Annals of Medical Research
DOI: 10.5455/annalsmedres.2019.06.310 2019;26(9):1907-12

Original Article

The frequency of paranasal pathologies and variations in patients with migraine and their effects on patients' pain experience

Emre Gedik[1], Ali Zeynel Abidin Tak[2], Ali Haydar Baykan[2]

[1]Kirklareli State Hospital, Clinic of Neurology, Kirklareli, Turkey
[2]Adiyaman University Education an Research Hospital, Adiyaman, Turkey

Abstract

Aim: We aimed to evaluate the frequency of paranasal pathologies and variations in migraine patients, and also whether such situations have an effect on the strength and frequency of pain attacks that the patients experienced.

Materials and Methods: Patients between 18 and 58 years old were included in the study who were diagnosed as migraine according to International Classification of Headache Disorders (ICHD)-3 beta criteria. The images of patients whose axial and coronal brain CT examination were done are prospectively examined.

Results: Totally 130 migraine patients were included in the study as 112 women (86.2%) and 18 men (13.8%). The average age of the patients was found as 32.5±10.4. Migraine with aura was observed in 31 of the cases (23.8%) and migraine without aura was observed in 99 (76.2%). It is found that the rate of paranasal pathology and / or variation in the patients with migraine as 76.9% in total.

Conclusion: It is thought that paranasal regions should be evaluated carefully during the evaluation of brain imaging studies in terms of differential diagnosis of paranasal pathologies that may differ in treatment and prognosis in migraine patients. It is considered that there is a need for longitudinal and multi-centered studies regarding the matter.

Keywords: Migraine; attack frequency; paranasal variation; paranasal pathology; pain severity.

INTRODUCTION

Migraine is a primary headache disorder characterized by recurrent headache episodes accompanied by transient autonomic nervous system dysfunction (1). It is periodic, often unilateral, characterized by throbbing pain and affecting 15-20% of individuals applied with headache (2).While the patients are completely normal in the period out of the attack period, nausea / vomiting, lightness and sensation of sensitivity accompanying the headache that lasts 4-72 hours during the attacks can be seen (3). Migraine is clinically divided into two subtypes as migraine with aura and migraine without aura (4). It is shown as one of the 20 diseases that mostly decreases the quality of life by the World Health Organization (WHO) (5). Migraine, throughout the world, affects 11% of adult population (4). Prevalence of migraine in Turkey is 8.5 in men and 24.6% in women (6). The International Headache Society (IHS) has divided migraine into subgroups and determined diagnostic criteria (7). Although the pathophysiology of migraine is not fully understood yet, many mechanisms such as vascular, neurovascular, hypoxic, cellular, hormonal, genetic, are discussed (8). The pain that is typically unilateral has suggested that its pathology may be of trigeminovascular origin and in recent years, various studies suggesting that trigeminovascular system has an active role in the pathogenesis of migraine are conducted (9,10). In the trigeminal sensory neurons innervating the cephalic veins, substance P (SP), calcitonin gene-related peptide (CGRP) and neurokinin A (NKA) are present. Trigeminal activation for any reason leads to the release of these neuropeptides and, ultimately, to neurogenic inflammation. It is thought that aura is developed due

Received: 02.06.2019 **Accepted:** 16.08.2019 **Available online:** 30.09.2019
Corresponding Author: Emre Gedik, Kirklareli State Hospital, Clinic of Neurology, Kirklareli, Turkey, E-mail: murat.cakir@bozok.edu.tr

to the arterial vasoconstriction accompanied by cortical spreading depression (2,11).

