



## Paranasal Sinus Osteomas: Evaluation of Surgical Management with 13 Cases

İrfan Kara<sup>1</sup> , Alperen Vural<sup>2</sup> , Metin Ünlü<sup>3</sup> , Kerem Kökoğlu<sup>2</sup>

### ABSTRACT

Paranasal sinus osteomas are slowly growing and frequently asymptomatic benign tumors. Surgery is the treatment method, and the approach may vary according to many factors about the tumor. The prominent locations of tumors were in the frontal sinuses and in the ethmoid sinus. The most common complaint was a headache. The diagnosis was made by paranasal computed tomography in all patients. This report describes the approach to managing osteoma in the paranasal region in 13 patients. Information on demographic features, the clinical presentation of the cases, radiographical outcomes, and surgical procedures were gathered and analyzed. Five patients were operated on endoscopic technique, six with osteoplastic flap technique, and two with a combined approach. Symptomatic osteomas require surgery. The surgery considers the localization, size of the lesion, and the experience of the surgeon.

**Keywords:** Headache, neoplasm, osteoma, paranasal sinus, surgery

**Cite this article as:**  
Kara İ, Vural A, Ünlü M, Kökoğlu K. Paranasal Sinus Osteomas: Evaluation of Surgical Management with 13 Cases. Erciyes Med J 2022; 44(6): 608-11.

### INTRODUCTION

Paranasal sinus osteomas (PNSOs) are indolently developing tumors that usually involve no symptoms and are recognized incidentally on routine radiological tests (1). The frequency of PNSOs in standard radiological tests varies between 0.42% and 3% (2). Sites of PNSOs involvement are listed as follows in order of frequency: Frontal sinus (70–80%), ethmoid sinuses (20–25%), maxillary sinus (5%), and sphenoid sinus (3). PNSOs stay asymptomatic until the tumor arrives at a certain mass. Then, they may give rise to symptoms as it grows to nearby tissues there by compromising the patency of drainage pathways of the sinus or compressing the surrounding structures (4). The most common complaints are headache, facial pain, facial deformity, and anosmia (5). Treatment of PNSO is controversial. Surgery should be planned if the osteoma exceeds 50% of the sinus volume, grows up swiftly (>1 mm/year), shows intracranial or intraorbital extension, or causes chronic sinusitis and mucocele after the closure of the frontal recess (6). While the endoscopic technique is used to manage ethmoid osteomas and median frontal osteomas, open technique surgery remains a valuable method in managing of frontal sinus osteomas alone or with endoscopic procedures (7).

In this article, we aim to present cases with a diagnosis of PNSO and discuss the diagnosis and treatment options of this pathology.

### MATERIALS and METHODS

A retrospective study was performed on the records of the patients treated for paranasal sinus osteoma in two university hospitals' otolaryngology departments between 2015 and 2021. Information on demographic features, the clinical presentation of the cases, radiographic findings, possible etiological factors, lesion site, and surgical approach were gathered and analyzed (Table 1). The ethics committee of Kahramanmaraş Sütçü İmam University Faculty of Medicine granted the ethical approval of the study (2021/34/08).

According to the CT findings, patients diagnosed with PNOS by CT scan and classified into five patterns: Uniformly sclerotic lesions, target-like lesions, partially corticated shell with heterogeneous matrix, heterogeneous matrix without a well-defined surface, and laminated design (3). Patients have one of these aspects at least were enrolled in the study and operated; symptomatic placed more than 50% of the related sinus, extended intracranial or intraorbital region, cause proptosis, obstruct the frontal recess, and cause to chronic sinusitis. Asymptomatic patients with ethmoid osteomas who are candidates for developing complications were also operated. Asymptomatic patients with frontal sinus osteoma and patients who could not be followed after the surgery were excluded from the study. Operations were performed under general anesthesia. All patients' diagnosis was confirmed radiologically in the pre-operative and histopathologically in post-operative period. CT sinus scan was done 1 year postoperatively only selected cases. Patients were followed annually.

