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Prelacrimal Approach to Maxillary Sinus Pathology

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Abstract

Background: Access to the anterior, lateral, inferior, and inferomedial maxillary sinus has been a limitation of the middle meatal antrostomy. Expanded techniques such as the modified medial maxillectomy provide access to many of these areas but require remucosalization, and crusting can occur during the recovery phase. The prelacrimal approach (PLA) offers direct 0° endoscope access to these areas. Additionally, PLA can preserve the nasolacrimal duct and mucosal coverage.
Objectives: We describe the current surgical technique and outcomes of PLA patients.
Methods: Consecutive adult patients with pathology addressed by PLA to the maxillary sinus were assessed. The primary outcome was the restoration of the lateral wall, and the secondary outcomes were early (< 90 days) and late morbidity (> 90 days).
Results: Forty patients (52.8 ± 17 years, 62.5% female) were assessed. All patients had successful restoration of the lateral nasal wall (100% [95CI: 91.2%-100%]). The complications reported were primarily dysesthesia (early 10% and late 2.5%).
Conclusion: The PLA provides robust access to the anterior, lateral, inferior, and inferomedial maxilla. PLA offers rapid mucosal recovery while preserving the normal physiology and the lacrimal systems with low morbidity.

Keywords

endoscopic nasal and sinus surgery, endoscopic endonasal surgery, paranasal sinus neoplasms, maxillary sinus neoplasms, paranasal sinus diseases

Introduction

The endoscopic middle meatal antrostomy (MMA) has limitations to the anterior, inferior, lateral, and inferomedial maxillary sinus and infratemporal fossa. Expanded surgery such as endoscopic modified medial maxillectomy (EMMM) provides access to most areas. However, the anterior wall of the maxillary sinus remains difficult to access in EMMM, and the lateral nasal wall mucosa is sacrificed.[1] Prelacrimal access is a minimally invasive approach to the maxillary sinus, preserving lateral nasal wall mucosa and the nasolacrimal duct (NLD).[2] We describe a modification of the original description[2] of the prelacrimal approach (PLA) and the associated outcomes.

Materials and Methods

A retrospective chart review of consecutive adult patients with peri-maxillary pathology managed with PLA was performed. This study was approved by St Vincent's hospital human research ethics committee (2019/PID13822).

Outcomes

The primary outcome was lateral wall integrity (or remucosalization). Remucosalization in this study was defined by

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complete healing of the lateral wall mucosa that was raised in the approach with no defects nor areas of secondary healing. Secondary outcomes were surgical morbidity, defined as early (< 90 days) or late (> 90 days). Early morbidity included infection, temporary paresthesia, necrosis of mucosa, bleeding, pain, adhesion, and skin changes. Late morbidity included epiphora, inferior-meatal communication, stenosis, paresthesia, maxillary sinus dysfunction, and cosmetic change.

Preparation

An endotracheal tube was positioned in the lower right commissure. The patient was prepared topically with 1% ropivacaine and 1:2000 adrenaline-soaked cotton pledgets. The mucosa was injected with 1% ropivacaine and 1:100 000 adrenaline across the lateral wall and floor. The patient's head was in a neutral anatomic position, and the patient was in a 15° to 20° reverse Trendelenburg position. The patient was given total intravenous anesthesia and was in a bradycardic condition (HR 50-70 bpm).

Surgical Technique

An MMA was performed for inspection and postoperative irrigation as well as surveillance. The incision on the lateral nasal wall began high above the axilla near the nasal roof by needle-point diathermy coagulation, setting 12 (0016AM Megadynne, NJ, USA). The incision carried forward and down to the bony pyriform aperture, inferior and behind the bony pyriform aperture to the nasal floor, medially to the nasal septum, then continued along the nasal septum posterior to the depth of the middle meatus (Figure 1). These incisions were to the bone and the posterior-based mucosal flap was elevated subperiosteally. The flap was folded back until the membranous NLD was identified as entering the bony NLD canal (Figure 2).

The inferior turbinate bone was separated from the mucosa, in the subperiosteal plane anteriorly and removed, keeping the mucosa and submucosa intact. The NLD bone was removed with a Kerrison rongeur, and the membranous duct can be mobilized from the bony canal. Drilling with a 4-mm 15° diamond burr removed bone around the area of the NLD and thus the surgical corridor was created "peri-lacrimally" and not just via the prelacrimal recess. The lateral pyriform was thinned to allow access for straight-shafted instruments and the anterior superior alveolar canal was the lateral limit. The medial wall of the maxillary sinus was removed to the nasal floor. In closure, the inferior turbinate was returned with three to four sutures (5/0 Vicryl-Rapide, Ethicon, NJ, USA) (Figure 3). The septum was covered with two 0.5-mm silastic sheets (Medtronic, FL, USA) secured with suture (4/0 Prolene, Ethicon, NJ, USA). The MMA was stented with either absorbable or

