

AUDIT OF APPROPRIATENESS AND OUTCOME OF COMPUTED TOMOGRAPHY BRAIN SCANNING FOR HEADACHES IN PAEDIATRIC AGE GROUP

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Background: Headache is a common complaint in children. With the proliferation of brain imaging centers and the increasing patient demand for CT or MRI studies, brain imaging has become widely used to evaluate headache and exclude malignant lesion. The objectives of this descriptive study were to assess the appropriateness and outcomes of computed tomography brain scanning for headaches in paediatric age group. This study was conducted at the Radiology Department Hayatabad Medical Complex, Peshawar over a period of 1 year July 2008–July 2009. **Methods:** Both genders between the ages of 4–18 years included in the study presenting with headache either isolated or common/classic migraine were included in this study. These variants of headache were allocated an appropriateness rating of 2 for CT scan by the American College of Radiology Appropriateness Criteria (ACRAC) for children with headaches. **Results:** Out of the 100 patients only 4% patients showed abnormal findings on CT scan while the remaining 96% of the scans were absolutely normal. The four patients with abnormal findings all had sinusitis no notorious lesions. **Conclusion:** This audit suggests that a proportion of the computed tomography studies performed for children with isolated headaches or common/classic migraine may have been inappropriate. The development of a local guideline for imaging referral is indicated.

Keywords: Children, Headache, Computed tomography.

INTRODUCTION

Headache is a common complaint in children. With the proliferation of brain imaging centers and the increasing patient demand for CT or MRI studies, brain imaging has become widely used to evaluate headache and exclude malignant lesion¹ The primary medical concern when a child presents with headache is the possibility of intracranial pathology. One of the most difficult problems is when ionizing radiation is used for reassuring worried parents that their child with headaches does not have a brain tumour. Although this sounds like a misuse of radiation, 8-10% of children with brain tumours may have headache as their sole presenting complaint.^{2,3}

The high prevalence of headache and the low yield of imaging in paediatric patients who presents with headache alone bring into question the value of screening.⁴

However, there are clinical features that influence the yield of positive imaging examinations. Numerous studies have helped to identify the clinical symptoms and signs that, when associated with headaches, appear to be useful predictors of positive imaging evaluation and therefore appropriateness of imaging.⁵

MATERIAL AND METHODS

The American College of Radiology Appropriateness Criteria (ACRAC) for children with headaches was chosen as the standard for the current audit report. Released in 1999 and revised in 2005 by the American College of Radiology, the ACRAC is a

clinical guideline on the appropriateness of various imaging modalities used for children with headache. The guideline was developed following an analysis of the literature and expert panel consensus.⁴

The ACRAC classifies headaches into five variants:

1. Isolated headache. These are headaches unaccompanied by neurologic signs and symptoms or historical data.
2. Headaches with positive neurologic signs or symptoms, including papilloedema, gait disturbance, abnormal reflexes, cranial nerve findings, altered sensation, nystagmus, or confusion.
3. Headaches with supporting historical data, such as diplopia, morning vomiting; headache that awakes the patient from sleep; intense, prolonged, and incapacitating headaches with an absent family history for migraine; headaches that are increasing in frequency, duration, and intensity; vomiting.
4. Acute severe (thunderclap) headache. And absence of family history of migraine.
5. Common or classic migraine with no neurologic findings.

The ACRAC assigned appropriateness ratings (AR) for various imaging modalities for each headache variant. An AR of 1 implies the radiological examination modality is least appropriate for the headache variant, whereas an AR of 9 suggests that the modality is most appropriate. The imaging modality used is CT scan. The ACRAC assigned appropriateness ratings are shown in Table-1.

Table-1: Summary of the headache variants and computed tomography (CT) appropriateness rating used in this audit

Headache variant	Appropriateness rating scale of CT scan
Isolated headache	2
Headache with positive neurological signs and symptoms	8
Headache with supporting historical data	8
Acute severe headache	9
Common or classic migraine	2

For our study we included patients of both genders between the age of 4-18 years with type 1 and type 5 headaches that had the CT scan appropriateness rating of 2. Standard protocol for CT scan brain axial sections was adopted using HELICAL CT SCANNER, available in Hayatabad Medical Complex, Peshawar. Pre contrast scans were taken. CT was performed with the head supine and the plane of section at 10–25 degree to Reid’s baseline. Serial 10 mm slices, axial sections from below upward were taken.

RESULTS

A total of 100 patients of both genders between the ages of 4–18 years were included in our study. 40% of the patients were below 10 years of age while 60% were above 10 years. These patients presented with either isolated headaches or common/classic migraine. It included 69% males while 31% were females.

Out of the 100 patients only 4% patients showed abnormal findings on CT scan while the remaining 96% of the scans were absolutely normal. Four patients with abnormal findings all had sinusitis.

DISCUSSION

Headache is one of the most frequent physical complaints in children.⁶ The prevalence of headache in patients aged 7 years or younger has been reported as 19 to 51% which is comparable to our study in which 40% of the patients were below the age of 10 years.⁷ While in school going children the estimated prevalence of headache is 85.5%.⁸

In adolescent boys and girls, the prevalence was found to be 56% and 74% respectively.⁹ Irrespective of the clinical history; most children referred for imaging have normal studies or incidental findings that do not relate specifically to the headache presentation.¹⁰

In comparison to the study conducted by Kan *et al*² which showed that in patients with AR of 2, 86% showed no abnormal findings on subsequent CT scans our study showed that 96% of the scans were normal while only 4% patients showed abnormal findings on CT scan. All the four patients with abnormal findings

had sinusitis just like the Kan study that showed that the only abnormal finding was sinusitis.²

Our findings of no relevant abnormalities in a series of 100 brain imaging studies indicate that the maximal rate at which such abnormalities might appear in paediatric population is 4% which is comparable to the study of Mytal *et al*¹ which showed a figure of 3.8%.

The ACRAC recommended no imaging for this group of patients. While we realize the decision of imaging in children with isolated headaches is not easy.

Prudent clinical assessment might have helped to identify these low risk children and thus avoid their unnecessary exposure to radiation which is estimated to be approximately 90 mGy for children in a single CT scan head examination.¹¹ There is substantial room for improvement in this area of clinical decision making and continuous auditing could be instrumental in this regard.

CONCLUSION

This audit suggests that a proportion of the CT studies performed for children presenting with headache may have been inappropriate. Liaison with paediatric colleagues to develop an appropriate referral protocols would likely reduce the number of CT studies requested and thus avoid unnecessary radiation exposure in many cases.

A local clinical practice guideline appears necessary for decision making with respect to imaging and to aid the identification and prioritization of high risk children. The construction of such a guideline need to be multidisciplinary effort between paediatricians and radiologists, and should be based on available literature and existing evidence based clinical practice guidelines used by other institutions.

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