The sinonasal cavity is the entire air-filled cavity filled with the respiratory epithelium, which is formed by the nasal cavity separated by the septum and the paranasal sinuses, which are a pair of openings on each side. Paranasal sinuses are the gaps inside the maxillary, frontal, sphenoid and ethmoid bones. These gaps are fitted with mucoperiosteum and they are filled with air. They are related to cavitas nasi via the small holes (12). Sinonasal area is one of the areas showing the most anatomic variations in humans and it is shown that besides these anatomic variations play a role as an effective factor in the pathogenesis of sinus inflammation, they are also effective in the pathogenesis of some types of headaches (13,14). SP release may occur from the areas where the anatomic variations develop mucosal contact points. Rhinologic headaches are generally unilateral due to swelling and pressure. In addition, it is thought that mucosal contact in the nasal cavity causes pain via trigeminal activation (15). Today, sinus computerized tomography (CT) is routinely used to detect the anatomy and pathology of paranasal structures (16). Computerized tomography is the most sensitive imaging method for showing the paranasal sinuses. CT scan of the paranasal sinuses has the advantages of showing the details of the bone (using wide window settings) and obtaining good soft tissue imaging (using narrow window settings) (17).

The aim is to evaluate the frequency of paranasal pathologies and variations in migraine patients, and also whether such situations have an effect on the strength and frequency of pain attacks that the patients experienced.

MATERIAL and METHODS

Study Protocol

This study was designed as a prospective cross-sectional study. To our study, 130 migraine patients between 18 and 50 years of age, who are diagnosed with migraine in accordance to the International Classification of Headache Disorders (ICHD)-3 beta, and who were monitored in Neurologic Clinic of Adiyaman University are included. Sociodemographic data such as age, gender, educational status and marital status of all the patients were evaluated and recorded in detail. All the patients were asked about whether there is an aura or not, the factors provoking pain (physical activity, hunger, etc.), duration of illness, accompanying symptoms (nausea, vomiting, phonophobia etc.) and headache and / or migraine history in the family and they were recorded. Patients were asked to grade the severity of the headache qualitatively as mild, moderate, severe, very severe and irresistible, from 0 to 10 (VAS score) of the severity of the headache of the patient. The responses given were recorded for every patient. Pain frequency was categorized as 2-3 per week, 1 per week, 2 per month, 1 per month and less frequently for every patient and the recorded. The prevalence of each paranasal pathology in migraine patients evaluated and migraine patients with each paranasal pathology were compared with migraine patients who did not have this pathology for pain severity and frequency. Ethics approval for the study is taken from Ethics Committee of the Adiyaman University.

Computerized Tomography Protocol

Examination was performed by a Philips Aquilion branded 64-slice CT device. The images of our patients whose axial and coronal brain CT examination were done are prospectively examined. Before scanning, the patients were told to remove if any, removable dental prosthesis, hearing aids, metal earrings, hair pins etc. After the patient was laid in supine position, the patient was told to stay stationary. The examination was started by taking a topogram at first. Then on the topogram, in the axial plane, from 1 cm under the supraorbitomental line to the end of the vertex plane, as parallel to the supraorbitomental line, scanning plan was developed and unenhanced images were obtained by using 5 mm sections in the infratentorial area and 7 mm sections in supratentorial area by using 120 kV (kilovolt), 220 mA (milliampere). Scanning time was 8-9 seconds. FOV (Field Of Wiev) was 210 mm. Mean radiation exposure dose was 40,0mGy. The images obtained were transferred to "Picture archiving and communicating system"-PACS". All images were evaluated via PACS (KarmedPacs Viewer) where image manipulations such as window adjustment, magnification, and measurement could be performed. Reformat images were created in all the cases in coronal plane. In the CT sections taken according to these protocols, anatomical variations were assessed both in bone (window width: 2700 Hounsfield unit (HU), window level: 350 HU) and both soft tissue (window width: 120 HU, window level: 40 HU) windows. Brains CT's were assessed by a specialist radiologist in terms of the paranasal pathologies such as the inflammatory changes in maxillary, frontal, ethmoid and sphenoid sinuses and also maxillary sinus hypoplasia, frontal sinus hypoplasia, septal defect (SD), crista galli (KG) aeration, pneumatized medium concha, paradoxical angular concha, uncinated process (UP) adherence variations (Type 1, Type 2, Type 3, Mixed), 3 keros category according to the depth of olfactory fossa; keros 1 (1-3 mm), keros 2 (4-7 mm) and keros 3 (8-16 mm), paranasal variations such as pterygoid process pneumatization (PPP), anterior clinoid process pneumatization (ACPP). Any aeration in the bone structures was assessed as pneumatization. Turbinates with a convexity towards the lateral nasal wall were accepted as a paradox. Curvatures observed in the septum were recorded as deviations (Figure 1 and 2).

