SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 5.
Issue: 2.
Page N. 226-230
Year: 2021

Original Article www.wjahr.com

ROLE OF COMPUTERIZED TOMOGRAPHY (CT) MODALITY IN EVALUATING HEAD INJURY

Saad Abdulrazzak Hamdan*[1], Zeena Abdulkader Tapou[2], Nehad kasim[1] and Muataz Alani[3]

[1]M.B.Ch.B D.M.R.D Alkhansaa Teaching Hospital Department of Radiology.
[2]M.B. Ch. B. Msc College Of Medicine University of Mosul.
[3]Consultant Pediatric Surgeon Alkhansaa Teaching Hospital.

Received date: 13 February 2021 **Revised date:** 03 March 2021 **Accepted date:** 23 March 2021

***Corresponding author: Saad Abdulrazzak Hamdan**

M.B.Ch.B D.M.R.D Alkhansaa Teaching Hospital Department of Radiology.

ABSTRACT

Objective: This study is done to evaluate the CT findings in patients attended to the emergency department with head injury and to find out the common findings. **Setting:** It is carried out in alkhansaa teaching hospital - Mosul from Feb.2017 to April 2020. **Participants**: It is a prospective study of 400 patients whose ages range from 4 months -72 years. **Subjective:** Four hundrand patients were admitted to Emergency department, presented with head injury and examined by CT scanner within one week from the onset of trauma to evaluate the common CT findings in them. **Method:** Spiral CT used was Siemens somatom plus 4, using bone and brain window, sedation used for children under 6 years, no contrast was used. **Result:** The peak frequency of head injury was in the age range between 0-10 years of 150 patients (37.5%) and less frequent in older age groups . 233 were males (73.25%) and 167 were females (26.75%), M:F ratio was 2.8:1.Fall from height was the commonest cause of head injury64 patients (32.25%),Road traffic accidents 32 patients(14.7%), Bullet injury 35 patients (8.7%) shell injury 24 patients (6.2%), assault patients 4(2.5%). Normal CT was seen in 172 patients (43%) and abnormal CT findings were seen in 228 patients (57%), the most common abnormal CT findings were skull fracture 167 patients (41.7%),cerebral edema{pure 12 patients patients(3%), associated with other CT findings 63 patients (15.6%) total75}, contusion 66 patients (16.5%), sub arachnoid hematoma 40 patients(10%), it is important to mention that one patient may harboring more than one feature. The most common type of skull fracture was linear 107 patients (64%). Skull fracture was most commonly seen in association with cerebral edema 42 patients, then contusion 41 patients, sub arachnoid hemrrhage 32 patients, sub dural hematoma11patients . **Conclusion:** Skull fracture remains the commonest CT finding and cerebral edema is the most common intracranial findings because young children suffer greater damage from deffuse injury than older age groups while epidural hematoma is the least common intracranial hematoma. So CT remains the best modality of evaluating patients with head injury because it can show skull fracture with or without intracranial damage and every patient with history of head injury should have CT examination.

KEYWORDS: Head injury, CT, Skull fracture, Intracranial hematoma.

INTRODUCTION

An intracranial hematoma occurs when a blood vessel is torn between the skull and the brain then blood leaks leading to the collection of the hematoma.[1]

According to recent statistics from the United States (annually):1000000 (72.5%) are treated and released from hospital emergency unit with intracranial hematoma and 70000 (5.1%) are died.[2] Falling down is the most common cause of head injury, road traffic accidents and then missile injury.[3] Meninges which are three layers, Dura mater is a tough membrane described as having two layers: the outer is, in fact, the periostium of the inner table of skull; the inner is the dura matter proper. Arachnoid membrane is a delicate membrane which is impermeable to CSF separated from the dura by thin layer of lymph in subdural space and separates from pia mater by the subarachnoid space which contains CSF; the arachnoid project into inter-hemispheric fissure and sylvian fissure but does not dip into the sulci. Pia mater is closely adherent to the surface and dips into all the sulci.[1,4,5]

CT is the method of choice for the evaluation of head injury including intra cranial hematoma and fracture; it

has a huge impact for the treatment of traumatic head injury and it is rapid non-invasive technique.[6,7,8]

A fracture of bone occurs when there is a break in the continuity of bone; either closed if the bone fragments are covered with skin or open when something pierces the skull such as a bullet. Skull fracture can be vault or basal fractures and vault fractures either linear, stellate or depressed type.[2,5,9,10]

The epidural hematoma occurs when there is a tear in a vascular structure, usually arterial. The middle meningeal artery is most commonly injured, while dural arteries or dural veins are less commonly affected.

