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# Osteoplastic approach to the frontal sinus, unilateral

**Kevin C. Welch, MD**

*From the Department of Otolaryngology - Head and Neck Surgery, Loyola University Health System, Maywood, Illinois.*

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Osteoplastic flap;
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Osteoma;
Frontal sinus obliteration

Disease within the frontal sinus is primarily treated with endoscopic techniques; however, in certain circumstances, the endoscopic approach is insufficient or impractical to treat frontal sinus disease. The osteoplastic approach to the frontal sinus remains a time-honored procedure for treating challenging frontal sinus disease that is inaccessible to endoscopic instrumentation. Disease in the frontal sinus can be subdivided based on its laterality. Elsewhere in this text, the treatment of bilateral disease is discussed. In this article, the authors describe the osteoplastic approach to the frontal sinus for unilateral disease.


In this era of endoscopic frontal sinusotomy, the osteoplastic approach to the frontal sinus remains a useful operation in the armamentarium of the otolaryngologist. It is an operation that is becoming less common, partly due to unfamiliarity with its technique. Many resident physicians who are well trained in endoscopic techniques have never seen this procedure, and even fewer may know the indications. There are several circumstances[1-4] in which the osteoplastic approach to the frontal sinus is necessary for the effective treatment of frontal sinus disease.

The osteoplastic approach to the frontal sinus was first described in 1894 by Schonburn[5] and later modified through the earlier parts of the twentieth century. Modern concepts of the osteoplastic approach to the frontal sinus stem from the studies of MacBeth[6] as well as Goodale and Montgomery[7,8] some years later. How we perform the osteoplastic approach to the frontal sinus today is somewhat different from the well-known descriptions of Goodale and Montgomery in that we tend to exercise less the use of an extended brow or gull-wing incision and more frequently the use of the coronal flap technique.[9] This technique achieves the same endpoint, and it obviates the need to incise the patient's face.

Address reprint requests and correspondence: Kevin C. Welch, MD, Department of Otolaryngology - Head and Neck Surgery, Loyola University Health System, 2160 S. First Avenue, Maguire Bldg, Maywood, IL 60153.

E-mail address: kwelch2@lumc.edu.

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Although we tend to think of the osteoplastic approach to the frontal sinus as a bilateral procedure, Goodale, Hardy, and Montgomery[8-11] originally described this procedure for addressing unilateral lesions such as osteomata, mucoceles, and frontal recess cells. Interestingly, at that time, they grappled with questions that still challenge us today: whether to obliterate, choice of obliteration material, treatment of the frontal recess (originally described as the nasofrontal duct), and treatment of the contralateral normal sinus.

In this article, the indications and techniques for performing the osteoplastic approach (a.k.a. osteoplastic flap) to the frontal sinus for unilateral disease and the management of the frontal sinus itself following definitive treatment of the underlying frontal sinus disease are described.

## Indications

Indications for the unilateral osteoplastic flap procedures do not differ extensively from those of the bilateral osteoplastic flap procedure. The distinct difference is that, when the disease is isolated to one side of the frontal sinus, a unilateral osteoplastic flap procedure may be indicated. Diagnoses that fall within this classification include unilateral fibro-osseous lesions (fibrous dysplasia, ossifying fibroma), benign neoplasms (eg, osteoma), unilateral defects in the posterior table of the frontal sinus resulting in cerebrospinal fluid (CSF) rhinorrhea, unilateral frontal sinus fractures

with frontal recess involvement, mucoceles, and obstructing frontal recess cells. A unilateral osteoplastic flap may also be used in combination with an endoscopic approach to treat any of the aforementioned diagnoses as well. Discretion, of course, must be used when treating more aggressive lesions, such as inverted papillomas, or malignancy when a bilateral osteoplastic flap may better serve the patient's interests.

## Surgical technique

All patients should undego preoperative computed tomography (CT) examination of the maxillofacial region in axial and coronal planes. In select patients, magnetic resonance (MR) imaging may also be indicated to help differentiate certain frontal sinus lesions. If the surgeon plans on entering the frontal sinus using traditional techniques,[12,13] a 6-foot (1.8 m) Caldwell roentgenogram is obtained; two copies are printed, one for reference and one to be used as a sterilized cut-out template for surgery. If the surgeon plans on using stereotactic image-guided surgery,[14-16] the appropriate CT scan and image-guidance hardware is required intraoperatively.

The patient is placed in the supine position on the operating table and placed under general anesthesia. Once full anesthesia is attained, the patient is placed in a beach chair position because this elevates the patient's head to a level more conducive to performing the initial portions of the operation. Temporary tarsorrhaphy sutures are placed with monofilament polypropylene sutures or corneal shields are placed to protect the corneas from abrasions. The face and scalp are prepared in a sterile fashion.

