ENDOSCOPIC ENDONASAL SURGERY FOR RESECTION OF BENIGN SINONASAL TUMORS: EXPERIENCE WITH 107 PATIENTS

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Background: The use of endoscopic surgery for nasal and sinus pathologies has revolutionized our approaches towards the diseases of these areas. Because of direct visualization, better magnification, lack of external incision, and decreased morbidity, this method is more suitable than open techniques.

Objective: To report our experience with endoscopic surgery of benign tumors and tumor-like conditions of the nose and paranasal sinuses.

Methods: The medical records of 105 patients with benign sinonasal tumor, who had undergone endoscopic surgery for removal of their neoplasm between 1997 and 2003, were retrospectively studied.

Results: The studied patients included 32 with juvenile nasopharyngeal angiofibroma, 24 with inverted papilloma, 23 with benign fibroosseous lesions, 18 with pyogenic granuloma, 6 with intranasal hemangioma, and 2 with pleomorphic adenoma. The patients had a follow-up ranging from 9 to 73 (mean: 41) months. During the follow-up period, the patients were under close observation by performing serial endoscopy and yearly CT scan. Eight cases of recurrent tumor—2 angiofibroma, 4 inverted papilloma, 1 fibrous dysplasia, and 1 osteoma—were noted and managed endoscopically alone or in combination with Caldwell-Luc approach. The major complication encountered in this study was cerebrospinal fluid leakage (2 cases) that was sealed intraoperatively with local tissue flaps without any further sequela.

Conclusion: Endoscopic surgery is a valuable tool for removal of benign tumors of the nose and paranasal sinuses in the hands of an experienced surgeon.

Keywords: Endoscopy • nose • paranasal sinuses • endoscopic surgery • tumor

Introduction

The use of endoscopic surgery for nasal and sinus pathologies has revolutionized our approaches towards the diseases of these areas. Because of direct visualization, better magnification, lack of external incision, and decreased morbidity, this method is more suitable than open techniques.

Although initially it has been used to treat chronic inflammatory conditions of sinuses, during the last decade, it has moved towards advanced treatment of a variety of other sinonasal pathologies. Among these, a growing number of benign tumors are currently treated with this minimally-invasive approach. In this article, we reported our experience with endoscopic surgery for treating benign tumors and tumor-like conditions of the nose and paranasal sinuses.

Patients and Methods

The medical records of all patients with benign nasal and paranasal sinus tumors who had undergone endoscopic resection between 1997 and 2003 were retrospectively reviewed. All patients with inflammatory diseases, such as mucoceles or retention cysts, were excluded from the study. The collected data included the pathologic diagnosis,
sites of involvement, the procedure performed, the follow-up period, outcome, and complications.

Preoperative computerized tomography (CT) scan was performed for all patients. In those with suspected intracranial or intraorbital extension of the tumor or when we could not determine the extent of tumor from the retained secretion, magnetic resonance imaging (MRI) was also performed during the preoperative assessment. Before operation, diagnostic endoscopy was performed in all patients and a biopsy was taken from accessible lesions, except in patients suspected to have vascular tumors (such as hemangioma or juvenile nasopharyngeal angiofibroma).

After induction of general anesthesia, a 1:100,000 solution of epinephrine diluted in normal saline was injected into the lateral nasal wall, root of the middle turbinate (if possible), and any tumoral tissue. It was followed by topical application of lidocaine and epinephrine-soaked cotton pledget.

At the beginning of dissection, a zero-degree endoscope was used as much as possible, because of its more convenient application. Thirty-, 45-, and 70-degree telescopes were used as necessary, especially in the frontal recess area or the maxillary sinus.

The operation was begun with debulking of any tumoral tissue that had not involved the nasal or sinus mucosa. This allows better visualization, provides enough space for determination of the original site, and prevents breach of tumor margin. This is not true for resection of angiofibroma, where debulking would lead to massive bleeding or for small tumors where the periphery of the tumor is completely visible.

After identification of the original site, using a sickle knife and an elevator, the mucosa was incised and elevated with a few millimeters of a normal-appearing mucosa at the margin.

In most patients, total ethmoidectomy and wide maxillary antrostomy were performed. In cases with involvement of the inferior turbinate or when tumor extension was beyond the medial maxillary wall, an endoscopic medial maxillectomy was performed. If the disease involved the anterior or lateral maxillary wall so that it was inaccessible through an endoscopic approach or when the maxillary sinus involvement was extensive, a combined approach of endoscopy and Caldwell-Luc was employed.

