

Evaluation of Computed Tomography Scan of Brain in Pediatric Patients

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ABSTRACT

Objective: To determine the effectiveness of computed tomography in pediatric patients referred to radiology department for computed tomography scan brain

Study Design: Cross sectional study

Place and Duration of Study: Radiology Department, Sandmen Provincial Hospital Quetta form 1st January 2018 to 30th March 2018.

Methodology: Sixty pediatric patients included in the study who referred from Pediatric OPD for computed tomography scan of brain. Patients with trauma were excluded while all other patient's age between 1 month to 4 years were included. Findings were divided with normal and abnormal findings.

Results: Twenty five (41.7%) were boys and 35 (58.3%) were girls. Only 25% were negative and 75% were positive and showed significant pathology. Major complaint was fits accompanied with fever and unconsciousness was also one of the reasons.

Conclusion: Computed tomography scan is quick and now-a-days with easy access it is an effective diagnostic method in sick children with cases of neurological disease in spite of its radiation exposure child.

Key word: Computed tomography (CT), Effectiveness, Children

INTRODUCTION

Computed tomography scan is the recent era proved its importance in diagnoses of diseases. From the day of its invention it turned to be one of the pillars in diagnoses of brain diseases. Now a day CT scan is playing a major role in emergency department for diagnosis and management of patient's either adults and children.¹

Children developing fever and fits are of great concern for their parents. Febrile fits develop when fever is above 38°C or 100.4 F. fits can be overlapped with fever and there maybe underlying other causes for fits. child can be unconscious after having episode of fits. Fits can be caused by many other causes, these includes (1) an imbalance of nerve-signaling brain chemicals (neurotransmitters) (2) brain tumor (3) stroke and (4) brain damage from illness or injury.^{2,3}

Clinical examination with Laboratory test which includes blood test, urine test, electroencephalogram (EEG) helps in diagnoses but in recent era cross sectional diagnostic imaging has developed excellent for diagnoses. Direct visualization of brain confirms the diagnoses and help in management. Revolutionary development in MDCT technology has increase the diagnostic application and accuracy even in children. As it not only show brain but all anatomical structures around it. Ct scan is quick, easily available and low cost but major drawback is use of ionizing radiation and risk of radiation induced side effect. One of it is induction of cancer however it is believed that there is no threshold risk relationship but we should try to reduce medical radiation exposure to children as much as possible (as low as reasonably achievable (alara) concept. Scan must be justified, patient must be prepared, technical and scan parameters and contrast administration must be considered. Radiologists must be aware of it.⁴⁻⁶

MATERIALS AND METHOD

This cross sectional study was conducted at Radiology Department of Sandman Provincial Hospital Quetta from 1st January 2018 to 30th March 2018. Sixty patients were included in study who were referred for CT scan brain from Pediatric ward and OPD while exclusion criteria was history of trauma. Radiological findings of CT scan were interpreted by radiologist. Protocol for children was followed for CT scan brain. CT scan was performed on Toshiba Asteion scanner with proper positioning and protocol appropriate for children. Intravenous contrast was given when needed. Non co-operative patient was sedated for scan. Computed tomography images were studied by experienced radiologist and data was collected and analyzed by SPSS-20.

RESULTS

There were 25 (41.3%) boys and 35 (57.6%) girl patients. Out of these, 24.9% CT scan were normal and show no abnormality. 74 % were positive cases which shows meningitis and its complication, hypoxic ischemic encephalopathy, asymmetry of lateral ventricles, hydrocephalus and duct of sylvius stenosis. 33% CT scan of boys were positive, 9 cases were of meningitis in which 3 has developed communicating hydrocephalus and 1 of which show infarction. Ten showed hypoxic ischemic encephalopathy out of which 1 show sinusitis and mastoiditis. 1 case show asymmetrical lateral ventricle. Girls with positive cases, 11 cases show meningitis with complications, 12 cases were of Hypoxic ischemic encephalopathy with one case of infarction, 1 case of duct of sylvius stenosis, 1 case show communicating hydrocephalus (Table 1-2).

