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CT and MR Evaluation of Choanal Polyps[1]

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Purpose : To evaluate the various types and CT and MR imaging findings of choanal polyps.

Materials and Methods : We classified 42 cases of surgically proven choanal polyps into three types according to site of origin, and retrospectively analyzed imaging findings ; in the case of antrochoanal polyps, particulr attention was given to extension of the lesion into the nasal cavity. We also determined whether MR imaging can provide more information than CT.

Results : The antrochoanal polyp was the most common type(33/42 : 78.6 %).

Three cases of choanal polyps(7.1 %) originated in the sphenoid sinus (sphenochoanal polyps), and while six (14.3 %) did not involve the sinus(pure choanal polyps).

Thirty-six of 42 choanal polyps(85.7 %) extended into either the choana or nasopharynx. Three cases of antrochoanal polyps protruded through the middle meatus, and two into the oropharynx. The maxillary sinus component of an antrochoanal polyps extended more frequently through the accessory ostium (29/33) than through the natural ostium. For delineating the stalk of an antrochoanal polyp, MR imaging was not superior to CT.

Conclusion : The most common type of choanal polyp is the antrochoanal, followed by pure choanal and sphenochoanal. CT and MR imaging can help identify lesion continuity between a choanal polyp and the paranasal sinus.

Index words : Nose, MR
Nose, neoplasms
Paranasal sinuses, CT
Paranasal sinuses, MR
Paranasal sinuses, neoplasms

Choanal polyp may also be known as 'antrochoanal polyp' and usually also includes the sphenochoanal, ethmochoanal, and pure choanal polyps. Those arising from the paranasal sinuses may be connected with the nasal component through a stalk. This type of polyps clinically presents as a nasal polyp and accounts for less than 6 % of all such polyps. Unless completely removed, choanal polyps have a high recurrence rate. Recurrence is particularly common when a mucosal remnant is present at the site of origin. CT or MR images can help identify the sinus origin of a choanal polyp, and this is important when determining surgical approach.

Materials and Methods

Between August 1991 and April 1995 we classified 41 patients(42 cases, 1 case bilateral) of choanal polyps into three types, depending on site of origin.

Twenty-five males and 16 females were examined,

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their ages ranged from six to 63 years. We included choanal polyps located in the nasal cavity and extending into the paranasal sinuses, but excluded cases of general polyposis that extended to the choana. CT scanning was performed in all 41 cases and MR imaging in 11. CT examination was performed on GE-CT/T 9800 Hi Light(GE Medical System, Milwaukee, USA). Scans in the axial planes were obtained with 5 mm section thickness, while in the coronal planes, section thickness was 3 and 5 mm. In 30 cases, contrast enhanced scans were obtained, using iodinated contrast material(Rayvist or Ultravist ; Schering, Berlin, Germany). MR imaging was performed on a 1.5-T Signa imager(General Electric, Milwaukee, WI), using a head coil. Sagittal localizer(600/min/1 [TR/TE/excitation]), axial T2 weighted(3500/102/2), coronal T1 (600/12/2) and T2 weighted images, and Gd-enhanced axial and coronal images were obtained.

We retrospectively analyzed CT findings with attention to the extent of choanal polyps and entrance site of an antrochoanal polyp. We also determined whether MR imaging provided more information than CT for the evaluation of choanal polyps.

Results

The most common type was antrochoanal polyp (33 of 42 cases) (Fig. 1, 2). Six cases of choanal polyp did not involve the sinus and were designated 'pure choanal polyp'(Fig. 3) ; in three cases, choanal polyp

