Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

RADIOLOGICAL STUDY OF CT AND MRI CORRELATION IN CHRONIC HEADACHE AND ITS OUTCOME

Anoop Kumar N[1], Abdul Navid Shattari[2], Ashok Kumar Sharma[3], Tejaswini Mukundraj[4]

[1]Consultant Radiologist, Department of Radiodiagnosis, Sarji group of hospital, Shimoga, 577202 Karnataka, India.
[2]Assistant professor, Department of Radiodiagnosis, Vilasrao Deshmukh Government Medical College Latur 413512, Maharashtra, India.
[3]Assistant Professor, Department of Radiodiagnosis, Government Medical College Kota - 324010, RAJASTHAN, India.
[4]Junior Resident, Department of Dermatology, Karnataka institute of medical science Hubli, 580022, India.

Received Date: 03/07/2024 Acceptance Date: 02/08/2024

Corresponding Author: Dr. Ashok Kumar Sharma, Assistant professor, Department of Radiodiagnosis, Government Medical College Kota -324010, RAJASTHAN, India.
Email: sharma.ak92@gmail.com

Abstract
Background: Making clinical and economic decisions it is important to distinguish between the primary and the secondary cause of headache, which is often associated with brain pathology. Present study was aimed to study CT findings and MRI findings correlation in chronic headache and its outcome. **Material and Methods:** Present study was single-center, cross-sectional, observational study, conducted patients of age 10-70 years who are presented with chronic headache as chief complaint to the OPD, underwent imaging by CT & MRI. **Results:** The percentage of females (53%) was slightly higher than males (47%). M:F ratio was found to be 1:1.13. Average age of the population was 50.5± 13.8 years. Majority of the patient population were from urban areas (85%). 7% Patients were found to be overweight whereas 2% were underweight. Average BMI of the population was 22± 2.9 kg/m2. A vast majority (66%) of the patients had complaints between 6-9 months. Average duration of complaints was 8.72± 2.7 months. Majority of the patients (43%) had frontal headache. One sided headache was reported by 38% patients. 5% cases had headache at the back of the neck whereas 2% had it around the eyes. The most common detected pathology was paranasal sinusitis (n= 08), followed by brain tumours (5 %). 2 Pineal lesions were identified in MRI which were missed out by CT scans. 3 Vascular malformations were identified on MRI compared to 2 on CT. Calcified granuloma was defined better compared to CT. The detection rate of CT was found to be 20 % whereas detection rate of MRI was found to be 23%. **Conclusion:** This study has provided detection rate of 20-23% using CT and MRI and thus given reasonable evidence for radiodiagnosis of chronic headache cases with normal neurological examination and significant intracranial pathology
Keyword: CT, MRI, radiodiagnosis, chronic headache, intracranial pathology, neuroimaging

Introduction

Headache is a very common complaint of the patients' visiting the doctors on OPD basis. Headache occurs in all age groups. On a global basis headache is responsible for more

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

disability than any other neurological problem. Among general population about 95 % have suffered from the headache with one year of prevalence among 1 in 2 adults.[1] Headache accounts for 1 in 10 general practitioner (GP) consultations,[2] 1 in 3 neurology referrals[3] and 1 in 5 of all acute medical admissions.[4]

The International Headache Society classifies headache as primary and secondary. Primary headaches are those which are not associated with disease and its associated features are the disorder itself. Secondary headaches are those caused by external disorders. Common types of primary headache include tension type headache, migraine headache, cluster headache, idiopathic stabbing headache, exertional headache and others. Common causes of secondary headache include systemic infections, head injury, vascular disorders, subarachnoid hemorrhage, brain tumor, others.[5]

Making clinical and economic decisions it is important to distinguish between the primary and the secondary cause of headache, which is often associated with brain pathology. In certain scenarios neuroimaging is performed on headache patients. Present study was aimed to study CT findings and MRI findings correlation in chronic headache and its outcome.