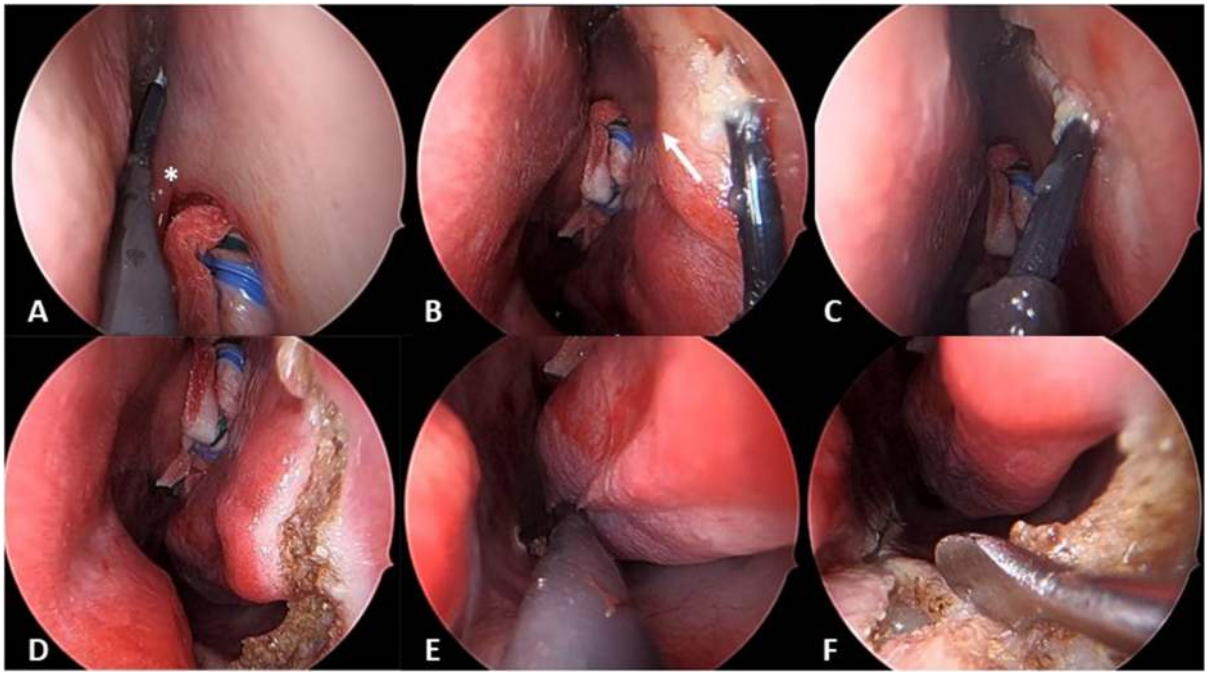

Figure 1. Incision of nasal wall flap. Representative intraoperative endoscopic imaging of the left nasal cavity. (A) The incision on the lateral nasal wall begins high above the axilla (asterisk) near the nasal roof. (B) The incision carries forward to the bony pyriform aperture (arrow). (C) The incision is down and behind the bony pyriform aperture. (D) The incision carries down to the nasal floor and medially to the nasal septum. (E, F) This incision is then continued along the inferior border of the nasal septum posterior to the middle meatus depth.