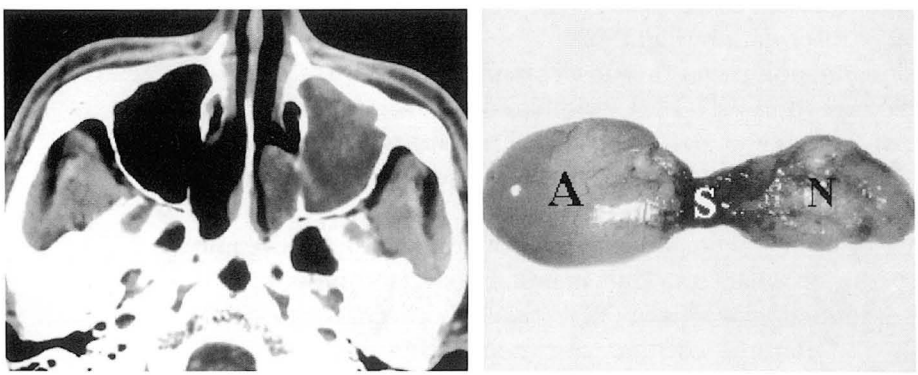

Fig. 1. Antrochoanal polyp.
A. Axial CT scans shows left antral soft tissue mass that prolapses into the posterior left nasal fossa.
B. Corresponding surgical specimen. Cystic component of the the maxillary antrum (A) is connected by a stalk (S) with solid nasal component (N).

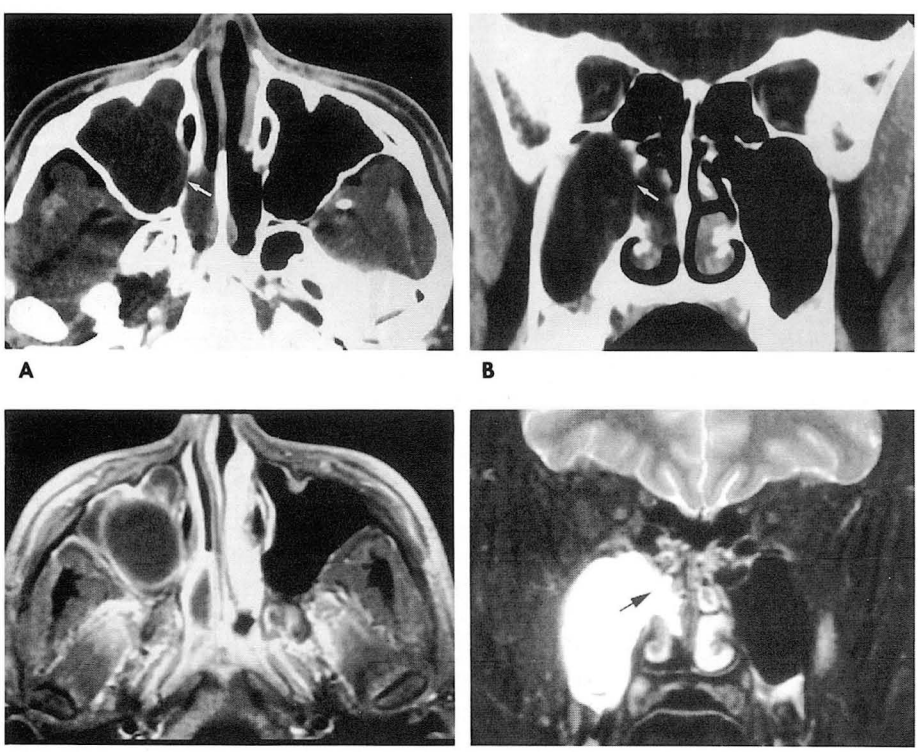

Fig. 2. Anrochoanal polyp. Axial (**A**) and coronal (**B**) enhanced CT scans. Low attenuation antral component extends into the nasal fossa through the accessory ostium and rim like enhancement of the nasal component is noted. The stalk is well delineated on both axial and coronal scans(white arrows). Gd-DTPA enhanced axial T1-weighted MR image (**C**) shows peripheral rim enhancement of antral and nasal components. Two components appear to be separate. Coronal T2-weighted MR image (**D**) delineates the stalk (black arrow) through the accessory ostium.

arose from the sphenoid sinus(Fig. 4, Table 1). Nineteen cases extended into the nasopharynx and 17 into the choana.

