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Audit of CT head request appropriateness for patients referred from emergency department

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ABSTRACT

Introduction: Considering the usefulness and relative ease of Computerized Tomography (CT) based diagnosis, the propensity to request it in the Emergency Room setting when at times it is not really indicated can become an issue.

Objective: To audit use of CT imaging in the emergency department of Rehman Medical Institute by evaluating the clinical practice for CT referral and compliance with clinical guidelines by NICE (National Institute for Health and Care Excellence).

Materials & Methods: This study was conducted at Radiology Department of Rehman Medical institute Peshawar in Oct-Dec 2019 on 100 patients referred for computed tomography (CT) head scans from the emergency department (ED), mostly performed outside normal working hours. Clinical record and CT reports of patients who had their CT head scans done between 1 January 2018 and September 2019 were reviewed. The imaging record of included patients was reproduced from the Picture Archiving and Communication system (PACS) and laboratory data were reviewed through the Hospital Management Information System (HMIS). Clinical details were reviewed to assess risk factors satisfying NICE criteria for a CT scan in those with head injuries. An urgent CT head scan request was deemed appropriate if it led to an immediate change in patient management. Appropriateness of the requests according to the various guidelines was also evaluated. The NICE guideline 176 was used as a standard of care. Data were entered and analyzed using Microsoft Excel.

Results: For suspected brain injuries at least one of the NICE criteria was fulfilled by 84 patients, and 3 or more criteria by 16 patients with a history of head injury; 81% scans were both requested and performed in afternoon and night (between 1700 hrs and 0800 hrs). Most (70) patients were males; ages of patients were from 1- 90 years, most being 51-60 years. Most common presenting complaint was altered consciousness (85%); 51% of the advised CT scans were reported normal, 10% had skull fractures (base 2%, vault 8%), 13% extra-axial hemorrhages, 7% contusions, 7% only scalp hematoma, 6% intracerebral hemorrhages. 2% had infarcts and 2% were cerebral abscesses. Common change in patient management included intracranial bleed requiring urgent neurosurgical intervention and hemorrhagic stroke being ruled out. CT head scans also facilitated early discharge of the patients with head injuries and headache from the hospital.

Conclusion: All (100%) patients had CT head in compliance with NICE guidelines and 81% of these were performed in off hours.

Keywords: Head; Tomography; Craniocerebral Trauma.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Computed Tomography (CT) scan of head is one of the frequently performed investigation when patient presents to emergency department. To date, CT remains essential for detection of intracranial pathologies requiring immediate neurosurgical intervention as well as to determine the road map for patient management e.g. whether requiring in-hospital observation or follow up management.[1] CT head indications include trauma, stroke, transient ischemic attack, sudden loss of consciousness, etc.[2]

The National Institute for Clinical Excellence (NICE) issued guidance on management of head injuries in the UK in June 2003, focusing on increasing indications for CT and suggested replacement of skull radiography for minor head injury.[3] It was a favorable decision as skull radiography in emergency now appears to be of limited or no value. Updated versions of NICE in 2007 (clinical guideline 56) and 2014 (clinical guideline 176) established CT scan as primary imaging modality in minor head injury.

Advantages of CT head include its sensitivity for demonstrating bone injuries, acute hemorrhage, mass effect, ventricular size and their configuration. Also, it offers widespread availability, scanning rapidity, and medical device compatibility.[4] CT scans are now globally performed as the first line of investigations in patients with trauma and stroke. However, a common practice has started to order CT scan even if no clinical indication is present. In such cases, NICE guidelines have a role. Justification of each CT scan to be imaged is required by the referrer as well as the radiology end. For this purpose, different centers have started a justification and protocolling station to filter out those patients in which CT scan is not indicated thus lowering the burden of radiation, wastage of time as well as finances.

This audit was done in the Radiology department of Rehman Medical Institute, Peshawar, on patients referred from the emergency department to check the appropriate use of CT imaging in compliance with guidelines by NICE (National Institute for Health and Care Excellence).

MATERIALS & METHODS

This clinical audit was conducted at Radiology department of Rehman Medical institute Peshawar in October and December 2019 on 100 patients undergoing computed tomography (CT) head scans referred from the Emergency Department (ED) between 1 January 2018 and September 2019, most of the scans having been performed outside normal working hours. Clinical record and CT reports of patients were reviewed who had their CT head scans done. Exclusion criteria involved any non-ED referrals. The imaging record of included patients was reproduced from the Picture Archiving and Communication system (PACS), a computer-based system that stores imaging examinations. Hospital Management Information System (HMIS) was used to review the rest of the laboratory analysis of these patients. Patients' clinical details were reviewed to assess the risk factors satisfying NICE criteria to qualify for a CT scan in those with head injuries. An urgent CT head scan request was deemed appropriate if it led to an immediate change in a patient's management. Appropriateness of the requests according to the various guidelines was also evaluated. The NICE guideline 176 was used as a standard of care. The standard was Referral Adherence to standardized NICE guidelines. The Indicator was scanned imaging request forms during the audit cycle. The Target was 100% concordance with NICE guidelines. All data were entered and analyzed using Microsoft Excel.