Material And Methods

Present study was single-center, cross-sectional, observational study, conducted in department of radiodiagnosis, at XXX medical college & hospital, XXX, India. Study duration was of 18 months (January 2020 to June 2021). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Patients of age 10-70 years who are presented with chronic headache as chief complaint to the OPD, willing to participate in present study

Exclusion criteria

- All patients who didn't give consent to be part of this study.
- Patient of acute head injury or history of neurosurgery (patients having VP shunts, aneurysms clip or coil).
- Patients with claustrophobia, metallic implants (contraindicated for MRI), cardiac pacemakers and cochlear implants.

Study was explained to patients in local language & written consent was taken for participation & study. Demographic data collection (age and sex), Pulse rate, blood pressure and history were noted. These findings were noted in a predesigned proforma. Emergency drugs like Inj. Hydrocortisone, Adrenaline, Dexamethasone and resuscitation apparatus were kept ready. The patient was positioned supine on the scanning table, immobilization of the patient was achieved, and the standard brain coil was applied for MR scanning (on 1.5Tesla GE-Signa HDxtMRI machine). Patients were subjected to MRI scanning. When necessary, adequate sedation was given under the supervision of a trained anaesthesiologist. Followed by CT scan (SIEMENS SOMATOM Definition AS, 128 slice CT scan with CPS software)

Data was collected and entered in MS Excel. The categorical data were expressed as rate, ratio, proportions and percentage. Statistical results of this study were analysed and compared with available studies in the literature.

Results

The percentage of females (53%) was slightly higher than males (47%). M:F ratio was found to be 1:1.13. Average age of the population was 50.5± 13.8 years. The youngest patient enrolled was 22 years old whereas the olderst was 78years old. Major percentages of patients were found in age group 41-50 years (29%) and 51-60 years.(23%). Majority of the patient

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

population were from urban areas (85%). 7% Patients were found to be overweight whereas 2% were underweight. Average BMI of the population was 22± 2.9 kg/m2.

Table 1: General characteristics

	No. of patients	**Percentage**
Age groups (in years)		
21-30 Years	9	9
31-40 Years	14	14
41-50 Years	29	29
51-60 Years	23	23
61-70 Years	17	17
>70 Years	8	8
Mean age (mean ± SD)	50.5 ± 13.8	
Gender		
female	53	53.0
Male	47	47.0
Residency		
Urban	85	85.0
Rural	15	15.0
BMI (Kg/m2)		
<18.5 kg/m2 (Underweight)	2	2
18.5-25 Kg/m2 (Normal weight)	91	91
25.1 to 30 kg/m2(overweight)	7	7
Mean BMI	21.98 ± 2.89	

A vast majority (66%) of the patients had complaints between 6-9 months. Average duration of complaints was 8.72± 2.7 months.

Table 2: Duration of Headache

Duration of Headache	**No. of patients**	**Percentage**
< 6 months	1	1
6-9 months	66	66
10-12 months	25	25
> 12 months	8	8
Mean duration	8.72 ± 2.7 months	

Nausea/vomiting was reported by 9% patients. Abnormal vision/aura was complained by 8 % cases. Fever was associated in 4 cases whereas 2 cases had history of weight loss.

Table 3: Other associated Symptoms

Other associated Symptoms	**No. of patients**	**Percentage**
Nausea/vomiting	9	9
Abnormal vision/aura	8	8
Fever	4	4
Runny nose	4	4
weight loss	2	2

The average blood pressure was 136.6±12 mmHg whereas average diastolic blood pressure was 85.4 ±8.7mmHg. Average heart rate was 89.9±11.5 beats/minute. Majority of the patients

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

(43%) had frontal headache. One sided headache was reported by 38% patients. 5% cases had headache at the back of the neck whereas 2% had it around the eyes.

Table 4: Part of the head where headache occurs

Part of the head where headache occurs	No. of patients	Percentage
around the eyes	2	2.0
Back of the neck	5	5.0
Entire head	13	13.0
Front	43	43.0
one side	38	38.0

The most common detected pathology was paranasal sinusitis (n= 08) 8 % among total cases studied. It was followed by brain tumours (Space occupying lesions) which were observed in 5% cases. Vascular malformation and venous sinuses thrombosis were found in 2% cases each. Subdural collection was observed in one case similarly pituitary lesion and calcified focus were detected in one case each.

