Total Removal of a Giant Frontal Sinus Osteoma with Orbital Extension - A Case Report

Farid Zahrou, Yassine Ait M'barek, Lamia Benantar, Khalid Aniba

Department of Neurosurgery, Ibn-Tofail Hospital, Mohammed VI University Hospital, Marrakesh, Morocco

Abstract

The Rationale: Osteomas are benign tumours that are usually asymptomatic. However, giant osteomas can lead to severe complications. We report here the management of a giant frontal sinus osteoma with orbital extension. **Patient Concerns:** We present the case of a 17-year-old patient presenting with rapidly progressive isolated right exophthalmos. **Diagnosis:** A cerebral computed tomography scan was performed and showed a giant osteoma of the right frontal sinus extending to the orbit and massively eroding the anterior wall of the frontal sinus. **Treatment and Outcomes:** The patient underwent surgery and a complete removal of the osteoma was accomplished via an open approach, but without performing a bone flap. No recurrence was observed after 2 years of follow-up. **Take-away Lessons:** Although rare, giant frontal osteomas can cause severe functional impairment due to their proximity to noble structures. Therefore, open approach remains the mainstay of therapy.

Keywords: Frontal sinus, giant, osteoma, surgery

Introduction

Osteomas are benign, slow-growing tumours of connective tissue characterized by the proliferation of cancellous or cortical bone. Craniofacial osteomas are frequent, especially in the paranasal sinuses.[1] An osteoma is considered to be a large or "giant" sinus osteoma when its diameter is >30 mm or when it weighs more than 110 g.[2] Giant osteomas are rare and frequently invade the orbit and central nervous system requiring surgical intervention. We report here a case of a giant frontal sinus osteoma with significant erosion of the anterior wall of the frontal sinus and orbital extension, to discuss the clinical manifestations, the radiological findings, and the surgical indications of the frontal osteoma. Secondarily, we describe the surgical procedure to completely remove the tumour *en bloc* without performing a bone flap.

Case Report

The clinical history began in January 2018, when our 17-year-old patient noticed a small swelling at the internal angle of her right eye. However, she did not consult a doctor until December 2019 when she presented with a rapidly progressive isolated right exophthalmos [Figure 1]. Clinical examination revealed the presence of a firm and painless mass filling the right medial canthus. The mass was responsible for axile, irreducible, and nonpulsatile right eye proptosis of 11 mm with inferolateral globe displacement. The right eyeball movements were restricted in medial gaze without diplopia or other associated neurological or ophthalmological signs. Visual acuity was preserved. There was no nasal obstruction or rhinorrhoea.

A cerebral computed tomography (CT) scan was performed and showed a polypoid and bony mass with well-defined borders occupying the anterior part of the frontal sinus and extending toward the anteromedial angle of the orbit with thinning of the upper wall of the frontal sinus and destruction of the anterior wall. The lesion measuring approximately 3.6 cm × 2.7 cm × 1.9 cm displaced the right globe and the orbital soft tissues inferiorly and laterally. There was no intracranial extension of the mass and the posterior wall of the frontal sinus was unimpaired [Figure 2].

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Address for correspondence: Dr. Farid Zahrou, 12, Al Hamra Neighbourhood Amerchich Marrakesh 40080, Morocco.
E-mail: farid.zahrou87@gmail.com

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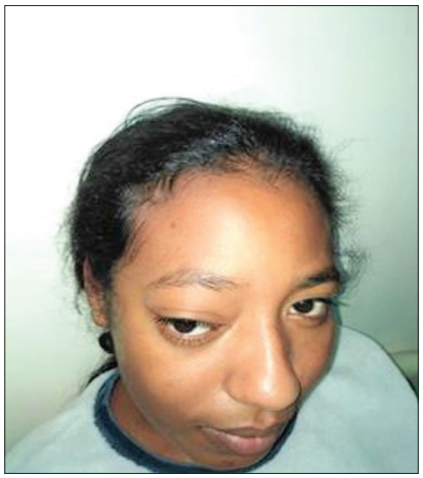

Figure 1: Clinical evidence of right eye exophthalmos

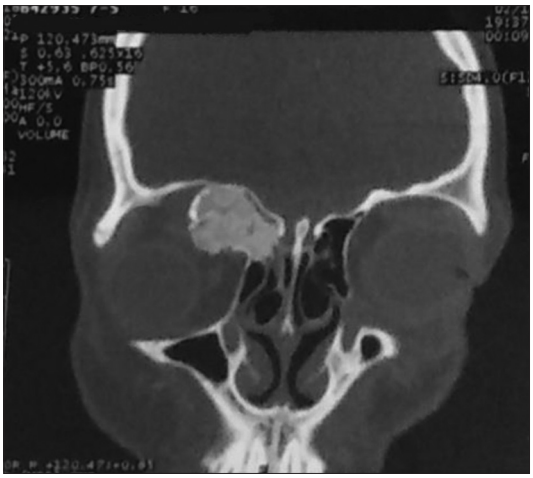

Figure 2: Computed tomographic slide showing endosinusal frontal mass with orbital involvement