MDCT Technique

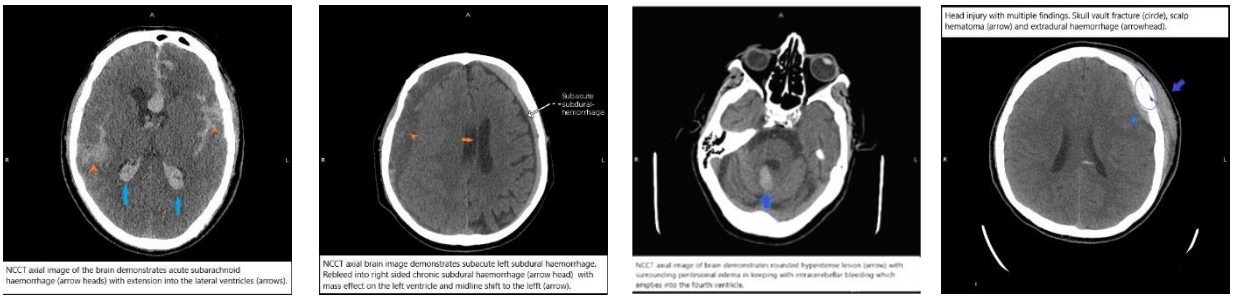
CT scans were performed on GE 16 slice machine and Toshiba 128 slice machine. Whole head including upper cervical spine was included in the scan, to rule out C1-C2 dislocation or fracture. Pediatric patients were sedated. It was a non-contrast scan. In case of follow up for known intracranial disease, previous scans were reviewed.

Post Processing of CT Images

Images were reviewed on state of the art Vitrea workstation. Multiplanar reformation (MPR) was done and volume images assessed. Scans were reported by on-call radiologist and later findings were confirmed by a senior consultant radiologist.

RESULTS

For suspected brain injuries at least one of the NICE criteria was fulfilled by all the 84 patients referred with a history of head injury with 3 or more criteria in 16 patients. 81% scans were both requested and performed in afternoon and night (between 1700 hrs and 0800 hrs). Age range was 1- 90 years with most of the patients in 51-60 years age group. 70 were males and 30 females. Most common presenting complaint was altered consciousness (85%). 51% of the advised CT scans were reported normal, 10% had skull fractures (base 2%, vault 8%), 13% extra-axial hemorrhages, 7% contusions, 7% only scalp hematoma, 6% intracerebral hemorrhages. 2% had infarcts and 2% were cerebral abscesses. Common changes in patient's management included intracranial bleed requiring urgent neurosurgical intervention, and hemorrhagic stroke being ruled out. CT head scans also facilitated early discharge of the patients with head injuries and headache from the hospital.



Figures 1-4: Displaying the various head conditions for which CT scans were requested by Emergency Department.

DISCUSSION

Head injuries account for 15%-20% of deaths in the age group 5-35 years, with more than half caused by motor vehicle accidents.[5] Royal College of Radiology (RCR) guidelines focus on the appropriate use of diagnostic radiology and so reduce the number of clinically unhelpful radiographic examinations.[6] Appropriateness of emergency X-rays has been a topic of discussion in past studies on the basis of cost and effectiveness.[7-9] This audit helped us find out that the Emergency department (ED) consultants were referring patients for CT scans after proper history and physical examinations which is in concordance with the NICE clinical guidelines for the use of CT head following mild head injury. Mild head injury is now defined as a GCS score of 15 without acute radiological abnormalities, whereas high-risk mild head injury is defined as the GCS score of 13 or 14 or a GCS score of 15 with acute radiological abnormalities.[10]

A similar study has been carried out in England at St Peter's Hospital, by Vinod Ravindran, Devesh Sennik and Rod A. Hughes,[11] who assessed the appropriateness of out of hours CT head scans performed. Their study concluded all patients presenting with head injuries had CT head in compliance with the NICE guideline. This is similar to our study in which all patients reviewed in our ED with head injuries also had CT head in compliance with NICE guidelines.

CONCLUSION

We conclude from our study that 100% of our patients had CT head in compliance with NICE guidelines and 81% of these

were performed in off hours. For suspected brain injuries at least one of the NICE criteria was fulfilled by all the 84 patients referred with a history of head injury with 3 or more criteria in 16 patients.

RECOMMENDATION

Having guidelines in place in the ED and adopting CT imaging as an initial screening modality following injury may reduce time to definitive care and improve resource implications.

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