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Review Article

Choanal Polyps: A Current Review

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Abstract

Antrochoanal polyps constitute 33% of nasal polyps in children and 4% to 6% of those in adults. Most common symptoms at presentation usually include unilateral nasal obstruction, rhinorrhea and headache. Diagnosis is made by history, endoscopic nasal examination and computed tomography. A prudent surgical intervention, endoscopic removal with or without Caldwell-Luc procedure, is fundamental to eradicate the disease. The most important way to prevent recurrences is to excise the origin site of ACP via angled telescopes and forceps. Minimum follow-up period to detect a recurrent disease should be at least two years.

Keywords: Choanal polyp; Antrochoanal polyp; Caldwell-Luc approach; Endoscopic sinus surgery

Introduction

Nasal polyps are commonly encountered by otolaryngologists in their daily practices. They are benign diseases characterized by nasal obstruction and bilateral polypoid mass in the nasal cavity. Stammberger and Hawke classified the nasal polyps into five groups, these are

1) Antrochoanal polyps,

2) Choanal/isolated large polyp,

3) Polyps associated with chronic rhinosinusitis, non-eosinophil dominated,

4) Polyps associated with chronic rhinosinusitis, eosinophil dominated and

5) Polyps associated with specific diseases [1].

Choanal polyps (CP) are unilaterally polypoid lesions arising from the maxillary (antrochoanal), ethmoid (ethmoidochoanal) or sphenoid sinus (sphenochoanal) as well as unusual origin sites, which are the middle turbinate, inferior turbinate, posterior part of nasal septum (septochoanal), soft and hard palate or even choana [2-11]. CPs can extend into the choana, nasopharynx or even oropharynx. The etiology of CP has been not yet fully understood [4]. Clinical manifestations of CP encompass nasal discharge, nasal obstruction, anosmia, rhinorrhea, snoring, sleep apnea and dysphagia [12, 13].

Antrochoanal polyp (ACP, also known as Killian polyp), first documented by Gustav Killian in 1906, is characterized by a polyp arising from the maxillary antrum of Highmore (defined by Fredrik Ruysch) and proceeds through the main or accessory ostium into choana, nasopharynx, or oropharynx [14-16]. Presenting symptoms are nasal obstruction, nasal discharge, snoring, headache, cheek pain, epistaxis, hemotympanum, halitosis, foreign body sensation and weight loss [6, 17].

The appearance of CPs resembles a benign, well-circumscribed, glistering, fleshy and yellowish mass. ACPs may rarely be seen as a polypoid mass in the nostril on physical examination [18]. Anterior

rhinoscopy, endoscopic nasal examination with rigid or flexible endoscopes and computed tomography can provide essential information for the diagnosis. Surgical management of these polyps requires surgical removal of polyp and origin site within the involved sinus or originating anatomical region.

Discussion

Epidemiology

Antrochoanal polyp predominantly occurs in children and young adults, with a mean age of 40 years. The incidence of ACPs corresponds to 3.7% of a series of 1.720 nasal polyp patients in a-ten-year period [15]. ACPs account for 33% of nasal polyps in children and 4%-6% of nasal polyps in adults [19, 20]. It usually originates from one of the maxillary sinuses whereas bilateral cases (1.5-1.8%) rarely occur [20, 21]. It has been shown that ACP has slightly male predominance and a male: female ratio is 1.7:1 [20-22]. Bilateral ACPs, nevertheless, are more commonly seen in females than males [23]. It is slightly more common in the left maxillary sinus, with an occurrence of 57.7-62.9% in children and 51.7% in adults [21, 24].

Etiology

The exact etiopathogenesis of ACP has been not yet well understood. ACPs have been demonstrated to be associated with allergy (35%), asthma (3%), chronic rhinosinusitis (10%), nasal septal deviation and inferior turbinate hypertrophy [20]. Allergy is present in 50% of patients with ACP confirmed by skin prick test [6]. Allergic rhinitis and asthma are the most common comorbid diseases in patients with ACP [22, 24]. Although the hereditary origin has not yet been explained, Montague and McGarry reported two brothers with ACP [25].

