



ORIGINAL RESEARCH PAPER

Radiodiagnosis

UTILITY OF COMPUTED TOMOGRAPHY OF BRAIN AND LIMITED PARANASAL SINUSES SCANNING IN PATIENTS WITH HEADACHE

KEY WORDS: Headache, Paranasal Sinus, Referral, Useful

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ABSTRACT

This prospective study was done to assess the utility of CT of the brain in the identification of causative factors for headache, & to determine the additional value of acquiring limited paranasal sinus images after evaluation of the brain in patients with headache. Total 200 cases with primary complaint as headache undergoing CT of the brain and limited paranasal sinus CT scan are included. The most common symptom for referral to CT brain was isolated headache followed by headache with vomiting. Significant abnormality was detected in 22 subjects, 13 due to intracranial pathology and 9 due to paranasal sinus disease. Among these 22 positive cases, 6 are space occupying lesions, 2 acute infarcts, 1 subarachnoid hemorrhage, 4 cortical vein thrombosis and 9 had sinusitis. In conclusion Computed tomography is a useful screening modality in evaluating patients with headache. Additional acquisition of PNS along with CT brain increase the diagnostic yield, differentiates intracranial cause of headache from PNS cause.

INTRODUCTION

Headache is the most frequently suffered illness by human beings. As much as 90 percent of individuals have at least one episode of headache each year and severe headache is reported to occur at least annually in 40 percent of the population.[1]

Headache is a common disorder with many potential causes. The primary headache disorders which include migraine, cluster and tension-type headaches, account for the majority of headaches, while secondary headaches which are those with underlying pathology (e.g., tumour or aneurysm) are far less common.[2] Most patients presenting with headache in the primary care setting do not have serious underlying conditions.[3,4]

The relative rarity of secondary headaches compared with the large number of patients with primary headache raises concerns about the wisdom of routine neuroimaging studies like computed tomography (CT) to exclude underlying causes of headache. The high prevalence of headache and low yield from imaging in patients with headache alone bring into the question of screening. However there are clinical features that influence the yield of positive imaging examination.

AIMS & OBJECTIVES-

To assess the utility of CT of the brain in the identification of causative factors for headache

- To determine the additional value of acquiring limited paranasal sinus images after evaluation of the brain in patients with headache.

MATERIAL & METHODS -

In this prospective study, 200 cases with primary complaint as headache undergoing Computed Tomography of the brain and limited paranasal sinus CT scan during the period from November 2018 to April 2019 are included.

- The results were tabulated, The statistical analysis was then done for the diagnostic yield from imaging in patients with only headache, headache with associated symptoms like nausea, vomiting and vision abnormality. Analysis of continuous variables like gender, analysis of diagnostic yield from imaging in patients with migraine, tension headache, chronic daily headache and diagnostic

yield in patients with known systemic illness were done.

INCLUSION CRITERIA

All patients (male and female) aged more than 12 years with headache (acute or chronic) with or without other neurological signs and symptoms.

EXCLUSION CRITERIA

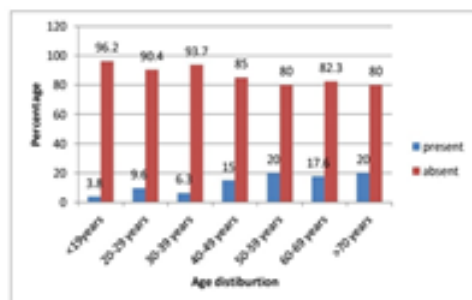
- Headache due to ophthalmic cause.
- With immediate history of trauma.
- Known case of brain tumors or space occupying lesion in the brain.
- Pregnant women with headache