CT findings: biconvex shape, high density area generally does not cross mid line. Around 75% are associated with skull fracture usually passing through middle meningeal vessels.[5,6,7,8]

The subdural hematoma occurs when there is injury in the cortical bridging veins. CT findings: crescentic high density area extends freely along the convexity. Typically it is not an isolated finding, it is associated with other kinds of brain injury.[5,8,9]

The subarachnoid hemorrhage occurs when there is laceration of pial vessels The blood is commonly seen in bassilar cistern sulci supra sellar cistern, falx and tentorium.[6,9]

The intraventricular hemorrhage which was most commonly due to rapture of subependymal veins. Blood is most commonly seen in lateral ventricle, and if it is in a small amount, it will gravitate in occipital horns as fluid level, it is usually associated with subarachnoid hemorrhage.[5,6,8]

While Contusion are of two types and may be detected by CT. Hemorrhagic contusion appears as mixed density lesion (high and low density) with mass effect, and non hemorrhagic type appears as low density area which is also with mass effect.

Brain edema or swelling appears as low-density area with mass effect Head injury may show brain edema only or are associated with intracerebral hematoma or contusion.[6,9]

This study is aimed to evaluate the CT findings in patients attended to the emergency department with head injury and to find out the common CT findings

PATIENTS AND METHODS

A prospective study of 400 patients, whose age ranges from 4 months - 72 years old, was carried out at Al khanssa general hospital in Mosul between Feb.2017 to April 2020, CT scanning taken in the first weak from the time of traumatic head injury.

Spiral CT scanner used was Siemens somatom plus 4; which is a sophisticated X-ray machine linked to a computer to produce detailed images of the head The patient lies on a movable table that is guided into X-ray generating device that looks like an enormous doughnut shape that rotates around the body where the images are taken, they can be viewed on a monitor or reproduced as phtographes, it is painless and takes minutes only.[2,6,9,11]

Sedation was used for children under 6 years old:
Diazepam i.v dose 0.2-0.3 mg / kg , per rectal dose 5 mg, or i.m Chloral hydrate in a dose of 5 mg / kg i.v.

RESULT

All patients were examined with bone and brain window.

Few patients were examined with skull X-ray AP and Lateral view.

CT was performed on 400 patients with a history of head injury and presented with loss of consciousness, headache, confusion, dizziness, blurred vision, ringing in ears, fatigue, change in behavior and sleep pattern, memory troubles, nausea, vomiting, seizures and agitation.

The highest frequency of patients presented with history of head injury was seen in the age range between 0-10 years 150 patients (37.5%) followed by the age range 21-30 years 84 patients (21%) then 11-20 yeras 69 patients (17.25%), 31-40 years 48 patients (12%), 41-50 years 35 patients (8.75%), 51-60 years 10 patients (2.5%), 61-70 years 3 patients (0.75%) and only one patient in 71-80 years age group (0.25%), as shown in Table :1.

Table :1 . The Age Distribution of the Patients :

Age (years)	No. of patients	%
0-10	150	37.5
11-20	69	17.25
21-30	84	21
31-40	48	12
41-50	35	8.75
51-60	10	2.5
61-70	3	0.75
71-80	1	0.25
Total	400	100

Out of 400 patients who had CT scanning, there were 233 males (73.25%) and 167 females (26.75%), so Male: female ratio was 2.8:1

Fall from height (FFH) was the most common cause of head injury, It was seen in 129 patients (32.25%) with 64 patients who had abnormal CT and 65 patients who had normal CT scanning, followed by road traffic accidents (RTA) as the 2nd cause was seen in 59 patients (14.75%) with 32 patients who showed abnormal CT and 27 patients who showed normal CT, then bullet injury which was seen in 35 patients (15.53%) with all patients with abnormal CT, shell injury was seen in 25 patients (6.25%)with 24 patients who show abnormal CT and only one patient showing normal CT, assault injury was seen in 10 patients (2.5%) with 4 patients showing abnormal CT and 6 patients showing normal CT.