Table 1: Demographic information of the patients (n=60)

Variable	No.	%
Gender		
Boy	25	41.6
Girls	35	58.3
CT Scan		
Normal	15	25.0
Abnormal	45	75.0
Abnormal CT		
Boys with abnormal CT	20	33%
Girl with abnormal CT	25	41%

Table 2: Findings in abnormal CT scan

Finding	No.
Meningitis	19
Hypoxic ischemic encephalopathy	23
Hydrocephalus	1
Duct of sylvius stenosis	1
Asymmetry of lateral ventricle	1

DISCUSSION

Cranial ultrasound, magnetic resonance imaging (MRI) and computed tomography (CT) have been used for diagnostic purposes in pediatric population. Each modality has its advantages and disadvantages. For example ultrasound is performed along the bed side of patient who are critically ill but for limited age of pediatric patients. Computed tomography requires patient to be transported to the radiology department. Computed tomography is quick, painless and non-invasive. It is preferred method used for emergency and acute clinical diagnosis. It has proved its advantage in diagnoses of blood and calcification. Magnetic resonance provides excellent anatomical detail without the use of

ionizing radiation but examinations are long and require infant and child to remain still. It may require anesthesia. Magnetic resonance imaging scans are also noninvasive but noisy, take more time and can be associated with Claustrophobia. Magnetic resonance imaging is costly than CT scan but in some special cases where detailed anatomy is required MRI is taken as modality of choice.⁶

As exposure to ionizing radiation and its relative risk is always a reason of debate but quick and easy access to diagnosis makes its worth, taking consideration of ALARA principal and multiple studies conducted for low radiation dose scanning in pediatric patients.⁵

Gaillard et al⁸ conducted a study on pediatric population for evaluation of new onset seizures. It showed that 50% of images were abnormal in patient with local seizure. The study emphasized in the absence of history of localized-related seizures, proper abnormal neurological examination and abnormal EEG, any significant abnormality is not detected.^{7,8}

Another study in which children with non-traumatic head ach were studied show that most of them had no significant intracranial lesion but in small percentage significant life threatening disorder were appreciated. So red flags must be checked before making decision for neuroimaging.⁹⁻¹³

In our study, results showed most cases were positive with findings and it helped in taking appropriate decision for management. All patients were referred for CT scan had history of fits which were preceded by fever. Fever was not given so much attention but Fits were the main cause for referral with which unconsciousness was also another accompanied reason. Major complaints were fits with fever either continuous or on off. Then it was fits with unconsciousness which was also accompanied by fever. In CT scans most common findings were of meningitis followed by hypoxic ischemic encephalopathy than congenital anomaly. History, examination with laboratory reports and then making referral for computed tomography has made the day and maximum positive cases were diagnosed.

CONCLUSION

Easy access and rapid scanning is the main reason for considering the CT scan brain in pediatric patients. It is important that clinical

history, examination while considering red flags and laboratory reports are required to make a proper referral. It will help in diagnosis and unnecessary imaging can be prevented and risk can be minimized.

REFERENCES

1. Malla AK, Mittal C, Lee M, Scholten DJ, Assis L, Norman RM. Computed tomography of the brain morphology of patients with first-episode schizophrenic psychosis. *J Psychiatry Neurosci* 2002;27(5):350-58.
2. Wilden JA, Cohen-Gadol AA. Evaluation of first non-febrile seizures. *Am Fam Physician* 2012;86(4):334-40
3. Haghighi M, Bagheri MH, Rashidi F, Khairandish Z, Sayadi M. Abnormal findings in brain CT scan among children. *J Comp Pediatr* 2014; 5(2): e13761.
4. Pages J, Buis N, Osteaux M. CT doses in children: a multicentre study. *BJR* 2003; 76(911): 803-11.
5. Nievelstein RJA, van Dam IM, van der Molen AJ. Multidetector CT in children: current concepts and dose reduction strategies. *Paediatr Radiol* 2010; 40(10): 1324-44.
6. Strobel AM, Gill VS, Witting MD, Teshome G. Emergent diagnostic testing for pediatric nonfebrile seizures. *Am J Emerg Med* 2015;33(9):1261-4.
7. do Carmo RL, Simão AKA, do Amaral LLF, Inada BSY, Silveira CF. Neuroimaging of emergent and reemergent infections. *Epilepsia* 2009; 50(9): 2147-53.
8. Gaillard WD, Chiron C, Cross JH, Harvey AS, Kuzniecky R, Hertz-Pannier L, et al. Guidelines for imaging infants and children with recent-onset epilepsy. *Epilepsia* 2009; 50(9): 2147-53.
9. Trofimova A, Vey BL, Mullin ME. Imaging of children with nontraumatic headaches. *Am J Roentgenol* 2018;210(1): 8-17.
10. Fink KR, Thapa MM, Ishak GE, Pruthi S. Neuroimaging of pediatric central nervous system cytomegalovirus infection. *Radio Graphics* 2010; 30(7): 1779-96.
11. Sipayya V, Kashikar S. Role of computed tomography scan in evaluating children with seizure. *IJRMS* 2016; 21: 15-8.
12. Gaillard WD. When to order diagnostic imaging for seizures in infants. *Neurol Today* 2010; 10(2): 1-38.
13. McAbee GN, Barasch ES, Kurfist LA. Results of computed tomography in "neurologically normal" children after initial onset of seizures. *Pediatr Neurol* 1989; 5(2): 102-9.