Endonasal Endoscopic Resection of Giant Ethmoido-Orbital Osteoma with Intra Orbital Extension

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Abstract

Objective: Osteoma is a benign, osteogenic tumor that usually grows slowly and asymptptomatically. Giant ethmoido-orbital osteoma is a rare event that can give rise to ocular signs and symptoms; in such a case treatment is mandatory, although debates persist regarding the optimal approach.

Methods: Between 1999 and 2007, six patients (four men and two women) with giant ethmoido-orbital osteomas were treated using endonasal endoscopic approach. Their ages ranged from 17 to 63 years (mean 46.3 yr). All procedures were performed under general anaesthesia using 0° and 30° nasal endoscopes. The osteoma was fragmented using intra-nasal drill and then the divided parts were detached from surrounding structures and pulled out of the nose. Finally the surgical site was packed.

Results: The transnasal endoscopic approach was successful in all six patients. Follow up period ranged from 12 months-8 years (mean 46 months). There were no major complications and only one patient had postoperative persistent epiphora which was treated by endoscopic DCR and insertion of silicon tube.

Conclusion: In selected cases of ethmoido-orbital osteomas, endonasal endoscopic approach provides a safe and effective alternative to open approaches, offering cosmetic advantages and lowering the morbidity.

Key Words: Osteoma – Ethmoid - Orbit – Endoscopic surgery.

Introduction

OSTEOMAS are benign, osteogenic tumours that usually originate in the fronto-ethmoid area and much less frequently in the maxillary and sphenoid sinuses [1]. Osteomas of the paranasal sinuses may occur at any age, although most are found during the fourth and fifth decades [2]. They usually remain the same size for a long period of time with a low rate of growth. Rarely, they can have a relatively high rate of growth with involvement of not only the paranasal sinuses but neighboring tissues as well [3]. Lesions larger than 3 cm in diameter are considered giant tumors [4]. C.T. scan is the suggested method for determining the regional anatomy and the extent of the lesion [8].

Surgical management of fronto-ethmoid osteoma may be challenging due to its proximity to vital structures, access and hard consistency [6]. Most authors agree that small asymptomatic lesions do not need surgery suggesting periodic imaging in order to follow the growth and allow intervention before the development of complications [7]. Osteomas of the paranasal sinuses should be removed surgically if they extend beyond the boundaries of the sinus, continue to enlarge, are localized in the region adjacent to the nasofrontal duct, or if signs of chronic sinusitis are present and, irrespective of their size, if patients with osteomas complain of headache when other causes of headache have been excluded [8].

Technological advances in endoscopic instrumentation expanded the use of endoscopic surgery for the management of ethmoid osteomas. The main advantages of the method are the minimal soft tissue dissection, the absence of facial bony disruption and the avoidance of a facial incision. The magnification and the different angled view, which are possible with the use of endoscopes, may facilitate the removal of osteoma, with minimal morbidity [9]. Endoscopic transnasal resection is ideal for tumors confined to the ethmoid and nasal cavity. However, when osteomas are large and expanded into the orbit and anterior cranial base, the external approach is considered the method of choice [7].

The aim of this study is to evaluate the feasibility of utilizing the transnasal endoscopic approach in the treatment of giant ethmoidal osteoma with intra-orbital extension.

Materials and Methods

Between 1999 and 2007, six patients (four men and two women) with giant ethmoido-orbital osteomas were treated using endonasal endoscopic
approach at the Beni Suef University and Nasr City hospitals. Their ages ranged from 17 to 63 years (mean 46.3 yr). All patients were subjected to preoperative evaluation which included (1) questionnaire about preoperative symptomatology with duration, prior and recent therapy, previous nasal operations and associated medical problems (2) general and otolaryngologic examination, (3) nasal endoscopic examination for the presence of any abnormalities with special attention to the osteomeatal area, (4) careful ophthalmologic assessment (5) CT. scan of the nose and paranasal sinuses in both axial and coronal cuts with bony and soft tissue windows to determine the site and extent of the disease, its relationship with surrounding vital structures (skull base and orbit) and the presence of associated pathology.

