

# Management of Frontal Sinus Tumors



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## KEYWORDS

• Frontal sinus • Tumor • Endoscopic • Sinonasal malignancy • Draf IIb • Draf III

## KEY POINTS

- Accurate diagnosis of tumor type and appropriate staging are crucial to choosing the optimum management strategy.
- Considerations in determining the approach to frontal sinus tumors include frontal anatomy, tumor location, and tumor attachment sites.
- The endoscopic approaches to the frontal sinus include Draf IIa, IIb, and III procedures. These procedures are a continuum affording progressive access and exposure.
- The Draf IIb involves resection of the frontal sinus floor between the lamina papyracea and the nasal septum. The Draf III involves the bilateral removal of the frontal sinus floor through an anterosuperior septectomy, allowing confluence of the bilateral frontal sinuses.
- Although these tumors can often be approached via endoscopic techniques, surgeons should always be prepared to use open techniques.

## OVERVIEW

Surgical management of frontal sinus tumors has traditionally challenged otolaryngologists because of the inherently narrow confines of the frontal sinus and its proximity to critical structures such as the anterior skull base, lamina papyracea, and anterior ethmoidal artery. Historically, removal of the various tumors that can occupy this space necessitated an open approach. After early and often morbid attempts at trephination and sinus obliteration, the use of osteoplastic flaps (OPFs), often with sinus obliteration, became the mainstay of surgical access to the frontal sinus.<sup>1,2</sup> Although

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this technique offered effective visualization and bimanual instrumentation, it too had the risk of morbidity or failure, including potential mucocele formation and loss of bone flap caused by chronic osteitis. Furthermore, long-term quality-of-life issues such as frontal bossing or depression and frontal neuralgia remained a possibility.<sup>3-6</sup> Through significant improvements in optical technologies and power instrumentation, the endonasal endoscopic approach has become a feasible and popular approach to a variety of paranasal sinus disorders. Many frontal sinus tumors can now be addressed with endoscopic techniques or via a combined approach.<sup>2,7</sup> Although endoscopic access to the frontal sinus can be complicated by the variability of frontal recess pneumatization, this approach offers significant advantages compared with previous open approaches. These advantages include decreased need for sinus obliteration, significantly easier postoperative monitoring, improved cosmetic results, and decreased morbidity. This article describes the most common tumors that affect the frontal sinus and discusses the current surgical approaches that best facilitate their removal.

## PRIMARY TUMORS

### *Osteoma*

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Osteoma is the most common benign tumor of the paranasal sinuses, with a reported incidence of 0.5% to 3% in the general population.<sup>8,9</sup> These tumors are slow growing and are often discovered as an incidental finding.<sup>10</sup> Although osteomas were previously thought to occur most often in the frontal sinus, a recent study found that 55% of these tumors were located in the ethmoid sinuses, followed by the frontal sinuses at 37.5%.<sup>11</sup> Possibly because of their slow growth rate, most paranasal osteomas are asymptomatic and tend to only cause symptoms when they grow large enough to compress local structures or obstruct the sinus drainage pathways. Presenting symptoms can vary based on tumor location, but most frequently include frontal headache, facial pain, and chronic sinusitis.<sup>10,12</sup> Less commonly, these tumors can lead to the development of a mucocele or erode nearby structures such as the orbit or cranium.<sup>13-16</sup>

Because of their benign course, osteomas that are small and asymptomatic can be conservatively managed with observation.<sup>12</sup> However, specific indications for surgical intervention have been proposed. Savic and Djeric<sup>17</sup> recommended surgery for osteomas that are symptomatic, rapidly growing, obstructing the frontal recess, leading to rhinosinusitis, causing facial deformity, or extending beyond the frontal sinus (**Fig. 1**). More recently, Chiu and colleagues<sup>18</sup> proposed a frontal sinus osteoma grading system to guide decisions regarding appropriate surgical approach. Their system categorizes osteomas into 4 distinct grades based on 3 primary characteristics: the location of the base of attachment, anterior-posterior diameter of the lesion, and tumor location relative to a virtual sagittal plane through the lamina papyracea. Although their original recommendations for an endoscopic versus open approach based on these grades have been adjusted with subsequent endoscopic innovation, this grading system remains useful and is widely used in the literature.

### *Inverted Papilloma*

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Inverted papillomas (IP) are benign tumors of the paranasal sinuses. The incidence of IP has been reported at 0.74 per 100,000/y,<sup>19</sup> with 1% to 16% of these tumors originating in the frontal sinus<sup>20</sup> (**Fig. 2**). Overall, the most common site of origin for IP is the lateral nasal wall.<sup>21,22</sup> In addition, there seems to be a male predominance for these tumors, with a male to female ratio of 3.3:1.<sup>20</sup> IPs are typically treated with complete surgical resection because of their risk of recurrence without complete resection

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