Undetermined causes were seen in 142 patients (35.5%) with 69 patients showing abnormal CT and 73 showing normal CT scnning. The total number of patients with normal CT were 172 patients (43%) and of those with abnormal CT findings was 228 patients (57%), Abnormal CT findings according to their frequency where as follows: skull fracture 167 patients, cerebral edema 75 patients (pure 12 (3%), associated 63),contusion 66 patients (16.5%), sub arachnoid hemorrhage 40 patients, subdural hematoma 18 patients, sinus hematoma 18 patients, intracranial shell 15 patients, intraventricular hematoma, intra cerebral hematoma and pneumocephallus all had the same results 12 patients, epidural hematoma 10 patients extra cranial shell 6 patients, intra cerebellar hematoma 3 patients, communicating hydrocephallus 2 patients, orbital hematoma was seen in one patient only

It is important to mention that one patient might have harbored more than one CT finding Out of 167 patients who had skull fracture, linear type was the most commonest seen in 107 patients (64%), then bone loss 28 patients (16.7%), depressed 16 patients (9.5%), comminuted 16 patients (9.5%)

Skull fracture was most commonly associated with cerebral edema. The total number was 42 patients (pure edema 9: linear 5, deprressed 2, comminuted 1, bone loss 1; associated edema 33: linear 17, bone loss 7, comminuted 6, depressed 3). Cerebral contusion was seen in 41 patients (linear 14, bone loss13, comminuted 8, depressed 6), while subarachnoid hemorrhage was seen in 32 patients (linear 19, comminuted 5, bone loss Subgaleal hematoma was seen in 19 patients (linear 15, depressed 2, comminuted 1, bone loss 1); subdural hematoma was seen in 11 patients (linear 10, comminuted 1); pneumocephallus was seen in 11patients (linear 5, bone loss 4, comminuted 2) epidural hematoma was seen in 8 patients (linear 6, bone loss 2), intraventricular hematoma was in 8 patients (linear 3,bone loss 3, comminuted 2); intra parenchymal hematoma was seen in 8 patients (linear 3, bone loss 3, comminuted 2), communicating hydrocephallus was seen in 2 patients linear 2).

It is also important to mention that one patient might have harbored more than one feature. Skull fracture was most commonly seen in parietal bone 74 patients (35.2%), frontal bone 60 patients (28.5%), occipital bone 33 patients (15.7%), temporal bone 18 patients (8.5%) and basal bone 6 patients (2.8%); Contusion was most commonly seen in parietal lobe 44 patients (41.7%), frontal lobe 34 patients (31.7%), occipital lobe 15 patients (14%) and temporal lobe 14 patients (13%). Subdural hematoma was most commonly seen in parietal area 11 patients (55%), frontal area 4 patients (20%),occipital area 3 patients(15%)and temporal area 2 patients (10%); Intraparenchymal hematoma was most commonly seen in parietal lobe 9 patients (64.2%), occipital lobe 4 patients (28.5%) and frontal lobe only one patient(7.1%); Epidural hematoma was most commonly seen in parietal area 3 patients(50%), frontal area 2 patients(33.3%) and occipital area only one patient(16.6%).

DISCUSSION

Head injury is any injury that causes focal or diffuse damage of cranium, meninges and brain. It is a common event and a major world health problem. It is the leading cause of death in children and young adults. In general survivors of traumatic brain injury are often left with significant cognitive, behavoiral and communicative disabilities or long-term medical complications such as epilepsy.[2,12,13] Regarding the age of patients, Alissa A. study[3] stated that about 50% of patient had head injury were between 16-65 years.

