Giant Post-Traumatic Frontoethmoid Osteoma: Diagnostic, Therapeutic and Reconstructive Approach

Case Report

Cátia Azevedo[1], António Lima[1], Miguel Afonso Filipe[2], Nobelio Duarte[2], Luís Dias[1], Renata Marques[2]

[1]Department of Otorhinolaryngology- Head and Neck Surgery, Hospital de Braga, Braga, Portugal
[2]Department of Neurosurgery, Hospital de Braga, Braga, Portugal

Abstract

Paranasal sinus osteomas are rare, slow-growing and benign lesions with potentially serious complications. They usually remain asymptomatic but when osteomas grow they can lead to local complications and cause evident aesthetic deformity due to the direct mass effect and in these situations, surgery is required. This is a report of a 30-year-old man with a rare giant post-traumatic osteoma that occupies the right nasal fossa, ethmoidal cells and frontal sinuses with extension into the right orbit.

Keywords: Osteoma, paranasal sinus, craniofacial reconstruction, titanium mesh, methyl methacrylate

Introduction

Osteoma is a benign and slow-growing tumor of mesenchymal osteoplastic nature that mostly occurs in head and neck region (1). Usually, osteomas are asymptomatic and therefore only incidentally detected in imaging studies (1-4), but they can grow, become symptomatic and cause evident aesthetic deformity due to the direct mass effect (3). From a histological perspective, sinus osteomas can be classified into three main types: compact, spongious or mixed (5). Regarding size, an osteoma is generally considered to be giant when it is larger than 30 mm in diameter or 110 g in weight (1, 3, 4, 6). In this study, a 30-year-old man with a rare giant post-traumatic osteoma that occupies the right nasal fossa, ethmoidal cells and frontal sinuses with extension into the right orbit was reported.

Case Presentation

A 30-year-old man was referred for an otorhinolaryngology consultation with a midline forehead mass, with progressive growth in the preceding four years and a significant aesthetic impact. He had a history of a frontal trauma nine years previously but otherwise there was no other relevant medical or family history. The patient had no other symptoms and the only abnormal finding on head and neck examination was a hard frontal swelling at the level of the glabella (Figure 1).

The patient underwent a computed tomography (CT) scan (Figure 2) and magnetic resonance imaging (MRI) (Figure 3) of the head that showed a bony mass occupying the right nasal fossa, the bilateral ethmoidal cells and the frontal sinuses with extension into the right orbit, suggestive of osteoma. The maximum diameter of the mass was approximately 60 mm to 40 mm. Images were also suggestive of a concomitant frontal mucocele.

The patient was admitted for tumor excision. An informed consent form was taken from the patient. In the first phase, a joint team of otorhinolaryngologists and neurosurgeons performed a bicoronal frontal flap approach and bifrontal craniotomy for removal of the frontal mucocele (Figure 4). Subsequently, the massive bilateral frontoethmoid bone lesion was excised with extensive removal of the roofs and medial walls of the orbits and their extension to the nasal cavities. Next, four Nasopore® (Stryker Global Headquarters; Kalamazoo, MI, USA) were placed in the nasal cavities for subsequent craniofacial reconstruction: The recon-

ORCID IDs of the authors:
C.A. 0000-0002-8431-0860;
A.L. 0000-0001-9888-9394;
M.A.F. 0000-0003-2500-094X;
N.D. 0000-0002-8495-1852;
L.D. 0000-0001-9630-5463;
R.M. 0000-0002-3200-9208.

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Corresponding Author:
Cátia Azevedo, catiacazevedo17@gmail.com

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struction of the floor of the anterior cranial fossa was made with titanium mesh; the reconstruction of the frontal convexity and the nose was made with titanium mesh and screws, coated with methyl methacrylate (Figures 5, 6). Fat obliteration of the frontal sinus was not performed.

There were no complications after surgery and postoperative CT scan with 3D reconstruction showed complete removal of the mass (Figure 7). Postoperatively, antibiotics were given for one week and the patient was discharged on the ninth day.

Figure 1. Hard frontal swelling at the level of the glabella seen at the first consultation

Figure 2. CT scan (axial plane) showing marked dysmorphia of the anterior and right paramedian aspect of the face, which was due to multiple bony structures of nodular features that occupied the right nasal fossa, the bilateral ethmoidal cells and the frontal sinuses, conditioning enlargement of the sinus cavities, with extension into the right orbit. The maximum diameter of the mass was approximately 60 mm to 40 mm

Postoperative histopathological findings revealed bone tissue with osseous trabeculae associated with fibrous tissue, suggestive of spongious osteoma.