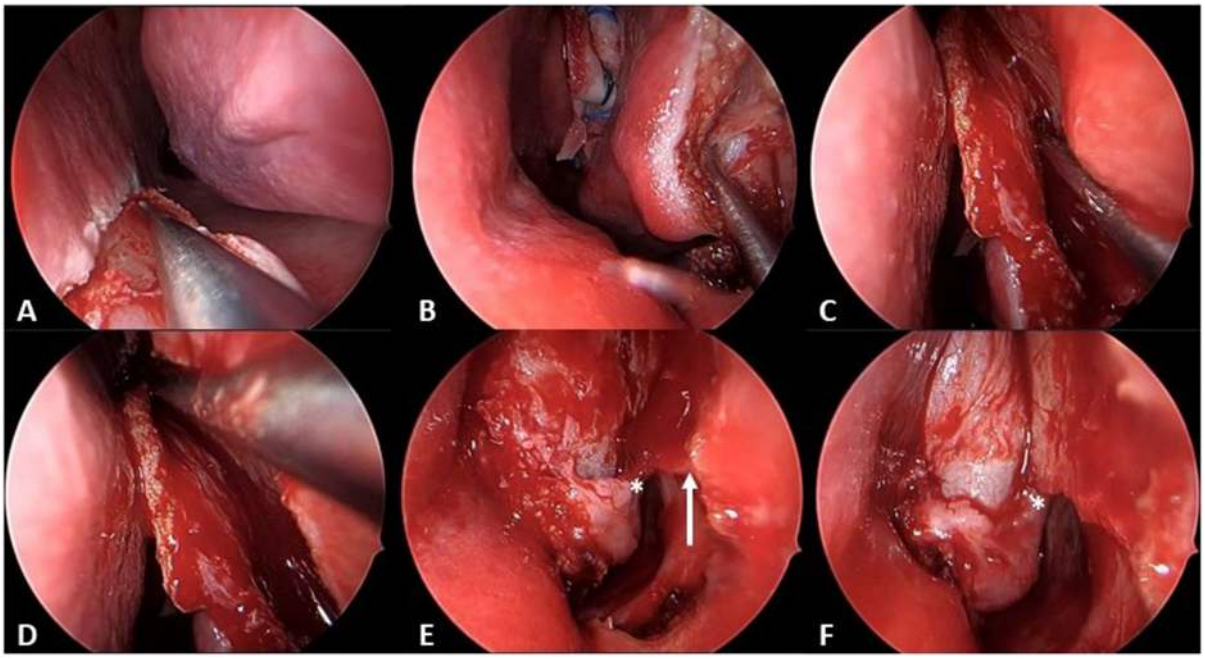

Figure 2. Posterior-based nasal wall flap creation. Representative intraoperative endoscopic imaging of the left nasal cavity. The subperiosteal posterior-based mucosal flap is elevated from the nasal floor (A), the medial wall of the maxillary sinus (B), the inferior turbinate bone (B), and the lateral nasal wall (C, D). (E) The flap is retracted until the membranous nasolacrimal duct (asterisk) is identified, entering the bony nasolacrimal duct canal. (F) The bone around the inferior turbinate attachment and the anterior part of the inferior turbinate bone is removed.

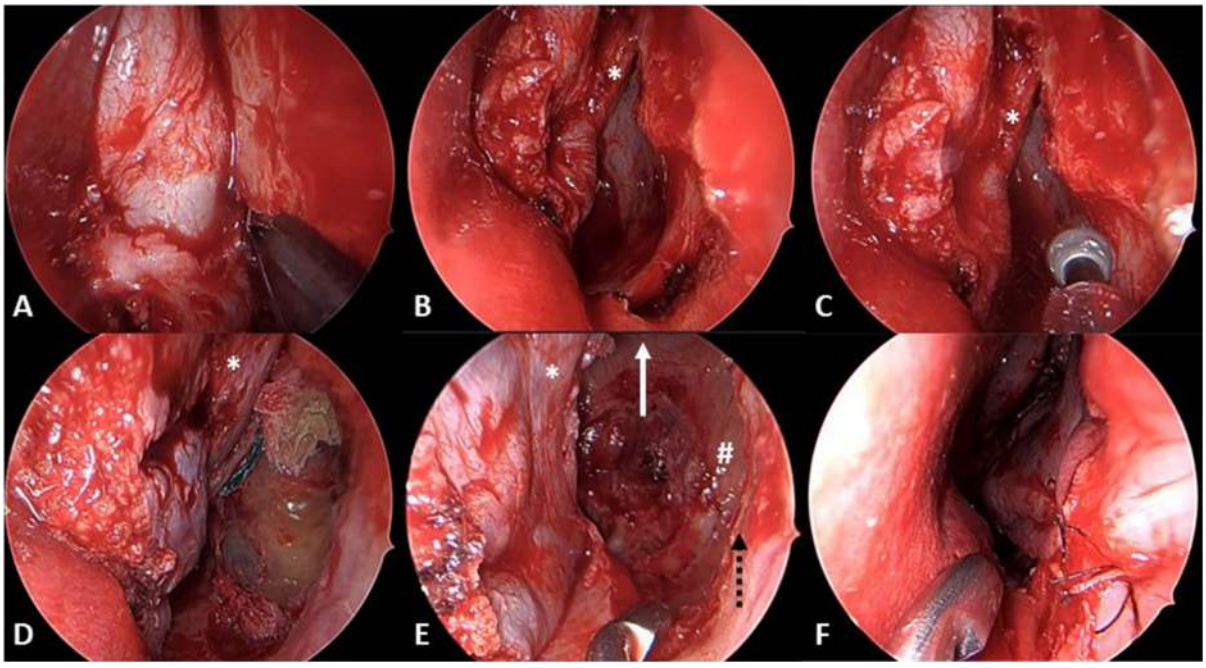

Figure 3. Perilacrimal bone removal steps. Representative intraoperative endoscopic imaging of the left nasal cavity. (A, B) The entire bone around the membranous nasolacrimal duct (asterisk) is removed with a Kerrison rongeur. (C, D) The inferior turbinate and membranous nasolacrimal duct is mobilized medially, and drilling with a 4-mm 15° diamond burr removes the bone around the area of the nasolacrimal duct. (E) Access has now been obtained to all walls of the maxillary sinus with 0° endoscope (superior wall [arrow], lateral wall [number sign], anterior superior alveolar canal [dash arrow]). (F) The inferior turbinate is returned with 3 to 4 simple interrupted absorbable sutures.