In 14 cases, antrochoanal polyp extended into the choana(Fig 2), and in 14 more into the nasopharynx, three cases protruded through the middle meatus, and two extended into the oropharynx(Table 2). On CT, the antrochoanal polyp showed mucoid density ; this filled in the maxillary sinus and extended by a slender 'stalk' either through the natural ostium of the maxillary sinus or through an accessory ostium in the posterior fontanelle(Fig. 1, 2). The polyp gained entrance to the nasal fossa by a stalk, and this was more frequently through the accessory ostium (29 of 33 cases) (Fig. 2) than through the natural ostium(4/33 cases). On CT, mucoid density was apparent in all cases and on contrast-enhanced CT scans, 15 of 31 cases showed peripheral rim enhancement(Fig. 2A, B). In cases of antrochoanal polyp which extended to the nasal fossa through the natural ostium, there was erosion of the uncinated process and widening of the infundibular region. On MR images, ten cases of antrochoanal polyp showed low to intermediate signal intensity on T1-weighted images and homogeneous high signal intensity on T2-weighted images(Fig. 2C). In two cases of sphenochoanal polyp, signal intensity of the sinus compone-

Table 1. Classification of Choanal Polyps

Type	No. of cases(%)
Antrochoanal polyp	33(78.6)
Pure choanal polyp	6(14.3)
Sphenochoanal polyp	3(7.1)
Total	42(100)

Table 2. Extent of Choanal Polyps

	ACP	PCP	SCP	Total
Middle meatus	3	—	—	3
Choana	14	1	2	17
Nasopharynx	14	4	1	19
Oropharynx	2	1	—	3
Total	33	6	3	42

ACP=antrochoanal polyps, PCP=pure choanal polyps
SCP=sphenochoanal polyps

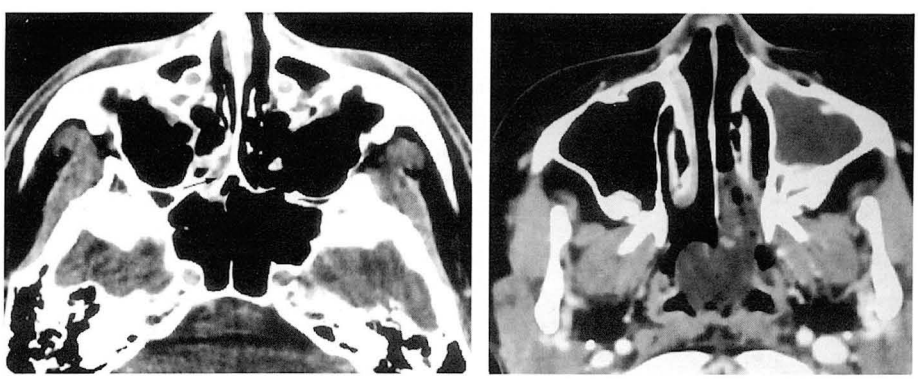

Fig. 3. Pure choanal polyp. Axial CT scan (**A**) shows a choanal polyp originating in the sphenoethmoidal recess(arrow). Another pure choanal polyp arising from the left middle turbinate and extending into the nasopharynx is seen on axial CT(**B**). Left maxillary antrum is filled with soft tissue density with no connection between two components.