Table 5: Distribution of Findings on CT

Findings on CT	No. of patients	Percentage
Paranasal sinusitis	8	8
SOL (Brain tumours)	5	5
vascular malformation	2	2
venous sinuses thrombosis	2	2
subdural collection	1	1
Pituitary	1	1
Calcified focus	1	1

2 Pineal lesions were identified in MRI which were missed out by CT scans. 3 Vascular malformations were identified on MRI compared to 2 on CT. Calcified granuloma was defined better compared to CT.

Table 6: Distribution of Findings on MRI

Findings on MRI	No. of patients	Percentage
Paranasal sinusitis	8	8
SOL (Brain tumors)	5	5
vascular malformation	3	3
venous sinuses thrombosis	2	2
pineal lesions	2	2
subdural collection	1	1
Pituitary tumours	1	1
Calcified Granuloma	1	1

The detection rate of CT was found to be 20 % whereas detection rate of MRI was found to be 23%.

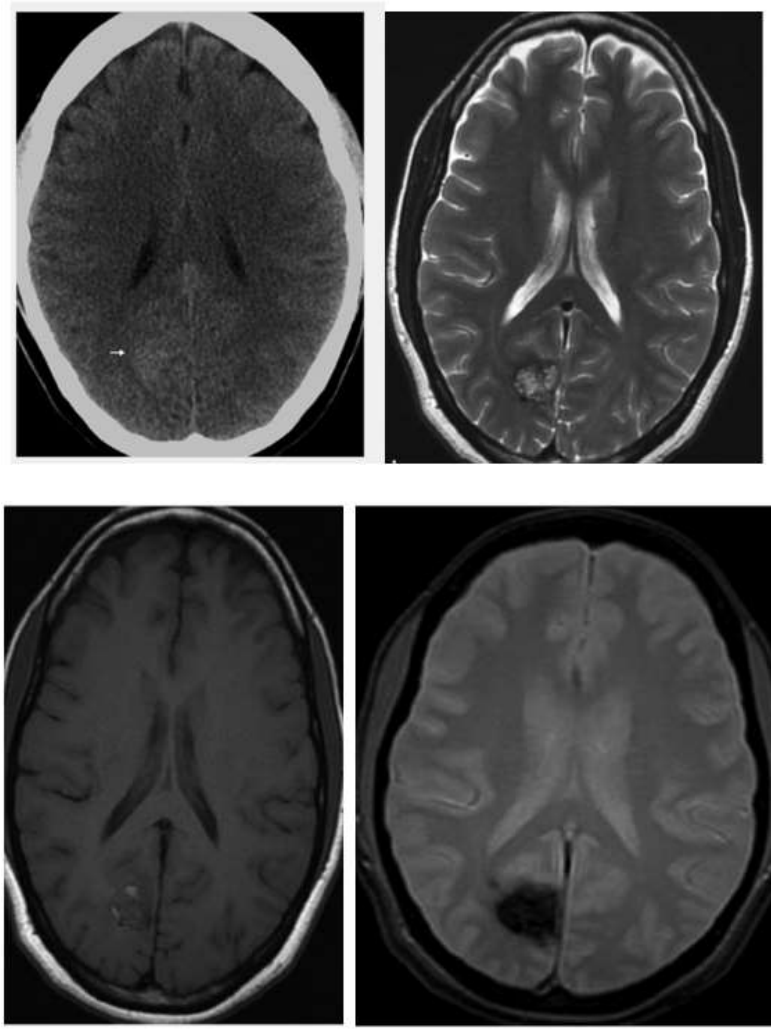
Table 7: Correlation between CT & MRI finding

Findings	No. of patients	Percentage
Positive findings on CT	20	20
No findings on CT	80	80
Positive findings on MRI	23	23

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

No findings on MRI	77	77

CASES
CASE 1:

