

# Assessment of Appropriateness of Doing CT Scan for Investigating Headache in a Tertiary Care Hospital in Eastern India

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## Abstract

**Background:** Headache is one of the most common presenting symptoms encountered in day to day clinical practice. A computed tomography is often the most common imaging modality to diagnose the underlying causes of headache, majority of which turns out to be normal. The objective of this research is to study the morbidity patterns in the CT scan reports of patients presenting with headache in the population attending a tertiary care hospital in Eastern India.

**Method:** The study was a retrospective analysis of all the CT scan reports performed in a tertiary care government hospital performed for diagnostic evaluation of headache referred from different clinics and included all patients regardless of the age during the time period December 2018 to November 2019.

**Results:** All the patients were classified into two groups traumatic and non- traumatic depending on the history. Out of a total 1142 patient evaluated, 649 patients (56.83%) did not yield any positive findings on CT scan, i.e. the reports were normal. In fact, a routine CT scan is not advised for all headache complaints even by the ACR (American College of Radiology) appropriateness criteria. The difference between the number of patients with normal CT scan and abnormal CT scan in both the groups was statistically significant ( $p < 0.05$ ).

**Conclusion:** In concordance with the previous similar studies, it may be concluded that in evaluation of headache, CT scan should be advised only in selected cases as recommended by ACR Appropriateness Criteria® Headache or any other guidelines that may be developed for this purpose.

**Keywords:** Headache, Computed Tomography Scan, CT scan findings.

## Introduction

Headache is one of the most common presenting symptoms encountered in day to day clinical practice. According to WHO estimates, the prevalence of headache among adults is about 50%.<sup>1</sup> Unfortunately, there are insufficient statistics for the prevalence of headache in India and other developing countries.<sup>2</sup>

Though there may be regional variations, yet headache disorders are a worldwide problem, affecting people of all ages, ethnicities, socio-economic status and geographical areas. A computed tomography is often the most common imaging modality to diagnose the underlying causes of headache. Previous studies have shown that in most of these cases, CT findings turned

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out to be normal.<sup>3,6</sup> The objective of this research is to study the morbidity patterns in the CT scan reports of patients presenting with headache in the population attending a tertiary care hospital in Eastern India.

## Materials & Methods

The study was a retrospective analysis of all the CT scan reports performed in the Department of Radiology College of Medicine and Sagore Dutta Hospital (CoMSDH), Kamarhati, Kolkata – a tertiary care government hospital and Medical College, from December 2018 to November 2019. It was basically a secondary data analysis carried out on the information retrieved from the CT scan reports of the patients who underwent CT scan of head for diagnostic evaluation of headache referred from different clinics and included all patients regardless of the age.

The study was carried out in accordance with the guidelines of the Institutional Ethics Committee (Registration No. ECR/1210/Inst/WB/2019 issued under Rule 122 DD of the Drugs and Cosmetics Rules, 1945) at the College of Medicine and Sagore Dutta Hospital.

CT scan reports of all patients referred for CT scan of head for evaluation of headache at CoMSDH for a period of 1 year was included in the analysis. A structured checklist was used for the analysis and the information collected was based on the following parameters:

**Individual:** Age in completed years/ Gender/ History of trauma in completed days/other associated symptoms like vomiting/loss of consciousness/vertigo.

**Radiological:** The CT scans were carried out on 16-slice spiral CT scanner (GE MEDICAL SYSTEM, OPTIMA CT540) in Department of Radiology CoMSDH. 5 mm contiguous slices were taken from foramen magnum to the vertex, which were reconstructed into 1mm slices both in soft tissue and bone window.

The CT scan findings were classified into 26 categories: Normal, Mild diffuse cerebral atrophy, Diffuse cerebral atrophy, Periventricular ischemic changes, Lacunar infarcts, Focal gliosis, Encephalomalacic changes, Chronic ischemic changes, Sub acute infarct, Intracranial haemorrhage, Intra-axial calcification, Hydrocephalous, Neoplasm, Intra-axial lesion other than neoplasm, Extra axial lesion, Mega cisterna magna, Extra axial collection, Infection, asymmetrical dilatation of lateral ventricle, Osteoma, Contusion, Scalp hematoma, Extra axial calcification, Metastasis, Deviated nasal septum, Sinusitis.