Exclusion Criteria

The patients with a previous paranasal and/or brain operation and/or trauma, having an oncological disease, having a systemic disease that may affect the paranasal structures (Wegener, Systemic Lupus Erythematosus etc.) and all the situations other than migraine that may cause headaches were excluded from the study.

Statistical Method

SPSS 21 (Statistical Package for Social Sciences) for

Windows 10.0 program was used for the statistical analyses. The Kolmogorov Smirnov test was used to evaluate whether our sample showed normal distribution or not. Mann Whitney U Test, Chi Square and Kruskal Vallis Tests were applied to the comparison of the descriptive statistical methods (Mean, Standard deviation) as well as the non-normal distribution parameters in the comparison of the quantitative data while the study data was being evaluated. The results were evaluated in a confidence interval of 95% and a significance level of p <0.05.

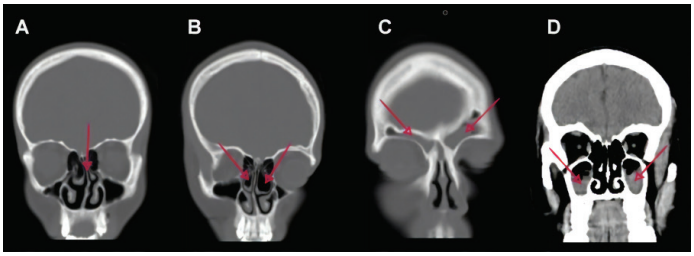

Figure 1. A; Septal defect, B; Bullous appearance in the medium concha (bilateral), C; İnflammatory changes in the frontal sinus, D; İnflammatory changes in the maxiller sinus (in the parenchyma window)

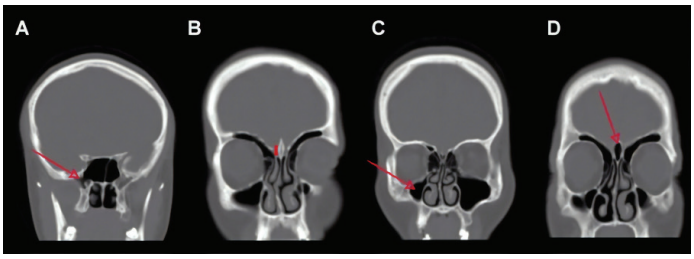

Figure 2. A; Pterygoid process pneumatization, B; Olfactory fossa depth measurement, C; Right maxillary sinus hypoplasia, D; Crista galli pneumatization

RESULTS

Totally 130 migraine patients were included in the study as 112 women (86.2%) and 18 men (13.8%). The average age of the patients was found as 32.5±10.4. Migraine with aura was observed in 31 of the cases (23.8%) and migraine without aura was observed in 99 (76.2%). The educational status of the patients was 9 (6.9%) illiterate, 4 (3.1%) literate, 36 (27.7%) primary school and 15 (11.5%) middle school 38 (29.2%) were high school students and 28 (21.5%) were university graduates. 40 (30.8%) of the cases were single, 88 (67.7%) were married and 2 (1.5%) were divorced. 69 (53.1%) housewives, 23 (17.7%) students, 9 (6.9%) officers, 4 (3.1%) workers, fifteen 7.7%) were unemployed. 27 (%20 .8) were smoking. 122 (93.8%) patients were describing phonophobia, 109 (83.8%) photophobia, 109 (83.8%) nausea and 35 (26.9%) vomiting as the accompanist. Women had head ache since 61.3 months and men since 64.4 months in average. 55 (%42.3) patients identified 2-3 migraine attacks per week, 48 (36.9%) once per week, 12 (9.1%) twice per month, 15 (11.5%) once per month or less frequently (Table 1). Of the patients, 102 (78.5%) defined anxiety, 91 (70%) sleeplessness, 79 (60.8%) fatigue, 79 (60.8%) worriment, 77 (59.2%) hunger, 50 (38.5%) odor, 42 (32.3%) menstruation, 8 (6.2%) cold, 3 (2.3%) sugary foods as the attack triggers and 4 (3.1%) specified that there was no triggering factor.

