Underestimation of Rhinogenic Causes in Patients Presenting to the Emergency Department with Acute Headache

Jae-Heon Lee, Hyun-Jik Kim, Young-Ho Hong, Kyung-Soo Kim

Abstract-

Objectives: Differential diagnosis is essential, since secondary headache due to paranasal sinus lesions are similar in headache characteristics to primary headache. However, since patients visiting the emergency department due to acute severe headache are primarily treated by neurologists, paranasal sinuses lesions and anatomical variations of the nasal cavity causing the headache are commonly overlooked because of the clinician's lack of knowledge about rhinosinugenic headache. This study investigated the prevalence of paranasal sinus lesions and anatomical variations that may cause secondary headaches in patients who were diagnosed as primary headache and treated by neurologists in the emergency room.

Methods: A retrospective study was done involving 1235 patients who visited the emergency department from January 2008 to December 2012 and who were diagnosed with primary headache. From the axial view of brain computed tomography, examination of sinusitis, mucosal contact points, concha bullosa, isolated sphenoid lesion, and osteoma were done, and location and morphology was analyzed.

Methods: Three hundred fifty-five of 1235 (28.7%) patients had sinusitis, mucosal contact points, concha bullosa, isolated sphenoid lesion, and osteoma as possible causes for secondary headaches.

Conclusion: Differential diagnosis of primary headaches requires knowledge of paranasal sinus lesions including rhinosinusitis or anatomical variations. Also, interdisciplinary evaluation of acute headache presenting to the emergency room is necessary for accurate diagnosis and proper management.

Key Words: Acute headache; Primary headache; Paranasal sinus pathology; Anatomical variation; Computed tomography; Emergency room

Acta Neurol Taiwan 2015;24:37-42

INTRODUCTION

Headache is a very common manifestation that is nearly universal in the course of everyone's life, with a lifetime morbidity of at least 90%[(1)]. Many causes for headaches make the complete understanding of diagnostic criteria, in-depth knowledge, and experience crucial for accurate diagnosis and proper management. Headache

From the Department of Otorhinolaryngology-Head and Neck Surgery, Chung-Ang University College of Medicine.
Received October 21, 2014. Revised January 23, 2015.
Accepted February 10, 2015.
Correspondence to: Kyung-Soo Kim, DM. Department of Otorhinolaryngology-Head and Neck Surgery, Chung-Ang University College of Medicine, 224-1, Heukseok-dong, Dongjak-gu, Seoul, Korea.
E-mail: 99-21045@hanmail.net

may be classified as primary and secondary headache[2]. Primary headache does not have specific causes and is subcategorized as migraine, tension type headache, and cluster headache. Secondary headache may be triggered by specific causes including infections, inflammation, trauma, neoplasm, vascular factors, and metabolic diseases[1,2]. Among secondary headaches, the most relevant common causes of concern to otolaryngologists are paranasal sinuses lesion and anatomical variations, such as septal spur, concha bullosa, and septal deviation[3]. Differential diagnosis is essential since secondary headache due to paranasal sinus lesions are similar in headache characteristics to primary headache[4]. Migraine and tension type headache can be mistaken for headache attributed to acute rhinosinusitis because of similarity in location of the headache and, in case of migraine, because of the commonly accompanying nasal autonomic symptoms[5]. In one study, 42% of patients diagnosed as migraine according to the International Headache Society (IHS) guideline were misdiagnosed as sinus headache by internal medicine doctors[6]. Another study reported the 90% of self-diagnosed sinus headache patients corresponded to migraine according to the IHS criteria[4].

Patients visiting the emergency department due to acute severe headache are primarily treated by neurologists. As a result, paranasal sinuses lesions and anatomical variations of the nasal cavity that can be the cause of the headache are commonly overlooked because of the neurologist's lack of knowledge about rhinosinugenic headache.

This study investigated the prevalence of paranasal sinus lesions and anatomical variations that may cause secondary headaches in patients diagnosed as primary headache and treated by neurologists in the emergency room.

MATERIALS & METHODS

Study Design & Study population

From January 2008 to December 2012, we conducted a retrospective analysis of 1235 patients presenting with acute severe headache in the emergency room. They received treatment from neurologists under the diagnosis of primary headache and headache relief was provided. In all cases, non-contrast enhanced brain computed tomography (CT) or contrast enhanced brain CT was performed. Patients who did not receive CT and patients with intracranial hemorrhage, ischemia, or trauma were excluded.

