

Surgical approaches for antrochoanal polyp: a comparative analysis

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Abstract. *Surgical approaches for antrochoanal polyp: a comparative analysis.* **Objective:** The aim of this study was to evaluate the clinical and histopathological characteristics of antrochoanal polyps (ACPs) and to perform a comparative analysis of surgical techniques in terms of recurrence.

Methods: The clinical, radiological and histopathological features of 42 patients with a diagnosis of ACP who underwent surgery in a period of 6 years (January 2000 - January 2006) were investigated retrospectively. Histopathological examinations were present for all patients and were re-examined for histological analysis.

Results: Endoscopic sinus surgery (ESS) was performed in all patients. Transcanine sinuscopy (TS) and the Caldwell-Luc approach (CL) were used in addition to ESS in 14 and 13 patients respectively. The attachment site was detected in 21 patients (50%) and the most frequent site was found to be the lateral wall in 15 patients (71.4%). There was no relationship between the choice of surgery, the attachment site or accessory ostium, or any sinusitis with ACP. Histological examination showed prominent eosinophilia in 29 patients (69%). The follow-up time was a minimum of 12 months with a mean of 28.9 months. Three recurrences were seen after ESS. However, there was no recurrence after ESS+TS and ESS+CL.

Conclusion: Our study showed that the most important factors affecting the choice of surgical approaches are the preference of the surgeon, the age of the patient and the presence of recurrent disease. Combined approaches with either TS or CL should be considered, particularly when the attachment site of the antral part of ACP is undetected, in order to prevent incomplete excision and recurrences.

Introduction

Antrochoanal polyps (ACPs) are nasal polyps originating from the maxillary sinus with a long stalk attached to the antral mucosa and passing from the natural or accessory ostium with extension into the choana.¹⁻³ ACPs are rare. They constitute 4-6% of all nasal polyps in the general population.^{2,4} However, the incidence rate is higher in children.⁵

ACPs are usually unilateral and macroscopically similar to nasal polyps.⁶ Histologically, they are lined with pseudostratified ciliated epithelium with a stroma containing different inflammatory cells and they may have histological

features that are different from nasal polyps.^{1,6} The pathogenesis of their formation has not yet been clearly explained. There are many theories but, by contrast with typical nasal polyps, the relationship of ACPs with allergy has not been clearly identified.^{6,7}

The treatment for ACPs is surgery to remove the origin of the polyp inside the maxillary sinus and therefore prevent recurrence.^{8,9} Endoscopic sinus surgery (ESS) has been widely performed to treat many nasal and sinus pathologies including ACP.^{3,8} However, in some cases, it is not possible to achieve the complete removal of the origin of the ACP in the maxillary sinus using

endoscopy.^{4,9,10} Consequently, there are descriptions of numerous surgical procedures or endoscopic manipulations for this purpose. Transcanine sinuscopy (TS) and the Caldwell-Luc (CL) operation combined with endoscopic sinus surgery have recently emerged as the best methods for the removal of the antral part of an ACP.^{4,9} However, little information was found in the literature stating the reason for the preference for these surgical methods, or about the comparison of the methods in terms of recurrence.^{2,4,9}

In this study, we review the clinical and histopathological features of our patients with ACP and discuss the surgical approaches

we have used in our department for treatment over the past six years. We also compare the effectiveness of different therapeutical approaches to postoperative follow-up and recurrence.

Materials and methods

This study includes the patients with a diagnosis of ACP who were operated on at the Baskent University Faculty of Medicine Adana Research and Training Hospital between January 2000 and January 2006. All clinical data were obtained from patients' medical records.

The patients were diagnosed by clinical examination, nasal endoscopy and radiological examination with coronal paranasal sinus computed tomography (CT). The presenting symptoms, allergic diathesis and previous sinus disorders and surgery for sinonasal disorders of all patients were noted. Serum immunoglobulin levels and full blood counts were also obtained from records.