All patients were admitted and scheduled for endonasal endoscopic resection of the osteoma. An informed consent was obtained from all patients, and the probability of changing the surgical approach to an open one was completely explained. Surgery was performed under general anesthesia using endotracheal intubation. Being the patient in the supine position, Pledgets soaked with 1: 200,000 epinephrine were inserted into the nose for Ten minutes. Using a 4 mm, 0° nasoendoscope, the uncinate process and the ethmoid bulla were resected, resulting in clear visualization of the whitish osteoma. The middle turbinate was partially excised if the ethmoid space was inadequate for manipulation of the osteoma. Using a 30° nasoendoscope, the maxillary sinus ostium was identified to determine the plane of the lamina papyracea. Using a 4-mm, 0° and 30° nasal endoscopes, the ethmoidal part of the osteoma was divided (fragmented) using intranasal drill then it was gently and meticulously detached from adjacent structures and pulled out of the nose. This step gives space for the intraorbital part of the osteoma to be removed. Care was taken around the superior aspect of the osteoma adjacent to the skull base. The intraorbital part of the osteoma was then separated from the lamina papyracea or orbital periosteum by manipulating it gently in the direction of the nasal septum using a double-ended blunt elevator. Ultimate care was taken around the lateral aspects of the osteoma adjacent to the optic nerve. Repeated fragmentation and elevation was sometimes necessary if the mass was too large to be extracted via either the choana or the piriform aperture. Surgical instruments were only applied against the surface of the osteoma to avoid damage to the orbit and surrounding structures. After complete removal of the osteoma the operative field was inspected especially the roof of the ethmoid and the perios-

tum of the medial wall of the orbit to detect any defect. Finally, the nasal cavity was lightly packed with Vaseline containing gauze for 24 hours. All patients were submitted to immediate postoperative ophthalmic assessment and they were discharged within 24-48 hours. Postoperative treatment included antibiotic, anti-inflammatory, nasal decongestant and regular nasal irrigation. All patients were followed up with nasoendoscopy in the out-patient clinic at least once a month for 12 months. A CT scan of the sinuses was performed at the end of the follow-up period.

Results

The transnasal endoscopic approach was successful in all six patients. The time required to complete the procedure ranged from 75 minutes to 160 minutes. The mean follow-up period was 46 months (12 months- 8 years).

The data of the 6 patients are summarized in (Table 1). Proptosis was the most commonly reported symptom occurring in all patients (100%), followed by facial pain or headache (83.3%), diplopia (66.7%), limitation of eye movement (33.3%) and persistent epiphora (16.7%). Nasal endoscopy revealed nothing abnormal in all cases. Preoperative CT scan showed a well defined osteogenic ethmoidal lesion extendingcranially up to skull base (without invasion) and laterally into the orbit with displacement of the orbital contents. Two osteomas (33.3%) were found in the anterior ethmoid sinus and four osteomas (66.7%) were found involving both anterior and posterior ethmoid sinuses. Secondary sinusitis was observed in 2 cases.

Table (1): Showing the age, sex, side of involvement and the preoperative symptomatology.

<table>
<thead>
<tr>
<th>Number</th>
<th>Sex</th>
<th>Age</th>
<th>Side</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>17</td>
<td>LT</td>
<td>Proptosis + diplopia + limited eye movement</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>61</td>
<td>RT+LT</td>
<td>Proptosis + facial pain + diplopia</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>37</td>
<td>LT</td>
<td>Proptosis + facial pain + epiphora</td>
</tr>
<tr>
<td>4</td>
<td>Male</td>
<td>53</td>
<td>LT</td>
<td>Proptosis + facial pain + diplopia</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>63</td>
<td>LT</td>
<td>Proptosis + facial pain + diplopia + limited eye movement</td>
</tr>
<tr>
<td>6</td>
<td>Male</td>
<td>47</td>
<td>RT</td>
<td>Proptosis + facial pain</td>
</tr>
</tbody>
</table>

During surgery, the expected site of origin was detected in the lamina papyracea in 4 cases (66.7%), middle turbinate in one case (16.7%) and nasal septum in the case (16.7%) with horseshoe osteoma.
Partial removal of middle turbinate was performed in two cases. In all cases the osteoma was found in direct contact with the orbital perios- teum. After removal of the osteoma, the periosteum of the medial wall of the orbit was found intact in all cases without any defect. Histological examination confirmed the clinical diagnosis of the osteoma in all cases.