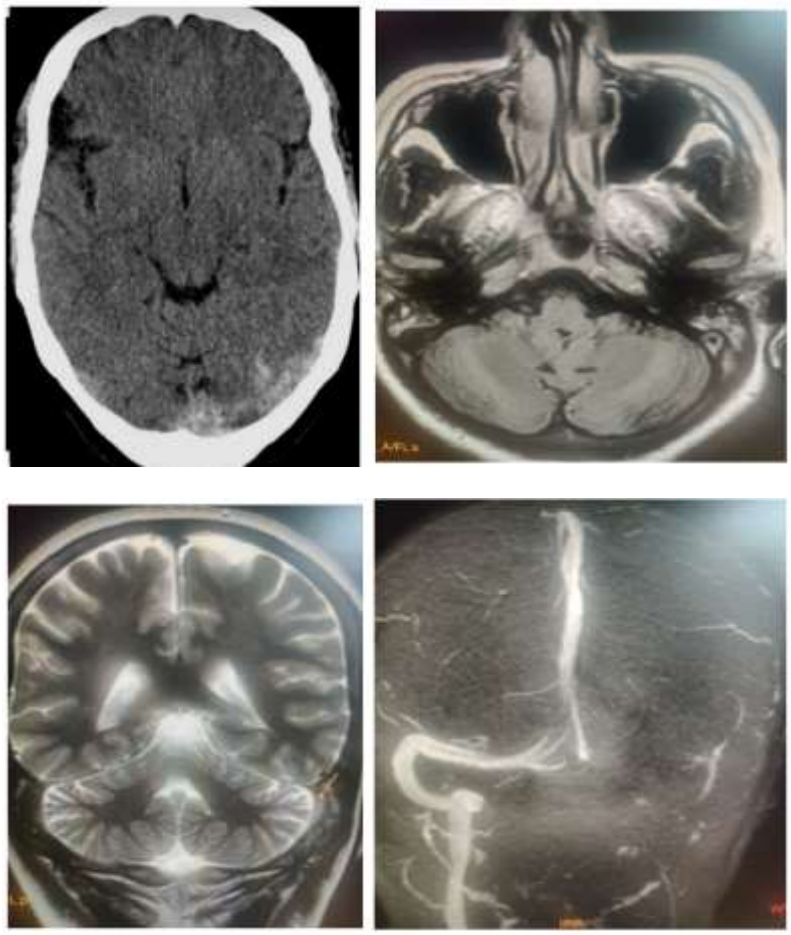


Images are: Axial NCCT, AXIAL T1W, AXIAL T2W and GRE images.

CAVERNOMA : On NCCT ill defined area of hyperdenisty is noted in right occipital region. On MR T1W image it shows mixed signal intensity with areas hyperintensity and hypointensity, on T2W image appears predominantly hyperintense resemlbing a ‘popcorn’ ball. On GRE image it shows areas of blooming within.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

CASE 2:



Images are : AXIAL NCCT, AXIAL AND COR T2W, MRV IMAGES

CEREBRAL VENOUS SINUS THROMBOSIS: On NCCT left sigmoid and transverse sinues appears hyperdense. On MR absence of normal signal void of left sigmoid and transverse noted in T2 image and absence of signal intensity in MRV.

Discussion

Headache is the most frequent illness suffered by human beings, which has many potential causes. Neuroimaging in case of chronic headache poses several challenges and do not always yield evidences for the diagnosis. Detection of significant and treatable lesions that impact quality of life remains the primary reason to image brain, however other important causes include relieving of patient's anxiety and improving patients' overall satisfaction and medical care.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

In our study the percentage of females (53%) was slightly higher than males (47%). M:F ratio was found to be 1:1.13. In the similar design Indian studies AP Jain et al.,[6] reported male 38% and female 62%, Gidibidiet al.,[7] reported only 26% male compared to 74 % female. Similar to our study these studies have shown female predominance in chronic headache cases. WHO factsheet mentions that migraine is more common in women, usually by a factor of about 2:1, because of hormonal influences. Tension-type headache (TTH) is also affecting three women to every two men.[8]