Outcome Measures

Brain CT imaging was performed to find the causes of headache in the sinonasal areas including the rhinosinusitis, intranasal contact point, septal spur, concha bullosa, isolated sphenoid lesion, and osteoma. Rhinosinusitis was defined in those cases where there was haziness in the sinus or mucosal hypertrophy of the sinus was noted. Intranasal contact point was defined as having a contact point between the nasal septum and inferior turbinate according to the CT findings. Since only the axial view was analyzed, in cases of having septal spur without contact point, this was considered to be the contact point. Concha bullosa was defined as having pneumatization of the middle turbinate. Also, lesions associated with headache, such as isolated sphenoid lesion and osteoma, were also separately categorized.

RESULTS

Patient distribution

Of the 1235 patients, 439 were male with a mean age of 38.4 years (range, 10~86 years old) and 742 patients were female with a mean age of 43.4 years (range, 10 ~ 88). Sex distribution was similar for all ages and showed an even distribution (Table 1). All patients were diagnosed with "primary headache" by neurologist which

Table 1. Demographic data.

Age	Number of cases (%)		
(years)	Male	Female	Total
10-19	62(12.5%)	37(5.0%)	99(8.0%)
20-29	98(19.9%)	157(21.2%)	255(20.7%)
30-39	127(25.7%)	130(17.5%)	257(20.8%)
40-49	88(17.8%)	125(16.9%)	213(17.3%)
50-59	50(10.1%)	164(22.1%)	214(17.3%)
60-69	42(8.5%)	81(10.9%)	123(10.0%)
70-79	20(4.1%)	37(5.0%)	57(4.6%)
80-89	6(1.2%)	11(1.5%)	17(1.4%)
Mean (Range)	38.4 (10-86)	43.4 (10-88)	41.4 (10-88)
Number of cases	493	742	1235

Table 2. Subcategory of primary headache diagnosed by neurologists at ER.

Subcategory	Male (N=493)	Female (N=742)	Total (N=1235)
Tension type headache	224	321	545
Migraine	123	185	308
Cluster headache	78	120	198
Unclassified	68	116	184

was subcategorized as migraine, tension type headache, cluster headache and unclassified primary headache. The frequency of each subcategory was shown in Table 2.

General results

Three hundred fifty-five patients (28.7%) had rhinosinusitis, intranasal contact point, septal spur, concha bullosa, isolated sphenoid lesion, and osteoma, which may have caused headache. There were no significant findings for the remaining 880 patients. Of the 355 cases, rhinosinusitis was the most common (n=172) and 122 patients had intranasal contact point. Eighty-two patients were diagnosed with concha bullosa, six patients were diagnosed with isolated sphenoid lesion, and nine patients were diagnosed with osteoma (Figure 1). Thirty-six patients had two or more causes that may have caused the headache.

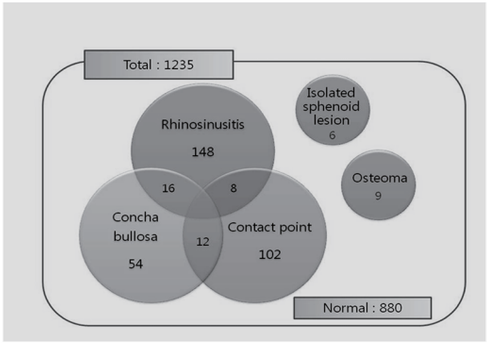

Figure 1. The prevalence of paranasal sinus pathologies and intranasal anatomical variations in the study groups. (n=1235)

Rhinosinusitis

One hundred seventy-two patients (13.9%) had rhinosinusitis. Of these patients, sinusitis was confined to the maxillary sinus in 67, to the ethmoid sinus in 40, to the frontal sinus in 7, and sinusitis originating from more than one sinus in 58 (Figure 1A & Table 3).

Table 3. Distributions of sinusitis. (N=172, 13.9%)

Sinusitis	Total
M	67
E	40
F	7
Sinusitis involving more than one sinus	58
Total	172

* M : maxillary sinus, E : ethmoid sinus, F : Frontal sinus

Intranasal contact point

One hundred twenty-two patients (9.9%) had an intranasal contact point. Of these patients, 33 had right intranasal contact point (contact point between the nasal septum and right inferior turbinate) and 35 had left intranasal contact point (contact point between the nasal septum and left inferior turbinate). For 54 patients, an intranasal contact point was not observed, but a septal spur was evident (right spur in 29 patients, left spur in 25 patients) (Table 4 & Figure 2).