<sup>1</sup>Department of Otorhinolaryngology, Kahramanmaraş Sütçü İmam University Faculty of Medicine, Kahramanmaraş, Türkiye

<sup>2</sup>Department of Otorhinolaryngology, Erciyes University Faculty of Medicine, Kayseri, Türkiye

<sup>3</sup>Department of Ophthalmology, Erciyes University Faculty of Medicine, Kayseri, Türkiye

**Submitted**  
21.12.2021

**Revised**  
04.02.2022

**Accepted**  
03.04.2022

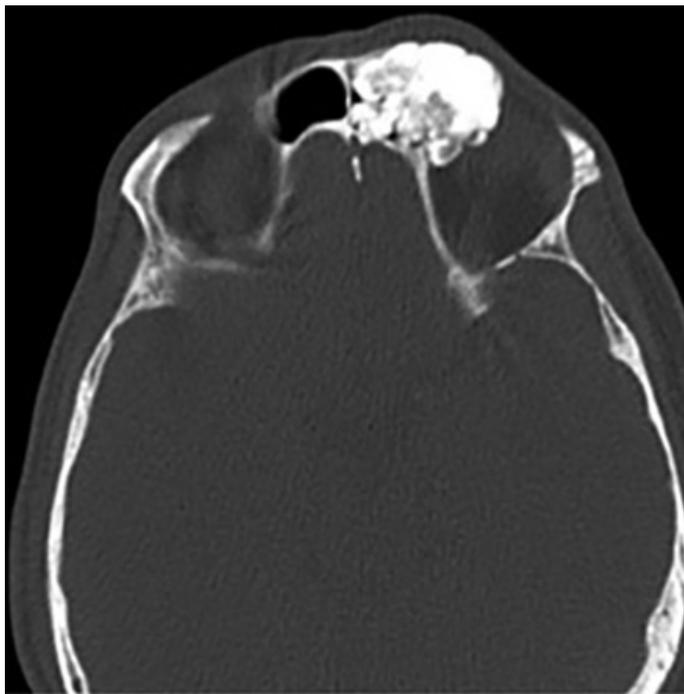
**Available Online**  
14.10.2022

**Correspondence**  
İrfan Kara,  
Kahramanmaraş Sütçü İmam University Faculty of Medicine, Department of Otorhinolaryngology, Kahramanmaraş, Türkiye  
Phone: +90 344 300 3434/3400  
e-mail:  
drirfankara@gmail.com

©Copyright 2022 by Erciyes University Faculty of Medicine - Available online at www.erciyesmedj.com

**Table 1.** Table demonstrating the demographic and clinical data of the patients

Case	Age	Sex	Symptoms	Localization	Size	Approach
1	47	F	Headache	Left frontal sinus	28×22 mm	Osteoplastic flap
2	40	F	Headache	Left frontal sinus	20×20 mm	Endoscopic
3	42	M	Headache	Right frontal sinus	18×16 mm	Endoscopic
4	35	F	Headache	Right frontal sinus	22×14 mm	Osteoplastic flap
5	58	M	None	Left ethmoid sinus	10×10 mm	Endoscopic
6	54	M	Headache	Left frontal sinus	30×22 mm	Combined
7	58	M	Headache	Right frontal sinus	35×30 mm	Osteoplastic flap
8	59	F	Headache, proptosis, diplopia	Right frontal sinus	45×35 mm	Osteoplastic flap
9	51	F	None	Left ethmoid sinus	8×6 mm	Endoscopic
10	28	M	Facial deformity, proptosis	Left frontal sinus	45×25 mm	Osteoplastic flap
11	63	M	Headache	Right frontal sinus	25×20 mm	Combined
12	60	F	None	Right ethmoid sinus	10×10 mm	Endoscopic
13	18	M	Facial deformity, proptosis, diplopia, headache	Right frontal sinus	25×23 mm	Osteoplastic flap

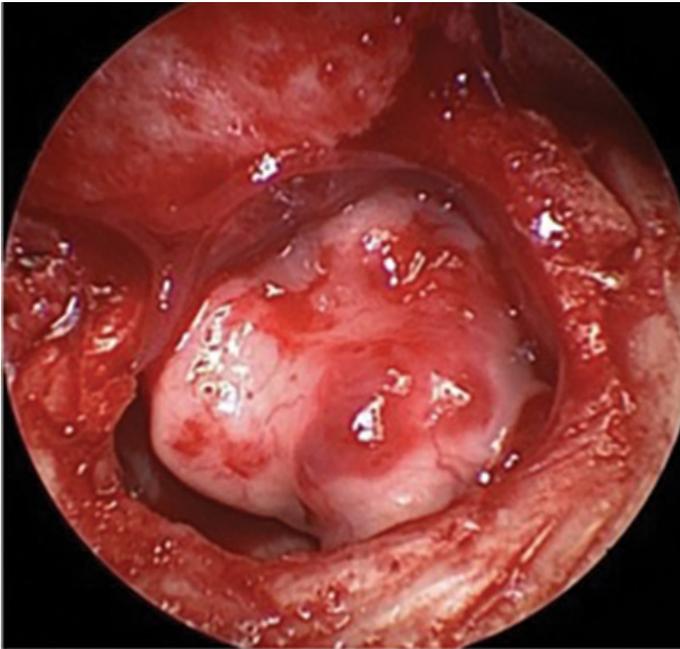
**Figure 1.** Axial CT scan of a patient with a large osteoma of the left frontal sinus