OBSERVATION & RESULTS -

Figure-1

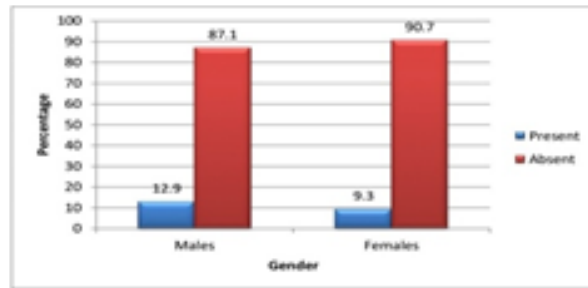
Age distribution.								
Age distribution	<19	20-29	30-39	40-49	50-59	60-69	>70	Total
Number of patients	26	52	47	33	20	17	5	200
Percent	13.0	26.0	23.5	16.5	10.0	8.5	2.5	100.0

Age distribution with and without abnormality on imaging.								
Abnormality on CT	<19years	20-29 years	30-39 years	40-49 years	50-59 years	60-69 years	>70 years	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Present	1 (3.8)	5 (9.6)	3 (6.3)	5 (15)	4 (20)	3 (17.6)	1 (20)	22 (11)
Absent	25 (96.2)	47 (90.4)	44 (93.7)	28 (85)	16 (80)	14 (82.3)	4 (80)	178 (89)
Total	26 (100)	52 (100)	47 (100)	33 (100)	20 (100)	17 (100)	5 (100)	200 (100)



Age distribution with and without abnormality on imaging.

Figure-2



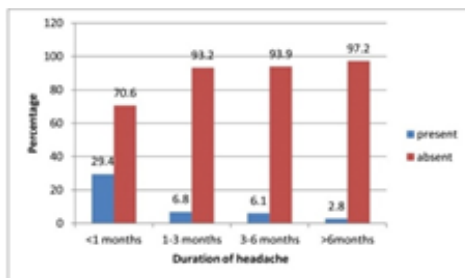
Gender distribution with and without abnormality on imaging.

Distribution of gender with and without abnormality on imaging.			
Abnormality on CT	Males n (%)	Females n (%)	Total n (%)
Present	12(12.9)	10 (9.3)	22 (11.0)
Absent	81 (87.1)	97 (90.7)	178 (89.0)
Total	93 (100.0)	107(100.0)	200 (100.0)

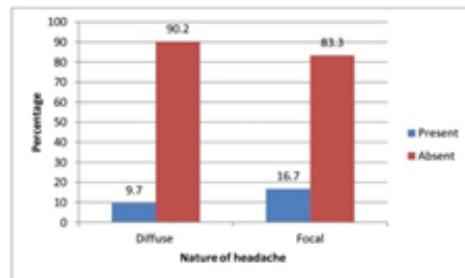
Distribution of duration of headache.		
Duration of headache	Number of patients	Percentage
< 1 month	51	25.5
1-3 months	29	14.5
3-6 months	49	24.5
>6 months	71	35.5
Total	200	100

Figure-3

Distribution of duration of headache with or without abnormality on imaging					
Abnormality on CT	< 1 months n(%)	1-3 months n(%)	Months n(%)	>6 months n(%)	Total n(%)
Present	15 (29.4)	2 (6.8)	3 (6.1)	2 (2.8)	22 (11)
Absent	36 (70.6)	27 (93.2)	46 (93.9)	69 (97.2)	178 (89)
Total	51(100)	29(100)	49(100)	71(100)	200 (100)



Distribution of duration of headache with or without abnormality on imaging.

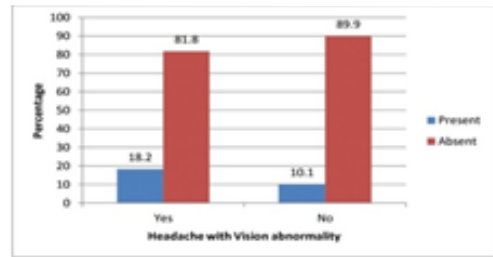


Distribution of nature of headache with and without abnormality on imaging.