In our study Nausea/vomiting was reported by 9% patients. Abnormal vision/aura was complained by 8 % cases. Fever was associated in 4 cases whereas 2 cases had history of weight loss. The associated symptoms were mostly non-specific to any aetiology however as reported previously the migraine headaches were characterised by headaches that are unilateral, throbbing, and moderate to severe, aggravated by physical activity and associated with nausea, vomiting and/or photophobia.[9,10] In cases of Idiopathic intracranial hypertension, the headache is associated with transient visual disturbances; about 70% have a permanent visual impairment and about 5% even report a complete loss of vision. [11,12]

We observed that 7% Patients were overweight whereas 2% were underweight. Average BMI of the population was 22± 2.9 kg/m2. Recent research suggests that migraine and obesity may be directly linked. Obesity is related to higher frequency and severity of headache attacks among individuals who have migraine.[13,14,15] There is also some evidence to suggest that obesity is associated with migraine prevalence.[16,17]

Out of the 100 cases, 78 cases (78%) had normal CT study of brain. 22% were found to have positive findings with most common detected pathology as paranasal sinusitis (n= 08) 8 % among total cases studied and around 33.6% of total positive cases.

In a study by Rai et al.,[18] Out of 500 patients studied, only 29 cases (5.8%) revealed some form of brain parenchymal pathology whereas associated findings like sinusitis was seen in 58 (11.6%). Similar to our study the most prevalent pathology found in their study was paranasal sinusitis which was located in the maxillary sinuses in most of the cases and was coexisting with ethmoid, frontal and sphenoid sinusitis in few cases. Similar to our study, they observed that the associated findings like paranasal sinusitis, calcified granulomas, mild DNS, CSOM and mastoiditis may be incidental findings which falsely increase the yield of CT. In our study the yield of CT findings was 14% without sinusitis which increased to 22 % when sinusitis findings were added.

It was followed by space occupying lesions or brain tumours, observed in 5% cases. The rate of detection of tumours in our study was comparatively higher than similar study conducted by Evan et al.,[19] where tumours were 0.8% of total cases. This could be explained by the finding that Evan et al.,[19] aimed at diagnostic testing for the evaluation of headaches whereas we included all chronic headache cases.

A common manifestation of SOL is a headache and is the worst symptom in about half of the patients. [20] It's dull and constant, occasionally throbbing in nature. A retrospective review of 111 patients conducted by Forsyth et al.,[20] with brain tumor illustrated that headache was present in 48% of the cases. Sajjad et al.,[21] showed that 29% of the brain tumour patients were having headache alone and 18% presented with a headache and vomiting. A headache constituted about 33% of metabolic causes of SOL and 14% in infectious causes.

In the study by Rai et al.,[18] 4 cases had subarachnoid and subdural hemorrhage. Since a vast majority (66%) of the patients in our study had duration of headache between 6-9 months and average duration of complaints was 8.72± 2.7 months, we did not find any active

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

cases of subarachnoid or subdural hemorrhage unlike Rai et al.,[18] where more acute cases were enrolled.

One study reported the detection rate for significant intracranial abnormalities using CT and MRI. In a cohort of 1876 persons with a non-acute headache defined as any type of headache that had begun at least 4 weeks before enrolment Sempere et al.,[22] reported that the detection rate was 19/1432 (1.3%) using CT and 4/444 (0.9%) using MRI. Of 119 normal CT scans 2 (1.7%) had significant intracranial abnormality on MRI.

The detection rate of CT was found to be 20 % whereas detection rate of MRI was found to be 23%. The detection rate in our study was much better to this study and many previous studies. This can be attributed to better case selections done at the time of referrals for neuroimaging and vigilant history taking. Moreover, the earlier studies were conducted 2 decades before and the neuroimaging was performed using earlier low-resolution machines.