Endoscopic sinus surgery under general anaesthesia was performed in all patients. The nasal part of the ACP was removed. For the excision of the antral part, angled forceps and 30°-70° endoscopes were used. If an accessory ostium was present, then natural and accessory ostia were connected to each other, creating one large ostium, as defined by Stammberger.¹¹ The endoscopic approach was combined with transcanine sinuscopy or a modified Caldwell-Luc approach in some patients. During transcanine sinuscopy, remnants of the antral part of ACP were visualised and removed through the trocar sheath. However, in the modified

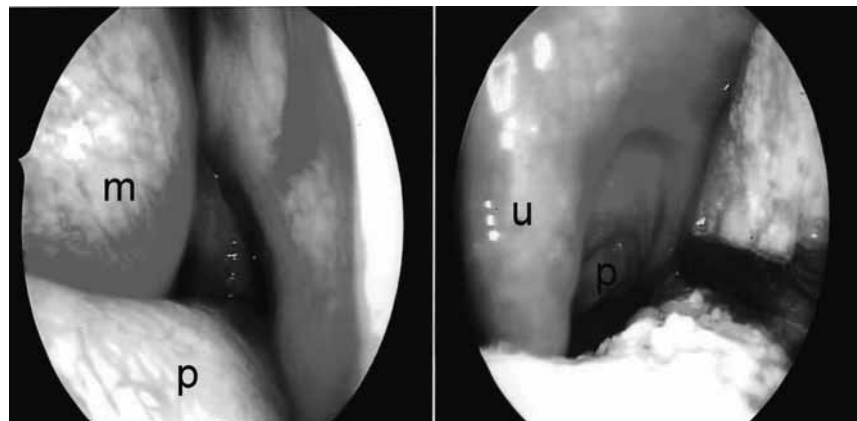


Figure 1

Endoscopic view of antrochoanal polyp extending into the choana and suspending from the nasopharynx into the oral cavity (4 mm, 0°); (m: middle concha, p: polyp, u: uvula).

Caldwell-Luc operation, a hole no larger than 1 cm in diameter was opened at the anterior wall of the maxillary sinus and the remnants of antral polyp were removed from this hole. The endoscope was also used through this hole to view the maxillary sinus.

Intra-operative findings and postoperative follow-up notes were also recorded for all patients. Follow-up was at least 12 months. Postoperative control was performed by nasal endoscopy in the first month and then at one-year intervals. The patients who did not attend check-up visits received reminders. In the check-up, the middle meatus and ostium of the maxillary sinus were observed with nasal endoscopy. CT was not used as follow-up routinely except in cases where the examination proved problematic.

All patient specimens were evaluated histopathologically. Hemotoxyline- and eosin-stained preparations of surgical specimens were re-examined to determine the histological characteristics of ACP.

Results

Over a period of six years, 240 patients with a diagnosis of common nasal polyps underwent surgery. Forty-two of these patients (17.5%) had ACPs. There were 16 females and 26 males with ages ranging from 9 to 51 years (mean 30.7 years). The most common presenting symptoms were nasal obstruction (42 patients, 100%) and snoring (20 patients, 47.6%).

The majority of our patients were referred to our department for the first time. Five patients had recurrent polyps shortly after simple polypectomy at other clinics. Upon examination, the ACPs were found to extend into the nasopharynx, causing the protrusion of the soft palate and uvula in 19 patients. They could be seen clearly from the mouth in five patients (Figure 1). However, in 10 patients, they were not seen during intranasal examination, even though there were polyps extending through the nasopharynx.

