Endoscopic endonasal medial maxillectomy: case series

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Abstract

Introduction A medial maxillectomy (MM) consists of a complete resection of the medial wall of the maxillary sinus. Traditionally the surgery is performed via an open approach. With more familiarity and expertise in endoscopic sinus surgery the endonasal approach is feasible.

Objective To expose the surgical technique and report the results of endonasal endoscopic MM in a series of 6 consecutive patients.

Materials and methods Between August 2006 and October 2009, 6 patients were operated with this procedure. All were men. The mean age was 62-year-old (range: 43–83). In 5 cases, the surgery was performed for inverted papillomas confined to the maxillary sinus. In one case it was a primary surgery whereas it was a revision surgery for the others. The sixth patient was operated for a solitary extramedullary plasmocytoma inserted on the intersinonasal wall persistent after an external radiation therapy.

Results All the patients are free of disease at the time of writing with a mean follow-up of 18,2 months (range: 9–38). This has been confirmed by a nasal endoscopy and CT scans. There were no major pre or postoperative complications. Patients suffered from crusting for at least 6 months postoperatively necessitating daily nasal douches. One patient is still complaining of intermittent epiphora when he is exposed to wind.

Conclusion Endoscopic MM can be successfully performed for the resection of expanding processes involving the maxillary sinus and/or the intersinonasal wall. Compared to open approaches, it seems to be as effective with less postoperative morbidity. An important technical point is to do the anterior osteotomy in front of the nasolacrimal duct in order to expose the prelacrimar recess that is typically an area for possible recurrence. Exact determination of the tumor attachment during the surgery is another key point for success.

Keywords Endonasal medial maxillectomy · Extended endoscopic surgery · Radical surgery · Surgical technique · Inverted papilloma · Recurrence · Solitary primary extramedullary plasmocytoma

Introduction

Medial maxillectomy (MM) consists of a complete resection of the medial wall of the maxillary sinus. The boundaries are inferiorly the nasal floor, superiorly the ethmoid sinus, anteriorly the anterior maxillary wall, including the nasolacrimal duct, and posteriorly the vertical plate of the palatine bone [1]. The Figure 1 illustrates the procedure on a cadaver. Typically, a complete ethmoidectomy is also performed during the same surgical procedure tailored to the type and extension of the disease.

The indications for such an extended surgery are [2]:

- Benign tumors (e.g. inverted papilloma [IP]) with involvement of the lateral nasal wall, the ostiomeatal complex and the medial maxillary wall.
- Recurrent IPs, confined to the maxillary sinus that cannot be completely removed with a more conservative approach.
- Malignant tumors confined to the medial wall of the maxillary sinus.

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Fig. 1 White arrow depicts: nasolacrimal duct; Gray arrow depicts: sphenopalatine artery; and Black line depicts: limits of the resection

- Access to the lateral or posterior walls of the maxillary sinus or to the infratemporal fossa. A typical indication is the removal of a juvenile angiofibroma extended to the infratemporal fossa.

In the past, the procedure was performed via an open approach (a Rouge-Denker, a lateral rhinotomy or a midfacial degloving approach) [3, 4]. Since the last 1990s, thanks to a greater familiarity and expertise in endoscopic endonasal surgery, the endonasal approach was proposed as a treatment alternative to the open approach [2, 5–13].

The authors report herein their 3-year experience with endonasal endoscopic MM, describe the surgical technique and comment their results.

Materials and methods (Table 1)

Six patients were operated between August 2006 and October 2009. All were men; the mean age was 62-year-old (range: 43–83).

Five patients had an IP confined to the maxillary sinus. The mean age was 60-year-old (range: 43–83). In one case, it was a primary surgery; the IP involved the medial wall of the maxillary sinus. In the other cases it was a revision surgery performed respectively 5 years, 12 years, 9 years and 2 years after the first resection. At that time, 2 of these patients underwent an ethmoidectomy and a middle antrostomy, the third one had a mini-Caldwell-Luc procedure and the fourth one had an ethmoidectomy associated with a middle and inferior antrostomy.

