

Role of Non-Contrast CT Brain in Evaluation of Patients with Headache

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Abstract: Headache is the most frequently suffered illness by human beings and affects wide range of population with a variety of etiology. 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. tumours) are far less common. Most patients presenting with headache in the primary care setting do not have serious underlying conditions. The relative rarity of secondary headaches compared with the large number of patients with primary headache raises concerns about the wisdom of routine studies like computed tomography of brain to diagnose intracranial causes of headache.

Keywords: Headache, Non Contrast CT Brain

1. Introduction

Headache is one of the common symptoms of various disorders with multi-factorial origin. 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 in 40 % of population annually.¹

Acute headache is a common symptom and is reported in approximately 2% to 4% of the patients who present to the emergency department.²

Classification of Headache.³

- 1) Primary headache
- 2) Secondary headache
- 3) Unclassified headache.

Primary headaches are classified as follows.

- 1) Migraine headache
- 2) Tension type headache
- 3) Cluster headache
- 4) Other types of headaches and cranial facial pain.

Secondary headaches are classified as follows.

- 1) **Caused by head or neck trauma:** Traumatic intracranial hematoma and chronic posttraumatic headache.
- 2) **Cranial or cervical vascular disorders:** Ischemic stroke and transient ischemic attacks.
- 3) Non-traumatic intracranial haemorrhage, un-ruptured vascular malformations, cerebral venous thrombosis.
- 4) **Nonvascular, non-infectious intracranial disorders:** Idiopathic intracranial hypertension secondary to hydrocephalus, non-infectious inflammatory diseases, Neuro-sarcoidosis, aseptic {non-infectious} meningitis and intracranial neoplasms.
- 5) **Attributed to use or withdrawal of substances:** Headache caused by substance use or exposure like cannabis & cocaine.

- 6) **Infectious causes:** Intracranial infections, bacterial meningitis, encephalitis, brain abscess, subdural empyema and systemic infections.
- 7) **Disturbance of homeostasis Attributed to hypoxia or hypercapnia, high altitude headache, sleep apnea, arterial hypertension and endocrine dysfunction.**
- 8) **Neck:** Cervicogenic headache, retropharyngeal tendinitis and cranio-cervical dystonia.
- 9) **Eyes:** Acute glaucoma, refractive errors and ocular inflammatory disorders.
- 10) **Ears:** Primary otalgia and referred otalgia.
- 11) **Disorders of the sino-nasal complex:** Infectious sinusitis and allergic sinusitis and neoplasms.
- 12) **Headache attributed to psychiatric disorder:** Attributed to somatization disorder and attributed to a psychotic disorder.
- 13) **Cranial neuralgias:** Trigeminal neuralgia, classical trigeminal neuralgia, symptomatic trigeminal neuralgia, glossopharyngeal neuralgia, nervus intermedius neuralgia, nasociliary neuralgia, supraorbital neuralgia, occipital neuralgia, neck-tongue syndrome, herpes zoster, acute herpes zoster and post-herpetic neuralgia.

Aim and objective of study: To diagnose the brain parenchymal abnormalities causing headache on non-contrast CT scan of brain.

2. Methodology

The study was performed from March 2021 to February 2022 on 29 patients who presented with acute and chronic headache with or without neurological signs and symptoms to various departments of The Oxford Medical College, Hospital and Research Centre Bangalore. They were evaluated clinically and underwent Non-Contrast CT Brain using a 16 slice GE Revolution ACT CT scanner machine. All patients aged between 18 to 85 years were included and

excluding patients with headache due to ophthalmic cause, immediate history of trauma and pregnant patients.

Study Design:

- Descriptive Cross-sectional study.
- Study Duration: 12 Months from 01st March 2021 to 28th Feb.2022.
- Place of study: The Oxford Medical College, Hospital and Research Centre, Bangalore
- Sample Size: 29 Patients.