Figure-4

Distribution of nature of headache with or without abnormality on imaging			
Abnormality on imaging	Diffuse n (%)	Focal n (%)	Total n (%)
Present	16 (9.7)	6 (16.7)	22(11)
Absent	148 (90.2)	30 (83.3)	178 (89)
Total	164 (100)	36(100)	200

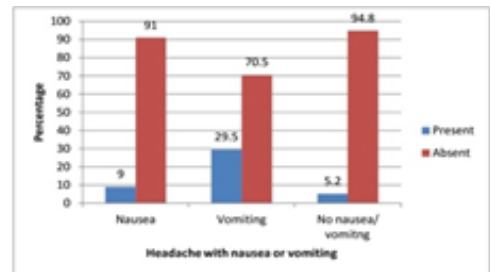
Distribution of vision abnormality with or without abnormality on imaging.			
CT abnormality	Yes n(%)	No n(%)	Total n(%)
Present	4(18.2)	18(10.1)	22(11)
Absent	18(81.8)	160(89.9)	178(89)
Total	22 (100)	178 (100)	200(100)



Distribution of vision abnormality with or without abnormality on imaging.

Figure-5

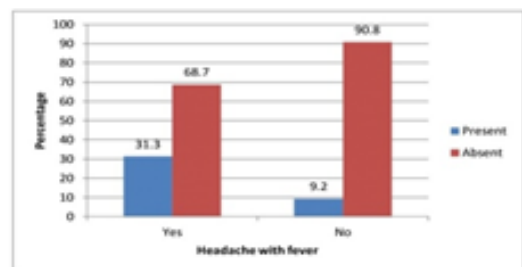
Distribution of nausea and vomiting with or without abnormality on imaging				
CT abnormality	Nausea n(%)	Vomiting n(%)	No nausea/vomiting n(%)	Total n(%)
Present	2(9)	13 (29.5)	7 (5.2)	22(11)
Absent	20 (91)	31 (70.5)	127(94.8)	178(89)
Total	22 (100)	44(100)	134(100)	200 (100)



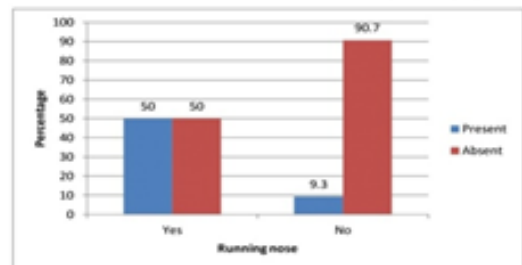
Distribution of nausea and vomiting with or without abnormality on imaging.

Distribution of fever with or without abnormality on imaging			
CT abnormality	Fever n(%)	No fever n(%)	Total n(%)
Present	5 (31.3)	17 (9.2)	22(11)
Absent	11 (68.7)	167 (90.8)	178(89)
Total	16 (100)	184 (100)	200 (100)

Figure-6



Distribution of fever with or without abnormality on imaging.

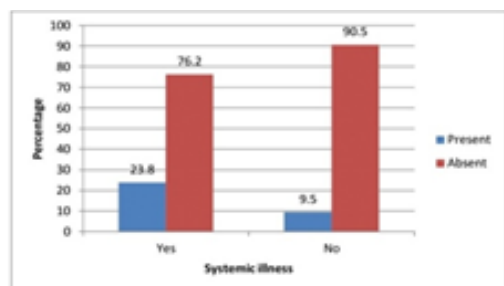


Distribution of running nose with or without abnormality on imaging.