The frontal sinus can be approached using multiple incisions: coronal, midforehead, brow, or gull-wing incision. The appropriate approach is dictated by how much exposure is necessary and on certain patient considerations (eg, age, sex, forehead wrinkles, male pattern baldness, etc.). The approach should be established before surgery, and the patient is to be made aware of possible risks (eg, scalp anesthesia, brow paralysis, hypertrophic scars, keloids, hair loss, skin necrosis, and poor cosmetic outcome). In most cases, the coronal incision provides the best exposure to the entire frontal sinus, minimizes poor cosmetic outcomes, can be used in men or women, and is suitable for both unilateral and bilateral osteoplastic approaches to the frontal sinus. However, this approach is more labor-intensive and may be unacceptable for men with male pattern baldness. In these patients, especially when the unilateral anterior osteoplastic approach is being considered, an extended brow incision may be more suitable. If the unilateral frontal sinus lesion extends beyond the midline (or if a bilateral approach is being considered), the incision can be fashioned across the midline approximately 1 cm below the glabellar skin. This incision has the habit of creating unsightly midline scars; therefore, careful consideration should be given to the patient before proposing such an approach.

When using the brow or gull-wing incision, the proposed incision line is infiltrated with 1% lidocaine with 1:100,000 epinephrine to maximize hemostasis. The incision begins along the lateral aspect of the brow and is carried medially parallel to the hair follicles. A subcutaneous dissection proceeds until the occipitofrontalis muscle is encountered. When this structure is reached, the supraorbital neurovascular bundles are identified. Other than poor cosmesis, the other major drawback to this approach is scalp anesthesia, which in some cases is unavoidable. In other instances, an incision can be fashioned such that it terminates medial to the supraorbital neurovascular bundles bilaterally. Once the supraorbital neurovascular bundles are identified, an attempt is made to isolate and retract the fibers. The scalp is raised in a subgaleal plane until the limits of the frontal sinus have been reached.

Reaching the frontal sinus via the coronal incision has advantages over the brow or gull-wing incisions. The planned incision is drawn through the preauricular crease anterior to the tragus to the contralateral side. The incision is directed more anteriorly such that the incision is made 2 cm posterior to the hairline. Some advocate creating a peak in the incision (Figure 1) or designing a multiple-W type incision to facilitate realignment at the end of the procedure. The incision is infiltrated with 1% lidocaine with 1:100,000 epinephrine, and approximately 10-15 minutes is allowed for maximal effect. The hair is shaved along the incision line. Starting in the midline, the skin is incised parallel to the hair follicles. The subcutaneous tissues are divided sharply; electrocautery may be used, but it must be used with discretion so as to preserve the hair follicles. Scalp

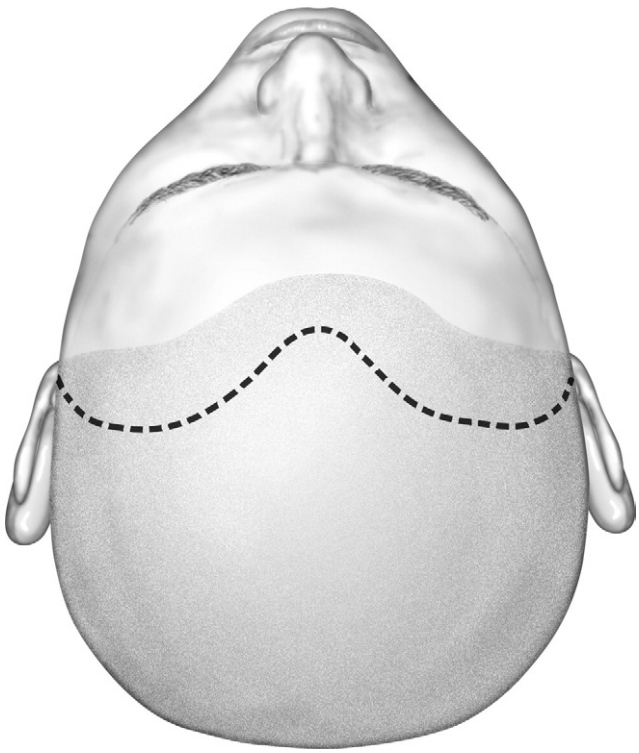

**Figure 1** A proposed incision for the coronal flap. The incision extends from just anterior to the tragus within the preauricular crease to the contralateral side. The incision is drawn anteriorly, and a peak can be designed to help approximation of the scalp flap at the termination of the case.