Table 4. Distributions of contact point. (N=122, 9.9%)

Contact point	Total
contact point septum to right inferior turbinate	33
contact point septum to left inferior turbinate	35
septal spur to right	29
septal spur to left	25
Total	122

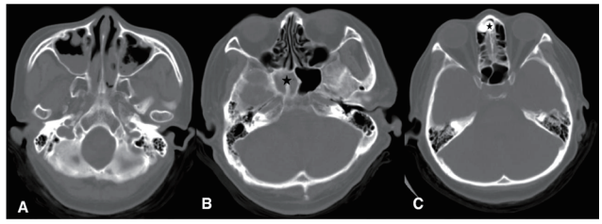

Figure 2. Axial CT scans of bilateral maxillary sinusitis (A), isolated fungal sinusitis in right sphenoid sinus (B, asterisk), osteoma in right anterior ethmoid sinus (C, asterisk).

Concha bullosa

Eighty-two patients (6.6%) had concha bullosa. Of these patients, had right middle turbinate concha bullosa, 31 had left middle turbinate concha bullosa, and 26 had bilateral concha bullosa. Intranasal contact point was observed in 12 patients, among whom eight patients had contact point between the concha bullosa and the nasal septum, and four patients had a contact point between the concha bullosa and the lateral nasal wall (Table 5 & Figure 2).

Table 5. Distributions of concha bullosa & contact point. (N=82, 6.6%)

Concha bullosa & contact point			Total
Right concha bullosa	nasal septum	5	25
	lateral nasal wall	2	
	no contact	18	
Left concha bullosa	nasal septum	4	31
	lateral nasal wall	4	
	no contact	23	
Both concha bullosa	nasal septum	6	26
	lateral nasal wall	2	
	no contact	18	
Total			82

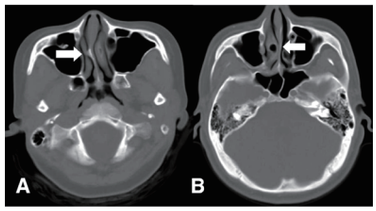

Figure 3. Axial CT scans of intranasal contact point (white arrow) between the right side septal spur and mid-portion of inferior turbinate (A) and between the left side septum and medial wall of left concha bullosa (B).

Isolated sphenoid lesion

Six patients had isolated sphenoid lesion. They were diagnosed with fungal sinusitis (n=2), sphenoid sinusitis (n=2), and mucocele (n=2) (Figure 2B).

Osteoma

Nine patients were diagnosed with osteoma. Six patients had osteoma originating from the frontal sinus and three patients had osteoma originating from the ethmoid sinus (Figure 2C).

DISCUSSION

The 2013 IHS diagnostic criteria recognizes headaches caused from both acute rhinosinusitis and chronic/recurring rhinosinusitis[5]. This was a change from 2004 diagnostic criteria, with the addition of diagnostic criteria attributing headache to chronic or recurring rhinosinusitis (ICHD-3, 11.5.2)[5]. However, whether or not chronic sinus pathology including rhinosinusitis can produce persistent headache has been debatable. Also, the term 'sinus headache' is outmoded because it has been applied both to primary headaches and headache supposedly attributed to various conditions involving nasal or sinus structures[5].

Rhinosinusitis and primary headache syndromes are common disease entities, and headache and facial pain are common reasons for referral to otolaryngology units. Due to an association of nasal symptoms with primary headache syndromes and considerable similarities in their clinical presentation, primary headache syndromes may be misdiagnosed as sinus disease and vice versa[7]. In 2004, the Sinus Allergy and Migraine Study concluded that primary headache syndrome patients are commonly misdiagnosed with chronic rhinosinusitis because they present to their primary care physicians complaining of symptoms classically associated with sinus disease[8]. Patients with primary headache, such as migraine, have similar symptoms compared to sinus headache and also may have nasal symptoms, such as blockage or congestion[3]. Hence, it is difficult to differentiate sinus headache from primary headache only from clinical manifestations. However, for a patient to receive adequate treatment, differential diagnosis is essential.

