

The Hand Lothrop: A Zero-Degree Endoscopic Draf III Procedure with a Kerrison Rongeur

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Abstract

Powered instruments such as drills are commonly used in the endoscopic modified Lothrop procedure, also known as Draf III frontal sinusotomy. However, the use of drills may be associated with increased bone exposure, prolonged postoperative healing, synechiae and crust formation, and mechanical injury to the nasal vestibule. The objective of this study is to present a simple alternative method for manually performing the endoscopic modified Lothrop procedure using a Kerrison rongeur and a 0-degree endoscope. A surgical candidate for an endoscopic modified Lothrop procedure was identified, and informed consent was obtained to record surgical footage to illustrate the technique. This article describes an alternative technique for performing the endoscopic modified Lothrop procedure using manual instruments, thereby avoiding the use of powered drills and potentially allowing for maximal preservation of the frontal recess mucosa. In addition, the technique enables the procedure to be performed without the use of angled endoscopes, facilitating surgical maneuvers. A summary table outlining each step of the procedure with technical tips, as well as a surgical video illustrating the technique, are also presented. This manual Draf III frontal sinusotomy technique may complement the surgical armamentarium of the frontal sinus surgeon.

Keywords: Draf III; frontal sinus; Lothrop; revision sinus surgery; endoscopic sinus surgery; technique



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1. Introduction

The Lothrop procedure for the frontal sinus was first described in 1914, whereby a combined open and transnasal approach was used to remove the bilateral frontal sinus floor, the frontal inter-sinus septum, and the superior nasal septum, thereby creating a common drainage pathway [1]. Prior to the widespread adoption of powered instrumentation, frontal sinus surgery relied primarily on a combination of external approaches and manual intranasal techniques aimed at restoring drainage. Early attempts at intranasal frontal sinus drainage were limited by poor visualization and anatomical variability, often resulting in high failure rates and complications [1]. As a result, external procedures such as the

osteoplastic frontal sinusotomy became the standard of care, despite their associated morbidity and limited postoperative surveillance [1].

The original Lothrop procedure, described in 1914, was largely abandoned due to technical difficulty and inadequate visualization [1].

With the advent of endoscopic sinus surgery and powered drills, surgeons were able to perform more precise and efficient bone removal under improved visualization, facilitating safer and faster procedures. This technological advancement likely contributed to the transition away from manual instrumentation toward powered systems, particularly in complex procedures such as the Draf III frontal sinusotomy.

Even if the procedure is considered safe when performed by an experienced surgeon [2], it is still associated with more short-term morbidity than similar procedures such as the Draf-IIa [3]. Current techniques of the endoscopic modified Lothrop procedure, or the Draf III frontal sinusotomy, generally rely on the use of powered drills [4,5]. While the use of powered instrumentation carries numerous advantages, the use of drills has been associated with increased bone exposure, the formation of synechia and crust, prolonged postoperative healing, and potential burn or mechanical damage to skin of the nasal vestibule [6]. The Draf III procedure represents the most extensive of the Draf classifications (Draf I–III), involving the creation of a common frontal sinus cavity through bilateral frontal sinusotomy and superior septectomy [7]. Two principal surgical approaches have been described: the “inside-out” approach, typically used when the frontal recess is sufficiently wide to allow safe instrumentation, and the “outside-in” approach, which is preferred in cases of a narrow frontal recess where access is otherwise limited [7]. In addition, mucosal preservation has been increasingly emphasized as a key factor in preventing postoperative stenosis. Techniques such as careful avoidance of mucosal stripping, the use of pedicled mucosal flaps, and adjunctive stenting have been proposed to reduce crusting and neo-ostium narrowing [7–9]. Furthermore, restenosis remains one of the main causes of surgical failure following extended frontal sinus procedures, partly due to exposed bone and subsequent osteoneogenesis [10]. Recent evidence suggests that mucosal reconstruction using grafts or flaps can significantly improve neo-ostium patency and reduce postoperative stenosis rates [11,12]. The objective of this report is to describe an alternative method for manually performing an endoscopic Draf III frontal sinusotomy with the Kerrison rongeur and a zero-degree endoscope, thereby allowing for maximal nasal mucosa preservation, and optimal post-operative topical irrigation delivery [13].