The patient has been disease-free for 14 months, still in regular follow-up and is satisfied with the aesthetic result (Figure 8).

Discussion

A giant frontoethmoidal osteoma, especially of this size, occurs rarely following a head trauma and so other diagnostic hypotheses should be considered in these cases, such as fibrous dysplasia or ossifying fibroma (2, 4). These entities share clinical, radiological and histological features but may have distinct behavior (7).

The pathogenesis of osteoma that occurs after local trauma is not yet well defined. Some authors consider that in these situations an osteogenic process occurs due to the formation of

Figure 3. MRI images (sagittal plane) were also suggestive of a concomitant frontal mucocele

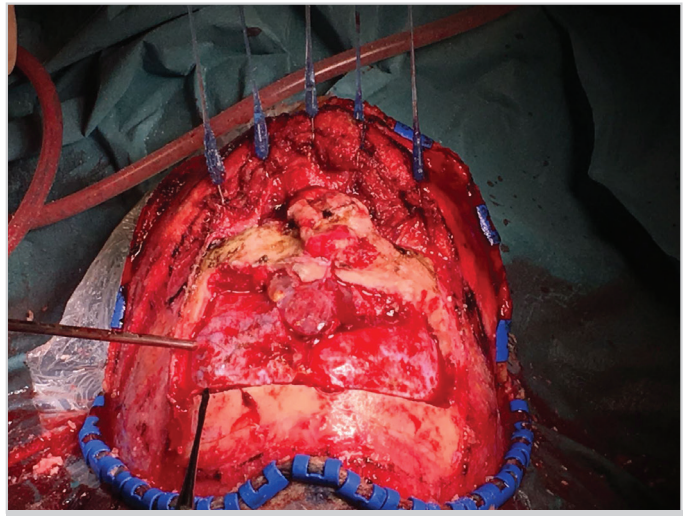

Figure 4. Intraoperative imaging: Bicoronal frontal flap approach and bifrontal craniotomy were used. Note the massive bilateral frontoethmoid bone lesion

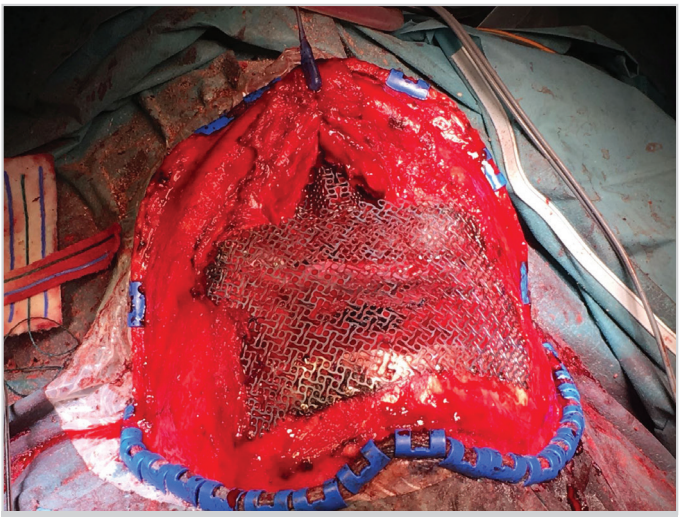

Figure 5. Intraoperative imaging: Reconstruction of frontal convexity and nose with titanium mesh and screws

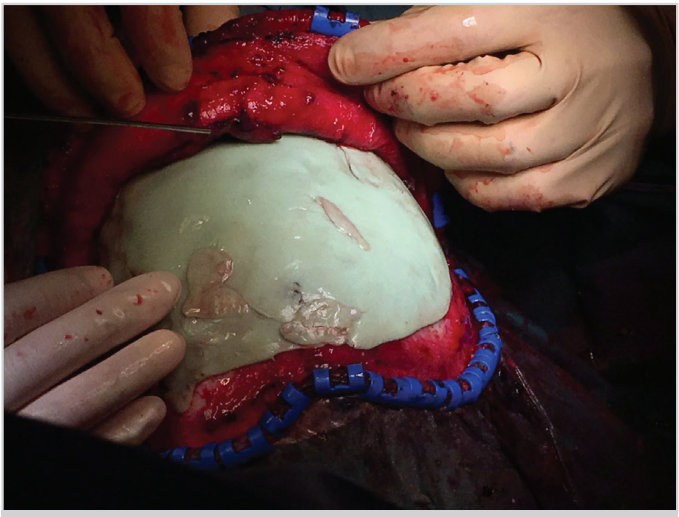

Figure 6. Intraoperative imaging: Coating the titanium reconstruction with methyl methacrylate