The data thus collected was compiled and tabulated and checked for consistency and outliers. The proportions of CT scan with and without abnormality are expressed in percentages. The distribution of the morbidity patterns among the abnormal CT scan according to different population groups are also expressed in percentages.

## Results:

A total of 1142 patient's CT scan reports were evaluated in our study. Out of them 32.2% (n=368/1142) of the patients were males, the rest 67.8% (n= 774/1142) were females. The mean age of the patients was 37.92 with a standard deviation of 16.67. The median age was 36. From the histories obtained from these 1142 patients, who's CT Scans were evaluated, the patients were classified under two groups, namely traumatic 27.4 % ( n=313/1142) and non-traumatic 72.5% ( n= 829/1142). In the non-traumatic category, 54.28 % of patients (n=450/ 829) had normal findings on CT scan. In the traumatic category, 63.5% (n=199/313) of the patients showed no abnormal findings on CT scan. Out of the total 1142 patients included in the study, 649 patients (56.83%) did not yield any positive findings on CT scan, i.e. the reports were normal.

The results obtained on statistical analysis are summarised in the following tables (Table 1 -3):

**Table 1: Distribution of findings in both groups:**

CT Scan findings	Non-trauma	Trauma	Grand total
Normal	450	199	649
Mild diffuse cerebral atrophy	62	17	79
Diffuse cerebral atrophy	16	1	17
Periventricular ischemic changes	33	5	38
Lacunar infarcts	71	13	84
Focal gliosis	18	3	21

CT Scan findings	Non-trauma	Trauma	Grand total
Encephalomalacic changes	2	0	2
Chronic ischemic changes	2	0	2
Sub acute infarct	5	1	6
Intracranial haemorrhage	2	0	2
Intra-axial calcification	12	4	16
Hydrocephalous	3	1	4
<b>Neoplasm</b>	0	0	0
Intra-axial lesion other than neoplasm	1	0	1
Extra axial lesion	6	1	7
Mega cisterna magna	5	6	11
Extra axial collection	4	1	5
<b>Infection</b>	0	0	0
Asymmetrical dilatation of lateral ventricle	5	1	6
Osteoma	3	1	4
<b>Contusion</b>	0	3	3
<b>Scalp hematoma</b>	0	4	4
Extra axial calcification	1	0	1
Metastasis	0	1	1
Deviated nasal septum	193	67	260
Sinusitis	90	18	108
Grand Total	829	313	1142

Table-2: Distribution of findings according to gender:

Category	CT Scan Findings	Gender		Total
		F	M	
1	Normal study	454 (70.0)	195 (30.0)	649
2	Mild diffuse cerebral atrophy	41 (51.9)	38 (48.1)	79
3	Diffuse cerebral atrophy	10 (58.8)	7 (41.2)	17
4	Periventricular ischemic changes	22 (57.9)	16 (42.1)	38
5	Lacunar infarcts	56 (67.5)	27 (32.5)	83
6	Focal gliosis	16 (76.2)	5 (23.8)	21
7	Encephalomalacic changes	1 (50.0)	1 (50.0)	2
8	Chronic ischemic changes	2 (100.0)	0	2
9	Sub acute infarct	1 (16.7)	5 (83.3)	6
10	Intracranial hemorrhage	1 (50.0)	1 (50.0)	2
11	Intra-axial calcification	14 (87.5)	2 (12.5)	16
12	Hydrocephalous	3 (75.0)	1 (25.0)	4
13	Neoplasm	0	0	0
14	Intra-axial lesion other than neoplasm	1 (100.0)	0	1
15	Extra axial lesion	4 (57.1)	3 (42.9)	7
16	Mega cisterna magna	8 (72.7)	3 (27.3)	11
17	Extra axial collection	3 (60.0)	2 (40.0)	5