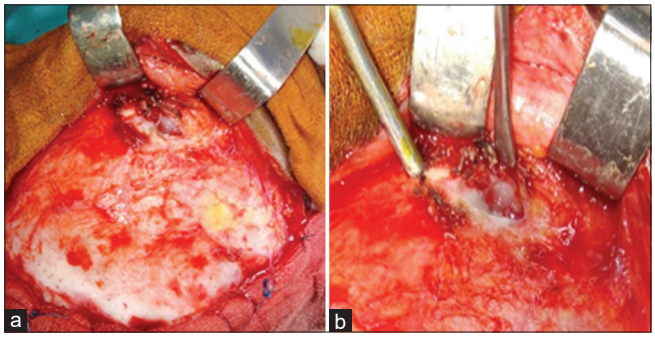

Figure 3: Intraoperative view: (a) Frontotemporal incision behind hairline extending a few centimeters beyond the midline, scalp flap, and anterior wall of the frontal sinus destroyed by the osteoma. (b) Dissection of the lesion starting from its anteroinferior part

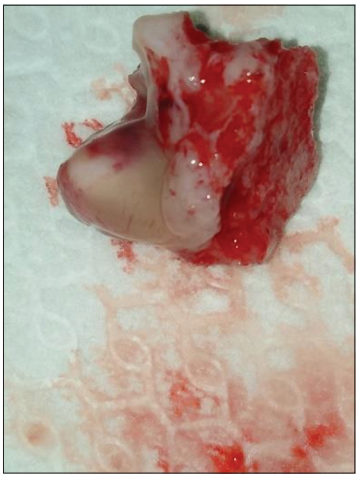

Figure 4: Removal of the osteoma

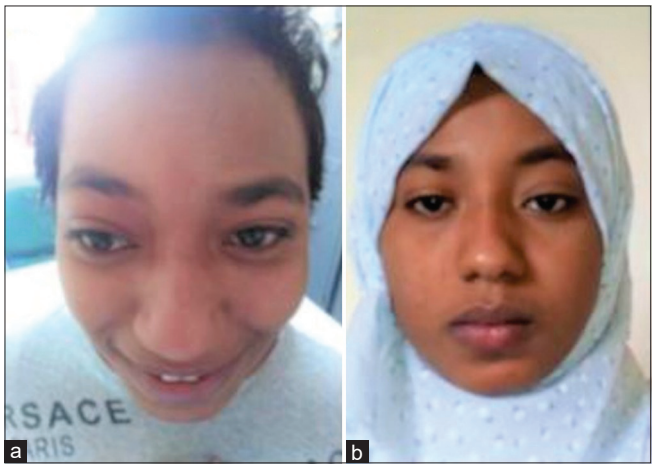

Figure 5: Total regression of exophthalmos after 6 months (a) and 13 months from surgery (b)

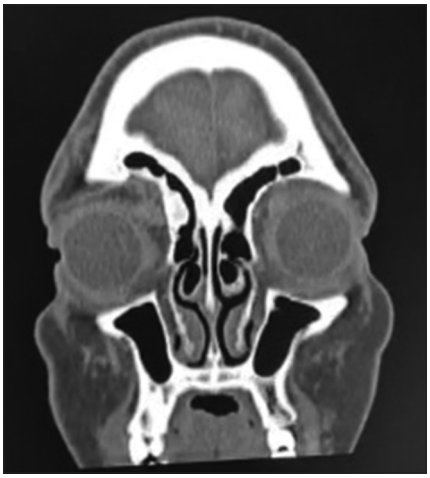

Figure 6: Computed tomography scan of the sinus coronal plane at 6-month follow-up showing resolution of the tumour

