Case Report

Frontal sinusitis associated with orbital decompression for Graves’ orbitopathy

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ABSTRACT

Orbital decompression (OD) for Graves’ orbitopathy usually includes removal of orbital medial wall. While OD occasionally cause or worsen chronic sinusitis because of the obstructed sinus drainage by prolapsed orbital fat, to date few reports have been published on the management or prevention of sinusitis associated with OD. Here, we present two patients (three sides) with newly developed and one patient (one side) with worsening obstructive frontal sinusitis following OD. These three patients had OD including the removal of the superior attachment of uncinated process to lamina papyracea. Endoscopic modified Lothrop procedure (EMLP) was useful to relieve symptoms and keep an enough access to frontal sinuses for all cases. We also performed EMLP for another two patients (four sides) with pre-existing sinusitis before OD. Worsening of sinusitis could be avoided by EMLP before OD. EMLP was useful approach for both treatment and prevention of sinusitis related to OD. The superior attachment site of uncinated process and the pattern of frontal sinus drainage might predict the occurrence of obstructive frontal sinusitis following OD.

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1. Introduction

Graves’ disease is an autoimmune disorder caused by an excess of thyroid stimulating immunoglobulins. Approximately 40% to 75% of patients develop various orbital manifestations including exophthalmos, proptosis, periorbital edema and chemosis, eyelid retraction, ocular dysmotility leading to squint and diplopia, and optic neuropathy [1]. Systemic corticosteroids and external beam radiation are useful treatment strategies that minimize proptosis and optic nerve compression during the acute inflammatory phase. However, patients in the chronic fibrosis phase who are unresponsive to medical therapy need surgical intervention.

Orbital decompression (OD) for Graves’ orbitopathy, the most frequent and invalidating extrathyroidal expression of Graves’ disease, is generally safe and effective. Overall postoperative sinusitis reportedly occurs in 3.5%–6.1% of patients, but 40% of those with preoperative sinusitis develop obstructive sinusitis after OD [2,3]. Sinusitis after OD is often refractory to medical therapy and difficult to manage because sinus drainage is blocked by prolapsed orbital fat.

We treated two patients (three sides) with newly developed and one patient (one side) with worsening obstructive frontal sinusitis following OD by endoscopic sinus surgery (ESS)

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including endoscopic modified Lothrop procedure (EMLP). We also performed ESS for another two patients (four sides) with pre-existing sinusitis before OD. As few reports have been published on sinusitis related to OD, this report aims to introduce the management and prevention of frontal sinusitis associated with OD.

2. Case reports

Case 1: A 35-year-old female with frontal pain and swollen eyelids was referred to our hospital. She had a OD for Graves’ orbitopathy five months ago. Computed tomography (CT) revealed bilateral frontal and right sphenoid sinusitis with blocked sinus drainage caused by prolapsed orbital fat. While frontal pain was relieved by intravenous antibiotics, we recommended surgery to prevent recurrent sinusitis. Since the middle meatuses were completely blocked by orbital fat, we selected the outside-in modified endoscopic Lothrop approach (EMLP) for the frontal sinus, drilling frontal process of the maxilla without confirming the frontal recess in middle meatus [4]. We also adopted the trans-septal approach for the sphenoid sinuses. The septum of both frontal and sphenoid sinuses were removed. The patient has remained free from sinusitis after ESS for 17 months.

Case 2: Another 35-year old male with worsening foul-smelling nasal drip due to refractory sinusitis after OD was referred to our hospital. CT revealed sinusitis in the right frontal and maxillary sinuses. Pre-operative MRI before OD showed sinusitis in right frontal and maxillary sinuses and this sinusitis got worse after OD. We used the same approach as for Case 1 for the frontal sinus and extended inferior antrostomy for the maxillary sinus, creating wide nasoantral window through inferior meatus [5]. This patient has been free from sinusitis after ESS for 15 months.

Case 3: A 45-year-old female was referred to our department for the treatment of sinusitis. She was scheduled for OD since medication and radiotherapy failed to suppress the progression of orbitopathy. A standard endoscopic trans-ethmoidal approach was used, which involved making large apertures in the maxillary, sphenoid, and frontal sinuses. The postoperative period was uneventful and OD was performed 3 months after ESS. Migrated orbital fat in middle meatus was shown in Fig 3. No obstructive sinusitis has occurred at least 14 months after ESS.

Case 4: A 46-year-old female with refractory sinusitis caused by nasal polyps was referred to us for medical therapy. Trans-ethmoidal ESS, similar to that for Case 3 and also involving large apertures in the sinuses was performed, followed by OD 3 months later. Since then, no obstructive sinusitis or complications such as diplopia, nasal obstruction, or olfactory loss have been noted during the 17 months after the surgery.

Case 5: A 61-year old male with history of left OD 12 months ago was referred because of left frontal sinusitis. Uncinated process (UP) was attached to medial orbital wall (Fig 1A) and removed by OD (Fig 1D). UP was lateralized medially by orbital fat and blocked drainage from left frontal sinus (Fig 1B and C). Same EMLP could relieve left frontal sinusitis.