a subperiosteal hematoma, which is associated with muscular traction that elevates the periosteum (4). This process is usually limited, which explains why most osteomas are small and only incidentally detected, contrary to what would be expected in pure neoplastic processes. Therefore, in most cases of osteomas, a "wait and see" approach may be adopted (7). However, surgical resection is indicated if the lesion exceeds 50% of the sinus volume, grows rapidly (>1 mm/year), shows intracranial or intraorbital extension, causes chronic sinusitis and mucocele or marked aesthetic deformity (1). In giant frontoethmoidal osteomas, it is established that an external approach is the best way to complete resection, as it allows radical tumor removal under direct visualization and enables the reconstruction of bone defects (1). The osteoplastic flap technique is considered the best surgical option among the available external approach surgical techniques (1).

After the resection of bone tumors, several biomaterials have been used extensively to restore the function and aesthetic defects, such as methyl methacrylate, silicone, titanium mesh, hydroxyapatite, polyetheretherketone and porous polyethylene,

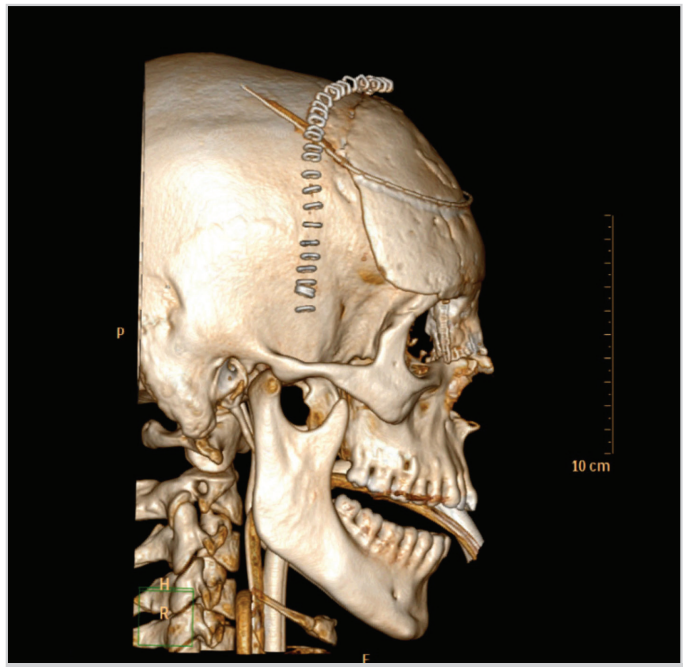

Figure 7. Lateral view of CT scan with 3D reconstruction showing a complete removal of the mass

Figure 8. Aesthetic result 21 days after surgery

and the choice of material depends on the surgeon's preference, as well as the type, cause, size and location of the defect (8).

The case presented here is a giant post-traumatic osteoma with dimensions rarely presented in the cases previously described in the literature. There is no gold standard treatment in these situations. We chose to combine two types of materials: titanium mesh and methyl methacrylate. There are only a few cases in the literature in which the same technique has been used.

Titanium mesh allows for the restoration of extensive bone loss, it's easy to mold, and sufficiently rigid to prevent displacement.

Other advantages are that it produces minimal artifacts on MRI and CT imaging and has low susceptibility to infection, being an ideal material for the reconstruction of the paranasal sinus walls (8, 9).

Methylmethacrylate, the most widely used alloplastic material for craniomaxillofacial reconstruction, can be used directly during surgery by applying it over the bone defect and shaping it to form the desired bone contour, with good aesthetic results. A major disadvantage is that the polymerization reaction, which makes the material hard, is highly exothermic (8, 10).

In our view, the main advantages of using both materials together are, on the one hand, that the bone cement (methyl methacrylate) strengthens titanium mesh that is not suitable for impact-prone surfaces, as in our case. On the other hand, the porous surface of the mesh facilitates tissue ingrowth. The only disadvantage is that the addition of titanium considerably increases the cost of surgery.

Although the risk of infection is low with these materials, it does exist but can be reduced by covering the alloplastic material with vascularized tissues and maintaining with broad-spectrum antibiotics for five days after the reconstructive surgery (10).

Conclusion

Giant frontoethmoid osteomas are rare but may cause symptoms and intracranial or intraorbital complications. After the removal of these bone tumors, large craniofacial reconstruction procedures are generally required. Polymerized methyl methacrylate and titanium mesh implants have proven to be effective and easy to handle, providing excellent aesthetic and functional results. The surgical outcome is good and recurrence is very rare, but follow-up consultation should be conducted at least once every year following the surgery.

Informed Consent: Written informed consent was obtained from the patient who participated in this case.

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

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