Fig. (1): (Patient No. 2).
(A): Preoperative C.T. scan showing a big horseshoe osteoma.
(B): Postoperative C.T. of the same patient 6 years after surgery.

Fig. (2): (Patient No. 1).
(A): Preoperative axial and coronal C.T. scan showing the osteoma and its relation to the optic nerve.
(B): Axial C.T. scan after 1st operation the osteoma became away from optic nerve.
(C): Coronal C.T. scan after 2nd operation with complete removal of the osteoma.
In all except one, complete removal was achieved in the first surgery. In one patient (Patient No. 1) the tumor was found in close contact with the optic nerve (Fig. 2-A), so, the operation was terminated after dislocation of the intraorbital part to avoid traction and injury of the optic nerve due to presence of unnoticed adhesions between the osteoma and the optic nerve. Immediate postoperative ophthalmic consultation revealed no change in the visual acuity. Postoperative CT scan was done to determine the new position of the dislocated intraorbital part and its relationship to optic nerve. The intraorbital part of the osteoma was found moved away from the optic nerve (Fig. 2-B). After two weeks, this residual part of the osteoma was removed through endonasal endoscopic approach (Fig. 2-C).

Postoperative ophthalmological examination for all cases revealed no ecchymosis or visual impairment. The full range of eye movement was restored and the diplopia gradually resolved over the following days. Postoperative nasoendoscopy showed normal re-epithelialization within 4 to 6 weeks of surgery. Postoperative CT scans showed no residual osseous tumor in any case.

None of the patients experienced intra or postoperative hemorrhage or CSF leak. Postoperative persistent epiphora was observed in one patient (16.7%) and was treated with endonasal endoscopic DCR and insertion of silicon tube.

Discussion

Although small frontoethmoidal osteomas are relatively frequent [8,10,11], a search of the literature reveals only a few case reports of giant osteomas, which are very rare findings in that region [12,13,14].

In relation to its dimensions and localization, a large osteomas exhibit a variety of clinical symptoms and signs which include, headache or facial pain localized over the area of the osteoma, facial deformity, rhinorrhea, anosmia, sinusitis and sometimes ocular symptoms (diplopia, exophthalmos and proptosis) or cerebral complications [15]. Involvement of the orbit generally results from the direct extension of an osteoma from the adjacent paranasal sinuses [2]. In this study, proptosis was found the most common presenting symptoms (100%), followed by facial pain or headache (83.3%), diplopia (66.7%), limitation of eye movement (33.3%) and persistent epiphora (16.7%).

A CT scan is a fundamental tool that not only permits diagnosis but also allows the correct surgical approach to be planned [8]. In this study, careful analysis of CT scan in the axial and coronal views determined the size and extent of the tumor and its relation with the surrounding vital structures.

In this study, the diameter of the osteoma ranged from 4.1-7.4 cm (mean 4.9 cm). Strek et al. [4] considered osteomas larger than 3 cm in diameter giant tumors.

Management of paranasal osteomas remains controversial. Generally, conservative policy with no treatment is recommended for asymptomatic osteomas [7]. Osteomas that cause symptoms must be removed. A pre-requisite for complete tumor resection is adequate access to all tumor borders. The surgical approach has to take into account the following factors: protection of the vital structures especially optic nerve and cribiform plate, complete resection and minimal cosmetic deformity [15].

The choice of surgical approach to osteoma always depends on the size of the lesion, its location and the personal experience of the surgeon. Approaches to ethmoidal osteomas can be divided into external, endoscopic and combined endoscopic and external procedures [4].

External surgical procedures have been the method of choice in the treatment of ethmoidal osteomas. These procedures include: lateral rhinotomy, external ethmoidectomy, frontoethmoidectomy and direct anterior surgical approach. Although all these techniques are effective in certain conditions, they bear some disadvantages like permanent scar formation, hemorrhage CSF fistula, damage to surrounding structures, mucocele formation, and paresthesias [5].