The sixth patient, a 71-year-old man, had a solitary primary extramedullary plasmocytoma (EMP) in the inferior meatus, persistent after an external radiotherapy.

All the patients had a complete preoperative assessment including a biopsy, a computerized tomography of the sinuses and a magnetic resonance imaging (MRI). Concerning the IPs, except for the first patient, the others had a complete involvement of the maxillary sinus without any infiltration of the lateral, superior and anterior walls of the maxillary sinus. No patient had a malignant transformation of the IP.

Surgical technique

The surgery was conducted under general anesthesia; the patient was in a recumbent position. Neurosurgical cottonoids soaked with a solution of adrenalin (1 mg of adrenalin mixed in 40 ml of saline) were placed in the nasal cavities for at least 10 minutes before the surgery. The lateral nasal wall was infiltrated with a solution of lidocain 1% plus adrenalin (1/10,000).

The procedure started with a dacryocystorhinostomy performed in a high position as described by Wormald in 2003 [14]. The lacrimal pathway was cut at the junction of the lacrimal sac and the nasolacrimal duct. Then the tumor was removed from the middle meatus and the upper portion of the maxillary sinus with conventional forceps. The sphenopalatine artery was then coagulated with a bipolar cautery. The inferior turbinate was completely removed with a scissor and the microdebrider (XPS - Medtronic – tricut blade). Then osteotomies were done with a hammer and a chisel. One was performed very anteriorly at the level of the maxillary crest, in front of the nasolacrimal duct; the other was performed inferiorly at the junction of the nasal floor and the medial wall of the maxillary sinus. With such a wide access and using angulated telescopes (45° and 70°

Table 1 The cohort of patients and their characteristics

Nb Patient	Patient	Age (years)	Pathology/type of surgery	1st surgery	Last surgery	Follow-up (months)
1.	V.M	58	Inverted papilloma/ Primary surgery	–	2006 Left ethmoidectomy and MM	38
2.	K.I	71	Plasmocytoma/ Primary surgery	–	2008 Left MM after radiotherapy	18
3.	T.D	58	Inverted papilloma/ Revision surgery	1996 Standard FESS X2	2008 Revision: Left MM	18
4.	C.M	43	Inverted papilloma/ Revision surgery	2006 Right mini- Caldwell-Luc	2008 Revision: Right ethmoidectomy + MM	14
5.	H.F	59	Inverted papilloma/ Revision surgery	1999 FESS - antroscopy	2008 Revision: Left MM	13
6.	M.J	83	Inverted papilloma/ Revision surgery	2004 FESS + bimeatotomy	2009 Revision: Left MM	9

telescopes) and forceps, the tumor and the sinus mucosa were completely removed from the different walls of the maxillary sinus. The dissection was made in a subperiosteal plane. Drilling of the site of attachment was done with a diamond drill transnasally. We did not use a sublabial approach through the canine fossa.

Frozen sections were done to ensure that all the tissue margins were free of tumor.

A bicanalicular silicone tube was put in place for 3 months postoperatively and a nasal packing for 2 days. The patient received broad-spectrum antibiotics for 5 days postoperatively. He was also informed to wash his nose with a saline solution and use a nasal ointment 3 times a day as long as crusting persists.

Cleaning of the crusts was done 3 times, every 7 days, postoperatively. A CT of the sinuses was ordered 6 months after surgery. The follow-up at the consultation was made every 3 months the first postoperative year, then every 6 months for the next 5 years.

Results

The mean follow-up period is 18,2 months (range: 9–38 months).

All the patients are free of disease at the time of writing based on an endoscopic evaluation and radiologic studies. On the postoperative CT scan, a common finding was a thickening of the soft tissue on either the lateral, inferior or superior walls of the maxillary sinus.

One patient was complaining of crusting during 11 months postoperatively.

One patient presented a watering eye when he was exposed to the wind.

We have had no major complications, particularly no hemorrhage. The pathological examination of the surgical specimen confirmed that the tissue margins were free of

disease in all cases but the inferior turbinate was infiltrated by the IP in 3 out of the 5 cases of IP. There was no malignant transformation. The Figure 2 illustrates one clinical case.

