

## Choanal polyps: One entity, one surgical approach?\*

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### SUMMARY

*Twenty consecutive patients (ten women and ten men; 14-66 years old) operated on from September 1993 to November 1995 were included in this study. The only inclusion criterion was a large polyp protruding from the nasal cavity into the nasopharynx. CT, MRI and endoscopic sinus surgery identified sites of choanal polyp (CP) origin as follows: maxillary sinus (n=11), sphenoid sinus (n=3), posterior ethmoids (n=4), anterior ethmoids (n=1), and lateral aspect of the head of the middle turbinate (n=1). Light microscopy demonstrated no correlation between the site of CP attachment and its morphological appearance, but in two cases of CP (one originating from the sphenoid sinus and the other from the middle turbinate) morphological examination confirmed the diagnosis of inverted papilloma. Long-term follow-up in 15 patients revealed no cases of recurrence. The results obtained allow us to define three types of CP: antrochoanal, sphenochanal, and ethmochoanal. In case of an unusual site of CP origin, the diagnosis of inverted papilloma should be considered.*

*Keywords: nasal polyps, antrochoanal polyps, sphenochanal polyps, endoscopic sinus surgery*

### INTRODUCTION

The first description of choanal polyps (CP) was reported by Killian (1906). Since then CP have been commonly considered to be large solitary polyps originating from the mucosa of the maxillary sinus or the posterior edge of the maxillary ostium and protruding in a backward direction to the choana and nasopharynx. It has been claimed that CP always grow through the accessory ostium of the maxillary sinus and extends into the posterior part of the nasal cavity, because of certain anatomical conditions (Stavraki, 1928). During almost 80 years the Caldwell-Luc procedure was the surgical approach most often used to treat a patient with CP.

Introduction of new diagnostic modalities, such as nasal endoscopy, CT- and MR imaging, made it possible to localize the site of CP origin more precisely. Cases of CP originating from the sphenoid sinus and sphenothmoidal recess (Prusad et al., 1970; Hayes and Lavelle, 1989; Weissman et al., 1991) and even from the frontal sinus (Vangehuchten et al., 1993) were reported. All CP have a similar morphological appearance, and differential diagnosis based on anterior rhinoscopy and biopsies alone is often unreliable.

Functional endoscopic sinus surgery (FESS) has been popularized by Messerklinger (1978), Kennedy et al. (1985) and Stammberger (1986), and now has become the surgical procedure of choice for treating chronic and recurrent sinusitis. FESS

has also changed our philosophy in the management of CP. A method for endonasal removal of the antral part of antrochoanal polyps (ACP) under direct endoscopic control was introduced in the early nineties (Kamel, 1990; Vleming and De Vries, 1991; Cook et al., 1993; Loury et al., 1993). The endoscopic technique allows a rhinosurgeon to completely remove the sphenoidal part of a polyp via the enlarged sphenoid sinus ostium (Crampette et al., 1995).

### MATERIAL AND METHODS

From September 1993 to November 1995, all cases of CP were treated by an endoscopic approach. Twenty consecutive patients (ten women and ten men; 14-66 years old) were included in this study. The only inclusion criterion was a large polyp protruding from the nasal cavity into the nasopharynx. Younger patients prevailed: there were 8 patients under 25 years old. Surgery was performed previously in 5 cases (2 cases of Caldwell-Luc procedure, 2 cases of simple polypectomy and 1 case of FESS). One patient suffered from bronchial asthma. In 5 cases endoscopic examination revealed a deviated nasal septum, and in 1 case numerous synechia after previous surgery. CT- and/or MRI scans were available in all patients.

The polyps removed during FESS were studied by means of light microscopy. Samples were fixed in 10% neutral formalin and then embedded into paraffin. Next, 7-9µm thick sections

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were cut and stained with haematoxylin and eosin. Some sections were stained with Van Gieson's method and/or the methylgreen/pyronin method according to Brachet. Alcian blue staining and silver impregnation using the Gomori technique were also used. The morphological structure of the polyps was carefully documented with respect to the degree of inflammatory alteration and stromal fibrosis as well as the condition of the ciliated epithelium and mucoserous glands.