When the pain strength of the patients was assessed; 17 (13.1%) expressed as severe, 51 (39.2%) as very severe and 62 (47.7%) as irresistible. When the pain strength was assessed according to the VAS score; 6 (4.6%) patients scored the head ache strength as 5 points, 11 (8.5%) as 6 points, 25 (19.2%) as 7 points, 26 (20%) as 8 points, 42 (32.3%) as 9 points, 20 (15.4%) as 10 points. Mean of head ache strength in migraine with aura was determined as 8.48±1.30 and in migraine without aura as 8.15±1.35 and no significant difference was found between both groups (p>0.05). When the pain strength was considered according to the gender, VAS score was 8.00±1.53 in men and 8.15±1.35 in women and no significant difference was found between the groups. There was no significant difference between the two groups when comparing the frequency of attacks according to migraine auras.

Table 1. Demographic findings

	n	%
Gender		
Male	18	13.8
Female	112	86.2
Type of headache		
Migraine with aura	31	23.8
Migraine without aura	99	76.2
Photophobia	109	83.8
Phonophobia	122	93.8
Nausea	109	83.8
Vomiting	35	26.9
Frequency		
2-3 per week	55	42.3
1 per week	48	36.9
1 per every 15 days	12	9.2
1 per month and less frequently	15	11.5

Among the anatomic variations and pathologies assessed, the most frequent one was determined as SD with 53.8% (n=70) and no significant difference was found when its effect on the attack frequency and pain strength was evaluated (p>0.05). In the study, maxillary sinus hypoplasia frequency was observed in 1 (0.8%) patient and inflammatory changes were observed in 24 (18.5%) patients. Hypoplasia in frontal sinuses was observed in 4 (3.1%) and inflammatory changes were observed in 11 (8.5%) patients. In ethmoid sinus and sphenoid sinus, the inflammatory findings were determined in 13 (10%) and 7 (5.4%) patients, respectively. Among the cases, osteomeatal complex obliteration was found in 2 (1.5%) and inflammatory changes in at least one of the sinuses were found in 31 (23.8%). KGP was determined in 5 (3.8%) patients, ACPP in 12 (9.2%) patients and PPP in 46 (35.4%)

patients. Superior concha was observed as hypertrophic in 3 (2.3%) patients. Middle concha was evaluated as bullous at a ratio of 26.2% (n=34), hypertrophic at 3.1% (n=4), atrophic as 2.3% (n=3) and paradoxal as 1.5% (n=2) (Table 2). No significant difference was found between the presence or absence of each of these pathologies when the effects on attack frequency and severity of pain were assessed (Tables 3 and 4). In this study, the most frequent type of ethmoid roof heights was 2 according to the Keros classification with the ratio of 66.9% (n=87). Keros type 1 as 21.5% (n=28), Keros type 3 as 11.5% (n=15) and both were seen at a lower ratio. Patients grouped according to the Keros classification did not show any significant differences when assessed separately regarding the attack frequency and pain severity (Tables 5 and 6).

Table 2. Patient Distribution Frequencies according to paranasal pathologies

	n	%
Septal Deviation	70	53.8
Pterygoid process pneumatization	46	35.4
Anterior clinoid process pneumatization	12	9.2
Rhinolithiasis	1	0.8
Osteomeatal complex obliteration	2	1.5
Maxillary Sinus		
Normal	105	80.8
Inflammatory changes	24	18.5
Hypoplasia	1	0.8
Ethmoid sinus		
Normal	117	90.0
Inflammatory changes	13	10.0
Frontal Sinus		
Normal	115	88.5
Inflammatory changes	11	8.5
Hypoplasia	4	3.1
Sphenoid Sinus		
Normal	123	94.6
Inflammatory changes	7	5.4
Upper concha		
Normal	127	97.7
Hypertrophy	3	2.3
Middle concha		
Normal	87	66.9
Hypertrophy	4	3.1
Atrophy	3	2.3
Bullous	34	26.2
Paradox	2	1.5
Crista galli pneumatization	5	3.8