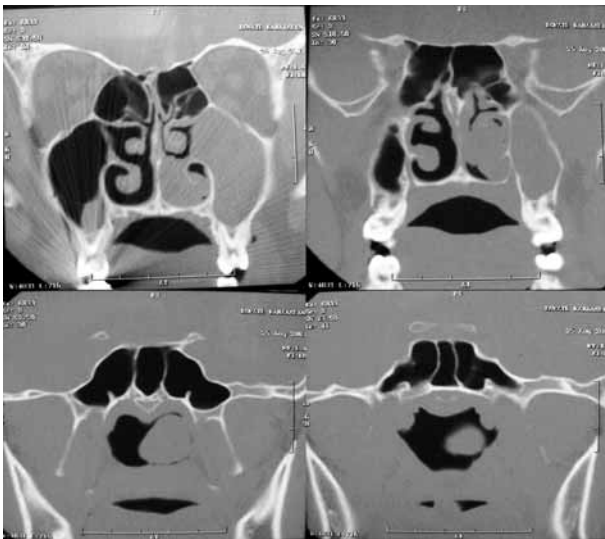


Figure 2

Consecutive coronal CT scans of the paranasal sinuses showing opacification of the maxillary sinus and antrochoanal polyp extending into the nasopharynx on the left.

Table 1
CT findings for patients with ACP

| | Number of patients | ESS | ESS + TS | ESS + CL |
|------------------|--------------------|-----|----------|----------|
| ACP R side | 18 | 4 | 8 | 6 |
| ACP L side | 24 | 11 | 6 | 7 |
| Septum deviation | 17 | 8 | 6 | 3 |
| Concha bullosa | 12 | 5 | 5 | 2 |
| Osteoma | – | – | – | – |
| Haller cell | – | – | – | – |
| Sinusitis | | | | |
| Stage IV | 1 | – | 1 | – |
| Stage III | 8 | 3 | 2 | 3 |
| Stage II | – | – | – | – |
| Stage I | 3 | 1 | – | 2 |

The blood counts for eosinophils and serum immunoglobulin E levels were studied in all patients. Seven of the patients had the symptoms and clinical findings of allergic rhinitis and a skin-prick test was also performed in these seven patients. *Dermatophagoides farinea* and *pteronyssinus* hypersensitivities were found in only 3 patients (7.1%) and these patients had also eosinophilia

in blood smears and high serum immunoglobulin E levels. Unfortunately, a skin-prick test could not be performed in all patients. However, laboratory tests of patients for allergy were normal with the exception of these three cases.

Coronal paranasal CT scans were obtained in all patients (Figure 2, Table 1). The pathology was present on the right in

18 patients (43%) and on the left in 24 patients (57%). Nineteen patients had isolated ACP (45.2%) while, in the remainder, ACP was associated with sinusitis that was graded as Kennedy staging.¹² There was bilateral pansinusitis in one case (stage IV), unilateral pansinusitis in eight cases (stage III) and isolated infiltration of one sinus in three cases (stage I). These infected sinuses were the contralateral maxillary sinus in two cases and the ipsilateral sphenoid sinus in one patient. Unilateral concha bullosa was present in 10 patients, on the same side as the ACP in 4 patients. Bilateral concha bullosa was seen in 2 patients. Septum deviation was noted in 17 patients, on the same side as the ACP in 12 patients. However, only 5 patients had severe septum deviation requiring septoplasty before ESS. We did not see any Haller cells or osteoma reducing the area of the osteomeatal complex.

In all patients, the nasal part of ACP was removed transnasally. The polyps passed through the natural ostium in 32 patients (76.2%) and through accessory ostia in 10 patients (23.8%). The antral part was removed completely from the enlarged maxillary sinus ostium in 15 patients. When the antral part was not removed transnasally, the transcanine sinuscopy (in 14 cases) or modified Caldwell-Luc approach (in 13 cases) was performed. The antral part of polyp was found to be cystic in 31 patients (73.8%) and polypoid in 11 patients (26.2%). The attachment site was noted in 21 patients and the most frequently seen origin of the antral part was the lateral wall of the maxillary sinus (15 patients) (Figure 3). There was no