Table 1. Baseline Characteristics of Prelacrimal Approach Case Series.

	Prelacrimal Approach (N = 40)
Gender, N (%)	
Male	15 (37.5)
Female	25 (62.5)
Age (years), mean ± SD	52.8 ± 17
Prior surgery, N (%)	9 (22.5)
Diagnosis, N (%)	
Pyriform aperture stenosis	2 (5)
Antrochoanal polyp	2 (5)
Mucocele	1 (2.5)
Fungal ball	4 (10)
Odontogenic maxillary sinusitis	2 (5)
Allergic fungal rhinosinusitis	2 (5)
Chronic rhinosinusitis	4 (10)
Odontogenic neoplasms	6 (15)
Paranasal neoplasms	10 (25)
Skull base neoplasms	4 (10)

Abbreviations: N, number; SD: standard deviation.

Table 2. Overall Morbidities of Prelacrimal Approach Case Series.

Surgical Morbidity	Prelacrimal Approach (N = 40) N (%)
Early (< 90 days)	
Infection (require additional antibiotics)	0 (0)
Temporary paresthesia	4 (10)
Necrosis of mucosa	0 (0)
Bleeding (require intervention)	0 (0)
Pain (require additional pain treatment)	0 (0)
Adhesion (need for removal)	2 (5)
Skin changes	0 (0)
Late (> 90 days)	
Epiphora	0 (0)
Inferior-meatal communication	0 (0)
Nasal cavity stenosis	0 (0)
Permanent paresthesia	1 (2.5)
Maxillary sinus dysfunction	1 (2.5)
Cosmetic change	0 (0)

Abbreviation: N, number.

nonabsorbable material but no other packing. The surgical steps are illustrated in Supplemental Video 1. Video 1: A prelacrimal or "perilacrimal" approach to an enlarging and symptomatic dentigerous cyst in 47 years old male. The cyst lining and ectopic tooth were removed as the lining was non-keratinized stratified squamous epithelium.[3]

Postoperative Care

Patients were managed via day surgery. Irrigation commenced on the first postoperative day. Amoxicillin/clavulanic acid was given for 10 days, and prednisone was given at 25 mg daily for 7 to 14 days to reduce congestion and swelling. Patients were followed up at 3 weeks postoperatively for the removal of silastic sheets.

Results

Forty patients (52.8 ± 17 years, 62.5% female) were assessed (Table 1). All patients had successful restoration of the lateral nasal wall (100% [95CI: 91.2%-100%]). Follow-up was 50.1 ± 25.2 months. Morbidities were primarily dysesthesia (early 10% and late 2.5%) with other morbidities uncommon (Table 2).

Discussion

PLA has evolved from its original description[2] with a broad posterior-based lateral wall flap and removal of the "peri-lacrimal bone." The large lateral wall flap is easy to preserve and provides excellent visualization of the bone to be removed. The premaxillary periosteum and lateral buttress of the pyriform remain intact and this technique does not affect cosmesis (cf maxillectomy). The anterior superior alveolar nerve is at risk during bone removal and can cause dysesthesia if injured. The normal physiology of the lacrimal system is preserved, including valve integrity. Returning this flap allows very rapid remuocsalization and is an advantage of this technique. The limitations of the PLA are that postoperative surveillance has to be performed through the MMA and restoring the lateral nasal wall compromises topical access to the maxillary sinus.[1,4] If large areas of secondary healing are required within the sinus cavity, such as an extensive inverted papilloma, it may be advantageous to leave the surgical cavity open by EMMM or total medial maxillectomy. However, for anterior-lateral access to odontogenic or infratemporal fossa pathology, in which limited disruption of the maxillary sinus mucosa is likely, then coming anterior to the lacrimal apparatus gives superior access to EMMM.[5]

Conclusion

PLA is a robust approach that creates anterior, inferior, lateral, and inferomedial access to the maxillary sinus and is ideal for dental pathologies. The PLA preserves normal lacrimal physiology and offers quick remucosalization with low morbidity.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Richard J Harvey is consultant/advisory board with Medtronic, Novartis, Glaxo-Smith-Kline and Meda pharmaceuticals. He has been on the speakers' bureau for Glaxo-Smith-Kline, Astra-zeneca, Meda Pharmaceuticals and Seqirus. Larry Kalish is

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Supplemental Material

Supplemental video 1 for this article is available online.

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