Table 3. Relationship between paranasal findings and pain strength

	N	P*	sd	min	max
Septal deviation	70	.952	1.37	5.00	10.00
Inflammatory changes	31	.270	1.37	5.00	10.00
KGP	5	.360	1.37	5.00	10.00
KB	29	.752	1.37	5.00	10.00
OMU obliteration	2	.421	1.37	5.00	10.00
PPP	46	.717	1.37	5.00	10.00
ACPP	12	.524	1.37	5.00	10.00

ACCP; anterior clinoid process pneumatization, KB; concha bullosa, KGP; crista galli pneumatization, OMÜ; osteomeatal unit, PPP; pterygoid process pneumatization, *Mann Whitney U test

Table 4. Relationship between paranasal findings and attack frequency

	N	P*	sd	min	max
SD	60	.304	.987	1.00	4.00
Inflammatory changes	31	.298	.987	1.00	4.00
KGP	5	.669	.987	1.00	4.00
KB	29	.067	.987	1.00	4.00
OMU obliteration	2	.201	.987	1.00	4.00
PPP	46	.308	.987	1.00	4.00
ACPP	12	.623	.987	1.00	4.00

ACCP; anterior clinoid process pneumatization, KB; concha bullosa, KGP; crista galli pneumatization, OMÜ; osteomeatal unit, PPP; pterogoid process pneumatization
*Mann Whitney U test

Table 5. Relationship of pain strength with ethmoid roof height and UP end point

	N	P*	sd	min	max
Keros					
Type 1	28	.519	1.37	5.00	10.00
Type 2	87				
Type 3	15				
Total	130				
UP end point					
Type 1	80	.846	1.37	5.00	10.00
Type 2	16				
Type 3	8				
Mixed	26				

*Kruskal Wallis Test

Table 6. Relationship of attack frequency with ethmoid roof height and UP end point					
Frequency	**N**	**P***	**sd**	**min**	**max**
Keros					
Type 1	28	**.254**	.987	1.00	4.00
Type 2	87				
Type 3	15				
UP end point					
Type 1	80				
Type 2	16	**.307**	.987	1.00	4.00
Type 3	8				
Mixed	26				
***Kruskal Wallis Test**					

DISCUSSION

Headache is the most important reason for consulting a neurologist worldwide and migraine is one of the most common causes of headache (18). Studies have reported that migraine is seen at higher rates in women (4,6). In the study, the ratio of male to female was similarly determined as 1/6. It is expressed the migraine is most frequently seen in the 3rd and 4th decades of adults and frequency gradually decreases after 40 years old (19). In this study, the average age is found as 32.5±10.4 that is compatible with the literature. In the literature, it is specified in various publications that approximately 75% of migraine has no aura (20,21). Migraine without aura is found in 99 (76.2%) of the patients and this is compatible with the literature.

