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The Hybrid Lid Crease Approach to Address Lateral Frontal Sinus Disease With Orbital Extension

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Abstract

Objective—This study aimed to describe the hybrid lid crease approach in conjunction with functional endoscopic sinus surgery (FESS) for lateral frontal sinus disease with orbital extension.

Study Design—Retrospective case review.

Methods—Patients undergoing hybrid lid crease approach with FESS for frontal sinus disease were reviewed retrospectively. Surgical indications consisted of inverting papilloma with extension into the frontal sinus (n = 1) and frontal sinus mucocele (n = 2). Inclusion criteria included presence of disease in the lateral frontal sinus with extension into the orbital space and erosion of the superior orbital rim. Preoperative and postoperative parameters included complete ophthalmologic exam, endoscopic exam, and computed tomography scan.

Results—We were able to access the frontal sinus and orbit in all 3 cases and address sinus pathology of the lateral frontal sinus and orbit using the lid crease approach with FESS. All patients had improvement in ophthalmologic symptoms and interval disease resolution and were satisfied with their postoperative lid crease incision.

Conclusion—The lid crease approach offers direct access to the frontal sinus with minimal dissection through a well-hidden incision. In our case series of lateral frontal sinus pathology with

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A video, available as supplementary material, depicts the hybrid lid crease approach for removal of a frontal sinus inverted papilloma including removal of the ectopic bony source.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

orbital extension, the hybrid lid crease approach with FESS allowed complete eradication of disease without recurrence.

Keywords

frontal sinus; endoscopic; lid crease; inverted papilloma; mucocele

Introduction

Over the past 2 decades, otolaryngologists have transitioned from open to endoscopic approaches to address frontal sinus disease.¹ This change has been made possible by technological advances including image guidance, angled endoscopes, and specialized instrumentation to reach the frontal sinus. The endoscopic approach to the frontal sinus offers the advantage of avoiding visible incisions and decreased postoperative recovery time while maintaining high success rates. There are circumstances, however, that may benefit from an open approach to the frontal sinus secondary to a narrowed frontal recess or sinus pathology that requires direct exposure and excision.²⁻⁵

Access to frontal sinus pathology located in the lateral sinus and involving the orbit can be challenging. Endoscopic approaches to the frontal sinus can range from removal of mucosal disease of the ostium (Draf type I) to resection of the frontal sinus floor bilaterally with superior nasal septectomy (Draf type III), thereby allowing access to the lateral frontal sinus.⁶⁻⁷ However, the osteoplastic open approach has been used when frontal sinus pathology is beyond the endoscopic operative field or if the frontal sinus pathology requires complete removal.

We describe the hybrid lid crease approach as an alternative to directly access the frontal sinus in cases of orbital bone erosion without the extensive dissection required from the osteoplastic flap. Three cases are reviewed in which a hybrid lid crease approach was used in order to combine advantages of open and endoscopic approaches. We hypothesize that the use of the hybrid lid crease and endoscopic approach offers excellent exposure to the frontal sinus, effectively treats sinus pathology, and leads to good postoperative aesthetic outcomes.

Materials and Methods

This study is a retrospective, noncomparative case series of 3 patients who underwent a hybrid lid crease and endoscopic approach to the frontal sinus by 2 surgeons (R.C.A., E.H.C.) at the University of Iowa Hospitals and Clinics between 2010 and 2013. The institutional review board at the University of Iowa Hospitals and Clinics approved this protocol, which included a waiver of informed consent. The study was HIPAA compliant.

All patients were seen collaboratively with otolaryngology and oculoplastics services and underwent thin slice computed tomography (CT) with multiplanar reconstruction for both preoperative diagnostic evaluation and intraoperative stereotactic guidance. High-resolution spiral CT scans were performed on multidetector CT scanners. The axial images were imaged at 0.625-mm slices and coronal and sagittal reconstructions at 1-mm slices.

Surgical Technique

Endoscopic sinus surgery consists of a Draf 2b approach with removal of ethmoid cells protruding into the frontal sinus and resection of the frontal sinus floor between the lamina papyracea and middle turbinate on the affected side.¹ We then incised the upper lid skin in a natural eyelid crease and through the epidermis. We dissected parallel to the layers of the orbicularis oculi and identified the preseptal plane above the levator palpebrae to the remnant superior orbital rim. Once the bony rim was identified, the periosteum was incised and elevated off the bone and into the frontal sinus. The neurovascular structures of the supraorbital nerve and artery were identified and preserved. A mucocoele lining or tumor capsule, if present, was then identified and meticulously dissected from the frontal sinus and periorbita. The mass was then removed using endoscopic instrumentation and suction, taking care to leave no remnant. The frontal recess ostium was visualized from both above and below. The soft tissue was then redraped, and the skin incision was closed loosely with 5-0 fast absorbing gut. A rubber band drain can be placed laterally and removed prior to discharge (Figures 1A–1D).

