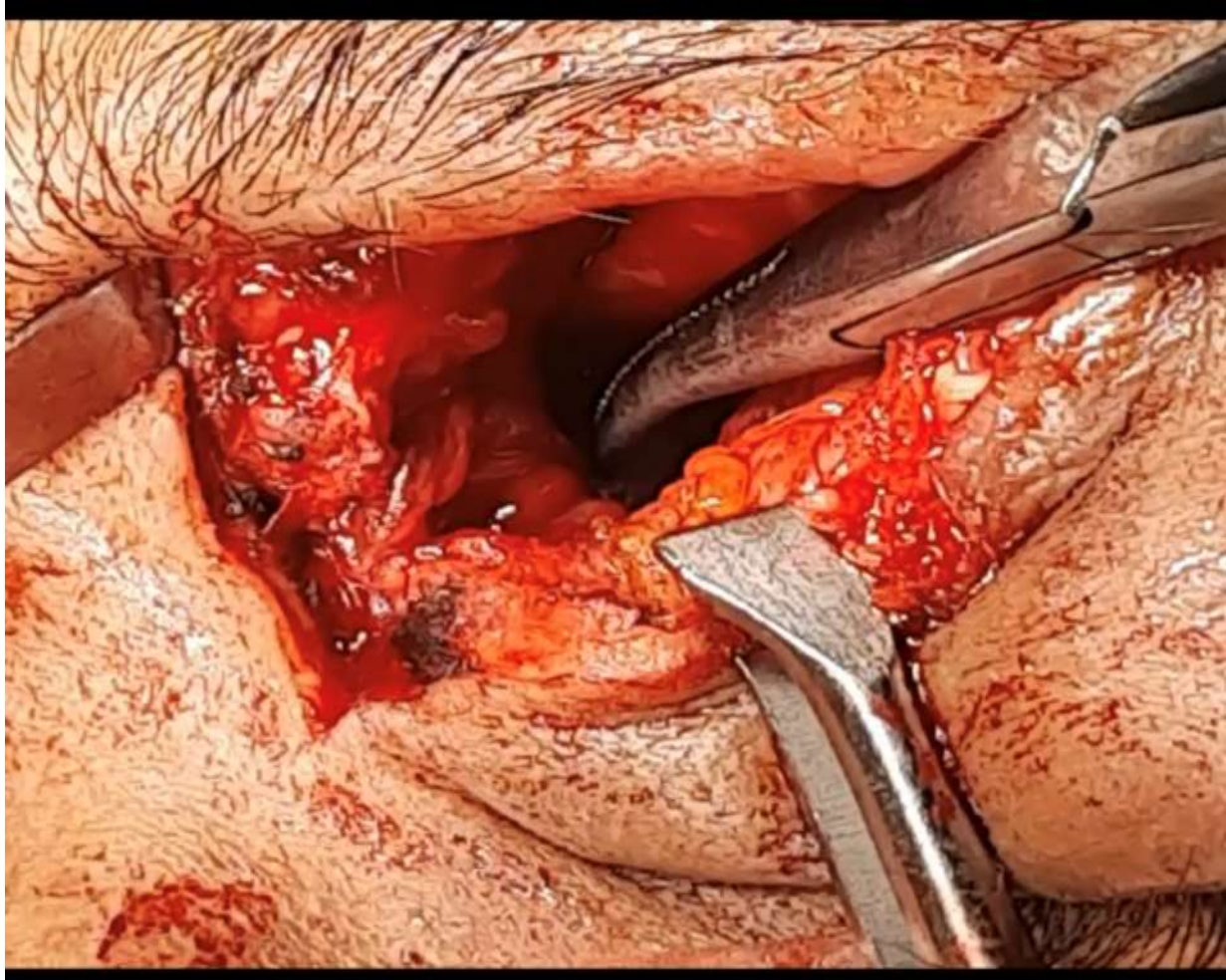


Figure: CT Scan (Coronal View) Showing The Extent Of The Mucocele

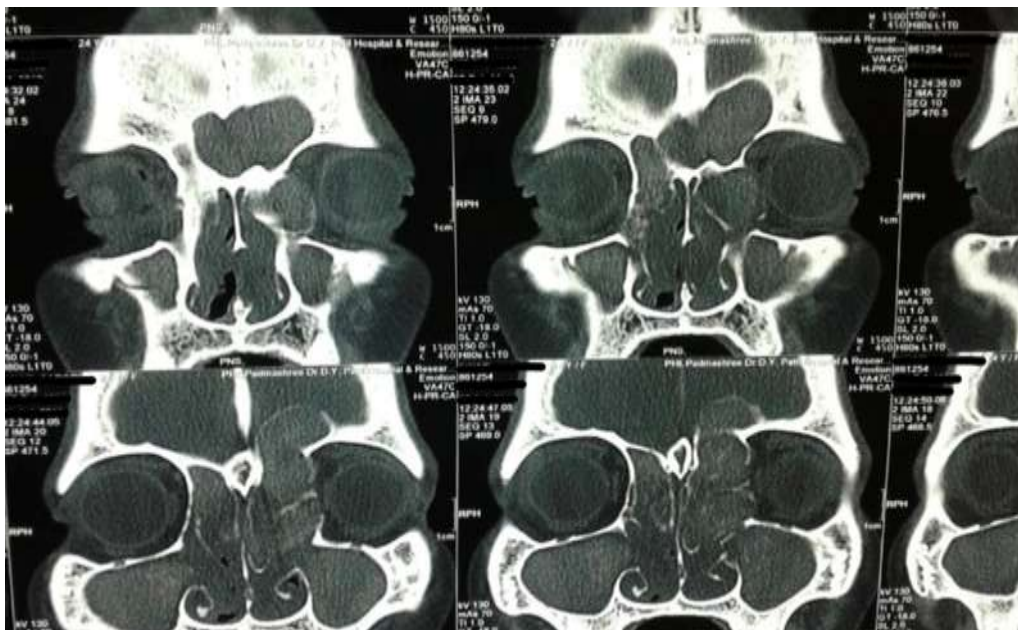


Figure: Pre-Operative CT Scan Of The Paranasal Sinus Showing Huge Left Frontoethmoid Mucocele