#### *Surgical technique*

In cases of ACP, surgery started with accurate removal of the postero-inferior part of the uncinate process using a sickle knife and back-biting forceps, and then the ostium of the maxillary sinus was identified. The ostium was sufficiently enlarged and the polyp together with its antral part was removed with a straight Blakesley's forceps under control of a 30° endoscope. To do this we pulled the root carefully and held it with a suction tip and moved the forceps closer and closer to the site of the polyp attachment. This trick usually allows the surgeon to remove the antral part of the polyp if it has a cystic consistency. Examination of the sinus with 30° and 70° endoscopes confirms complete polyp removal.

If the root of the polyp is solid, it is usually torn while pulling it out with a straight forceps. In that case the maxillary ostium is enlarged as much as is possible in the forward, backward and downward directions, and then the antral part is removed using 80°- and 110°-curved double-spoon forceps under control of a 70° endoscope. A microdebrider with a 20°-curved tip (Stryker Endoscopy, Santa Clara, CA, USA) is applied for the removal of polypoid tissue from the medial and superior parts of the sinus as well as for smoothing the edges of the enlarged maxillary ostium. In most cases of ACP, the maxillary ostium identified is accessory; careful inspection of the anterior groove often reveals the forwardly moved and stenotic natural ostium. As recommended by Stammberger (1991), the bridge between the ostia must be trimmed and both ostia must be united.

In cases of sphenchoanal polyps (SCP), surgery starts with medialization of the middle turbinate and introduction of a 0° endoscope into the superior meatus and identification of the upper turbinate. After these initial steps the ostia of the sphenoid sinus and posterior ethmoids can be easily visualised or palpated. The first one is located medially and inferiorly to the concha, the second one laterally to the concha. The ostium of the affected sinus is enlarged and the polypoid tissue is completely removed using a microdebrider with a straight aggressive tip. If septoplasty is needed, it is performed as a one-step procedure before FESS.

#### RESULTS

In this series the origin of CP from the maxillary sinus was confirmed in 11 cases; moreover, a cyst in the affected maxillary sinus was reliably diagnosed in only three cases (Figure 1). Frequently, the polyp's root was solid and was attached to the posterior edge of the accessory ostium or the posterior or lateral wall of the maxillary sinus. SCP were diagnosed in 3 patients; the sphenoid never was the only diseased sinus. In all cases, the