While In our study, the highest frequency of patients presented with history of head injury was seen in the age range between 0-10 years: 150 patients (37.5%) Suresh HS, et al. study.[15] explains that the age as a prognosticating factor has been the subject of controversy. Pliability of immature skull of new born babies make the brain more vulnerable to injury due to the lack of adequate sub arachnoid space reduces the buffering capacity for external impact, young children suffer greater damage from diffuse injury than older age groups but immature brain appears to tolerate anoxia and hypoxia better than adults. On other hand as myelin increases the plasticity of brain decreases, which explain why head injury is higher in the 1st ten years.

Regarding the gender distribution Abu Judeh HH. study that male: female ratio was 2:1.In our study,it is more common in male than female and a M:F ratio was 2.8:1, which is similar to previous author .Regarding the causes of head injury, Alissa A.[3] stated that Fall from height was the most common cause of head injury seen in (71.61%) and .In our study Fall from height was also the most common cause of head injury seen in (32.25%). which is similar to the previous author. Levitt M.[16] Show that Road traffic accidents was the 2nd cause of

head injury seen in (23.3%), and in our study it is the 2nd cause of head injury as seen in (14.75%). which is nearly similar to the previous author.

Bordignon KC.[13] raised the possibility of socioeconomic status as an important factor related to head injury between different communities represented by our city, Irbid and Muscat and also related to abnormal circumstances of our city. Concerning the disribution of CT findings of patients presented with head injury, Bordignon KC.[13] states that 1482 patients (74%) were presented with normal CT and 518(25.9%) out of 2000 were presented with abnormal CT findings. In our study, abnormal CT findings is found in 228 patients(57%) while normal CT is found in 172 patients (43%)as shown in table:4., which is dissimilar to previous author This is may be due to the violent circumstances in our locality. Mandera M. 2000 study.[17] states that 103 of 166 total patients showed skull fracture (62%). In our study skull fracture is also the most common CT finding seen in 167 patients (41.7%). which is similar to the previous author. Regarding the types of skull fracture in Alissa`s study, the linear type 75 patients (84%) was the most common type, then the depressed type 14 patients (15%), and can be correlated to the causes of head injury. In our study the most common type of Skull fracture was the linear type 107 patients (64%), then bone loss 28 patients (16.7%), depressed 16 patients (9.5%), which is nearly similar to previous author. Sousa A, et al. Shows that only 6 patients had brain swelling Suresh HS, Et al.[14] show that brain swelling was approximatly in 50% of children with severe head injury and Cerebral edema was the most common intra-cranial finding in our study where pure edema is seen in 12 patients (3%) while 63 patients (15.6%) are associated with other findings, which are dissimilar to former author and nearly similar to the 2nd author.

The outcome is significantly better in children as compared to patients with operable mass lesion. Edema develop in children because of the lack of CSF available for displacement So in children will suffer greater damage from diffuse injury than older age group and in our study, children less than 10 years had higher numbers than other age groups.[13,14]

Bodingnon KC and Alissa A. states that contusion is seen in 23 patients (12.9%) 35 patients (25%) Respectively, and in our study cerebral contusion is the 2nd most common finding seen in 66 patients (16.5%). which are nearly similar to the previous authors. Novack T. explains that brain tissue is soft and therefore can be compressed, pulled, stretched. With a localized injury, there can be contusions to the brain in a particular area.