2. Materials and Methods

A representative surgical case of an adult patient was chosen, and informed consent was obtained to record surgical footage to illustrate the technique. Exemption from the Institution Review Board was granted from the Columbia University Irving Medical Center.

Surgical Technique

Prior to the start of the procedure, a shoulder roll is placed for gentle neck extension. After standard draping, verification of equipment and proper surgical timeout, bilateral spheno-ethmoidectomies are completed with identification of the frontal sinus outflow tracts. Pledgets with 1:1000 epinephrine may be placed in each frontal sinus outflow tract to decongest the mucosa and better delineate the frontal sinus drainage pathway.

The Draf III frontal sinusotomy is then initiated with the 0-degree endoscope. A superior septectomy is first performed. The landmarks used for the superior septectomy are the sagittal plane of the nasofrontal beak anteriorly, the roof of the maxillary sinus inferiorly, and the posterior table of the frontal sinus posteriorly. The middle turbinates are then removed or trimmed from anterior to posterior to the level of the posterior table

of the frontal sinus. Then using the contralateral nostril and the Kerrison rongeur, the frontal sinusotomy is opened anteriorly by removing bone from the frontal recess until the frontal beak is encountered anteriorly while staying parallel to the lamina papyracea. Loose bony fragments are removed with the microdebrider, which allows for improved visualization of the dissection. The remainder of the frontal sinus floor is then removed by rotating the Kerrison rongeur medially by 45 degrees and removing bone towards the midline while marching anteriorly. Once again, alternating with the microdebrider, bony fragments and loose tissue are removed to enhance visualization. These same steps are then repeated on the contralateral side, which allows complete removal of the bilateral frontal sinus floors to the midline. All residual fronto-ethmoidal partitions are resected. Finally, the inter-sinus frontal septum is removed. This step is carried out with a combination of instruments such as the Kerrison rongeur, the Hosemann frontal punch, and through-cutting frontal instruments.

3. Results

A summary of the key steps is provided in Table 1. The accompanying video illustrates the key steps of the operative technique.

Table 1. Summary of the key steps for the Draf III frontal sinusotomy.

Step	Tips
Position patient	Place shoulder roll for gentle neck extension
Complete speno-ethmoidectomies and identify frontal drainage pathways	Use of pledgets soaked in 1:1000 epinephrine to decongest frontal drainage pathways
Complete superior septectomy	Use of frontal beak, roof of maxillary sinus and frontal sinus' posterior table as landmarks
Trim or remove middle turbinates	Trim middle turbinates from anterior to posterior until frontal sinus' posterior table
Widen frontal sinusotomy anteriorly until the frontal beak	Use of Kerrison rongeur through contralateral nostril
Remove frontal sinus floor medially	Rotate Kerrison rongeur by 45 degrees medially, and march anteriorly and medially
Remove residual ethmoid cells along skull base and lamina papyracea	Use of curette, Kerrison rongeur, and microdebrider
Remove frontal inter-sinus septum	Use of Kerrison rongeur, Hosemann frontal punch, and through-cutting frontal instrument

4. Discussion

This article describes an alternative operative technique for performing a Draf III frontal sinusotomy manually without the use of drills. The strengths of this technique are that it is reproducible and can be taught to trainees. Furthermore, avoiding the use of drills may lead to less exposed bone. Although time for procedure completion was not formally calculated, the use of this technique should be at least as efficient as previously described methods. Further research is required to formally evaluate surgical time to completion and comparison of bone exposure using the different techniques.