Despite the presence of several studies (22,23) in the literature that evaluated the relationship of paranasal pathologies with migraine and paranasal pathologies after medical and / or surgical treatment, headache episodes; possible effects on pain frequency and severity of pain in migraine patients' regarding paranasal variations and pathologies have not been evaluated. In this study, the frequency of paranasal pathology and / or variations in patients with migraine and whether it has any effects on the frequency and severity of pain experiences experienced by patients or not are evaluated. In the literature, results ranging from 20% to 79% have been reported in various studies in which SD is assessed in a normal population (16). In this study, the most frequently encountered paranasal pathology is SD. Concha bullosa (KB) is one of the most frequently seen variations of paranasal sinuses (24). Frequency of KB varies between 14 and 80% in the literature. The reason of this difference is the difference in the pneumatization criteria used in the studies (16,24). In this study, all the formations of the middle concha are accepted as KB and they are found to be 26.2% as lower than the rates in the literature. If the size of the paradoxical medium concha is small, it is clinically insignificant. If it is large, it is often associated with SD and may cause sinusitis by narrowing the OMU entry (25). In the studies conducted, it is observed in 11.1% of normal population and in 28.9% of the cases with sinusitis (26). It is found that the paradoxical middle concha frequency was 1.5% lower than the literature. The known rates of ACPP in the literature vary between 4% and 34% (16,17). In this study, sphenoid bone ACPP is found compatible with the literature with the ratio of 9.2%. In the case of pneumatization passing through the horizontal plane passing from the Vidian channel, pteryoid process pneumatization is specified. In the literature, PPP is specified between 29% and 44%. Prevalence in this wide interval may be caused by the use of different criteria (17). In this study, PPP is found as 35.4%. The frequency of KGP in the literature varies between 1.2% and 3.3% (16,17). In this study, the frequency of KGP is found as 3.8%. Gauba et all have expressed in their study that is performed on the coronal CT's of 32 patients according to the keros classification performed by measuring the depth of olfactory fossa that 34.3% was found as Type I, 28.1% as keros type II and 37.5% as keros type III (27). In this study, keros type I is observed at the ratio of 21.5%, keros type II at the ratio of 66.9% and keros type III at the ratio of 11.5%. In the literature, the end of superior part of the uncinate process as a single part is observed as 33% and end at the ethmoid roof as 10% (28). In this study, it is observed that unicinate process shows an end by attaching to the lamina paprisea at a ratio of 61.5%, the skull base at the ratio of 12.5%, medium concha at the ratio of 5% and more than one areas at the ratio of 20%. When we look at the literature as the adherence site of the upper end of UP, the most common is lamina paprisa, as in our study, although the rates vary. The reason for the variation in the ratios is that the detection of the upper end is not always possible in coronal CT and the adherence forms outside of the three main types of adherences described. Gungen et al. in their study performed on 100 patients with migraine, have found the inflammatory data in sinuses in 20% of the patients (29). In this study, inflammatory findings in the sinuses are similarly found in 23.8% of the patients.

Headaches due to rhinological reasons may mimic the migraine attacks because they are generally unilateral and can be caused by the trigeminal stimulation from paranasal trigger points and in time, they may be associated with occasional diseases (15,30). In our study, it is found that the rate of paranasal pathology and / or variation in the patients with migraine as 76.9% in total. When the effects of paranasal pathologies and anatomic variations on the strength of headache pain in our patients are evaluated, no significant result could be found. It is believed that this may be caused by the inadequate number of patients or the assumptions that patients' experience on migraine type headaches, even though they are paranasal.

CONCLUSION

Headache is a condition that directly affects the social life, psychology, work life and productivity of the person that can be seen in the majority of population. Although headache can be a disease on its own (such as migraine) or it can be a precursor of other diseases. Thus, accurate and effective differential diagnosis and treatment are very important for headaches. It is thought that paranasal regions should be evaluated carefully during the evaluation of brain imaging studies in terms of differential diagnosis of paranasal pathologies that may differ in treatment and prognosis in migraine patients. Also it is considered that there is a need for longitudinal and multi-centered studies regarding the matter.

Financial Disclosure: There are no financial supports.
Ethical approval: Ethics approval for the study is taken from Ethics Committee of the Adiyaman University.