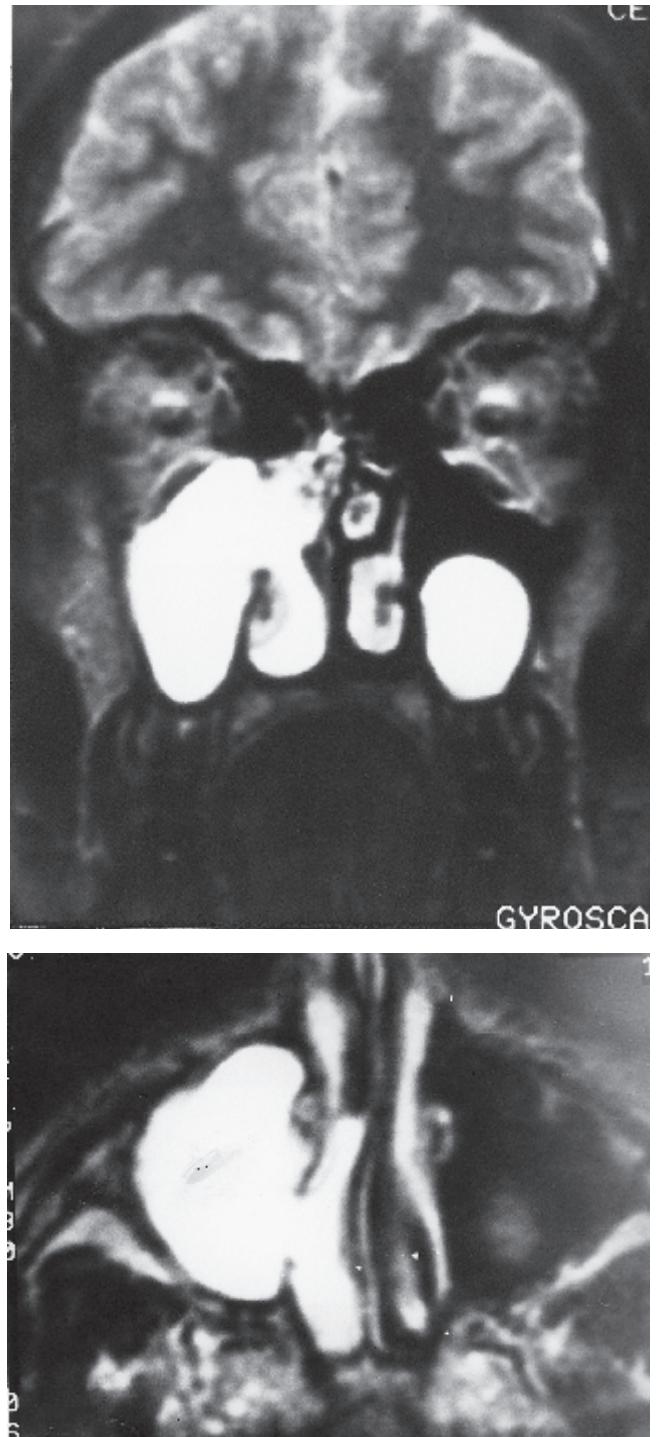


Figure 1. Coronal (a) and axial (b) T<sub>2</sub>-weighted MR images from a 22-year-old male patient: ACP originating from a cyst of the right maxillary sinus. A smaller cyst is seen in the left maxillary sinus.

posterior ethmoids were affected too; changes in the maxillary sinus were also detected in two of these patients. The posterior ethmoids were the site of CP origin in 4 cases. In one of the patients polyps grew into the sphenothmoidal recess and nasopharynx from the only diseased ethmoidal cell (Figure 2), in the other it originated from the cyst wall. Special cases were presented by one CP originating from the lateral aspect of the head of middle turbinate (Figure 3) and another CP originating from the anterior ethmoids. The sites of CP origin are listed in Table 1.



Table 1. Sites of choanal polyps origin.

maxillary sinus	11*
sphenoid sinus	3**
posterior ethmoids	4
anterior ethmoids	1
head of the middle turbinate	1***
total	20

\*: cyst was found in the sinus in 3 cases; \*\*: diagnosis of inverted papilloma was confirmed in one case; \*\*\* diagnosed as inverted papilloma



Figure 2. Coronal CT-scan from a 41-year-old female patient: CP originating from the only diseased posterior ethmoid cell.

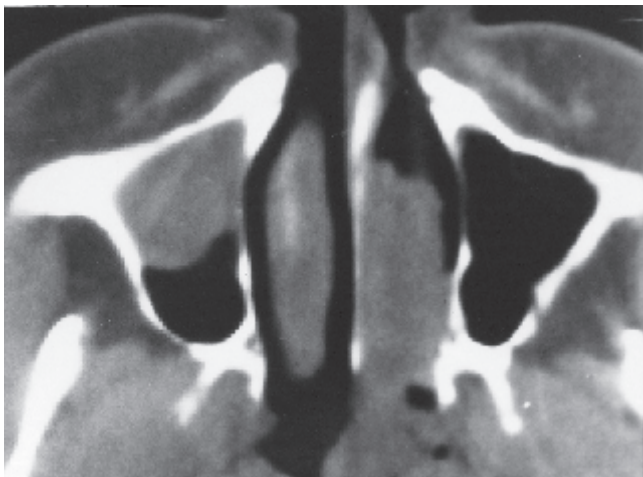


Figure 3. Axial CT-scan from a 64-year-old male patient: CP originates from the head of the left middle turbinate. (Light microscopy confirmed the diagnosis of inverted papilloma.)