Fig. 1. Attachment of uncinated process to orbital medial wall was removed and prolapsed orbital fat blocked the drainage from frontal sinus (Case 5). MRI before OD revealed no sinusitis and uncinate process (UP) attached to lamina papyracea (A). Left ethmoid and frontal sinusitis (B, C) by prolapsed orbital fat (arrowheads) was shown. The superior attachment of UP to lamina papyracea was removed after OD. Contra-lateral (E) and anterior (F) approach direction to frontal sinus by endoscopic modified Lothrop procedure (EMLP) was indicated by arrow.
Table 1
Clinical characteristics of sinusitis related to orbital decompression.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Sinusitis before OD</th>
<th>Sinusitis after OD</th>
<th>Attachment of Uncinate Process</th>
<th>Procedure</th>
<th>Interval</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>F</td>
<td>R</td>
<td>–</td>
<td>Orbit</td>
<td>ESS after OD</td>
<td>5M</td>
<td>17M</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>M</td>
<td>R</td>
<td>Et, MS</td>
<td>Orbit</td>
<td>ESS after OD</td>
<td>6M</td>
<td>15M</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>F</td>
<td>R</td>
<td>FS, Et, MS</td>
<td>Skull base</td>
<td>ESS before OD</td>
<td>3M</td>
<td>14M</td>
</tr>
<tr>
<td>4</td>
<td>46</td>
<td>F</td>
<td>R</td>
<td>FS, Et, MS</td>
<td>Skull base</td>
<td>ESS before OD</td>
<td>3M</td>
<td>17M</td>
</tr>
<tr>
<td>5</td>
<td>61</td>
<td>M</td>
<td>R</td>
<td>–</td>
<td>Orbit</td>
<td>ESS after OD</td>
<td>12M</td>
<td>1M</td>
</tr>
</tbody>
</table>

M, male; F, Female; R, right; L, left; Et, Ethmoid sinus; MS, Maxillary sinus; FS, Frontal sinus; SS, Sphenoid sinus; ESS, Endoscopic sinus surgery; OD, Orbital decompression.

Fig. 2. The mechanism of obstructing the drainage from frontal sinus depending on the superior attachment of the uncinate process (UP). Uncinate process (*) attached to lamina papyracea (A). Removal of superior attachment of UP by OD leads to obstruction of outflow tracts from frontal sinus (arrowheads). UP attached to cribiform plate (B). Orbital fat migrates into middle meatus, but wider outflow tracts would less likely to be obstructed.

3. Discussion

Orbital decompression surgery for Graves’s orbitopathy is a technique that varies among institutions and departments. While transconjunctival and transcaruncular approaches are popular among ophthalmologists [6,7], recently the transnasal endoscopic approach has come into use among otolaryngologists [8,9]. Our co-author adopted the balanced decompression, which includes the removal of medial and lateral orbital bony wall. Regardless of the surgical methods, the medial orbital wall (lamina papyracea) is usually removed and orbital fat would migrate into ethmoid sinus to some extent. Though Orbital fat decompression might be preferable only in terms of sinusitis [10], the optimal choice of surgical approach for Graves’ orbitopathy is beyond the scope of this paper. The issue is the difficulty of predicting to what extent the middle meatus would be blocked by the migrated orbital contents.

Frontal sinus outflow tracts were classified into two types, medial or lateral to the UP [11]. The superior attachment of UP was reported to be lamina papyracea (type 1/2, 63%), cribiform plate (type 3/4, 15%), skull base (type 5, 14%), and middle turbinate (type 6, 8%) [12]. Frontal sinusitis was most common in attachment type of lamina papyracea, type 1/2. Outlet tracts from frontal sinus in type 1/2 would be originally narrow and easily blocked by orbital fat when OD removed superior attachment of UP (Fig. 2A). Frontal sinus drainage is less likely to be obstructed in Type 3/4 than type 1/2 (Fig. 2B). The UP superior attachment was type 1/2 in our series of newly (3 sides) and worsening (1 side) frontal sinusitis after OD.

The draft guideline for Graves’s orbitopathy was released in 2018 by Japan thyroid association. As this guideline rec-
ommands MRI evaluation of severity for Graves’s orbitopathy, the rate of detecting comorbid sinusitis might increase thereafter. There are no practical guidelines about the management of sinusitis associated with Graves’s orbitopathy. The incidence of sinusitis after OD was reported from 3.5% to 6.3% [2,3,8]. Those patients were often required ESS after OD.

The surgical approach for obstructive sinusitis after OD is challenging. It is impossible to use the customary transethmoidal ESS and special attention needs to be paid to the risk of damaging the orbital contents. The outside-in modified endoscopic Lothrop procedure [3] to the frontal sinus is required to keep wide enough drainage. The trans-septal approach to the sphenoid sinus and extended inferior antrostomy via the inferior meatus to maxillary sinus [5] are needed only when symptomatic sinusitis existed in sphenoid and maxillary sinuses. However, sinus packing for hemorrhaging should be avoided since sinus infection could easily spread into orbit. Use of a surgical navigation system is therefore mandatory to verify anatomical landmarks and avoid damaging orbital contents. Considering all these technical challenges and restrictions, checkups for sinusitis and vigorous treatment before OD should be considered. Limitation of this study was the method of retrospective case series. The true incidence of sinusitis associated with OD and our speculation about the mechanism of frontal sinusitis should be investigated in further study.

4. Conclusion

OD might develop or worsen the sinusitis by obstructing the frontal sinus drainage. ESS including EMLP was useful both for the management and prevention of frontal sinusitis associated with OD. The superior attachment of uncinate process to lamina papyracea and removal might predict the high-risk group of frontal sinusitis after OD. Checkups for sinus CT and vigorous treatment against sinusitis before OD could be recommended.

Disclosure statement

None of the authors has received financial support or has a conflict of interest regarding this study.

Declaration of Competing Interest

All authors have no conflict of interest related with this paper.

References