In selected cases, sphenoidotomy, frontal recess exploration, middle turbinate resection, and removal of lamina papyracea were performed. In cases who required removal of lamina papyracea, the orbital periosteum was left intact because this is a good natural barrier for tumor extension. If the margins of resection were unclear or suspected for malignancy, a tissue sample was sent for frozen-section analysis.

After completion of the procedure, hemostasis was obtained by Merocele or antibiotic-impregnated nasal packing. Nearly all patients were discharged from the hospital the day after operation with oral antibiotics for one week. Nasal packing was removed after two days.

All patients underwent follow-up endoscopy, started one month after the operation and performed regularly every three months during the first year and then every six months. The first control CT scan or MRI was performed six months after the operation and repeated every year in selected patients (such as those with extensive disease).

Results

One hundred and five patients (71 males and 34 females) with benign sinonasal tumors were treated endoscopically from 1997 to 2003. These included 32 patients with juvenile nasopharyngeal angiofibroma, 24 with inverted papilloma, 23 with benign fibroosseous lesions (osteoma, fibrous dysplasia, and ossifying fibroma), 18 with pyogenic granuloma, 6 with intranasal hemangioma, and 2 with pleomorphic adenoma.

The age of patients ranged from 9 to 76 (mean: 31.6) years. The average follow-up period was 41 (range: 9 – 73) months (Table 1).

Eight of our patients—four with inverted papilloma, two with angiofibroma, one with fibrous dysplasia, and one with osteoma—had recurrence after endoscopic resection. The recurrent tumor in inverted papilloma patients was managed endoscopically or in combination with Caldwell-Luc approach. Other patients refused any further surgery.

Cerebrospinal fluid leakage occurred in two patients—one with fibrous dysplasia and the other with osteoma. The dural tear was repaired endoscopically, using local tissue flaps in the same session without any further sequela.

We had 32 patients with juvenile nasopharyngeal-
Endoscopic endonasal surgery for resection of benign sinonasal tumors

During the follow-up period, we encountered two patients with recurrence. The first patient had a stage IIA tumor who, after 61 months, presented with recurrent epistaxis. In the CT scan, a recurrent tumor in the pterygomaxillary fossa was seen. The patient refused revision surgery. The next one also presented with recurrent epistaxis after 39 months of follow-up. The original tumor was a stage IIB angiofibroma. Recurrence occurred in the pterygomaxillary fossa. The patient refused further surgery, despite his symptoms.

In 24 patients with inverted papilloma (Table 1), endoscopic technique was used in all but four patients in whom a combined approach of endoscopy and Caldwell-Luc for medial maxillectomy was used because the tumor had extended beyond the medial maxillary wall.

Four patients had recurrence and were managed with endoscopic or combined endoscopic and Caldwell-Luc approaches. No complication was observed and the patients were found to be disease-free at the end of this study (Figures 3 and 4).

Six patients with osteoma were noted; all had symptoms (Table 1). Three patients were within the ethmoidal and/or maxillary sinuses, two in the nasofrontal duct, and one in the posterior wall of the frontal sinus. The ethmoidal/maxillary osteomas were managed with endoscopic technique alone. Osteoma of the nasofrontal duct was also managed endoscopically. Removal of the nasofrontal duct osteoma was attained with drilling of the frontal recess region. After creating a wide path, the tumor was removed using a drill and other frontal sinus instruments.

The only osteoma that we observed in the frontal sinus had involved the medial portion of the

Table 1. Results of endoscopic resection of benign sinonasal tumors.

<table>
<thead>
<tr>
<th>Type of tumor</th>
<th>n</th>
<th>Age</th>
<th>Site of tumor or extension</th>
<th>Classification</th>
<th>Follow-up (months)</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juvenile nasopharyngeal angiofibroma</td>
<td>32</td>
<td>9 – 27</td>
<td>NP = 32, SS = 28 PMF = 11, NS = 4 MS = 5 Left = 3</td>
<td>IA – IIB (Radkowski staging system)</td>
<td>9 – 72</td>
<td>2</td>
</tr>
<tr>
<td>Inverted papilloma</td>
<td>24</td>
<td>46 – 79</td>
<td>Right = 8 Bilateral = 3 MS = 9 AE = 3 PE = 9 MT = 5 FS = 4 IT = 2 SS = 2 ND = 2 PMF = 1 SB = 1</td>
<td>T1 – T3 (Krouse staging system)</td>
<td>17 – 71</td>
<td>4</td>
</tr>
<tr>
<td>Fibroosseous lesions</td>
<td>23</td>
<td>12 – 54</td>
<td>FS = 4 IT = 2 SS = 2 ND = 2</td>
<td>—</td>
<td>15 – 70</td>
<td>2*</td>
</tr>
<tr>
<td>Pyogenic granuloma</td>
<td>18</td>
<td>12 – 34</td>
<td>NS = 10, MT = 5 IT = 3</td>
<td>—</td>
<td>15 – 73</td>
<td>—</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>6</td>
<td>12 – 29</td>
<td>NS = 2 MT = 2 IT = 2 MS = 1</td>
<td>—</td>
<td>23 – 71</td>
<td>—</td>
</tr>
</tbody>
</table>