Emre Gedik ORCID: 0000-0003-0033-9080

REFERENCES

1. Aradi M, Schwarcz A, Perlaki G, et al. Quantitative MRI studies of chronic brain white matter hyperintensities in migraine patients. Headache 2013;53:752-63.
2. Erdemoğlu AK, Ocaklılar EK, Yılmaz S. Evaluation of changes in cerebral structures in migraine patients with diffusion and perfusion MRI. Turk J Neurol 2013;19:44-51.
3. Raschi E, Poluzzi E, De Ponti F. Stroke, migraine and triptans: from bedside to bench. EBio Medicine 2016; 6: 14–15.
4. Kowalska M, Prendecki M, Kozubski W, et al. Molecular factors in migraine. Oncotarget 2016;2;7:50708-18.
5. Lemos C, Neto JL, Pereira-Monteiro J, et al. A role for endothelin receptor type A in migraine without aura susceptibility? A study in Portuguese patients. Eur J Neurol 2011;18:649-55.
6. Avci AY, Lakadamyali H, Arikan S, et al. High sensitivity C-reactive protein and cerebral white matter hyperintensities on magnetic resonance imaging in migraine patients. J Headache Pain 2015;16:9.
7. Headache Classification committee of the international headache society (IHS). The international classification of headache disorders, 3rd edition (beta version). Cephalalgia 2013;33: 629-808.
8. Tak AZA, Sengül Y, Bilak Ş. Evaluation of white matter hyperintensities and retinal fiber layer, ganglion cell layer, inner-plexiform layer, and choroidal layer in migraine patients. Neurol Sci 2018
9. Night YE, Kaube H, Bartsch T, et al. Effect on trigeminal firing PQ-type calcium channels in the periaquaductal grey. Cephalalgia 2001;281:5.
10. Buzzi G, Moskowitz M. The pathophysiology of migraine. J Headache Pain 2005;6:105-11.
11. Sherifa A. Hamed. The vascular risk associations with migraine: Relation to migraine susceptibility and progression. J Atherosclerosis 2009;205:15-22.
12. Standring, Susan. Gray's anatomy: the anatomical basis of clinical practice. Forty-first edition. New York: Elsevier Limited 2016; NLM ID: 101667594
13. Yousem DM. Imaging of sinonasal inflammatory disease. Radiology 1993;188:303-14.
14. Zinreich SJ. Abidin M, Kennedy DW. Ross-sectronal imaging of then asalcavity and paranasal sinuses. Operative Techniques in Otolaryngol Head Neck Surg 1990;1:94-8.
15. Cantone E, Castagna G, Ferranti I, et al. Concha bullosa related headache disability. Eur Rev Med Pharmacol Sci 2015;19:2327-30.
16. Dasar U, Gokce E. Evaluation of variations in sinonasal region with computed tomography. World J Radiol. 2016;28;8:98-108.
17. Hewaidi G, Omami G. Anatomic variation of sphenoid sinus and related structures in libyan population: CT scan study. Libyan J Med 2008;1;3:128-33.
18. Gladstone JP, Dodick DW. Migraine and cerebral whitematter lesions when to suspect cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL). The Neurologist 2005;11:19–29.
19. Gunes A, Demirci S, Tok L, et al. Is retinal nerve fiber layer thickness change related to headache lateralization in migraine? Korean J Ophthalmol 2016;30:134-9.
20. Cankaya C, Tecellioglu M. Foveal thickness alterations in patients with migraine. Med Arch 2016;70:123-6.
21. Smetana GW. The diagnostik value of historical features in primary headache syndromes a comprehensive review. Arch Intern Med 2000;160:2729-37.
22. Mehle ME, Kremer PS. Sinus CT scanfindings in "Sinus Headache" migraineurs. Headache 2008;48:67-71.
23. Schreiber CP, Hutchinson S, Webster CJ, et al. Prevalence of migraine in patientswith a history of self-reportedorphysician-diagnosed "sinus" headache. Arch Intern Med 2004; 13;164:1769-72.
24. Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. Laryngoscope 1991;101:56-64.
25. Beale TJ, Madani G, Morley SJ. Imaging of the paranasal sinuses and nasal cavity: normal anatomy and clinically relevant anatomical variants. Semin Ultrasound CT MR 2009;30:2-16.
26. Unlu HH, Akyar S, Caylan R, et al. Concha bullosa. J Otolaryngol 1994;23:23-7.
27. Gauba V, Saleh GM, Dua G, et al. Radiological classification of anterior skull base anatomy prior to performing medial orbital wall decompression. Orbit 2006;25:93-6.
28. Zhang L, Han D, Ge W, et al. Anatomical and computed tomographic analysis of the interaction between the unsinat proses and the aggernasi cell. Acta Otolaryngol 2006;126:845-52.
29. Gungen BD, Gur P, Tunc A, ve ark. Migrenli hastalarda sinüzal inflamasyon sıklığının araştırılması. Ajans 2015;3:118-122.
30. Clerico MD. Pneumatized superior turbinate as a cause of referred migraine headache. Laryngoscope 1996;106:874-9