Figure: Preoperative CT Scan (Axial View) Showing The Extent Of The Mucocele

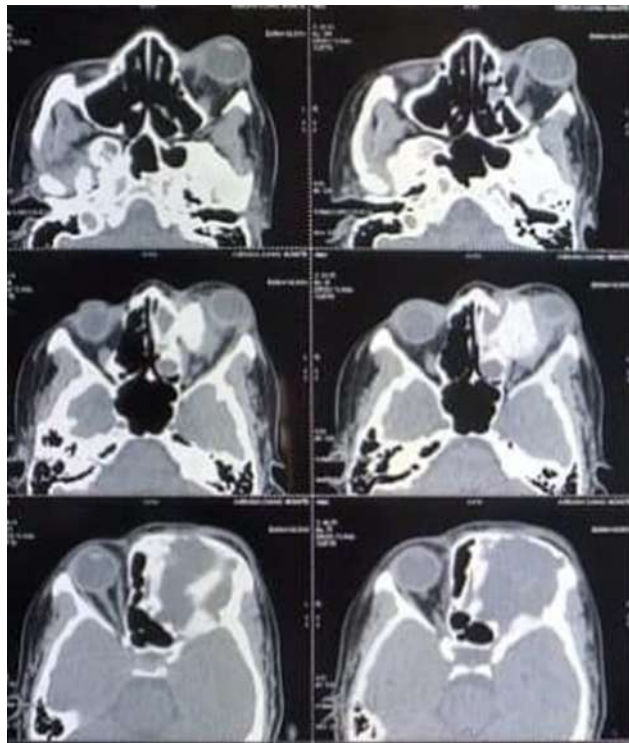


Figure: Preoperative CT Scan



Results:

Table 1 provides demographic details, clinical presentation, operative findings, and post-operative complications of all subjects.