NP = nasopharynx; SS = sphenoid sinus; PMF = pterygomaxillary fossa; NS = nasal septum; MS = maxillary sinus; AE = anterior ethmoid; PE = posterior ethmoid; MT = middle turbinate; IT = inferior turbinate; ND = nasofrontal duct; SB = skull base; * CSF leak only.

Figure 1. Axial preoperative CT scan showing angiofibroma.

Figure 2. Axial postoperative CT scan.
posterior wall in a highly pneumatized sinus. For its removal a combined approach of endoscopy and trephination was used. The frontal recess area was drilled for producing a wide access to the tumor and with endoscopic visualization from the frontal recess, osteotome and curette were introduced through the trephine hole. During removal, a fine osteotome was used which led to a dural tear at the lateral lamella region. After completion of the procedure, the tear was sealed using local tissue flaps without any sequela. After two years of follow-up, the recurrence of tumor at the same region was noticed, although the patient remained asymptomatic.

Twelve patients had fibrous dysplasia. Complete removal of the tumor with either endoscopic or endoscopic plus Caldwell-Luc technique was achieved in all but one patient (Table 1); she had an extensive disease in her maxillary sinus, which extended to the pterygo-palatine fossa. Using endoscopic and Caldwell-Luc approaches, the tumor was exposed but there was no distinct margin between the tumor and normal bone. Debulking of the tumor was performed with cutting burr. A wide antrostomy was created. Nearly two years later, the patient returned with recurrence of her symptoms. CT scan revealed extensive tumor recurrence. However, she refused further surgery. The combined endoscopic and Caldwell-Luc approach was performed in two other patients with extensive maxillary sinus involvement without any recurrence.

In one of our patients who had involvement of the skull base, a dural tear occurred at the lateral lamella region during drilling. It was repaired with local tissue flaps without any sequela.

We had five patients of ossifying fibroma, who were managed endoscopically except for one patient with extensive involvement of the maxillary sinus. This patient was a 52-year-old woman who underwent a combined endoscopic and Caldwell-Luc approach. During the follow-up period, using serial endoscopy and yearly CT scan, no evidence of recurrence was noted (Table 1).

Our series included 18 patients with pyogenic granuloma who had involvement of the septum, maxillary sinus, or inferior turbinate. All patients presented with recurrent epistaxis. Complete removal via endoscopic approach achieved in all patients without any recurrence or complication (Table 1).

We had six patients of intranasal hemangioma—two capillary and four cavernous types—which were removed endoscopically (Table 1). Recurrent epistaxis was the presenting symptom in all patients. In addition, four patients had progressive nasal obstruction. We encountered no complication or recurrence in these patients.

Two patients with nasal pleomorphic adenoma were females with involvement of the nasal septum. The presenting symptoms were nasal blockade and rhinorrhea. Endoscopic resection led to tumor control, without any complication or recurrence.

Discussion

There are many reports on the use of endoscopic approach for resection of juvenile nasopharyngeal angiofibroma in the literature. This technique is a safe and effective method that allows removal of small- and intermediate-sized juvenile nasopharyngeal angiofibroma without extensive involvement of the infratemporal fossa and cavernous sinus.

We used this technique for patients with stage
IA to IIB angiofibroma without any complication. The recurrence rate of 6% (2 – 32%) is comparable with other series. We had no asymptomatic recurrence. The presenting symptom in patients with recurrence was recurrent epistaxis. The long period between surgery and recurrence (61 and 39 months) makes residual disease less likely. Nonetheless, the disease was found in the pterygomaxillary fossa in two patients. Limited access to this area, especially the lateral part, during endoscopy may explain the cause. Furthermore, microscopic extension of the disease towards the adjacent bone has been described as a contributing factor.