3. Results

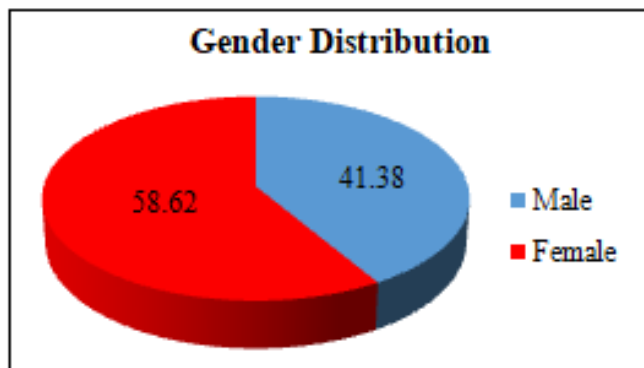
Among 29 patients of Non-Contrast CT Brain, 20 patients had Normal Brain Parenchyma.

The gender wise distribution among 29 patients were 12 Males (41.38%) and 17 Females (58.62%).

Significant abnormality on Non Contrast CT brain was seen in 9 cases (1 patient had Normal Pressure Hydrocephalus, 3 Lacunar infarct, 2 Partial Empty Sella Syndrome (PESS) and Idiopathic Intracranial Hypertension (IIH), 3 patients with Calcified Granuloma on imaging).

Table 1: Gender distribution of study population

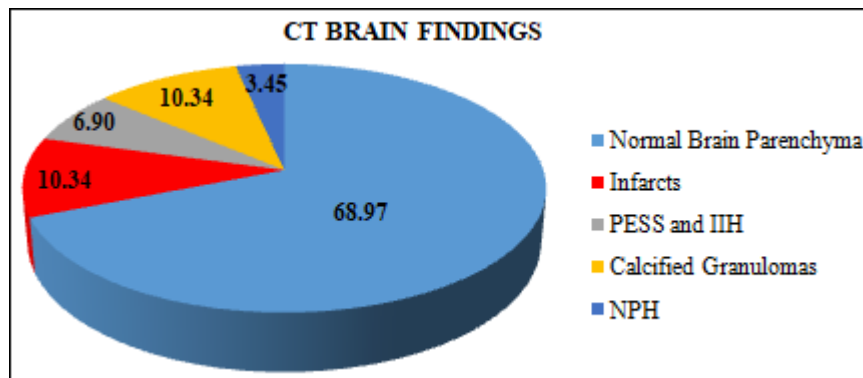
Gender	Frequency	Percentage
Male	12	41.38 %
Female	17	58.62 %
Total	29	100.00



Graph 1: Gender distribution of study population

Table 2: Distribution of cases according to imaging findings on CT Brain

CT Brain	Frequency	Percent
Normal brain parenchyma	20	68.97
PESS & IIH	2	6.90
Infarcts	3	10.34
Calcified granulomas	3	10.34
Normal pressure hydrocephalus (NPH).	1	3.45
Total	29	100



Graph 2: Pie chart showing distribution of patients according to imaging findings on CT Brain

4. Discussion

Headache is one of the most common symptoms of various disorders with multi-factorial origin. 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 in 40 % of population annually.¹

Acute headache is a common symptom and is reported in approximately 2% to 4% of the patients who present to the emergency department.²

The diagnosis of headache is based on subjective symptoms. In 1988, the “International Headache Society” published a classification for headache and is grouped into primary headache and secondary headache. This can facilitate evaluation and subsequent management and is both diagnostically and therapeutically useful. The increasing availability of high resolution CT scanners has encouraged its use to rule out secondary causes of headache and other serious neurological conditions in patients with headache.³

Headache associated with any neurologic findings or seizures have a substantially higher likelihood of a secondary cause such as tumour or other structural lesion. In these situations, imaging must be considered as part of the workup.⁴