Distribution of running nose with or without abnormality on imaging			
CT abnormality	Running nose Yes n(%)	No h/o running nose n(%)	Total n(%)
Present	4(50)	18 (9.3)	22(11)
Absent	4(50)	174 (90.7)	178(89)
Total	8 (100)	192 (100)	200 (100)

Figure-7

Distribution of Systemic illness with frequency of an abnormality detected on imaging				
Systemic illness	Number of patients	Percent	Frequency of abnormality on CT	Percent (%)
Hypertension	15	7.5	1	4.5
Carcinoma cervix	2	1.0	2	9.1
CML	1	0.5	1	4.5
Viral fever	1	0.5	0	-
liver mass	1	0.5	0	-
RHD	1	0.5	1	4.5
No systemic illness	179	89.5	17	77.4
Total	200	100.0	22	100

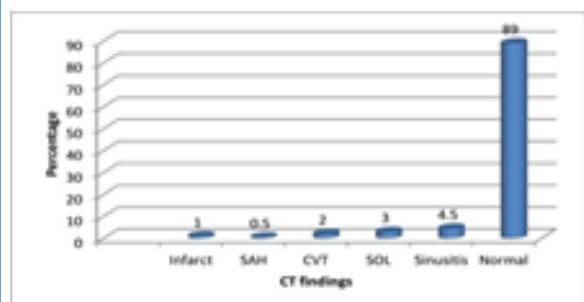


Distribution of systemic illness with or without abnormality detected on imaging.

Distribution of systemic illness with frequency of an abnormality detected on imaging.			
CT abnormality	Systemic illness + n(%)	No systemic illness n(%)	Total n(%)
Present	5 (23.8)	17 (9.5)	22(11)
Absent	16 (76.2)	162 (90.5)	178(89)
Total	21 (100)	179 (100)	200 (100)

Figure-8

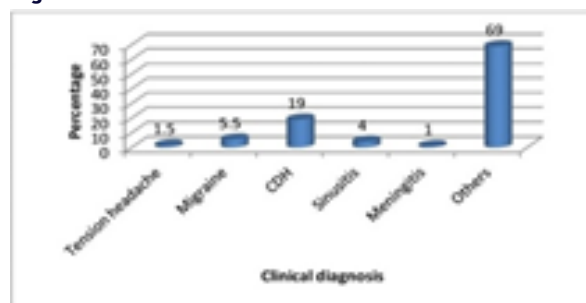
Frequency of distribution of abnormalities detected on imaging.		
Abnormality detected on CT	Frequency (200)	Percent (%)
Infarct	2 (200)	1.0
Cortical vein thrombosis	4(200)	2.0
SAH	1(200)	0.5
Space occupying lesion	6(200)	3.0
Sinusitis	9(200)	4.5
Total abnormality	22(200)	11
Normal CT study	178 (200)	89
Total	200 (200)	100



Frequency of distribution of abnormalities detected on imaging.

Distribution of clinical diagnosis of headache.		
Clinical diagnosis	Frequency	Percent
Tension Headache	3	1.5
Chronic daily Headache	38	19.0
Migraine	11	5.5
Sinusitis	8	4
Meningitis	2	1
others	138	69.0
Total	200	100.0

Figure-9

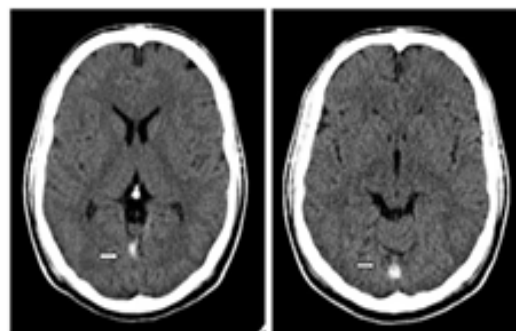


Distribution of type of headache.