Clinical presentation and considerations

The vast majority of choanal polyps can usually manifest predominantly with nasal obstruction and discharge. Patients with sphenochoanal polyp generally present with nasal obstruction, nasal discharge, snoring and otitis media with effusion [4, 12].

Complaints of the patients with ACP include unilateral (the most common) or bilateral nasal obstruction, rhinorrhea, headache, snoring, post nasal drip, anosmia/hyposmia, sleep apnea, tubal disfunction, sneezing, dysphonia, dysphagia and epistaxis [22, 26, 27]. Occasionally, ACP may be encountered incidentally without any symptom [28].

Anterior rhinoscopy may provide some information for making ACP diagnosis. The nasal endoscopic examination using rigid and flexible endoscopes reveals a well-circumscribed polypoid mass extending through the middle meatus into the choana or nasopharynx [24]. Typically, endoscopic appearance of ACP resembles a dumbbell-shaped mass, which contains a pedicle passing though the ostium that connects the cystic (antral part) and polypoid part each other [15]. Occasionally, it can present with polypoid mass extending downward between the soft palate and the posterior pharyngeal wall.

A bifid ACP passing through both the anterior and posterior accessory ostium may be rarely seen [29]. Al-Qudah [30] has speculated that ACP occupying the nasopharynx may cause less negative pressure within the nasal cavity on the contralateral side. Thus, less negative intranasal pressure does not give rise to pull the content of the maxillary sinus toward the nasal cavity. This explains the reason why bilateral ACPs are rarely observed [30].

ACPs generally consist of two compartments, which are cystic and polypoid parts. However, whether the nature of antral part of the polyp is cystic or polypoid is still a controversial issue. The cystic part occupies the maxillary sinus whereas polypoid part extends through the natural or accessory ostium into choana, nasopharynx or oropharynx [31-33].

ACPs can emerge from the maxillary sinus through the natural or accessory ostium. These polyps may pass predominantly into the nasal cavity by means of natural ostium, with a rate of 70%-75% [33, 34].

Özdek, et al. [34] suggested that 60% of patients with ACP had a cystic antral part [34]. Furthermore, El-Guindy and Mansour demonstrated in a series of 24 patients that all of the antral parts were cystic [35]. On the other hand, Kamel found to be polypoid of the antral part in 17 of 22 patients [36].

The most common origin of antrochonal polyp is the posterior wall of the maxillary sinus followed by the sinus floor, lateral wall, anterior wall and medial wall [26, 27].

Computed tomography shows hypointense mass extending from the maxillary sinus to the choana, nasopharynx, or oropharynx [24]. Any bony expansion, erosion or sclerosis of the sinus walls do not occur on CT [26, 37]. Angiomatous ACP, presenting with epistaxis and being a rare kind of ACP, may rarely reveal the destruction of the caudal septum and medial wall of the maxillary sinus [38]. Septochoanal polyps may show areas containing a dens central calcification on CT [13]. Magnetic resonance imaging can be used to distinguish CPs from malignant diseases. Magnetic resonance imaging findings include a hypointense mass on T1 and a hyperintense mass on T2-weighted images.

ACPs according to CT findings have been divided into three stages: stage I is an antronasal polyp that does not extend into the nasopharynx, stage II is an ACP extending into the nasopharynx by completely occupying the accessory ostium of the maxillary sinus by the neck of ACP, and stage III is an ACP extending into the nasopharynx by partially occluding the accessory ostium of the maxillary sinus by the neck of ACP [32].

Differential diagnosis should be made with the following diseases: unilateral nasal masses such as juvenile nasopharyngeal angiofibroma, nasal glioma, encephalocele, mucocele, retention cyst, inverted papilloma, hemangioma, grossly enlarged adenoids, nasopharyngeal malignancies, cystic fibrosis/nasal polyposis and allergic fungal rhinosinusitis [17, 24, 27].

Aydin et al. determined that the duration for recurrence after removal of ACP was 6-12 months [22]. Mantilla, et al. [24]

suggested that there was a mean time interval of 17.8±14.5 months between the first operation and recurrence, with a follow-up period of 26.9±11.4 months after the last operation [24].