## RESULTS

Thirteen patients were enrolled in the study. Seven patients were male and six were female, and the mean age was  $47.15 \pm 13.8$  (18–63). Ten patients with frontal sinus osteoma and three patients with ethmoid sinus osteoma were admitted to the study. All of the patient had no clear etiology. No patient had a known Gardner syndrome. The mean tumor size was 26.7 mm based on a computerized tomography scan (8–45 mm). Frontal osteoma extended the frontal recess in two of ten patients. The most common complaint was a headache present in nine of 13 patients followed by proptosis. Their visual acuity was normal in three patients with eccentric proptosis; however, outward gaze limita-

**Figure 2.** Coronal CT scan showing a osteoma in the left ethmoid sinus

tions were observed in one patient and upward gaze limitation in another. The mean tumor size was 9.3 mm in three patients with ethmoid osteoma. Their mean age was 56.3. Two of them had lamina papyracea extension and the last one had skull base extension. There was no patient with intracranial extension. No endoscopic endonasal examination revealed any lesion. The diagnosis was made by CT scan in all patients (Fig. 1, 2). According to the CT findings, four matrix patterns were detected. A uniformly sclerotic way was detected in five cases, a targeted-like design in three cases, a partially corticated shell with a heterogeneous matrix in four cases, and a heterogeneous matrix without a well-defined surface in one case. Five, six, and two patients treated with endoscopic technique alone, osteoplastic flap technique (through a coronal incision or an eyebrow incision) and combined approach, respectively (Fig. 3). No recurrence or complications were observed in 51 months mean follow-up (9–72 months).



**Figure 3. Intraoperative picture of a patient showing the osteoma in the left frontal sinus during osteoplastic approach**

## DISCUSSION

Paranasal sinus osteomas show a male predilection (1.5:1), and diagnosis is usually made around the 3<sup>rd</sup> and 4<sup>th</sup> decades of life (8). The mean age was  $47.15 \pm 13.83$  years in our study. The mean age was compatible with the literature in our series. The literature has reported the 4–10% of osteoma cases present with symptoms (3). In this study, ten of 13 patients had symptoms. The admission of symptomatic patients can explain this to our clinic or the low number of patients. Clinical presentation may vary according to the lesion's site, size, and growth rate (5). In this study, the most common complaint was headache that was compatible with the literature.

Ethmoid sinus osteomas present with symptoms earlier than those with frontal involvement, which is related to the anatomical difference (9). Unlikely, ethmoid sinus cases were asymptomatic in our study, and operation was recommended for them due to lamina papyracea and the skull base extension.

Even though the etiology of osteomas is controversial, embryologic, traumatic, and infective theories have been suggested (10). In the present study, no obvious etiology was noted in the 13 cases.

CT scan is the gold standard imaging technique for the diagnosing osteomas. In our study, CT was the primary examination imaging technique of choice for identifying the presence and location of osteoma. In literature, the management of asymptomatic cases is somewhat controversial due to the sluggish growth of the tumor (11). Small asymptomatic tumors, especially among elderly patients, are followed up regularly with physical examination and imaging methods (11). Surgical treatment is indicated in symptomatic patients, causing facial deformity, covering more than 50% of the frontal sinus (12). Wolf et al. (13) recommend at least one radiological follow-up to estimate the growth rate for

primary paranasal osteomas in critical regions such as the skull base and orbit. However, some authors recommend immediate surgery after diagnosis, as the tumors may cause complications in time and ethmoid osteomas can be easily removed without complications (14). In this study, we operated on three asymptomatic ethmoid osteomas regardless of tumor size. Because one of these tumors was located near the skull base, and two of them were located close to the lamina papyracea.

Depending on the size and location of the tumor and the surgeon's experience, the operative technique can change. PNSOs can be approached by endoscopic, external, and combined procedures (15). While the external approach is mainly used in frontal osteomas, the osteomas located at the upper part of the ethmoid, sphenoid, and maxillary sinuses can be removed endoscopically. Castelnovo et al. (6) recommended endoscopic management for all frontal osteomas located on the medial side of the sagittal plane passing through the medial aspect of the orbital wall, which provided that the anterior-posterior wall of the frontal sinus is not involved.

The open surgical technique allows adequate exposure of the tumor; however, disadvantages such as more extended hospital stay, pain in the frontal region, numbness, swelling, and operation scars must be considered (6, 12). In the present study, six patients were treated with an external approach using frontal incision, all with the osteoplastic flap technique. No complications were observed in any of the cases.