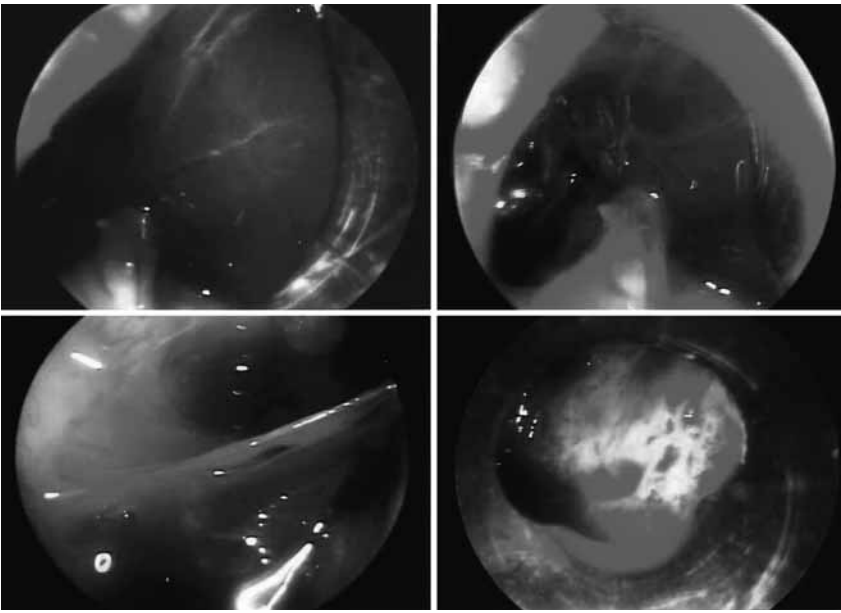


Figure 3

Endoscopic view of antral part of the polyp from the trocar sheath, showing cystic component and attachment site. When the cyst was punctured, normal mucosa was protected (4 mm, 0°).

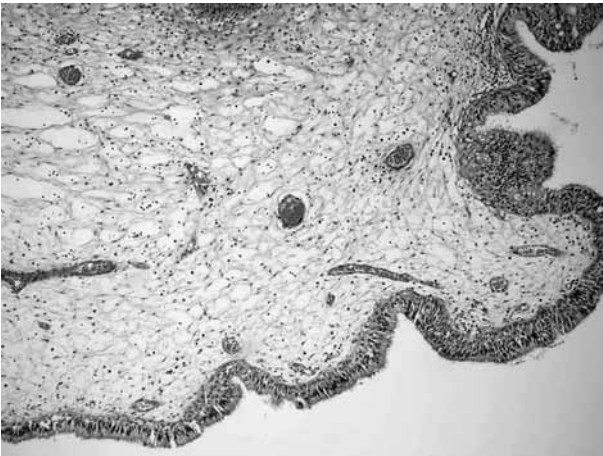


Figure 4

The histological examination of the antrochoanal polyp shows that the polyp was covered by respiratory epithelium and foci of squamous metaplasia and composed of mucoid stroma. (Hematoxyline and Eosine $\times 100$).

relationship between the choice of surgery and the attachment site or type of ostium or any sinusitis with ACP (Table 2).

Light-microscopic examination of H- and E- stained preparations revealed that the mucosal surface was respiratory epithelium

(Figure 4). However, squamous metaplasia was seen in 24 patients (57.1%) and dysplasia was seen in one case. The predominant cells in the lamina propria were lymphocytes and neutrophils in all cases. In six patients, mucous glands were present in the stroma.

Although there was a positive allergy test for 3 patients, eosinophilia was found in all cases, and was abundant in 29 patients (69%). Prominent vascular proliferation was present in 28 patients (66.6%).

The mean follow-up period after the treatment of ACP in our department during the six years was 28.9 months. No recurrence was seen in the patients who underwent ESS with TS or a modified Caldwell-Luc operation. In the 3 patients who underwent ESS only, recurrence was seen after one year, at which time a Caldwell-Luc operation was performed as a second operation. Complications related to the surgical methods applied in this series were intranasal adhesion (in one case) and facial swelling (in two cases, for 2 days) (Table 2).