Discussion

A MM is a radical surgery indicated in the majority of the cases for the removal of expanding processes involving the maxillary sinus or the intersinonasal wall that cannot be completely removed with a more conservative procedure.

In our case series, we have had an unusual indication, the resection of a solitary primary EMP implanted in the inferior meatus on the intersinonasal wall and persistent after an external radiation therapy. EMP is a neoplasm of the plasma cells arising in areas other than bone and bone marrow without any systemic signs of underlying multiple myeloma. The majority of EMPs occurs in the head and neck with a marked predilection for the nasal cavity and paranasal sinuses [15–19]. They are non-disseminating but locally aggressive [18]. The incidence of cervical lymph node metastasis ranges from 10 to 20% [17]. Conversion to myeloma is another possible issue [19]. Radiotherapy is usually regarded as the first option of treatment whereas surgery is indicated for persistent, radio-resistant or recurrent lesion. For our patient, a 71-year-old man, the combination of an external radiotherapy and surgery was necessary to be successful. After a 18-month followup, there is no sign of local recurrence or conversion to multiple myeloma.

The second indication to perform a MM we had, was surgery for IPs confined to the the maxillary sinus. IPs are benign tumors but they are characterized by high recurrence rates, tendency toward multicentricity, a capacity to erode adjacent bone, to extend to the orbit or intracranial cavity and a risk of malignant transformation in 5–15% of the cases [4, 20]. The treatment of choice for IPs is surgery. The goal to achieve is a complete resection of the tumor and

Fig. 2 A: nasal endoscopy – inverted papilloma extruding from the middle meatus. B: MRI showing a complete involvement of the left maxillary sinus. C and D: postoperative CT scans showing a maxillary sinus free of disease

surrounding mucosa with minimal cosmetic deformities and functional disabilities. In the past, the golden standard was the lateral rhinotomy combined with an open MM [3, 4]. Even if this approach was highly effective, providing the surgeon an excellent visualization of the tumor attachments and the possibility to extend the approach to adjacent areas (orbit, cranial vault, frontal and contralateral ethmoid sinus) tailored by the tumor extension, the open approach was associated with a great postoperative morbidity: numbness of the upper lip, hypoesthesia of the cheek and in the area of the trigeminal nerve (V2), lacrimal problems (epiphora and dacryocystitis [21]). Blindness was also reported [22]. With the advances in endonasal endoscopic surgery, the endonasal approach was proposed as an alternative to the open approach. A complete ethmoidectomy associated to a middle antrostomy and/or a sphenoidotomy was then performed by numerous surgeons successfully for a large number of IPs. This was well documented and reported in a meta-analysis conducted by Busquet and published in 2006 [23]. Nevertheless 2 localizations remain a challenge: the lateral portion of the frontal sinus and the maxillary sinus [24, 25].

This was published in 2000 in the Belgian ENT journal [24]. The authors pointed out that recurrences of IPs operated with a conventional endonasal approach

(ethmoidectomy and middle antrostomy) were much more frequent in the maxillary sinus than in the ethmoid sinus. Our series of patients confirmed this assertion as 3 patients had a recurrence of IP in the maxillary sinus after a complete ethmoidectomy associated with a middle antrostomy (2 cases) and a bimeatotomy (1 case).

This can be explained by different factors. The first one is that the surgeon might have confused FESS and ESS. FESS means functional endoscopic sinus surgery. It was first dedicated for the treatment of inflammatory sinonasal lesions. The background of FESS is a maximal preservation of the healthy mucosa. For IPs, the surgery must be radical consisting of a complete resection of the tumor and the surrounding mucosa [5]. Another explanation is that the surgeon underestimated the true extension of the IP within the maxillary sinus leading to an inadequate (too limited) surgical procedure. At this time, it is important to remind the conclusion of an anatomic study published in 2003 by Sadeghi [9]. The author reported that 64% of the volume of the maxillary cavity is below the lateral attachment of the inferior turbinate on the lateral nasal wall and 10–15% of the volume of the maxillary sinus cavity is located in the prelacrimal recess. This anatomic study pointed out that a wide opening is mandatory to have an optimal vision on all the walls and recesses of the maxillary sinus and on the