Histopathology and pathogenesis

ACPs are similar to the usual nasal polyps in terms of macroscopic and microscopic appearance. They are covered by the normal mucosal epithelium of the upper respiratory tract, with a ciliated pseudostratified columnar epithelium [22].

Ozcan, et al. [39] compared the light and electron microscopic findings of ACP with middle meatal polyps. They have suggested that nasal polyps had the exuberant eosinophil and that ACPs had more squamous metaplasia. The number of goblet cells was much higher in nasal polyps than in ACPs [39]. Özdek, et al. [34] was not demonstrated mucous glands on light microscopy of ACPs specimens [34]. Similarly, Heck et al. reported that nasal polyps frequently have more eosinophil and mucous glands than ACPs [15]. Septochoanal polyps may show a mature trabecular bone within polyp lined by respiratory mucosa along with devoid of eosinophil [13].

ACPs may result from chronic inflammation instead of allergy, considering the paucity of eosinophil, normal basement membrane, normal surface epithelium and many other inflammatory cells on light and transient electron microscopic examination [39].

Mills suggested that the ducts of the mucous glands are obstructed by infection and small retention cysts form. These cysts submucosally rupture and expanse. When the cyst enlarges, the mucosa of the sinus moves away from the sinus wall. Finally, a big extra-mucosal cyst develops in the maxillary sinus [40].

Berg, et al. [31] suggested that ACPs are comparable to intramural cysts considering macroarchitecture, microarchitecture and protein distribution. They have concluded that the expansion of intramural cyst in the maxillary sinus leads to ACPs [31]. ACPs may also originate from the obstruction of lymphatic channels due to mucosal inflammation of the maxillary sinus.

Chronic inflammation can cause edema in the middle meatus and development of ACP. The medial surface of the antral cyst entirely occludes the accessory ostium of the sinus. On the other hand, the natural ostium is narrowed by chronic inflammation. Complete obstruction of the natural ostium emerges during expiration on the basis of Bernoulli theory. Obstruction of natural and accessory ostium causes increase in air pressure within the sinus. This increased pressure enables ACP to pass into the middle meatus or beyond through accessory ostium [20].

Inflammatory mediators

Expression of inducible nitric oxide synthase (INOS) protein in ACP is moderate or severe in the epithelium and stroma as compared to nonallergic nasal polyp and inferior turbinate mucosa. Lymphocytic infiltration is more frequent in ACP than allergic nasal polyp. Eosinophilic infiltration is much more in nonallergic nasal polyp and allergic nasal polyps than in ACP [41].

An increased expression of IL-6 has been shown in ACPs when compared to the nasal polyp [42]. Tissue plasminogen activator (t-PA) has been detected in the paranasal sinus mucosa of the patient with chronic rhinosinusitis. On the other hand, Yamashiro et al. demonstrated a urokinase plasminogen activator (u-PA) in tissue extracts from ACPs. The u-PA may play an important role in inflammation and cell proliferation [43].

Arachidonic acid metabolites play an important role in the development of nasal polyps. Of these metabolites, leukotriene (LT) D4 and LTE4 are absent in ACP in contrast to nasal polyps, which contain LTD4 and LTE4. Moreover, ACPs have a low concentration of 15-hydroxyeicosatetraenoic acids (HETE) and 12-HETE when compared to nasal polyps [44]. Furthermore, Jung et al. demonstrated that levels of 15-HETE and PGE2 in polyps of allergic patients are higher in comparison with nonallergic patients and that LTB4 and LTC4 are higher in nasal polyp when compared to nasal mucosa [45].

Management of CP

The treatment of choice for CPs is surgical removal of all of the polyp along with the origin site. Sphenochoanal polyps can be successfully managed with endoscopic removal. Resection of posterior-inferior part of the middle turbinate can be done to increase the exposure. Polyp and its pedicle are first extirpated, afterwards the sphenoid sinus ostium is widened. The origin site of polyps should be removed to prevent recurrences [12].