Discussion

ACP usually appears as a unilateral solid mass and occurs mostly in children and young adults.⁴ The usual presentation is nasal obstruction, as seen in our cases. However, snoring, nasal discharge and, less frequently, epistaxis and apnoea are also seen.^{10,13} Although the diagnosis of ACP is quite easy with clinical and endoscopic examination and with CT findings, nasal polyposis, inverted papilloma, juvenile angiofibroma, encephalocele, adenoid hypertrophy and malignancies should be kept in mind in the differential diagnosis.^{2,4}

The pathogenesis of ACP and its relationship with allergy have been discussed in recent years. Although some studies in the literature suggested that the percentage of allergy is 67% in the patients with ACP,¹ most authors

Table 2
Surgical results for patients with ACP

| Surgical approach | Number of patients | Adults/ children | Appearance of antral part | Attachment side (n = 21) | Ostium | Complications | Follow-up/ months |
|--|--------------------|-----------------------|---------------------------|---|-------------------------|----------------------|-------------------|
| Endoscopic sinus surgery | 15 | 13 adults, 2 children | 1 polyp, 14 cystic | 4 lateral 2 posterior 1 superior wall | 4 accessory, 11 natural | 1 (postop. adhesion) | 25.8 |
| Endoscopic sinus surgery with transnasal sinuscopy | 14 | 8 adults, 6 children | 3 polyp, 11 cystic | 7 lateral 1 posterior 1 anterior wall | 4 accessory, 10 natural | – | 31 |
| Endoscopic sinus surgery with Caldwell-Luc | 13 | 11 adults, 2 children | 7 polyp, 6 cystic | 4 lateral, 1 posterior wall | 2 accessory, 11 natural | 2 (facial swelling) | 27.3 |

have not found eosinophilia or elevated IgE levels in all their cases.^{2,4} Skladzien *et al.*⁷ found allergy in only two out of ten patients with ACP and they claimed that the allergic process was merely coincident with ACP.

Many studies have shown that the inflamed mucosa of the maxillary antrum as a result of chronic maxillary sinusitis is responsible for ACP formation.^{7,14,15} Berg *et al.*¹⁵ claim that ACP develops from an expanding intramural cyst in the maxillary sinus. It has been suggested that this asymptomatic antral cyst arises from a blocked mucous gland following bacterial sinusitis attacks and emerges from the sinus through the ostium, passing into the nasal cavity as a result of negative pressure due to the obstruction in the osteomeatal unit.^{4,10,15} Chronic obstruction of the natural ostium of the maxillary sinus and/or osteomeatal unit may also be a factor in the development of ACPs.^{1,15} However, in our study, no relation was seen between the formation of ACP and structures that caused the obstruction of the osteomeatal unit, such as septum deviation, concha bullosa, Haller cell or any osteoma.

The histopathological features of ACP do not differ significantly from the usual nasal polyps.⁷ However, the authors agree that there are three differences between ACPs and nasal polyps: ACPs are larger and dumb-bell shaped, there is less eosinophilia and ACPs never contain mucous glands.⁶ In the majority of our cases, the histological evaluation of specimens established that they were lined with respiratory mucosa with focal squamous metaplasia. This focal squamous metaplasia may be a result of the inflammatory process itself or mediators released by inflammatory cells.⁷ However, this suggestion should be supported by electron-microscope findings.

All of our patients had prominent inflammatory cell infiltration, with abundant neutrophils and lymphocytes. Although allergy tests were positive in 3 patients, there were mucous glands in six cases and eosinophilia was seen in all patients, and was abundant in 29 cases (69%). These results differ from most reports, but concur with the data of Cooks *et al.*,¹ who claim that there is essentially no histological difference between

ACP and common nasal polyps, and that both are associated with allergy.¹ Our results could not yield enough information about the relationship between allergy and ACP. However, we can say that ACPs do not differ from common nasal polyps in terms of aetiopathogenesis and histopathology. In the aetiopathogenesis of antrochoanal polyp, allergy is responsible as well as chronic sinusitis.