Category	CT Scan Findings	Gender		Total
		F	M	
18	Infection	0	0	0
19	Asymmetrical dilatation of lateral ventricle	3 (50.0)	3 (50.0)	6
20	Osteoma	3 (75.0)	1 (25.0)	4
21	Contusion	0	3 (100.0)	3
22	Scalp hematoma	3 (75.0)	1 (25.0)	4
23	Extra axial calcification	1 (100.0)	0	1
24	Metastasis	1 (100.0)	0	1
25	Deviated nasal septum	169 (65.0)	91 (35.0)	260
26	Sinusitis	65 (60.2)	43 (39.8)	108
<b>Total</b>		774 (67.8)	368 (32.2)	1142

**Table 3: Table showing the results of the Chi square test.**

Groups	Normal	Abnormal	Marginal Row Totals
Traumatic	199 (176.56) [2.85]	165 (187.44) [2.69]	364
Non-traumatic	450 (472.44) [1.07]	524 (501.56) [1]	974
Marginal Column Totals	649	689	1338 (Grand Total)

Chi-square: 7.609; p= 0.005808.

OR=1.404

(95% CI) (1.103-1.788)

According to the results of the Chi-square test given above, the difference between the number of patients with normal CT scan and abnormal CT scan in both the groups was statistically significant ( $p < 0.05$ ).

### Discussion:

A careful consideration of the above table (Table 1) throws up some interesting results. Majority (almost 57%) of the patients with complaints of headache, who went for a CT scan, came back with normal reports. Even among patients in the traumatic category, a sizeable portion of the patients (about 63.5%) showed normal findings on CT. Our findings have been corroborated by other studies conducted in various parts of India and abroad also. But, the proportion of patients with abnormal findings in our study was higher than other studies. It has been further noted that even those who had abnormal findings on CT scan, most of them were deviated nasal septum and sinusitis and not any significant intracranial lesions. Our study has included the findings of the visualized paranasal sinuses which can be a potential cause of headache in patients and evaluation of paranasal sinuses was not reported in the previous studies.<sup>4,5</sup>

In a similar study reported from Nigeria, the authors opined that the yield of significant abnormalities on CT scans did not justify the huge number of CT Scans performed for the diagnosis of headache.<sup>4</sup> An analysis of about 2500 patients with headache from Chandigarh reported a poor yield of positive findings too.<sup>5</sup>

CT scan is almost routinely prescribed for investigation of chronic headache and has quite a few advantages. It is easily and widely available in many places, easy to perform and inexpensive. But, many studies have shown the futility of routinely prescribing Computed tomography to all patients with chronic headache. In most of these cases, either no serious intracranial pathology was found, or the CT scan findings did not significantly alter the clinical or therapeutic jurisdiction. So, our findings are in agreement with other studies where similar findings have been reported. Whenever there has been an audit of CT Scans prescribed for headache, the findings have been interestingly similar. In fact, a routine CT scan is not advised for all headache complaints even by the ACR<sup>6</sup> appropriateness criteria.<sup>7</sup>

The concurrence of findings in similar studies drives home the point that not all headaches reported to the outdoor and emergency for consultation merits a prescription for a CT scan, for it may not yield a positive finding. Even those patients who reported a positive finding, the diagnosis were mostly benign causes like sinusitis. Therefore we recommend reporting of pathology of the visualized paranasal and deviated nasal septum, if any in every CT scan referred for evaluation of headache as it may yield a potential cause.

The retrospective nature of our study is the main limitation as the referrals requisitions were occasionally incomplete in clinical information.

In concordance with the previous studies our study reiterated that in evaluation of headache, CT scan should be advised only in the cases of sudden severe headache, new headache with optic disc edema and with worsening headache in patients with history of trauma and MRI with or without contrast should be the preferred imaging modality in other cases as recommended by ACR Appropriateness Criteria® Headache.<sup>8</sup> This recommendation is however not followed in lot many cases because of the demand of the patients as such or the patient's relatives. There should be structured recommendations for the treating physicians as to when a CT scan should be advised; otherwise it would be just a waste of resources.

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None declared.

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