In the present study, even if the patients have radiographic sinus disease, we cannot suggest that there may be a close temporal relationship between the headache and rhinosinusitis. There are two reasons. First, although radiographic findings apparently play a supportive role in the diagnosis of acute or chronic sinusitis, simply finding pathological changes on imaging of acute rhinosinusitis, correlating with the patient's pain description, is not enough to secure the diagnosis of "headache attributed to

acute rhinosinusitis"[5]. Second, sinus disease and migraine may be comorbid conditions[9].

Anatomical variations and abnormalities in the sinonasal area can induce headache and masquerade as that of the primary origin. Significant symptoms sometimes can be caused by relatively small lesions, obscure sinusitis, or mucosal contact areas, such as septal spur or middle turbinate concha bullosa[10].

Headache caused by intranasal contact point are causally associated with trigeminal nerve and substance P.11 Stimulation of receptors in the nasal mucosa is responsible for the release of substance P, which is a neurotransmitter for pain in the central nervous system[11]. Headache caused by intranasal contact were added to the 2004 IHS diagnostic criteria as a cause for secondary headache with limited evidence[2]. Three characteristics for the diagnosis of headache caused by intranasal contact point are needed. First, a mucosal contact point has to be present in clinical, endoscopic, or radiologic findings. Second, upon local anesthesia of the mucosal contact point, pain should be completely resolved for 5 minutes. Third, pain should subside within 7 days[2]. In the present study, 8% of all patients had an intranasal contact point in CT findings. This indicates that the intranasal contact point may be a possible cause of headache. However, limitations exist in its diagnosis, since the change in character of the headache should be observed after local anesthesia of the intranasal contact point. We did not perform this anesthesia. Also, a recent study suggested that the majority of people with contact points experience no facial pain and the removal of a contact point rarely results in the total elimination of facial pain[12]. However, in another study involving 30 patients with headache due to intranasal contact point, 43% showed complete relief in symptoms, 47% showed marked improvement, and 10% showed no improvement[13]. That is the reason why intranasal contact point headache should be considered, and endoscopic and radiologic studies are needed in the differential diagnosis of headache.

Middle turbinate is often composed of a bony plate and if this plate is also pneumatized in the process of pneumatization of the ethmoid sinus, it is defined as concha bullosa[14]. Pneumatization of the middle turbinate is a normal variation occurring during the process ethmoid pneumatization and is not a pathologic condition[14]. However, huge middle turbinate may be in contact with the nasal septum or lateral nasal wall, and may cause pain. This phenomenon was dubbed the 'middle turbinate headache syndrome' by Morgenstein[15]. There seems to be a correlation between the size of the concha bullosa and the pain caused by intransal contact point. According to a study on patients with concha bullosa and intranasal contact point associated with pain, partial middle turbinectomy through nasal endoscopy can relieve headache symptoms[16]. In the present study, CT revealed concha bullosa in 82 patients. Of these patients, an intranasal contact point between the concha bullosa and nasal septum was noted in eight patients, and between the concha bullosa and lateral nasal wall in four patients.

Sinus lesions are a common disease, but sinus lesion confined only to the sphenoid sinus is very uncommon[17]. Sphenoid lesions are characterized by temporary or intermittent headache in the retro-orbital or frontal area. Also, there may be dull pain affecting the bregma or the entire head[17]. Although very uncommon, cranial nerve palsy, such as dipolpia, may develop and nasal symptoms are rather uncommon compared to other sinus lesions[17]. Symptoms of sphenoid lesion are mostly unspecific other than headache. Since a physical approach to the sphenoid sinus is difficult, diagnosis of isolated sphenoid lesion is difficult[17]. In the present study, there were six patients with isolated sphenoid lesion. Of these patients, two were diagnosed with sphenoid sinusitis, two with sphenoid fungus ball, and two with mucocele. Headache due to sphenoid sinus lesion has been recognized and the first division of the trigeminal nerve seems to be the reason for pain[18].

Osteoma is a slow growing tumor composed of osseous tissue and is usually found in the cranial bone, sinus, or the mandible bone[19]. Osteoma of sinus origin usually grows in the wall of the sinus, which invades into the sinus. Most (80%) of osteomas develop in the frontal sinus and 20% develop in the ethmoid sinus, but osteoma in the maxillary and sphenoid sinus is rare[19]. Most osteoma developing in the sinus are asymptomatic, but the patient may complain of headache and facial pain with insignificant characteristics[20]. The reason for the pain caused by osteoma is not known. There are three possible mechanisms: local mass effect caused by tumor growth, prostaglandin E2 synthesis, and referred neuralgia[21-23].