sites of tumor origin and attachment during the surgery [26]. A middle antrostomy even a large one, combined or not with an inferior antrostomy or a mini-Caldwell-Luc do not provide an optimal vision on the entire maxillary cavity and so, may be not the best option of treatment for IPs extended to the lateral portion of the maxillary sinus or to the intersinonasal wall. As a result of this, the Belgian report recommended to perform a true Caldwell-Luc procedure [24].

Nevertheless when the medial maxillary wall or the inferior turbinate are infiltrated by the IP, a complete resection of the intersinonasal wall must be done as it is the only way to resect completely the IP [7–13, 26]. In our series 3 patients out of 5 had an infiltration of the mucosa of the inferior turbinate by the IP. When the lateral portion of the tumor is not reachable through the MM, a limited external approach through the canine fossa can be combined to the endonasal approach.

Another important issue is the duration of the follow-up for a patient operated for an IP. As illustrated by our series a recurrence in the maxillary sinus can be symptomatic 10 years only after an endonasal conventional surgery. This can be explained by the fact that the maxillary sinus is a large cavity in which the papilloma can develop slowly without clinical symptoms during a long period of time. This is not the case for other localizations such as the ethmoid or the sphenoid sinuses which are symptomatic sooner. A very long and close follow-up is therefore mandatory for all patients with an IP. An endoscopy through the surgical opening is mandatory every 6 months. A MM has from this point of view the advantage to provide a large and permanent vision in the maxillary sinus, making easier and earlier the detection of recurrences.

The management of the recurrences is still a controversial issue in the literature taking into account that the behavior of the tumor may be more aggressive and the association with a squamous cell carcinoma is more frequent [5, 8, 27]. Therefore most authors prefer to do an external approach whereas others opt for an endonasal approach with the possibility to combine it with a limited external approach when needed. In our limited number of cases, we used the endonasal approach only. The patient was informed before the surgery of a possible switch to an external approach if necessary. The dissection was done in a subperiosteal plane. All the different walls of the maxillary sinus and the sites of attachment of the IP were clearly visualized using angulated telescopes. A drilling of the site of the tumor insertion was done. We did not find any malignant transformation of the IP or infiltration of the anterior and lateral maxillary walls.

Concerning the surgical technique, there are two different ways to do a MM. The first one consists of enbloc resection and the other is a sequential fragmental resection. Based upon Busquet's meta-analysis, there is no statistically

significant difference in the recurrent rates between these 2 modalities [23]. That is the reason why we preferred to do a sequential resection and a step by step surgical approach. All the procedure was then easily performed with a permanent visual control and a bloodless surgical field.

A crucial technical point is to do the osteotomy very anteriorly, in front of the lacrimal crest in order to expose the prelacrimal recess, area of possible recurrence.

The postoperative morbidity after such an extended surgery is low and far less important compared to the one observed after an external approach. Crusting remains the major problem for a period of minimum 6 months. No change in the voice quality was observed.

In conclusion, ENT surgeon who deals with primary or recurrent IP involving significantly the maxillary sinus must be able to perform a MM. It is an extended radical surgical procedure that is safe, reproducible and very effective. We recommend doing a step by step procedure allowing a complete extirpation of the tumor and the sinus mucosa, in a bloodless surgical field, with an optimal exposure and vision of the origin and attachments of the tumor. A sublabial approach can be combined to remove tumor extension in the anterolateral recess or the anterior maxillary wall. Malignant transformation of IP in the lateral portion of the maxillary sinus is a contraindication for a pure endonasal technique. A precise determination of the origin and site of attachment of the IP intraoperatively is almost as important as the preoperative assessment for a successful surgery. Postoperatively a very close and long follow-up is necessary to detect as soon as possible any recurrence.

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