The standard endoscopic Draf III procedure is most commonly performed using an “inside-out” approach, whereby the frontal sinus is accessed through progressive enlargement of the frontal recess. In contrast, the “outside-in” approach involves initiating drilling at the frontal beak and proceeding posteriorly and is particularly useful in cases of a narrow or obstructed frontal recess [7]. It is worth noting that the inside-out technique may be challenging in the presence of significant pathology or scarring within the frontal recess, which can obscure landmarks. Surgeons performing advanced frontal sinus surgery should thus also be familiar with the outside-in approach as it allows for direct access to the frontal sinus by bypassing diseased frontal recess anatomy [14].

Commonly accepted indications for Draf III frontal sinusotomy include severe refractory chronic frontal sinusitis, and the need for frontal sinus access to address both benign and malignant tumors, traumas, mucocèles and cerebrospinal fluid leaks. Given that the current described operative technique relies on early identification of the frontal sinus drainage pathway from which a common frontal sinusotomy is created, the use of this technique may be difficult whenever there is extensive bony remodeling or osteogenesis obstructing the frontal drainage pathways [7]. Furthermore, patients with a narrow frontal recess anterior–posterior diameter may be less amenable to this technique. In such instances, an “outside-in” approach to the frontal sinus or the use of drills may be necessary [5]. To summarize, ideal candidates for the Draf III technique with the Kerrison rongeur include chronic sinusitis cases without evidence of fronto-ethmoidal osteitis, patients with large anterior–posterior frontal recess diameters, and patients with skull base pathologies without significant bony changes needing a Draf III procedure for access.

Mucosal preservation remains a critical determinant of surgical success in Draf III procedures. Excessive mucosal stripping has been associated with increased risk of scarring and restenosis, whereas the use of pedicled mucosal grafts such as middle turbinate, inferior turbinate, or nasoseptal flaps has been shown to reduce neo-ostium stenosis and crusting [7–9]. Additionally, the placement of absorbable packing or silastic stents may further support mucosal healing and maintain patency during the postoperative period [7–12]. Recent prospective and long-term studies have demonstrated high rates of sustained neo-ostium patency following mucosal grafting techniques, with significant reductions in restenosis compared to traditional approaches [9–12]. Moreover, systematic reviews suggest that mucosal flaps may be more effective than stenting alone in maintaining long-term patency [15]. The described drill-free technique may inherently favor mucosal preservation by limiting thermal and mechanical injury. Further evidence from cadaveric or animal studies would be needed to confirm the association between thermal and mechanical injuries with mucosal preservation.

From an educational perspective, the relative simplicity of instrumentation and the avoidance of powered drills may facilitate teaching and improve procedural reproducibility among trainees. Endoscopic frontal sinus surgery remains technically demanding and typically requires structured training, including cadaveric dissection and supervised surgical experience, due to complex anatomy and proximity to critical structures (7). In this context, simplified and reproducible techniques may help lower the technical barrier and improve safety during early surgical training. Although formal studies evaluating learning curves are lacking, simplified techniques that rely on standard instruments may enhance accessibility and safety in training settings.

5. Conclusions

We present an alternative “Hand Lothrop” technique to complement the surgical tools for the frontal sinus surgeon. In our hands, this technique appears to be efficient and may

help minimize exposed bone. However, further research is needed to safely affirm that this procedure is more efficient and results in less bone exposure than other techniques.