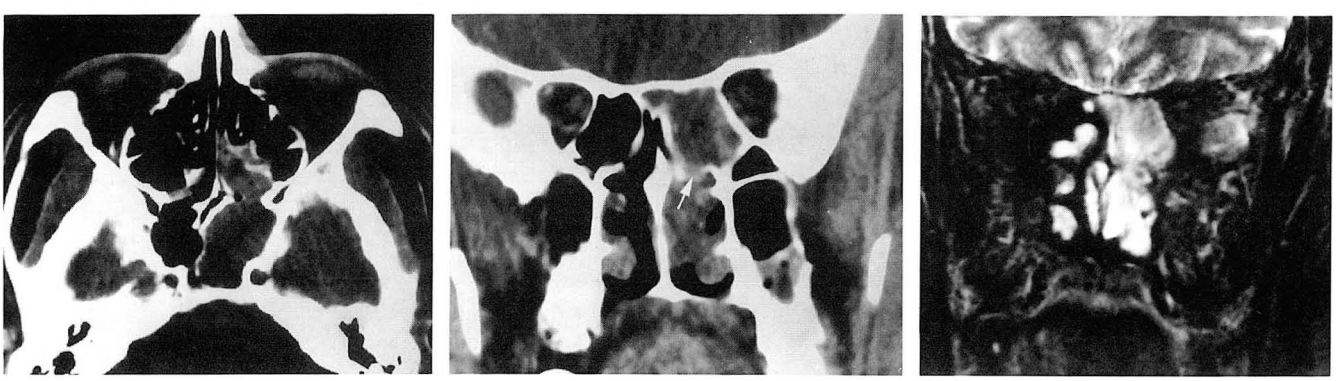

Fig. 4. Sphenochoanal polyp. Axial CT scans (**A**) shows the sphenoid sinus filled with soft tissue density. Coronal CT scan (**B**) shows widened sphenoid sinus ostium by the polyp(arrow), which extends into the nasal cavity. Coronal T2-weighted MR image (**C**) shows less bright signal intensity of the sinus component than that of the nasal component.

nt was lower than that of the nasal component(Fig. 4C). Coronal CT images were better than axial CT images for delineating the stalk, though on MR images, this was best delineated by coronal T2 weighted image. On T2-weighted images, the signal intensity of the antral component was homogeneously bright, a unique feature of the antrochoanal polyp. Surgery revealed that pure choanal polyps in which no sinus component was found originated in the nasal septum in two cases, in the ethmoidal bullae in two in the sphenoethmoidal recess in one(Fig. 3A), and in the middle turbinate in one (Fig. 3B).

Discussion

Choanal and the nasal polyps are distinct clinical entities. In contrast to nasal polyps, the former are often solitary, and unassociated with a history of allergies. Their etiologic relationship to allergies is however, controversial; some authors have reported that 15% to 40% of patients had a history of allergy(1—3). The antrochoanal polyp, the most common type arises from the maxillary antrum. A choanal polyp may arise from a different site, including the turbinate sinus, the anteroinferior surface of the ethmoidal bulla, the sphenoethmoidal recess, or the ethmoid or sphenoid sinus(4). True choanal polyp must be distinguished from general polyposis, in which the polyps extend to the choanae, though a combination of true choanal polyp and diffuse polyposis of the ethmoid is possible (4). A choanal polyp can be diagnosed by nasal endoscopy, but this procedure cannot clearly demonstrate connection with the original sinus. Continuity between a polyp and the sinus can however be evaluated by CT or MR imaging. When a choanal polyps extends into the nasopharynx, a patient may feel mechanical stress during deglutition and speech. Depending on its size, the intranasal component of a polyp may reach the nasopharynx, where it can completely obstruct the choana and extend below the level of the soft palate into the oropharynx. It may become visible through the mouth(4, 5). Unless all their components are completely reomoved, choanal polyps have a high incidence of recurrence which commonly arises in mucosal remnants at the site of origin. Histologically, they also differ from nasal polyps in that they contain few mucous glands and eosinophils. The lack of significant eosinophilia supports non-allergenic theory(7). They are liable to pseudocystic degeneration : a considerable amount of serous fluid may escape from the pseudocystic foci when they are ruptured during removal (8). Choanal polyps are composed of edematous, hyperplastic submucosal connective tissue and are relatively hypocellular(1, 9). This explains why they are of low density on CT scan and of homogeneous bright signal intensity on T2-weighted image. Variable densities of inflammatory cells are found, and they tend to be more concentrated near the mucosal surface ; this may be related to the peripheral rim enhancement scan on either CT or MR imaging.