Keeping in mind the presenting symptoms of the patient, surgery was scheduled after obtaining consent from the patient. The open approach was indicated given the size of the tumour, the anterior table of the frontal sinus erosion, and the important orbital extension. Through a frontotemporal incision behind the hairline, the scalp flap was retracted forward to expose the frontal skull and the orbital rim. The anterosuperior wall

of the frontal sinus was destroyed by the tumour [Figure 3]. Therefore, we decided to try to remove the osteoma through the bone defect without performing an osteoplastic flap. The frontal sinus was then explored. After removing the mucous membrane lining of the frontal sinus, the margins of the part of the tumour located in the sinus cavity were dissected out using the small cutting scissors. A large portion of the osteoma which was intraorbital in the medial canthus was taken by the bone forceps and carefully detached from its bone attachments, facilitated by the spongious nature of the tumour. Complete macroscopic removal of the osteoma was then accomplished *en bloc* without using a bone flap [Figure 4]. The posterior wall of the frontal sinus was intact. The remaining mucosa was removed. Next cranialization and fat obliteration of the diseased frontal sinus was performed. The bone defect of the anterior wall of the frontal sinus was large and reconstructed using a cement cranioplasty.

Histological examination of the operative specimen confirmed the diagnosis of benign osteoma. The postoperative course was uneventful. No significant complications were observed during or after surgery including cerebrospinal fluid leakage, neurological deficit, or infection. At 6-month follow-up, the patient was asymptomatic with complete resolution of her proptosis [Figures 5 and 6]. The scar was cosmetically satisfactory. No recurrence was observed after 2 years of follow-up.

Discussion

Osteomas are the most common benign tumours of paranasal sinuses, with frontal sinus being the most commonly involved.[3] Giant osteomas, although rare, can lead to severe complications, such as mucocoele, brain abscess, meningitis, or pneumocephaly.[3-5] Secondary orbital extension has historically been considered uncommon, with an incidence ranging from 0.9% to 5.1%.[6] Although unusual, orbital involvement can cause eye pain, diplopia, ptosis, exophthalmos, cosmetic disfigurement, epiphora, dacryocystitis, orbital cellulitis, and vision loss.[6] In the present case, a giant frontal osteoma was found extending into the orbit and massively eroding the anterior wall of the frontal sinus.

The pathogenesis of osteomas is still controversial. They could be triggered by trauma or infection or linked to an abnormality in embryological or genetic development.[7] In our case, none of these factors were detected. Thin-slice CT scan remains the gold standard for assessing the exact size, location, extension of the osteoma, and planning of the surgical approach.[8]

The management of paranasal sinus osteomas is still controversial. Indications for surgical intervention include symptomatic osteomas, asymptomatic lesions involving > 50% of the sinus volume, rapidly evolving osteomas (>1 mm/year), and those associated with current complications (mucocoele, orbital symptoms, neurologic symptoms, and external deformity) or imminent (complete obstruction of the frontal recess and intraorbital or intracranial extension) complications.[7] Various surgical approaches can be used, including endoscopic removal, external approach, or a combined approach.[9] The type of preferred surgical intervention depends on the size, the location, the site of attachment, and the extensions of the osteoma as well as the experience of the surgeon.[10] Although some authors recommend endoscopic approach despite the size of the osteoma, only 20% of all giant osteomas were removed endoscopically.[11]

The open approach is considered standard for removing frontal sinus osteomas. Although endoscopic approach has been increasingly used since the advancement of techniques, it is technically more difficult for frontal osteomas due to problems of accessibility, especially in the presence of orbital extension and for bone reconstruction.[12] In our case, an open surgical approach was decided taking into consideration the size of the tumour and its orbital extension. External surgery can be performed via eyebrow incision or bicoronal incision. The eyebrow incision can damage the supraorbital nerve and leaves a visible facial scar. The bicoronal incision is indicated for large tumours, intracranial extension, or orbital involvement. This approach allows optimal exposure of the lesion, leaves a barely visible scar, and also allows harvesting of a galeal or temporalis fascia with preservation of the supraorbital nerve.[10] The frontotemporal incision behind the hairline extending a few centimeters beyond the midline, as in our case, also gives more exposure of the osteoma like bicoronal incision, which allows achieving total removal of the osteoma, repairing a cerebrospinal fluid leak, as well as reconstruction of the anterior wall of the frontal sinus with satisfying aesthetic results. Reconstruction of bone defects is a crucial step to protect the underlying organs and to restore cranial form. Currently, the most commonly used materials include autologous bone grafts, titanium mesh, methyl methacrylate, polyethylene sheets, and hydroxyapatite cement.[9] In our case, we used a cement cranioplasty to repair the bone defect of the anterior wall of the frontal sinus.

Conclusion

Frontal giant osteomas are rare and usually require surgical resection. Despite the increasing use of endoscopic procedures, open approach via coronal incision remains the gold standard for frontal sinus osteoma with lower recurrence rates.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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