Conclusion

This study has provided detection rate of 20-23% using CT and MRI and thus given reasonable evidence for radiodiagnosis of chronic headache cases with normal neurological examination and significant intracranial pathology. However, in patients with red flag signs CT or MRI as a screening tool in has important value. Since the costs involved may be high the neuroimaging in headache patients need to be tailored on a case-by-case basis.

Conflict of Interest: None to declare
Source of funding: Nil

References

1. Stovner L, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia 2007; 27: 193–210.
2. Association of British Neurologist (ABN). Local adult neurology services for the next decade. Report of the working party. www.abn.org (2011, accessed June 2021).
3. Sender J, Bradford S, Watson D, et al. Setting up a specialist headache clinic in primary care: general practitioners with a special interest in headache. Headache Care 2004; 1: 165–171.
4. Weatherall MW. Acute neurology in a twenty-first century district general hospital. J R Coll Physicians Edinb 2007; 36: 196–200
5. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition.Cephalalgia. 2018; 38(1):1-211
6. Jain AP, Chauhan B, Bhat AD. Sociodemographic and clinical profile of headache, a rural hospital based study. Journal, Indian Academy of Clinical Medicine. 2007;8(1):26-8.
7. GidibidiG, Kareemsab D, Rachaiah N. The Socio-demographic Profile, Classification and the Clinical Profile of Headache: A Semi-urban Hospital Based Study. Journal of Clinical and Diagnostic Research. 2012 Apr 1;6:278–81.
8. Headache disorders [Internet]. [cited 2022 Jan 27]. Available from: https://www.who.int/news-room/fact-sheets/detail/headache-disorders
9. Steiner TJ. Lifting the burden: The global campaign to reduce theburden of headache worldwide. J Headache Pain 2005;6:373-7.
10. Clarke CE, MacMillan L, Sondhi S, Wells NE. Economic and socialimpact of migraine. QJM 1996;89:77-84.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

11. Blockmans, D., Bley, T. and Schmidt, W. (2009) Imaging for large-vessel vasculitis. CurrOpinRheumatol 21: 19–28.
12. Perry, J., Stiell, I., Sivilotti, M., Bullard, M., Emond,M., Symington, C. et al. (2011) Sensitivity ofcomputed tomography performed within six hours of onset of headache for diagnosis of subarachnoidhaemorrhage: prospective cohort study. BMJ 343:d4277.
13. Bigal ME, Liberman JN, Lipton RB. Obesity and migraine: a population study. Neurology. 2006;66:545–50.
14. Bigal ME, Lipton RB. Obesity is a risk factor for transformed migraine but not chronic tension-type headache. Neurology. 2006;67:252–7.
15. Bigal ME, Tsang A, Loder E, Serrano D, Reed ML, Lipton RB. Body mass index and episodic headaches: a population-based study. Arch Intern Med. 2007;167:1964–70.
16. Ford ES, Li C, Pearson WS, Zhao G, Strine TW, Mokdad AH. Body mass index and headaches: findings from a national sample of US adults. Cephalalgia. 2008;28:1270–6.
17. Peterlin BL, Rosso AL, Rapoport AM, Scher AI. Obesity and Migraine: The Effect of Age, Gender and Adipose Tissue Distribution. Headache. 2010;50:52–62.
18. Rai GS, Rai T, Jain L, Vyas MM, Roshan R. Evaluation of CT and MRI Findings among Patients Presented with Chief Complaint of Headache in Central India. J Clin Diagn Res. 2016 Feb;10(2):TC21-5.
19. Evans, R. (1996) Diagnostic testing for the evaluationof headaches. Neurol Clin 14: 1–26.
20. Forsyth PA, Posner JB. Headaches in patients with brain tumors: A study of 111 patients. Neurology. 1993;43:1678.
21. Sajjad et al.; JAMMR, 26(3): 1-8, 2018; Article no.JAMMR.38701
22. Sempere AP, Porta-Etessam J, Medrano V, Barcia-Morales I, Concepcion L, Ramos A. Neuroimaging in the evaluation of patients with non-acuteheadache. Cephalalgia. 2004;25(1):30–5.