Limitations

There were two important limitations in our study. First, radiologic findings for evaluation were brain CT; coronal view was not available. Therefore, the analysis of nasal anatomy variations, such as intranasal contact point and septal spur, were restricted. Septal spur and presence of intranasal contact point from the inferior turbinate were observed to some degree using the axial view, but there was restriction in evaluating the intranasal contact point between the superior turbinate or other nasal cavity lesions. Second, there was a limitation in that the causal relationship or temporal relation could not be explained between headache and paranasal sinus lesion or anatomical variations.

CONCLUSION

For differential diagnosis of primary headaches, knowledge regarding various paranasal sinus lesions including rhinosinusitis and anatomical variations is needed. Interdisciplinary evaluation of acute headache presenting to the emergency room is necessary for accurate diagnosis and proper management.

REFERENCES

1. Cady RK, Schreiber CP. Sinus headache: a clinical conundum. Otolaryngol Clin North Am 2004;37:267-288.
2. Headache Classification Subcommittee of the International Headache Society. The International classification of headache disorders, 2nd edn. Cephalalgia 2004;24:1-160.
3. Cady RK, Schreiber CP. Sinus problems as a cause of headache refractoriness and migraine chronification. Curr Pain Headache Rep 2009;13:319-325.
4. Cady RK. Distingishing "sinus headache" from migraine headache. Adv Stud Med 2002;2:582-585.
5. Headache Classification Subcommittee of the International Headache Society. The International classification of headache disorders, 3nd edition (beta version). Cephalalgia 2013;33:629-808.
6. Lipton RB, Diamond S, Reed M, Diamond ML, Stewart WF. Migraine diagnosis and treatment: results of the American Migraine Study II. Headache 2001;41;638-645.
7. Cashman EC, Smyth D. Primary headache syndromes and sinus headache: An approach to diagnosis and management. Auris Nasus Larynx 2012;39:257-260.
8. Eross E, Dodick D, Eross M. The sinus, allergy and migraine study (SAMS). Headache 2007;47:213-224.
9. Mehle ME, Kremer PS. Sinus CT scan findings in "sinus headache" migraineurs. Headache 2008;48:67-71.
10. Huang HH, Lee TJ, Huang CC, Chang PH, Huang SF. Non-sinusitis-related rhinogenous headache: a ten-year experience. Am J Otolaryngol 2008;29:326-332.
11. Abu-Bakra M, Jones NS. Does stimulation of nasal mucosa cause referred pain to the face? Clin Otolaryngol Allied Sci 2001;26:430-432.
12. Harrison L, Jones NS. Intranasal contact points as a cause of facial pain or headache: a systemic review. Clin Otolaryngol 2013;38:8-22.
13. Tosun F, Gerek M, Ozkaptan Y. Nasal surgery for contact point headaches. Headache 2000;40:237-240.
14. Braun H, Stammberger H. Pneumatization of turbinates. Laryngoscope 2003;113:668-672.
15. Morgenstein KM, Krieger MK. Experiences in middle turbinectomy. Laryngoscope 1980;90:1596-1603.
16. Anselmo-Lima WT, de Oliveira JA. Middle turbinate headache syndrome. Headache 1997;37:102-106.
17. Lawson W, Reino AJ. Isolated sphenoid sinus disease: an analysis of 132 cases. Laryngoscope 1997;107: 1590-1535.
18. Leroux E, Valade D, Guichard JP, Herman P. Sphenoid fungus balls: clinical presentation and long-term follow-up in 24 patients. Cephalalgia. 2009;29:1218-1223.
19. Earwaker J. Paranasal sinus osteomas: a review of 46 cases. Skeletal Radiol 1993;22:417-423.
20. Atallah N, Jay MM. Osteomas of the paranasal sinuses. J Laryngol Otol 1981;95:291-304.
21. Mansour AM, Salti H, Uwaydat S, Dakroub R, Bashshour Z. Ethmoid sinus osteoma presenting as epiphora and orbital cellulitis: case report and literature review. Surv Ophthalmol 1999;43:413-426.
23. Ishimaru T. Superior turbinate osteoma: a case report. Auris Nasus Larynx 2005;32:291-293.
24. Blumenthal HJ. Headaches and sinus disease. Headache 2001;41:883-888.