For ACPs, surgical intervention encompasses functional endoscopic sinus surgery, Caldwell-Luc procedure, mini-Caldwell-Luc, or functional endoscopic sinus surgery combined with Caldwell-Luc procedure. A simple removal of polyp alone without removal of the origine site does not warrant a complete cure [17].

Treatment of ACP involves removing polyp and the origin site within the maxillary sinus. The current management of ACP is the removal of the antral part of ACP under the guidance of angled telescopes using angled forceps or microdebriders. The polypoid mass in the nasal cavity and its pedicle is first removed, thereafter, the sinus ostium is widened. The natural and accessory ostium is connected if the accessory ostium is present.

The origin site of the polyp is removed through the widened ostium by using instruments such as angled forceps or microdebrider (60°, 90° and 120°) with angled endoscopes (30°, 45° and 70°) [26, 34]. The maxillary sinus should be examined in terms of any remnant tissue after the removal of ACP. Profuse hemorrhage, with the need for blood transfusion, may be rarely encountered during an angiomatous ACP removal [38].

Sometimes, accessing the origin site of ACP may be rather difficult through the maxillary sinus ostium via trans-nasal route. Using Caldwell-Luc approach, fenestration of anterior wall of the maxillary sinus can create an opportunity for accessing inaccessible areas such as anterior wall of the maxillary sinus.

Caldwell-Luc procedure can provide both a wide exposure and easy instrumentation for the removal of base of the ACP. This

procedure entails the removal of some part of the anterior wall of the maxillary sinus via a sublabial incision. The buccal mucosa is elevated superiorly until the infraorbital nerve, then anterior bony wall of the maxillary sinus is exposed. Subsequently, the bony wall is penetrated to enter into the sinus. This procedure can compromise teeth and facial growth in children. It also has some complications, such as cheek anesthesia, swelling and longer healing process as compared with endoscopic sinus surgery [22].

Trans-nasal pre-lacrimal recess approach may be used in patients with recurrent ACP, with a success rate of 83%. This method first includes raising a C-shaped mucoperiosteal flap on the lateral nasal wall 1cm anterior to the middle turbinate. Thereafter, a bony window of 0.5x0.5cm in size is performed through the frontal process of the maxilla and lacrimal bone. The nasolacrimal duct is fully exposed and pulled medially. The anterior part of the medial wall of the maxillary sinus is removed and subsequently, the antral part and origin site of ACP is resected. The mucoperiosteal flap is repositioned at the end of procedure and absorbable nasal packing is placed onto the mucoperiosteal flap. This approach contains a risk of injury to the nasolacrimal duct with a rate of 16.6% [46].

Lee and Huang have suggested that the successful rates for ACP removal are 76.9% in the endoscopic approach alone and 100% in transcanine combined with endoscopic approach. Additionally, they performed a transcanine approach combined with an endoscopic approach for three failures after endoscopic approach and did not see any recurrence [27]. Chaiyasate, et al. [16] suggested that the time period requiring to determine 95% of recurrences after surgical removal of ACP should be at least two years [16].

Woolley, et al. [17] reported that one of seven patients with ACP presented with recurrence in a mean follow-up period of 15 months after endoscopic removal. They employed Caldwell-Luc procedure as the treatment of choice in treating recurrent cases [17].

The most important reason for surgical failure is to leave inadvertently some remnant tissue at the origin site [21]. Recurrences occur more commonly in children (11.1%) than in adults (6.9%) (21,33). Özdek, et al. [24] reported a recurrence rate of 20% during a-thirty three-month follow-up period [34]. The recurrence rate for FESS in children is as much as 72.9% whereas that for combination FESS and Caldwell-Luc procedure is as little as 12.5% [24].

Conclusion

ACPs form most nasal polyps in children, whereas they can be seen less frequently in adults. The main presenting symptom is unilateral nasal obstruction. Diagnosis is made with history, endoscopic nasal examination and CT. A prudent surgical intervention, endoscopic removal with or without Caldwell-Luc procedure, is fundamental to eradicate the disease. The most important way to prevent recurrences is to excise the origin site of ACP via angled telescopes and forceps. Minimum follow-up period to detect a recurrent disease should be at least two years.

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Conflict of Interest

There is no conflict of interest in this study.

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