The most common choanal polyp is the antrochoanal polyp which is often found in teenager and young adults(4, 6). It typically originates in the lateral wall of the maxillary antrum, and as it enlarges, protrudes through the middle meatus and extends into the nasal cavity. It normally has two components, the cystic component frequently fills most of the maxillary sinus which extends by means of a slender 'stalk' either through the natural ostium of the maxillary sinus or more frequently through an accessory ostium in the posterior fontanelle. This extension reaches the middle meatus where it again develops into a solid polyp that, as it enlarges, can fill the floor of the nose and reaches the choana(4—6). Berg et al. (10) proposed the pathogenesis of the antrochoanal polyp. It develops from an expanding intramural cyst and protrudes through the maxillary ostium into the nasal cavity, thereafter assuming a more polypoid appearance. An obstructed osteomeatal unit may create a negative pressure differential that attempts to evacuate the maxillary sinus mucosa ; polypoid transformation occurs as a polyp enters the nasal environment(10). On CT, a mass of mucoid density is seen to occupy the maxillary sinus, the ipsilateral nasal cavity and nasopharynx(5, 9). Associated bony changes on CT are infundibular widening and destruction or remodelling of the antral wall when the polyp continues to grow. We have found that bony changes such as erosion of the uncinate process and infundibular enlargement are more apparent in cases where an antrochoanal polyp protrudes through the natural ostium rather than the accessory ostium. When an antrochoanal polyp grows through the accessory ostium, bony changes are associated only when the polyp is markedly enlarged. As previously mentioned, MRI characteristics usually reflect pathologic findings of pseudocystic degeneration, edematous submucosal connective tissue, and hypocellularity. Signal intensity tends to be low to intermediate on T1-weighted and proton-density-weighted images and high on T2 weighted images. In our cases, maxillary component of the antrochoanal polyps showed homogeneous high signal intensity on T2-weighted images. The solid nasal component also showed high signal intensity on T2-weighted image and thicker peripheral rim enhance-

ment on Gd-DTPA enhanced T1-weighted image, presumably because of inflammatory change in the nasal component. Although rare, sphenochoanal polyps and ethmoidochoanal polyps have also been described. The former was first reported by Zuckerkandle(11) and develops from a polyp in the sphenoid sinus that enlarges and bulges through the sphenoid ostium(9, 11). This may cause the polyp to contract or the polyp may enlarge the ostium, which opens into the sphenoethmoidal recess, high in the nasal cavity above and behind the superior turbinate. With further enlargement, the polyp herniates down into the choana. Our three cases of sphenochoanal polyp extended through the sphenoid sinus ostium and the sphenoethmoidal recess into the choana. On MRI, two cases showed bright signal intensity of the sinus component less than that of the nasal component and this might be due to a sphenoid sinus cavity which was narrower than the maxillary antrum. This narrow sphenoid sinus allows contraction of the polyp and inflammatory cells are concentrated on the mucosal surface. When the sphenoid sinus is seen on CT to be opaque, and the maxillary sinus is clear, the polyp is sphenochoanal. The definite therapy for antrochoanal or sphenochoanal polyps is resection of the sinus component, along with the choanal polyp itself. Although avulsion of a choanal polyp is simpler, the use of this technique is very likely to lead to recurrence(7, 9). Pure choanal polyps are not connected with the paranasal sinuses and may originate in the turbinate sinus, the anteriorinferior surface of the ethmoidal bulla, or the sphenoethmoidal recess. Our cases arose from the nasal septum, the middle turbinate, the ethmoidal bulla, or the sphenoethmoidal recess. Surgery revealed no evidence of connection with the paranasal sinuses.

In conclusion, CT and MR imaging can help identify soft tissue continuity between a choanal polyp and sinus origin, and this is important when determining the most appropriate surgical approach.