The endoscopic approach can be applied for inverted papilloma affecting the turbinates, ethmoid sinuses, and for limited involvement of the maxillary, frontal, and sphenoid sinuses. A more extensive disease requires external approaches, which may be combined with the endoscopic techniques at any time. The assessment of endoscopic resectability depends on preoperative endoscopic examination, CT, or MR imaging and more importantly, on intraoperative assessment.

The recurrence rate of endoscopic approach for resection of inverted papilloma ranges from 0% to 27%. We had four (16%) recurrences, which is similar to other series. It has been stated in other studies that recurrence is more prevalent in extensive diseases. Among patients suffering from a recurrent disease, case 17 had an extensive bilateral disease with involvement of both maxillary sinuses and erosion of septum (Table 1). The original approach was a combined endoscopic and Caldwell-Luc surgery, but after 8 months, a recurrence occurred in the left side, which was managed with a combined approach later on. Involvement of the medial orbital wall in case 3 and the lateral maxillary wall in cases 5 and 14 were in favor of high likelihood of recurrence, as reported by Lund. Regardless of choosing a combined approach or complete tumor removal in cases with involvement of the lateral maxillary wall, recurrence occurred. A possible explanation for this may be incomplete excision.

Recently, endonasal surgery has been considered to be a valuable contribution in the management of paranasal sinus osteomas. The reduced morbidity, shorter length of hospital stay, and superior cosmetic results are distinct advantages of this technique.

Treatment of asymptomatic osteoma is controversial. Symptomatic lesions, those located near natural ostium of the frontal sinus, those that occupy more than 50% of the frontal sinus, those extending beyond the frontal and ethmoidal sinuses, or those obviously enlarging, necessitate removal.

Ethmoidal osteomas without extrasinusual extension can be resected endoscopically. The endonasal approach should also be considered for frontal sinus osteoma, if sufficient frontal sinus access can be achieved endonasally. The osteoma placed medial to a virtual sagittal plane through the lamina papyracea and the tumor base is at the inferior parts of the posterior frontal sinus.

Most authors believe that asymptomatic fibrous dysplasia can be managed expectantly with serial CT scan. Surgery is reserved for patients with clinical symptoms, but the choice of approach is controversial. Complete surgical removal via endoscopic technique is the optimal method, because it avoids the cosmetic problems caused by external approaches. However, it is only feasible in limited lesions. In more widespread lesions, wide sinusotomies and curettage of lesion would relieve the symptoms. In these cases, endoscopic and radiologic follow-ups (with serial CT scan) are mandatory to observe the progression of the disease.

Differentiation between ossifying fibroma and fibrous dysplasia is essential, because of their different surgical management and natural histories. Complete removal of tumor, until obtaining a negative surgical margin, must be performed when the tumor involves paranasal sinuses. Using an aggressive endoscopic technique, the complete removal of ossifying fibroma is often possible. However, a long-term close follow-up is mandatory.

There are numerous reports on endoscopic removal of fibroosseous lesions in the literature, but most of these are case reports with a limited number of patients. Therefore, the exact indications of endoscopic tumor removal, the recurrence rate, or complications are still not clear.

There are limited reports on the use of endoscopy for nasal pyogenic granuloma in the literature, and most of them have a rather limited number of patients. Lack of recurrence and complication in 18 patients showed that endoscopic surgery is a valuable mean for this relatively unusual entity.
Although removal of intranasal hemangioma may be performed via endoscopic approach, it should be noted that debulking of the tumor will cause profuse hemorrhage. Therefore, en bloc resection of the tumor with normal peripheral tissues is advised. This could, however, be rather difficult in large tumors.

In recent years, a trend towards the use of endoscopic approach for the removal of nasal pleomorphic adenoma has come into existence. Because of the limited number of patients studied, it is quite difficult to explain the best way for treating this unusual nasal tumor. Nevertheless, endoscopic surgery is an effective and successful method.

Based on our experience, endoscopic approach could be successfully carried out on a variety of benign tumors and tumor-like lesions of the nose and paranasal sinuses. This procedure, however, requires ample experience in endoscopic nasal surgery—much more than that required for the management of inflammatory diseases. Furthermore, intranasal endoscopy offers a valuable mean for the follow-up of patients and for early diagnosis of recurrence. Improvements in our instruments and experience, as well as endoscopic management of more extensive benign tumors and probably malignant ones, would not be out of access.

References