We performed 16 surgeries which included 10 male and 6 female patients. All cases were postoperatively confirmed cases of mucocele with histopathological examination. They presented mainly with complaints of swelling and proptosis which was non-axial. Along with it headache was also a common complaint.

All patients underwent combined approach resection of the mucocele with postoperative stenting of the nasofrontal region for which a silicon tube was used.

No major complications such as CSF leaks were encountered during any of these procedures.

Postoperatively the stent was placed in situ for about 6 weeks after which it was electively removed. The shortest duration was 7 days.

The postoperative follow-up included nasal endoscopy showed a patent ostium and no evidence of stenosis in the outflow tract. Postoperative lid scarring was seen in 2 cases which was mild so no intervention was done.

Recurrence has not been encountered yet in any of these cases yet. Cosmetic results in all cases were good and eye movements improved drastically.

| Sr no | Age | Sex | Lateral ity | Clinical features | Intraoperative finding | Complicati on |
|-------|-----|-----|-------------|--|--|---------------|
| 1 | 22 | M | Right | Nasal Blockage, Facial Heaviness, Headache, Periorbital Swelling | Multiple Mucocele Visualized In Ethmoid And Frontal Sinus. | None |
| 2 | 77 | M | Left | Proptosis, Pain, Periorbital Swelling, Diminution of Vision | Frontoethmoidal Mucocele With Erosion of Sinus Floor and Superomedial Orbital Wall | Lid Scarring |
| 3 | 35 | F | Left | Swelling, Proptosis, Restricted Eye Movements | Large Mucocele in Frontal and Ethmoid Sinuses | None |
| 4 | 54 | M | Right | Proptosis, Nasal Blockage, Swelling | Frontoethmoidal Mucocele On Right Side | None |

| | | | | | | |
|----|----|---|-------|-------------------------------------|--|--------------|
| 5 | 27 | F | Left | Proptosis, Headache | Large Frontoethmoid Mucocele with Erosion of The Roof of The Frontal Sinus | None |
| 6 | 48 | F | Left | Swelling, Nasal Blockage, Headache | Mucocele In Frontoethmoid Region with Defect in Floor or The Frontal Sinus | Lid Scarring |
| 7 | 50 | M | Right | Swelling, proptosis, headache | Mucocele in frontal and ethmoid sinuses | None |
| 8 | 55 | M | Right | Proptosis, Nasal Blockage, Swelling | Mucocele In Frontoethmoid Region with Defect in Floor or The Frontal Sinus | Stenosis |
| 9 | 37 | M | Left | Proptosis | Mucocele in Frontal and Ethmoid Sinuses | None |
| 10 | 60 | F | Left | Proptosis and headache | Mucocele in Frontal and Ethmoid Sinuses | Stenosis |
| 11 | 53 | F | Right | Proptosis | Mucocele in Frontal and Ethmoid Sinuses | None |
| 12 | 42 | M | Right | Proptosis | Mucocele in Frontal and Ethmoid Sinuses | None |
| 13 | 64 | M | Left | Swelling, proptosis, headache | Mucocele in Frontal and Ethmoid Sinuses | Stenosis |
| 14 | 53 | M | Right | Swelling, proptosis, headache | Mucocele in Frontal and Ethmoid Sinuses | None |
| 15 | 51 | F | Left | Headache, proptosis | Mucocele in Frontal and Ethmoid Sinuses | None |
| 16 | 49 | M | Right | Headache, proptosis | Mucocele in Frontal and Ethmoid Sinuses | None |

Discussion:

Frontal sinus despite the advances in endoscopic surgeries and the invention of better scopes with precision instruments remains a challenge for rhinologists. The efficacy of stenting the FSOT is a grey area in some cases. Though many authors report it to be extremely beneficial in aiding mucosalisation of the outflow tract

Weber et al. in his study demonstrate good outcomes (80% patency) with silicone stenting in comparison to non-stented groups (33% patency) by conducting CT scans and diagnostic endoscopy postoperatively

[7]. Contrary to this Banhiran et al. in their study to gauge the effects of stenting in long run with a silastic stent in their post-operative EMLP cases, found no significant difference between stented and non-stented cases [8].

