Research Article

Diagnostic Utility of Conventional Radiography in Traumatic Skull Injury

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Abstract

This study was aimed to evaluate specific anatomical structures in patients who have sustained a traumatic brain injury and also to compare CT to x-ray in diagnosing brain injury. It was a cross sectional study, conducted at Mayo Hospital, from February to May 2017. A total of 65 patients were included in this study. CT was used as gold standard measure for evaluation of close head injuries. The most common trauma, which was found in this study, was motor vehicle 23(43.1%) and back of head was the most affected area 24(36.9%). Close head injury was found in 33(58.5%) patients. The sensitivity of skull radiography was 78.85%, whereas specificity was 76.92%. Other related risk factors were seen in trauma patients like double vision 28(43.1%), dizziness 59(90.3%), loss of balance 36(55.4%), loss of memory 4(6.2%), headache 58(89.2%), vomiting 21(32.3), and blurred vision 22(33.8%). The identification of fracture on the cranium suggests a significant brain and /or meningeal damage visible on a standardized x-ray film of skull bone. It is recommended that if CT scan is available, the victim of head injury must not have his rontgenogram done since it will give excessive radiations along with unnecessary interruption in reaching the actual diagnosis. However the choice of ideal tool used for the diagnosis for cranial wound is made on the basis of damage on the skull, if the damage is gigantic brain CT is the choice of investigation otherwise x-ray films can also be considered for some minimal problem.

Keywords: Computed Tomography (CT), X-Ray, Traumatic Brain Injury (TBI).

Introduction

Traumatic brain destruction is one of the most important reasons of mortality and morbidity in the developing and developed world alike causing almost half of the victims a permanent disability. Radiology plays a pivotal role in determining the magnitude of actual degree of damage caused by the accident and is quite handy in dealing with acute damages. However it is very important to identify the crucial pathogenesis associated with the trauma and the deprived consequences that occur after the head injury in the long run[1].

Injuries to brain, meninges, dura meter and skull bone remain are huge chunk of hospitalization after road traffic accidents and other unfortunate circumstances. These are the most cumbersome injuries responsible for deaths and disabilities[1,2]. Now with the advent of high tech apparatus in the field of diagnostic imaging and radiology, CT scans i.e. computed tomography is considered as a baseline investigation especially in cases of accidents and head trauma. It is a highly reliable tool with precise results provided within a limited period of time that can identify from minute fractures to brain bleeds[2].

The objective of this study is to determine the utility of both conventional skull X-ray for detection of skull fractures and taking CT head as gold standard.

Material And Methods

It is a cross sectional study, conducted at the radiology department of Mayo Hospital from Feb 2017 till May 2017. 65 patients of either gender who presented to emergency department with closed head injury were included in this study. Those patients who had open head injuries or require immediate surgical manipulations were not included in this study. Extensive physical examination of the injury site was taken before going to the radiology department. X-ray AP and the lateral view was done with Philips x-ray machine. CT head was done with Toshiba Machine CT.

Scanner(TSX 002A), Data was collected for the presence of a fracture and its exact anatomic location. CT was used as a gold standard measure for evaluation of closed head injuries[2].

Results

In this study. 46(70.8%) were males and 19(29.2%) were females (Table 1). The mean age of the patient was 30.74 years with a range from 17 to 56 years. Variable causes of head trauma were noted, most common cause was motor vehicle accident and falling from height and other causes summarised in (Table 2). The most common site of trauma was back of head, however all other locations that were involved are described in (Table 3). Patient complains were double vision 23(43. 1%), dizziness 59(90.3%), loss of balance 36(55.4%), loss of memory 4(6.2%), headache 58(89.2%), vomiting 21(32.3), and blurred vision 22(33.8%).

Out of 65 cases, 52 patients had a skull fracture on CT. Skull X-ray showed fracture in 41 cases, pseudo fractures were visible in 3 cases. 11 cases showed fracture on CT scan only. The sensitivity of skull radiography was found to be 73.35% and specificity was 76.92 %.

Table 1: Gender Distribution

Gender	Frequency	%age
Male	46	70.8
Female	19	29.2

Table 2: Causes of traumatic head injury

Causes of injury	Frequency	%age
Motor Vehicle	28	43.1
Blow to head	6	9.2
Drug Abuse	1	1.5
Stroke	5	7.7
Industrial Accident	1	1.5
Poison /Toxic substance	2	3.1
Hemorrhage	1	1.5
Fall	21	32.3

Table 3: Location of the injury

Site of injury	Frequency	%age
Forehead	14	21.5
Right-side	11	16.9
Left-side	5	7.7
Back of head	24	36.9
Top of head	7	10.8
Face	4	6.2

Discussion

The routine skull radiographic examination cannot detect minute hair line fracture of the cranium. The direction, size and spatial orientation of a fracture determines its visibility on a plain x-ray film. Fractures at skull bone of temporal region as well as sphenoid bone fractures are usually missed on radiography. Now X-ray is considered obsolete for the diagnosis of skull fractures[3,4]. CT scan is the investigation of choice for skull injury with sensitivity up to 93% with features like bone window and 3D reconstruction. For this reason it is more precise than conventional radiographs especially in identifying skull fractures causing depression in the cranial cavity[5].

In our study radiography missed 11 fractures. 56% of those fractures were at temporal bone, 20% at sphenoid bone and 24% in other bones. 3 fractures were misinterpreted as a fracture on radiography. Radiography was clearly showing fractures in 41 cases 82% in temporal bone, 12% in occipital bone and 6% in frontal bone. Many studies showed that radiographs are less accurate in detecting skull fracture, in a study conducted by Goel et al showed that autopsies have more fractures as much as 63.6% as compared to the x-rays performed while alive[6]. Another study also conducted by Hiruppathy et al also stated the supremacy of CT over plain radiographs[7]. According to Pfeifer & Pape, wrong interpretation of bony breaches is the most significant factor in false negative X-ray films in 15-34.9% of the cases. Naïve practioners (26.5%), measurement problems(33.3—60.5%) and different analytical difficulties are also important attributes in causing missed diagnosis of fractures on X-ray films. Traces of veins and arteries can cause hindrance in identifying fractures[8,9]. Skull base fractures are one of the most serious traumatic head injury which is almost missed to be diagnosed in radiography. Elrahim et al showed in their work that 1.3% linear along with 5.1% depressed fractures were unrecognized on X-rays. Also X-rays were unable to capture the breaches present at the base of cranium which were evident on CT scan among 12 patients. In most cases of severe traumatic head injury, there is usually intracranial hemorrhage associated with it[10,11]. CT head with bone algorithm have high accuracy in diagnosing, staging and preoperative planning of head injury. Yousfani et al study on 100 cases concluded that CT scan had superior performance in grading of damage to cranium as compared to roentgenograms. These X-ray films were unable to identify 21 brain damaging fractures[12,13]. CT scan is the investigation of choice when it comes to correctly detect the

problem, grading it and instituting accurate management options timely. It is a very useful, time and cost-effective modality[14].

Conclusion

The identification of fracture on the cranium suggests a significant brain and /or meningeal damage visible on a standardized X-ray film of skull bone. It is recommended that if CT scan is available, the victim of head injury must not have his roentgenogram done since it will give excessive radiations along with unnecessary interruption in reaching the actual diagnosis. However the choice of ideal tool used for the diagnosis for cranial wound is made on the basis of damage on the skull, if the damage is gigantic brain CT is the choice of investigation otherwise X-ray films will be enough for some minimal problem.

Limitations

The sample size of this study is quite small and is of the drawback of this study.

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