The endoscopic procedure requires surgical experience. With this method, post-operative morbidity and duration of hospital stay are shorter, and natural drainage pathways of the sinuses are better preserved. An endoscopic approach can easily remove small osteomas in the medial of the frontal sinus and the ethmoid sinus (5). The pure endoscopic technique was used in three patients with ethmoid osteoma and two patients with osteoma extending to the frontal recess in our series. Recurrence is rarely observed in patients after an adequate surgery in which complete removal of the tumor has been achieved (15). Patients should be followed for a long time in terms of mucocele development. There was no patient with recurrence or mucocele formation in the follow-up.

## CONCLUSION

CT is the most helpful method in diagnosis of PNSOs. Symptomatic osteomas require surgery. The surgery method should be tailored according to the location and size of the lesion and the experience of the surgeon. Complications and recurrences are rare after appropriate surgical procedures.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – İK; Design – İK, KK, AV; Supervision – AV; Materials – İK, AV; Data Collection and/or Processing – İK; Analysis and/or Interpretation – İK; Literature Search – İK, KK; Writing – İK, KK; Critical Reviews – AV, MÜ.

**Conflict of Interest:** The authors have no conflict of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

## REFERENCES

1. Smith ME, Calcaterra TC. Frontal sinus osteoma. *Ann Otol Rhinol Laryngol* 1989; 98(11): 896–900. [\[CrossRef\]](#)
2. Aksakal C, Beyhan M, Gökçe E. Evaluation of the association between paranasal sinus osteomas and anatomic variations using computed tomography. *Turk Arch Otorhinolaryngol* 2021; 59(1): 54. [\[CrossRef\]](#)
3. Earwaker J. Paranasal sinus osteomas: a review of 46 cases. *Skeletal Radiol* 1993; 22(6): 417–23. [\[CrossRef\]](#)
4. Cheng KJ, Wang SQ, Lin L. Giant osteomas of the ethmoid and frontal sinuses: Clinical characteristics and review of the literature. *Oncol Lett* 2013; 5(5): 1724–30. [\[CrossRef\]](#)
5. Cokkeser Y, Bayarogullari H, Kahraman SS. Our experience with the surgical management of paranasal sinus osteomas. *Eur Arch Otorhinolaryngol* 2013; 270(1): 123–8. [\[CrossRef\]](#)
6. Castelnovo P, Valentini V, Giovannetti F, Bignami M, Cassoni A, Iannetti G. Osteomas of the maxillofacial district: endoscopic surgery versus open surgery. *J Craniofac Surg* 2008; 19(6): 1446–52. [\[CrossRef\]](#)
7. Sofokleous V, Maragoudakis P, Kyrodimos E, Giotakis E. Management of paranasal sinus osteomas: A comprehensive narrative review of the literature and an up-to-date grading system. *Am J Otolaryngol* 2021; 42(5): 102644. [\[CrossRef\]](#)
8. Pamuk AE, Kılıç B, Özer S, Süslü AE, Önerci M. Paranasal sinus osteomas: Surgical outcomes at a single institution. *Eur J Rhinol Allergy* 2020; 3(1): 4–9. [\[CrossRef\]](#)
9. Huang HM, Liu CM, Lin KN, Chen HT. Giant ethmoid osteoma with orbital extension, a nasoendoscopic approach using an intranasal drill. *Laryngoscope* 2001; 111(3): 430–2. [\[CrossRef\]](#)
10. Larrea-Oyarbide N, Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Osteomas of the craniofacial region. Review of 106 cases. *J Oral Pathol Med* 2008; 37(1): 38–42. [\[CrossRef\]](#)
11. Arslan HH, Tasli H, Cebeci S, Gerek M. The Management of the Paranasal Sinus Osteomas. *J Craniofac Surg* 2017; 28(3): 741–5.
12. Rokade A, Sama A. Update on management of frontal sinus osteomas. *Curr Opin Otolaryngol Head Neck Surg* 2012; 20(1): 40–4. [\[CrossRef\]](#)
13. Wolf A, Safran B, Pock J, Tomazic PV, Stammberger H. Surgical treatment of paranasal sinus osteomas: A single center experience of 58 cases. *Laryngoscope* 2020; 130(9): 2105–13. [\[CrossRef\]](#)
14. Pons Y, Blancal JP, Vérillaud B, Sauvaget E, Ukkola-Pons E, Kania R, et al. Ethmoid sinus osteoma: diagnosis and management. *Head Neck* 2013; 35(2): 201–4. [\[CrossRef\]](#)
15. Keskin IG, İla K, İşeri M, Öztürk M. Paranasal sinüs osteomları. *Türkiye Klinikleri J Med Sci* 2013; 33(5): 1250–8. [\[CrossRef\]](#)