Results

Patient Characteristics

We performed the hybrid lid crease approach in conjunction with endoscopic surgery in 3 people with frontal sinus pathology extending into the orbital space with erosion of the superior orbital rim. The patient demographics and clinical data are presented in Table 1. One patient had a grade T4 inverted papilloma with extension into the left orbital space. Two patients had frontal sinus mucocoeles with subsequent erosion of the superior orbital rim. All patients had ocular findings including diplopia and hypoglobus secondary to depression of the orbit from the frontal sinus pathology (Figure 2). Ophthalmologic findings are presented in Table 2.

All patients had weekly follow-up checks in the first month including rigid nasal endoscopy to visualize the frontal sinusotomy, ophthalmologic exam, and wound check of their lid crease incision. Radiographic exam in the patient with inverted papilloma did not show recurrent disease at 6 months (Figure 3). No patients had evidence of recurrent disease on follow-up, ranging from 9 to 16 months, and all patients were satisfied with their aesthetic outcome (Figure 4).

Discussion

In this series, the hybrid lid crease and endoscopic approach provided a direct view of the frontal sinus and neurovascular structures, provided exposure to remove the mucocoele sac or inverted papilloma, and augmented the endoscopic approach to maintain frontal recess patency.

In 1989, Kennedy et al⁸ reported on a series of sinus mucocoeles that were successfully treated with an endoscopic approach and marsupialization rather than complete excision of the mucocoele. Patients were excluded from this approach if their frontal sinus disease was confined to the superior or lateral portion of the frontal sinus. Over the past 10 years, the rate

of endoscopic approaches to frontal sinus mucoceles has doubled from 25% to 54% with the result of slightly higher recurrence rates but lower complication rates compared to the open osteoplastic approach.⁹ However, sequestered lateral frontal sinus disease with orbital involvement can be challenging to address endoscopically. Knipe et al¹⁰ first reported that a transblepharoplasty approach could be used in combination with functional endoscopic sinus surgery to directly address the frontal-orbital space. In their case series, 5 patients were treated with this approach, with 2 of those patients who presented with acute mucopyoceles requiring revision endoscopic sinus surgery 5 months later. In our case series, rather than marsupialize, we dissected the complete mucocele lining, which was adherent to the periorbita, through the lid crease approach, and we have subsequently not detected recurrence on follow-up exams. This suggests that mucoceles with orbital involvement may benefit from excision of the mucocele lining rather than marsupialization. Our success in treating inverted papilloma also represents an advance in this approach.

The success of treating inverted papilloma involves the complete excision of all mucosal disease. Limitations in access to the frontal sinus may account for the higher rate of recurrence of inverted papilloma when the frontal sinus is involved (22.4%), compared to the low rate when confined to the ethmoid and maxillary sinuses (3%). Frontal sinus disease with inferior and lateral expansion can be difficult to treat endoscopically secondary to the lateral location, proximity to the orbit and brain, and narrow frontal recess exposure.^{11–13} The surgical management of frontal sinus inverted papilloma ranges from endoscopic approaches to combined approaches or open approaches, including osteoplastic flap and endoscopic frontal trephination.¹⁴ Although the osteoplastic approach does allow direct access with wide exposure, the approach can be associated with significant risk and morbidity, including scarring, delayed mucocele, and intracranial complications.¹⁵ The lid crease approach offered good exposure to the frontal sinus in our patient with T4 inverted papilloma. We were able to directly remove involved frontal sinus mucosa through the lid crease and visualize the dissection directly and with the use of endoscopy (see supplementary material). Nine-month follow-up including endoscopy and radiographic exam did not show evidence of recurrence.