Light microscopy in all the cases revealed a chronic inflammation with more or less pronounced signs of exacerbation. This was confirmed by the presence of neutrophils, mostly in the vicinity of the basal membrane and within the epithelial layer. Besides neutrophils, obligatory components of inflammatory infiltration were plasma cells, macrophages and degranulating mast cells. Under all other similar conditions, larger (i.e., “older”) polyps presented less activity of an inflammatory reaction, but more oedema and fibrosis. Presence of lacunae filled

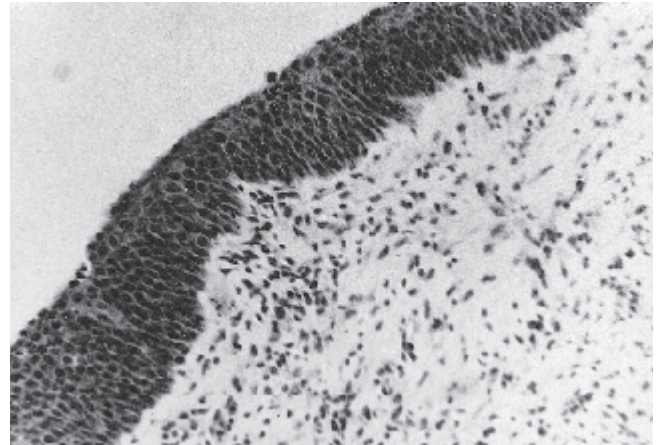


Figure 4. Metaplasia of the CP epithelium into stratified epithelium of the transitional type (haemotoxylin and eosin, x200).

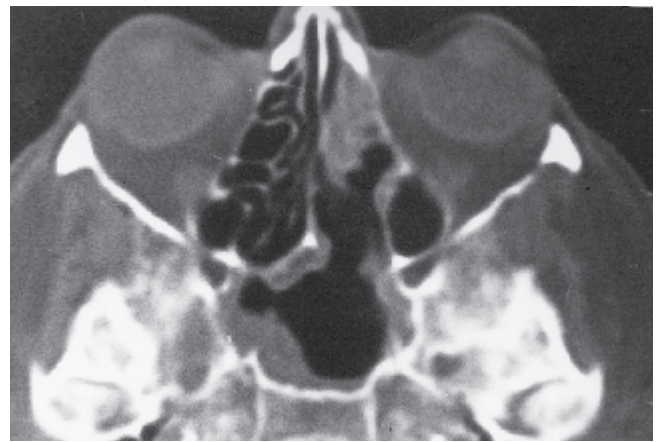


Figure 5. Axial CT-scan demonstrating the long-term result in a 64-year-old female patient 16 months after FESS was performed for a sphenoid sinus inverted papilloma, which mimicked an SCP. Only moderate thickening of mucosa of the sphenoid sinus and the left anterior ethmoids is present.

with transudate and dilated lymphatic vessels indicate that tissue oedema was not caused by inflammation alone, but also by lymphostasis.

Typical findings in the ciliated epithelium were increased numbers of goblet cells and decreased numbers of cells bearing cilia and microvilli. Mucoserous glands were found very occasionally in larger CP, usually near the root. As a rule, the body of the polyp itself had no glands. These findings were accompanied by desquamation of the epithelium, with loss of ciliated cells and goblet cells, as well as denudation of the basal membrane. There were also signs of epithelium regeneration, such as basal cell hyperplasia and metaplasia of pseudostratified into stratified epithelium of the transitional type (Figure 4). Development of inverted papilloma was found in two cases of metaplasia. One of the polyps originated from the head of the middle turbinate, the other from the sphenoid sinus.