Recently, FESS has offered an alternative approach and has been considered to be a valuable contribution in the management of paranasal osteomas. The closer and more direct visualization of the anatomy during the operation, the reduced morbidity, shorter length of hospital stay and superior cosmetic results are distinct advantages of this technique [16].

Like every other method, the endoscopic approach also has disadvantages. Osteomas are usually located in close proximity to the ethmoid arteries, lamina papyracea, orbit, cribiform plate and anterior skull base. Especially in cases where indications for endoscopic approach is not well-determined and/or the surgeon is not sufficiently experienced, injury to one or more of the above mentioned anatomic structures may arise [17].
Many surgeons considered lesions limited to the ethmoid sinus without evidence of orbital or intracranial extension, are suitable for this modality of treatment [2,3,11].

The treatment of large ethmoido-orbital osteoma remains the focus of debate. Many authors have recommended the removal of giant paranasal osteomas with traditional external procedures, [6,18,19, 20] while few recommended its removal via combined external and endoscopic procedures [4,7,21].

On the other hand, there are several reports of successful removal of large ethmoid osteomas with intraorbital extension, treated endoscopically but most of these publications are case report with a limited number of patients [1,5,15,22].

In this study, the removal of the ethmoidal part of the osteoma was found the key step in the endoscopic approach. The osteoma was widely exposed by removal of the uncinate process, bulla ethmoidalis and, in some cases (2 cases), the anterior end of middle turbinate. Separation of the ethmoidal part was accomplished by drilling (using curved nasal hand piece with medium sized cutting burr) in a plane parallel to the lamina papyracea. Removal of the ethmoidal segment allowed mobilization of the intraorbital part and permits easier dissection of its lateral surface from the periorbital tissues.

In this series, the tumour was found in close contact to the ethmoidal roof and skull base, although neither of these structures was invaded. So, plane of cleavage was found between the osteoma and the skull base in all cases.

In case with the horse shoe osteoma (Patient No. 2) was removed in four parts and all these parts were extruded from the LT nasal fossa. Also, bilateral removal of the anterior end of the middle turbinate was done to allow visualization of the osteoma in both RT and LT nasal fossae. The first part (LT ethmoidal part) was removed by drilling parallel to the plane of LT lamina papyracea and the LT side of the nasal septum. Removal of this part disimpacts the LT intra-orbital part (the second part) of the osteoma which was gently dissected and removed out of the nose. After removal of the LT half of the osteoma, the LT nasal fossa became roomy and it allowed easier manipulation and extrusion of the RT half of the osteoma. Drilling in the plane parallel to the RT lamina papyracea allowed separation of the RT nasal part of the osteoma. This part was extruded through the perforation in the nasal septum out of LT roomy nasal fossa. Finally, the remaining RT intra-orbital part (the fourth part) was detached from periorbital tissue and it was also extruded through the septal perforation out of the LT nasal fossa. Care was taken not to injure the nasal mucosa during fragmentation and removal of the osteoma.

This study showed that, the most difficult part in dissection was the postero-lateral aspect near the optic nerve. Traction must be avoided because of the potential unnoticed adhesion of osteoma to the optic nerve or its surroundings. Also the surgeon should terminate the operation or to switch to open procedure if he was unable to remove the osteoma safely.

In this study, the overall success rate was 100% (Fig. 3) and the only reported complication was dacryocystitis. Injury of the nasolacrimal duct during detachment of the anterior part of the osteoma was expected to be the cause.

![Preoperative coronal C.T. scan showing ethmoido-orbital osteoma.](A)  
![Postoperative coronal C.T. scan (same patient) 3 days after removal of the osteoma.](B)
Conclusion

In selected cases of ethmoido-orbital osteomas transnasal endoscopic approach constitutes a new sure and efficient alternative, offering some aesthetic advantages and lowering the morbidity noted in the classical surgical approaches. Although it is a safe technique, meticulous care and patience are necessary to prevent potential complications.

The surgeon should have sufficient knowledge and experience about the anatomy and surgical techniques related to this region. Also, the surgeon must be able to switch to an external approach or to combine it with the endoscopic approach if he is unable to remove the tumor safely and completely.

References