References

1. Barnes L, Verbin RS, Gnepp DR. *Disease of the nose, paranasal sinuses and nasopharynx.* In Barnes L, ed. *Surgical pathology of the head and neck.* New York : Deckker, 1985 : 403-451
2. Cook PR, Davis WE, McDonald R, Mckinsey JP. Antrochoanal polyposis : a review of 33 cases. *ENT Journal* 1993 ; 72 : 401-410
3. Batsakis JG. The pathology of head and neck tumors : nasal cavity and paranasal sinuses, part 5. *Head Neck Surg* 1980 ; 2 : 410-419
4. Stammberger H. *Functional endoscopic sinus surgery.* Philadelphia : B.C. Decker, 1991 : 227-229
5. Som PM, Bergeron RT. *Head and neck imaging.* 2nd ed. St. Louis : Mosby, 1991 : 128-142
6. Blitzer A, Lawson W, Friedman WH. *Surgery of the paranasal sinuses.* 2nd ed. Philadelphia : Saunders, 1991 : 121-156
7. Hayes E. Lavelle W. Sphenochoanal polyp : CT findings. *J Comput Assist Tomogr* 1989 ; 13 : 365-366
8. Friedmann I. *Systemic pathology.* Vol 1. *Nose, throat, and ears,* 3rd ed. Edinburgh London : Churchill Livingstone, 1986 : 14-47
9. Weissman JL, Tabor EK, Curtin HD. Sphenochoanal polyps : evaluation with CT and MR imaging. *Radiology* 1991 ; 178 : 145-148
10. Berg O, Carenfell C, Silversward, et al. Origin of the choanal polyp. *Arch Otolaryngol Head Neck Surg* 1988 ; 114 : 1270-1271
11. Towbin R, Dunbar JS, Bove K. Antrochoanal polyps. *AJR* 1979 ; 132 : 27-31
12. Nino- Murcia M, Rao VM, Mikaelian DO, Som P. Acute sinusitis mimicking antrochoanal polyp. *AJNR* 1986 ; 7 : 513-516

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후비공 용종의 CT와 자기공명 영상 소견[1]

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목 적 : 후비강 용종의 종류와 이들의 CT와 자기공명영상 소견을 알고자 하였다.

대상 및 방법 : 수술하여 후비공 용종으로 확인된 42예를 그 발생 부위에 따라 세가지 유형으로 나누어 보았고, 후비공 용종의 침범 정도를 살펴 보았으며 상악동 후비공 용종은 stalk의 개구부를 관찰하였다. 또한 CT와 비교시 자기공명영상이 부가적 정보를 주는가의 유무도 살펴 보았다.

결 과 : 후비공 용종중 상악동 후비공 용종이 33예(78.6%)로 가장 많았고 3예는 접형동에서 발생한 접형동 후비공 용종이였으며 6예는 부비동의 침범이 없이 비강에서 발생한 순수 후비공 용종 이었다. 후비공 용종 전체 42예중 36예에서 후비공이나 비인두까지 자라있었으며 상악동 후비공 용종의 3예는 중비도로, 2예는 구인두까지 자라있었다. 상악동 후비공 용종은 자연 개구부 보다는 부속 개구부로(29/33) 더 많이 자라 나왔다. 자기공명영상은 상악동 후비공 용종의 경우 특히 상악동 성분이 T2강조영상에서 균질한 고음영을 보였던 것이 특징적이었지만 stalk을 관찰하는데 CT보다 더 좋은 점은 없었다.

결 론 : 후비공 용종은 상악동에서 발생한 상악동 후비공 용종이 가장 많지만 드물게 접형동에서 기원 할 수도 있고 비강 내에서 발생 할 수도 있다. CT나 자기공명영상은 후비공 용종과 부비동의 연결성을 보는데 도움을 줄 수 있으며 발생한 부비동을 아는 것은 수술시 사전 정보로 중요하다.