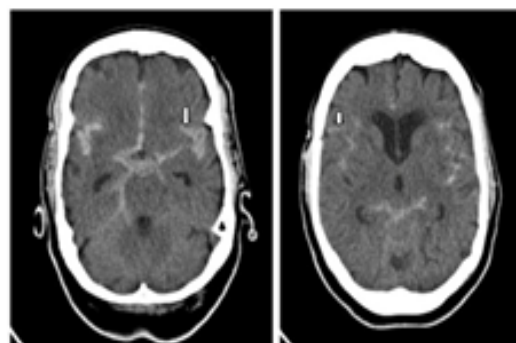
Distribution of type of headache with rate of detecting abnormality on imaging							
CT abnormality	TTH	Migraine	CDH	Sinusitis	Meningitis	Others	Total
Present	0	1	1	4	0	16	22
Absent	3	10	37	4	2	122	178
Total	3	11	38	8	2	138	200

Likelihood ratio for detecting an abnormality on imaging.		
Symptom	Likelihood ratio +	Likelihood ratio -
Only headache	0.19	1.22
Headache with nausea	0.714	1.02
Headache with vomiting	5.17	0.74
Headache with fever	3.3	0.75
Headache with blurring of vision	2.3	0.85
Headache with running nose	5.37	0.55
Severe headache	6.2	0.54
Abrupt onset	4.4	0.68
Systemic illness	2.5	0.84
Migraine	0.81	1.02
TTH	0	1.12
CDH	0.2	1.1

Figure-10

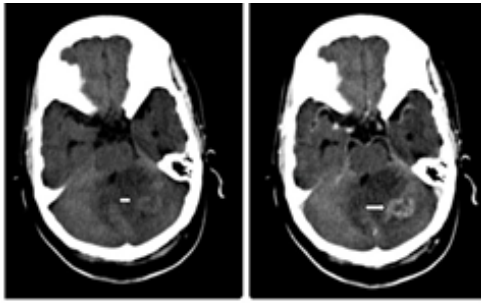


(Case 165): 38 year old male with diffuse severe headache and vomiting showing hyperdense straight sinus suggestive of thrombosis.

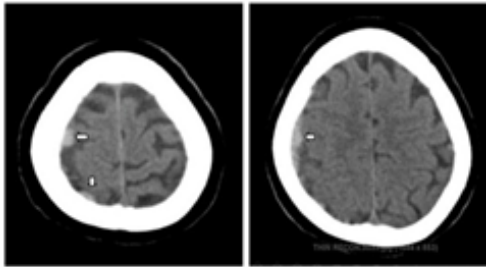


(Case 46): 76 year old female patient with accelerated hypertension and worst headache of life showing diffuse subarachnoid hemorrhage.

Figure-11



(Case 163): 53 year old female patient with Carcinoma of cervix with diffuse headache and vomiting showing space occupying lesion in the left cerebellum.



(Case 49): 67 year old female patient with chronic myeloid leukemia and severe headache with multiple episodes of vomiting showing multiple subdural deposits.

Figure-12



(Case 36): 42 year old female patient with migraine and sudden onset of severe headache with blurring of vision showing an acute infarct in the right middle cerebral artery territory.

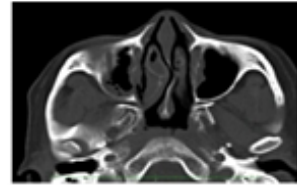


(Case 54): 45 year old male patient with frontal headache and fever showing bilateral maxillary sinusitis.

Figure-13

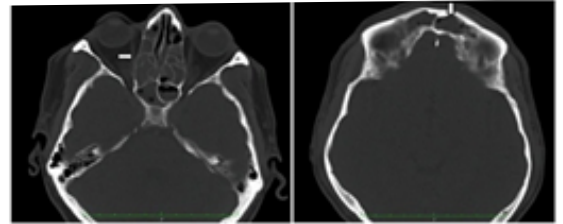


(Case 55): 58 year old female patient with fever, running nose and sudden onset of headache showing bilateral sphenoid and ethmoid sinusitis.

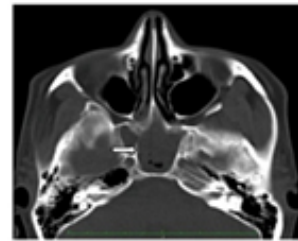


(Case 78): 17 year old male patient with chronic diffuse headache showing deviated nasal septum to the left.