A case reported by Mohd Khan et al. reported a rare complication of stenting of the frontal sinus. They reported migration of the stent and breach of the lamina papyracea with the use of T tube Biliary stent [9]. In addition, they reported granulation tissue formation due to foreign body reactions created by the stent. Multiple articles also report

Hypersensitivity, mucosal inflammations, and repeated infections as well secondary to stenting [10]. However, they do not clarify if it is secondary to the duration or any specific material leading to the above-mentioned complications.

In our experience with stenting in different scenarios, we came across 3 cases with stenosis of the frontal outflow tract. Lid scarring was seen in 2 cases. Granulation tissue formation was seen in 1 case which was treated with topical steroids and antibiotics. However, repeated infections, polyp formation, stent migration, stent occlusion, and cerebrospinal fluid leak were not observed in any of our post-operative cases.

Duration of stenting is another criterion of discussion. The precise duration of stenting required to achieve the best outcome and lesser complications is a matter of discussion. A case report published in 2009 by Ivana et al. reports a case of revision frontal sinus surgery in which the stent placed was followed up after 21 months and was normally placed and free of any symptoms of stenosis [11]. A study done in 2000-06 by Orlandi established a mean period of about 32.6 months for stenting[12].

On the other hand, within 12 months of stenting, Mohammed A. Khan et al reported a case of stent migration and breach in the medial wall of orbit with granulation tissue formation [9]. In our experience with frontal sinus stenting, the longest stent placement duration was 6 weeks after which they were electively removed and the shortest was 7 days as there was spontaneous expulsion of the stent. In either scenario, the post-operative nasal endoscopy did not reveal any scarring or stenosis of the ostium in the cases with short-term stenting. In a retrospective study done in the year 2000 by Weber et al on 12 patients with 21 stents, they conclude that long-term stenting of 6 months is more effective than the stents removed earlier[13].

Long-term stenting may seem beneficial in the formation of the neo-ostium and maintenance of the outflow tract and better sinus drainage. But there is no hard-core evidence to support the duration of stenting with its risks and benefits and removal.

A variety of materials have been used for the stenting of nasofrontal communication. Finn Amble et al. used thin silicone rubber sheeting in 164 patients

after the Modified external lynch procedure and found a 96% success rate and the patients were asymptomatic [14]. A silicone T tube was used as a stent in the FSOT by Yamasoba and they observed 16 out of 18 patients showed complete mucosalisation of the outflow tract, however, 2 showed stenosis formation [15]. Freeman developed a frontal sinus stent, a 20 mm silicone tube that is bi-flanged. This was fashioned in a way to avoid scarring, stenosis, and synechiae formation [6,16]. In our operative experience long silicone tubing works as a cost-effective yet appropriate material for stenting.

Another modality of surgical treatment for frontoethmoidal mucocele is the Draf procedure. Draf type II A/B would be alternate surgical management to combined approach. Complications such as recurrent sinusitis in remedial ethmoidal cells and scarring around the frontal recess and infundibulum region, irritation of the frontal sinus mucosa due to mechanical trauma remains an area of concern in type II Draf procedure [17]. In our experience with the other cases of mucocele which were managed with the Draf technique, no significant difference was observed in the postoperative outcome between Draf II surgery and combined approach management.

Conclusion: The outcome in cases of frontal sinus pathology despite endoscopic advances remains an area of concern for any sinus surgeon. Its complex anatomy, narrow pathway, and hindrance due to bony landmarks for endoscopes are varied challenges faced. Success rates depend on the formation of a wide enough ostium for adequate aeration and drainage of the sinus, preservation of its natural mucosa, and patency of the sinus outflow. And the long-term results of the patency of the tract are hampered due to postoperative stenosis. Stenting proves to be a good option in frontal sinus/recess surgeries to maintain its functions and hence give excellent postoperative results.

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