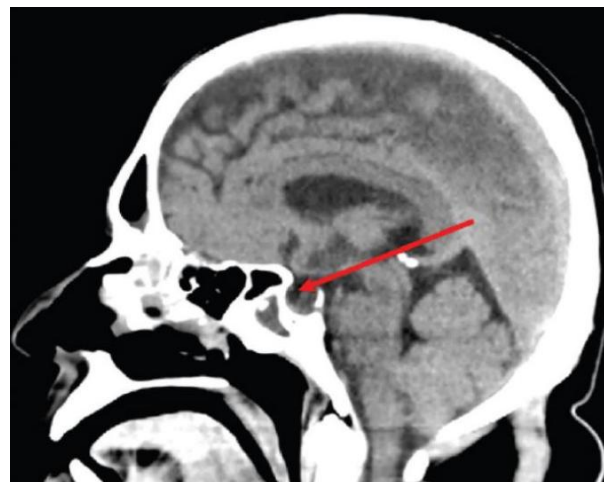
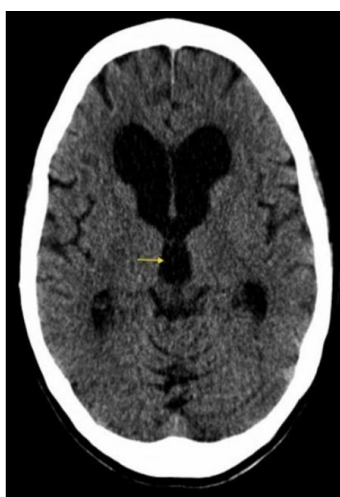
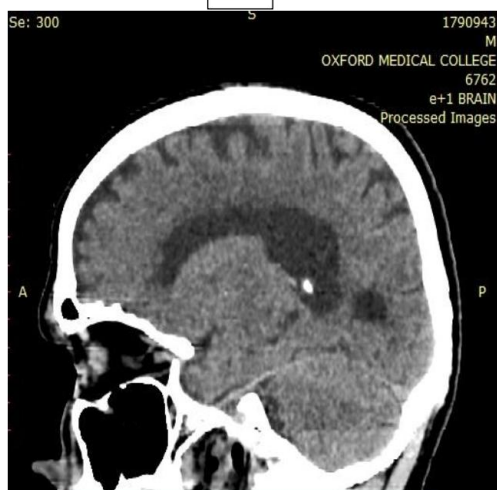


Figure 2: Sagittal Non Contrast CT Brain showing hypodense area in the diaphragmatic sella in which pituitary gland is partially compressed or shrunken suggestive of Partial Empty Sella Syndrome (PESS) & IH.



a



b

Figure 1: (a) Axial and (b) Sagittal Non-Contrast CT Brain with dilated ventricles (Normal Pressure Hydrocephalus).



Figure 3: Axial Non Contrast CT Brain showing lacunar infarct in left thalamus.

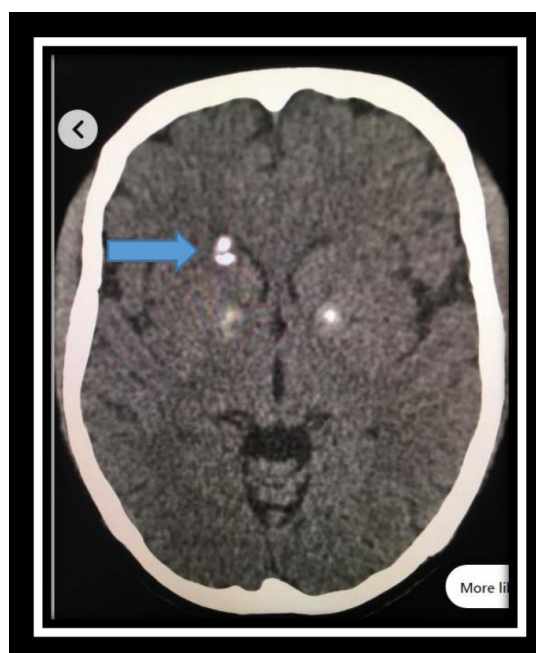


Figure 4: Axial Non Contrast CT Brain showing calcified granuloma in right caudate nucleus.

The present study results were similar to study conducted by Rizk B et al suggest that Non Contrast (unenhanced) CT images may be sufficient initial screening for the majority of patients admitted to an Emergency Department with headache and data have shown that 60% of all consecutive patients referred for CT because of headache could have been managed without the use of contrast media.⁵

In addition, unenhanced CT achieved 100% sensitivity for suspected intracranial pathology that prompted the need for further contrast CT screening because it might influence the patient's outcome.⁵

Most patients presenting with headache in the primary care setting do not have serious underlying conditions. The relative rarity of secondary headaches compared with the large number of patients presenting with primary headaches makes plain computed tomography (CT) an important screening investigation to evaluate underlying causes of headache.⁶

5. Conclusion

Non Contrast CT Scan of Brain is a valuable tool for screening and evaluating patients with headaches, as it can assist in diagnosing the underlying cause of the headache. Furthermore, in emergency situations, it can help in identifying structural abnormalities and guide early and appropriate treatment without need for contrast media.

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