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References

1. Gross, W.E.; Gross, C.W.; Becker, D.; Moore, D.; Phillips, D. Modified transnasal endoscopic Lothrop procedure as an alternative to frontal sinus obliteration. *Otolaryngol.—Head Neck Surg.* **1995**, *113*, 427–434. [[CrossRef](#)] [[PubMed](#)]
2. Anderson, P.; Sindwani, R. Safety and efficacy of the endoscopic modified Lothrop procedure: A systematic review and meta-analysis. *Laryngoscope* **2009**, *119*, 1828–1833. [[CrossRef](#)] [[PubMed](#)]
3. Jafari, A.; Tringale, K.R.; Panuganti, B.A.; Acevedo, J.R.; Pang, J.; DeConde, A.S. Short-term morbidity after the endoscopic modified Lothrop (Draf III) procedure compared with Draf IIa. *Am. J. Rhinol. Allergy* **2017**, *31*, 265–270. [[CrossRef](#)] [[PubMed](#)]
4. Wormald, P.J. Salvage frontal sinus surgery: The endoscopic modified Lothrop procedure. *Laryngoscope* **2003**, *113*, 276–283. [[CrossRef](#)] [[PubMed](#)]
5. Chin, D.; Snidvongs, K.; Kalish, L.; Sacks, R.; Harvey, R.J. The outside-in approach to the modified endoscopic Lothrop procedure. *Laryngoscope* **2012**, *122*, 1661–1669. [[CrossRef](#)] [[PubMed](#)]
6. Hosemann, W.; Draf, C. Danger points, complications and medico-legal aspects in endoscopic sinus surgery. *GMS Curr. Top. Otorhinolaryngol. Head Neck Surg.* **2013**, *12*, Doc06. [[CrossRef](#)] [[PubMed](#)]
7. Noller, M.; Fischer, J.L.; Gudis, D.A.; Riley, C.A. The Draf III procedure: A review of indications and techniques. *World J. Otorhinolaryngol.—Head Neck Surg.* **2022**, *8*, 1–7. [[CrossRef](#)] [[PubMed](#)]
8. Conger, B.T.; Riley, K.; Woodworth, B.A. Evolution of the Draf III procedure: Mucosal grafting technique. *Otolaryngol.—Head Neck Surg.* **2011**, *145*, 803–808. [[CrossRef](#)]
9. Conger, B.T.; Riley, K.; Woodworth, B.A. The Draf III mucosal grafting technique: A prospective study. *Otolaryngol.—Head Neck Surg.* **2012**, *146*, 664–668. [[CrossRef](#)] [[PubMed](#)]
10. Ospina, J.; Janjua, A. Revision surgery of the frontal sinus. In *Atlas of Frontal Sinus Surgery*; Lobo, D.R., Artiles, J.V., Ospina, J.A., Eds.; Springer: Cham, Switzerland, 2022; pp. 237–245. [[CrossRef](#)]
11. Lein, A.; Liu, D.T.; Knerer, B.; Mueller, C.A.; Rotter, N.; Vyskocil, E.; Jaiswal, A.; Brkic, F.F.; Bhalla, R. Mucosal grafts and flaps in Draf IIb and Draf III: A systematic review and meta-analysis. *Otolaryngol.—Head Neck Surg.* **2025**, *173*, 1079–1091. [[CrossRef](#)] [[PubMed](#)]
12. Illing, E.A.; Cho, D.Y.; Riley, K.O.; Woodworth, B.A. Draf III mucosal graft technique: Long-term results. *Int. Forum Allergy Rhinol.* **2016**, *6*, 514–517. [[CrossRef](#)] [[PubMed](#)]
13. Spielman, D.B.; Kim, M.; Overdevest, J.; Gudis, D.A. Zero-Degree Endoscopic Visualization of the Frontal Sinus Predicts Improved Topical Irrigation Delivery. *Laryngoscope* **2021**, *131*, 250–254. [[CrossRef](#)] [[PubMed](#)]

14. Carney, A.S. Draf III frontal sinus surgery: How I do it. *Am. J. Rhinol. Allergy* **2017**, *31*, 338–340. [[CrossRef](#)] [[PubMed](#)]
15. Chiari, F.; Guarino, P.; Donadio Caporale, C.; Orsini, K.; Trevisi, G.; Presutti, L.; Molteni, G. Clinical features, operative management and surgical results of first and revision Draf III procedure and the use of mucosal flaps and stents: A systematic review. *Eur. Arch. Oto-Rhino-Laryngol.* **2025**, *282*, 611–622. [[CrossRef](#)] [[PubMed](#)]

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