The primary goal of surgical procedures in the treatment of patients with ACP is the complete removal of both the antral and nasal parts of the polyp.¹⁶ Nasal polypectomy is a simple surgical approach that has been described historically as an original method in the treatment of ACP.¹³ However, this method is limited to the excision of intranasal polyps and does not tackle the antral part. Due to the high recurrence rate, this approach has fallen from favour in recent times.²

The Caldwell-Luc operation is a surgical procedure that is performed via the canine fossa, providing good exposure of the inside of the sinus. This method also ensures the removal of the origin of the polyp with all sinus

mucosa.^{9,16} There are many side-effects associated with the Caldwell-Luc antrotomy, such as facial swelling, numbness of the cheek, devitalisation of the teeth and interference with facial growth, as well as the disturbance of normal sinus function.¹¹ However, Yarrington¹⁷ found that the overall complication rate for the Caldwell-Luc operation in 270 patients was less than 3%.

Endoscopic sinus surgery is a reasonable alternative to the traditional methods for the treatment of ACP. Both the antral part and the nasal part can be removed completely, with the origin of the ACP inside the sinus being excised with endoscopy through the enlarged ostium. The use of 30° and 70° endoscopes with angled forceps is an effective approach in this surgery, with minimal side-effects.^{3,16} However, in some cases, the origin of the polyp inside the sinus could not be approached effectively, particularly when the origin was on the anterior or anterolateral wall of the sinus. In addition, children with narrow nasal cavities are not always suitable for this procedure because of the difficulty in the manipulation of instruments.⁹ ESS has been combined with transcanine sinuscopy recently in these difficult ACP cases.^{9,10}

Transcanine sinuscopy is usually performed by making a trocar puncture in the canine fossa. A small hole no larger than 0.4 cm in diameter is opened in the canine fossa and the inside of the sinus can then be examined with an endoscope using the trocar sheath. The antral part can be removed using fine forceps through the canine fossa or with angled forceps intranasally through the enlarged sinal ostium when

watching from the trocar or through the enlarged ostium using an endoscope.¹¹ This method results only in the removal of antral cysts, leaving intact the healthy sinus mucosa.¹⁰ However, TS may also be inadequate in some cases when the polyps are attached to the anterior wall of the sinus, and in the polypoid antral mucosa. In these situations, a modified Caldwell-Luc operation has been developed for combination with ESS in both adults and children.⁹ In this method, a hole is opened in the anterior wall of the maxillary sinus. This hole is smaller than the window in the classical Caldwell-Luc operation and is no larger than 1 cm in diameter. The antral polyp can be removed from this hole and the inside of the sinus can be examined through the hole using an endoscope. The normal sinus mucosa is also protected in this method.⁹ However, when all the sinus mucosa is polypoid, a true classical Caldwell-Luc remains an option.

TS is the most suitable approach and the first choice for younger patients.² When there is any suspicion of intra-antral remnants of polyps or cysts, a modified form of the Caldwell-Luc approach should be used in children, with direct visualisation of the removal of the origin of the polyp, without damage to the teeth and healthy mucosa.⁹ In our cases, a modified Caldwell-Luc operation had to be combined with ESS in 11 adult patients, particularly in cases of polypoid antra. Six children were treated with ESS and TS, and two with ESS in combination with a modified Caldwell-Luc. None of them suffered any major side-effects (Table 2).

Conclusion

Endoscopic sinus surgery is a reliable method for the treatment of both pediatric and adult patients of ACP without any recurrence. ESS can be applied alone and also in combination with transcanine sinuscopy or a modified Caldwell-Luc approach in selected cases, especially when complete removal through the nose is not possible. The type of surgery to be performed with ESS is influenced by factors such as the age of the patient, the previous surgical history and the possibility of the complete removal of the polyp. Our study showed that the most important factors in the choice of surgical approach are the decision of the surgeon during the operation and age of the patient. If the surgeon has any doubts about the complete excision of the polyp, then one of the transcanine or modified Caldwell-Luc approaches can be used in addition to ESS without any concern about inflicting damage, even in children.

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