In our case series, we have shown the successful treatment of frontal-orbital mucoceles and inverted papilloma of the lateral frontal sinus with the hybrid lid crease approach. Although our follow-up ranges from 9 to 16 months, there has been no evidence of recurrence. This approach represents a compromise between the extensive open approaches of the past 150 years, including the original Lothrop procedure, and the more recent trend toward exclusively endoscopic management.¹⁶ The endoscopic frontal sinusotomy allows long-term follow-up by rigid endoscopy, as recurrence can be delayed, whereas the lid crease approach allows complete removal of disease without extensive removal of the frontal sinus floor and with good cosmesis on long-term follow-up.

There are several limitations of this case series. First is the small number of cases with frontal sinus disease with erosion into the orbital space. Although these cases are relatively

Supplementary Material

Supplementary material for this article is available on the AOR website at <http://aor.sagepub.com/supplemental>.

uncommon, we believe that the hybrid lid crease approach is a viable alternative to access to the frontal sinus without performing an open osteoplastic flap. Second is the technical nature of the lid crease approach. We have the advantage of working with our oculoplastic surgery colleagues, but the anatomy of the region will be familiar to otolaryngologists who perform blepharoplasty, and the pathology of the orbital bone erosion allows direct access into the frontal sinus. Third is the belief that osteoplastic flap and obliteration of the frontal sinus represent the “gold standard” for the treatment of advanced frontal sinus disease. We believe that this philosophy is shifting as endoscopic approaches to frontal sinus disease are increasing with good long-term success rates. The hybrid lid crease approach offers the benefits of a direct open approach in combination with the minimal morbidity of an endoscopic approach.

Conclusion

The hybrid lid crease approach combines the benefits of both open and endoscopic approaches. This anatomy is familiar to otolaryngologists who perform blepharoplasties and can be used to access the frontal sinus and orbital space when the superior orbital bone has been eroded. We have successfully used this approach to treat frontal sinus mucoceles and inverted papilloma. Long-term follow-up by endoscopic evaluation of frontal sinus patency will be necessary to monitor for possible recurrent disease and validate this hybrid approach.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

The lid crease approach is depicted. (A) A blepharoplasty incision was made with dissection through the periorbital area to the frontal sinus defect. (B) The supraorbital pedicle was protected during removal of frontal sinus contents. (C) In this instance, mucocoele and lining were resected en toto. (D) A rubber band drain may be placed laterally.

Figure 2.

(A) Proptosis and hypoglobus secondary to frontolobal mucocoele with erosion of orbital wall. (B) T2 weighted coronal magnetic resonance image shows a fluid-filled mucocoele prolapsing through the superior orbital defect with resultant compression of orbital contents.

Figure 3.

(A) Preoperative coronal reconstruction of noncontrast thin-cut computed tomography depicts inverted papilloma with erosion of the superior orbit. (B) Sagittal reconstruction shows ectopic bone in the left frontal recess—the likely source of the inverted papilloma. (C) Postoperative comparison shows a patent frontal recess with complete exenteration of frontal sinus contents after the combined approach.

Figure 4. Postoperative lid crease appearance. (A) Forward gaze and (B) upward gaze demonstrate full ocular motility and acceptable cosmetic result.

Table 1

Patient Demographics and Clinical Data.

Case	Age/Sex	Pathology	CT Preoperative Findings	Postoperative Findings	Length of Follow-Up
1	50 y/M	Inverted papilloma	T4: involvement of bilateral frontal and ethmoid sinus with extension into orbit	No evidence of recurrent disease: endoscopy and CT	10 mo
2	51 y/M	Mucocoele	Left ethmoid and frontal sinus with extension into left orbit	No evidence of recurrent disease: endoscopy	1 y
3	71 y/M	Mucocoele	Right ethmoid and frontal sinus with extension into right orbit	No evidence of recurrent disease: endoscopy	16 mo

Abbreviation: CT, computed tomography.

Table 2

Ophthalmologic Preoperative and Postoperative Results.

Case	Preoperative Ocular Exam	Postoperative Ocular Exam	Postoperative Incision
1: Left side	Proptosis (3 mm), hypoglobus (2 mm), VA: 20/20	VA: 20/20	Well-healed lid crease incision
2: Left side	Proptosis (6 mm), hypoglobus (7.5 mm), near complete supraduction deficit, VA: 20/60	Resolution of diplopia, full extraocular motility, VA: 20/25	Well-healed lid crease incision
3: Right side	Proptosis (3 mm), full extraocular motility, VA: 20/30	Proptosis (1 mm), full extraocular motility, VA: 20/15	Well-healed lid crease incision

Abbreviation: VA, visual acuity.