Long-term results (terms of follow-up from 9 to 28 months) were obtained in 15 patients and revealed no case of recurrence. This is also true for both cases of inverted papillomas. Sixteen months’ follow-up of the patient with sphenoid sinus papilloma demonstrated a satisfactory long-term result (Figure 5). In all ACP patients, data of CT-scans 6 months after surgery confirmed patency of the naso-antral window. All patients were free

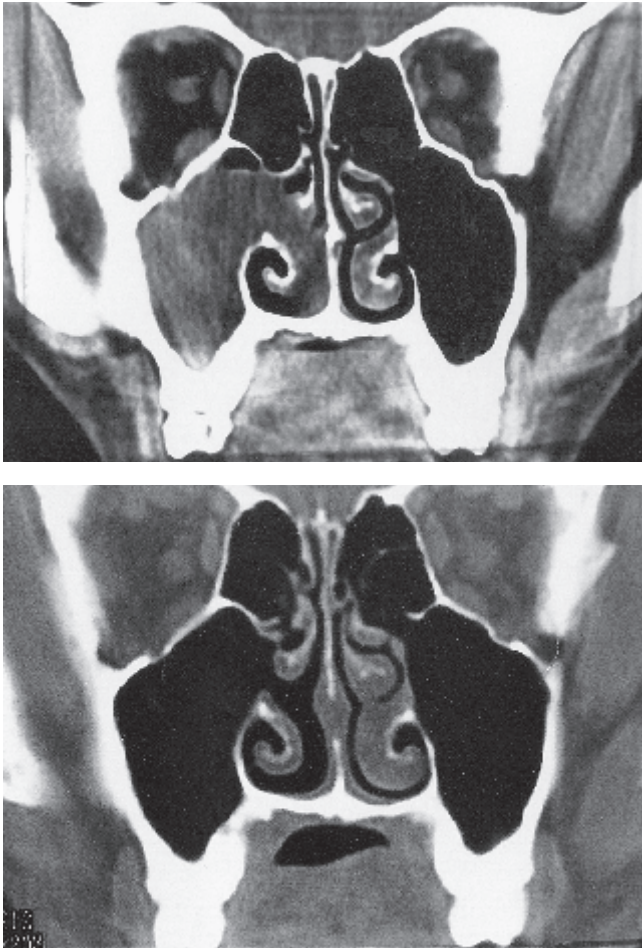


Figure 6. Coronal CT-scans from a 25-year-old male patient before (a) and 8 months after FESS (b). A: ACP originating from the cyst of the right maxillary sinus; B: complete normalization of the sinus mucosa, antral window in the middle meatus is patent.

of symptoms, and normalization of antral mucosa was noticed in most (but not in all) cases (Figure 6).

#### DISCUSSION

According to current knowledge, sites of CP origin are the maxillary or sphenoid sinus, and choanal polyposis is a disease usually affecting one sinus. There is strong evidence that the antral or sphenoidal parts of CP consist of a cyst surrounded by oedematous stroma (Berg et al., 1988; Crampette et al., 1995). Our data show that posterior ethmoid cells are not an unusual site of CP origin. In rare cases, CP can grow from the anterior ethmoids and middle turbinate. This study also demonstrates that several sinuses may be affected by a solitary CP. In such cases, even CT and MRI as well as endoscopic findings do not always allow one to determine the exact location of the site of the polyp's attachment (Figure 7). In these patients, FESS is both the diagnostic as well as the therapeutic procedure. In this study, surgery and light microscopy demonstrated that the part of a polyp located in the diseased sinus more often is solid than cystic of consistency.

FESS is an effective procedure in the treatment of CP. It offers an excellent approach to every affected sinus. Nevertheless, the basic concept of FESS - to establish sufficient sinus ventilation and drainage, and to leave the diseased sinus mucosa alone for



Figure 7. Coronal CT-scan from a 32-year-old female patient does not allow exact determination of the CP origin, because of opacification of posterior ethmoids as well as maxillary sinus on the left side. FESS elucidated the origin of the CP from a cyst locating in the posterior ethmoids.