Figure-14



(Case 143): 61 year old male patient with diffuse headache and fever for one month showing bilateral ethmoid and frontal sinusitis.

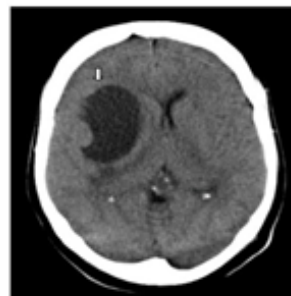


(Case 52): 23 year old male patient with chronic headache showing bilateral sphenoid sinusitis.

Figure-15



(Case 160): 36 year old male patient with diffuse headache and vomiting showing extra-axial space occupying lesion proved to be a meningioma.



(Case 161): 42 year old female patient with gradual onset of headache and vomiting showing an intra-axial solid cystic lesion in the right frontal lobe proved to be an ependymoma.

DISCUSSION & SUMMARY-

This study was carried out on 200 patients comprised of 107 females and 93 males between the age group 12 years to 84 years. The maximum number of patients were between 20-29 years with 52 subjects (26%), the average age of the subjects

was 35 years.

The most number of patients with headache were seen in the younger age group i.e. less than 39 years. Significant abnormality on imaging was seen in the older age group i.e. more than 50 years. These findings were similar to earlier studies which showed increasing age to be strongly associated with significant abnormality.[7,8] There was no significant gender difference in detecting abnormality on imaging.

Most common reason for referral for neuroimaging was isolated headache followed by headache with vomiting. These observations were similar to the study conducted by Sherf M et al, to evaluate the indications and results for brain CT by primary care physicians.[9] The yield from imaging in patients with only headache, headache with nausea in primary type of headache like tension headache and chronic daily headache was low with positive likelihood ratio less than 1. The probability of identifying an abnormality on imaging was high in patients with sudden onset of headache, severe in nature, associated with vomiting, blurring of vision, fever, neurological deficit and running nose with a positive likelihood ratio of more than 1. Presence of systemic illness eg- known malignancy with sudden onset of headache increase the yield.

Among the 22 patients with abnormality on imaging 13 had intracranial pathology as the cause of headache in which 6 were having space occupying lesions, 2 acute infarcts, 1 subarachnoid hemorrhage, 4 cortical vein thrombosis and 9 due to paranasal sinus disease.

Utility of imaging in patients with migraine is high when the patient has sudden change in the character of headache, change in severity associated with neurological symptoms. Rate of detecting an abnormality in migraine was 8% which was more than the earlier studies (0-3%).[6] This high rate of detecting an abnormality on imaging in this study is due to a relatively low number of patients with migraine. Most of the findings of our study were similar to the findings of other studies done previously for the similar objective.

Headaches resulting from disease of the nose or paranasal sinuses are usually associated with symptoms (congestion, fullness, discharge, obstruction) that point to the site of origin. Occasionally, however, nasal or sinus disease can be manifested solely as headache. In that circumstance, computed tomography (CT) scan of the sinuses may demonstrate an abnormality or disease of the nose or paranasal sinus.[4,5] In our study the yield of CT brain and limited paranasal sinus imaging together was 22 (11%) whereas CT brain alone would have been 13 (6.5%).

CT brain is a useful screening modality in evaluating patients with headache either to identify or to rule out structural abnormality thereby reducing patient apprehension. Numerous studies have helped to identify the clinical symptoms and signs, those when associated with headache appear to be useful predictors of positive imaging evaluation and justifying neuroimaging.

Significant number of patients presenting with headache had etiology attributed to both the paranasal sinus causes and intracranial causes. Thus additional acquisition of limited paranasal sinus along with brain increases yield, differentiate paranasal sinus cause of headache from intracranial cause with cost reduction and facilitation of better management of patient.

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