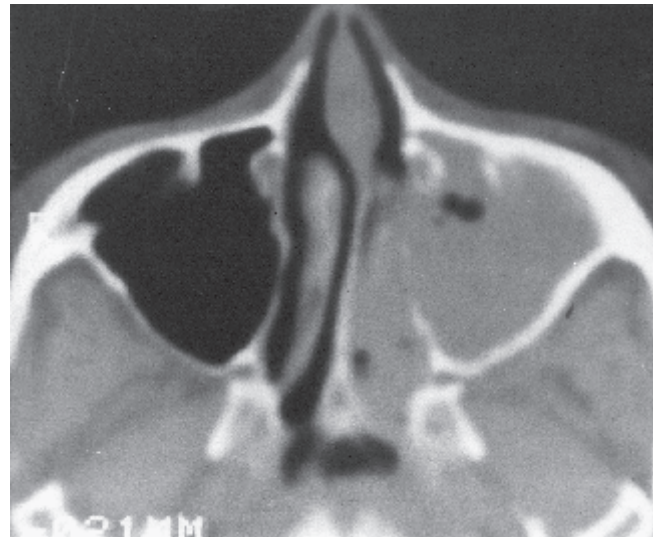


Figure 8. Axial CT-scans from a 39-year-old female patient before (a) and 6 months after FESS (b) performed for an ACP. After surgery the sinus mucosa remains severely thickened, while the window in the middle meatus is wide and patent.



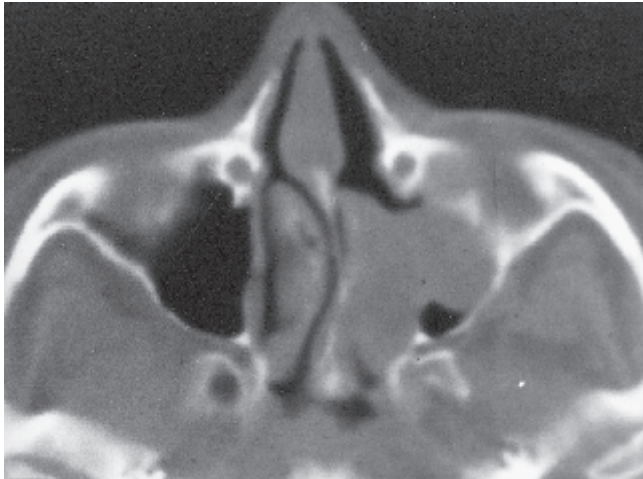


Figure 9. Axial CT-scan from a 54-year-old female patient demonstrates recurrence of ACP after previous surgery. The root of the ACP is attached to the lateral wall of the sinus. The polyp protrudes into the nasal cavity through the widely opened naso-antral window.

further healing - must not be applied to CP surgery. Cases of ACP with a solid antral part run an increased risk of recurrence after FESS, even if the antrostomy window is wide and patent (Figures 8-9). We recommend to remove all diseased mucosa from the affected sinus. If the endonasal technique fails, an additional transcanine approach should be used as it has been done in two patients of this series.

In this study, 2 out of 20 CP were proved to be inverted papillomas. We assume that these causally related to the considerable metaplasia of the epithelial layer.

#### CONCLUSIONS

Three types of CP can be distinguished: antrochoanal, sphenochoanal, and ethmochoanal. In case of CP, CT and MRI as well as nasal endoscopy usually give precise definition of the polyp's origin, thus preventing that unaffected sinuses are operated on. FESS is an effective and accurate method in the treatment of all types of CPs. The aim of the surgery is to make a wide opening of the affected sinus and the complete removal of diseased mucosa. In cases of an unusual site of CP origin, the diagnosis of inverted papilloma should always be considered.

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