When there is acceleration deceleration force the brain srtikes the inside of the skull hitting the back and the front of the skull causing bruising of the brain Sousa J, et al. and Bodingnon KC. show that subarachnoid hemorrhage was seen in 14 patients (8.4%), 34 patients (7%) respectively, while in Boto GR, et al.[19] show that it is seen in 16 patients (43%) such higher reading is due the fact that they are selected cases of 1526 patients study and traumatic subarachnoid hemorrhage (SAH) was seen in 40 patients(10%) in our study. which is much higher than the previous authors .Suresh HS, et al.[14] states that 34 patients(10%) had Subdural hematoma, while in our study the subdural hematoma (SDH) is the 2nd most common intracranial hematoma seen in 18 paients(4.5%). which is lower than the previous author. This can be explained as subdural hematoma is six times more often in infants than toddlers and outcome is worse due to underlying associated brain damage.[15] Alissa A. state that extradural hematoma was seen in 46 patients (32%), while the epidural hematoma (EDH) in our study is seen in 10 patients(2.5%). which is far similar to the previous author because extradural hematoma is significantly less common in children than adults and where the peak of age in our study is in the 1st decade. This will explains the lower readings in our study. Sutton D.[9] states that extradural hematoma was common in fronto-parietal area ,while the epidural hematoma in our study was most commonly seen in parietal area 3 patients (50%), frontal area 2 patients (33.3%). which is similar to the previous author. Sutton D. shows that Subdural hematoama was common in fronto-parietal area while the subdural hematoma in our study is most commonly seen in parietal area 11 patients (55%), frontal area 4 patients (20%), as shown in Table:7. which is similar to the previous author.

Novack T. states that contusion was most commonly seen in temporal and frontal area while in our study the Contusion is most common in parietal lobe 44 patients (41%), frontal lobe 34 patients (31.7%) as shown in Table: 7 which is not similar to the previous author. They explain that when acceleration–deceleration hit the head back and front causing contusion and because of the way that the temporal and frontal lobes fit in the skull, these are the area most commonly contused.

CONCLUSION

Skull fracture remains the commonest CT findings seen either in isolation or associated with most commonly cerebral edema, contusion and subarachnoid hemorrhage.

Cerebral edema is the most common intracranial finding (dissimilar to other authers) because young children suffer greater damage from diffuse injury than older age, followed by contusion, sub arachnoid hemorrhage.

Epidural hematoma is the least common intracranial finding (dissimilar .to other authors).

CT remains the best modality of evaluating patients with acute head injury. It is quick, easy and noninvasive. It is the method of choice of examining a patient with skull fracture with or without intracranial damage including

edema and contusion and hematomas Every patient with history of head injury should have CT examination.

REFERENCES

1. Ryan SP, McNicholas MM. Anatomy for diagnostic imaging, 2nd edition chapter 2 The central nervous system Harcout publishers Edinburgh, 2000; 68-69.
2. Bethesda MD. Traumatic brain injury. Nucleus medical art, 2003; 20: 1-3.
3. Alissa A. Radiological finding in patients who attended the emergency department with head injury The middle east journal of emergency medicine, 2003; 3(1): 1-4.
4. Dalley AF, Gloud DJ. Layers of Scalp and Meninges. Dynamic Human Anatomy, 2005; 2: 13.
5. Cihangiroglu, Multo Ransey, Ruth G. Dohramann ,George J. Brain injury :Analysis of imaging modalities. Proquest .com, 2002; 24: 7-18.
6. Cihangiroglu, Multo Ransey, Ruth G. Dohramann George J. Brain injury Analysis of imaging modalities. Proquest.com, 2002; 24: 7-18.
7. Fearnside MR, Zimmerman RA Greenberg J ,Marshall LF Toutant S, Cordobes F, et al Radiology for traumatic brain injury. Trauma .org, 2000; 5: 1.
8. Kelly AB, Zimmerman RD, Snow RB, Gandy SE, Heier LA , Deck MD. Head trauma camparisim of MR and CT – experience in 100 patients. American Journal of Neuroradiology, 2005; 9: 699-708.
9. Sutton D, Young JW, Miszkiel K, Stevens J. Text book of Radiology and imaging 7th edition Chapter 43 Young JW. Skeletal Trauma General Considration, Chapter 53 Suttan D. The Skull, Chapter 58 Suttan D, Kendall B, Stevens J. Intra Cranial Lesions Elsevier limited London, 2005; 1371-1641-1778-1781.
10. Dawodu ST. Traumatic brain injury, definition, epidemiology and pathophysiology. Emergency Medicine, 2005; 15: 9.
11. Ellisa TS Vezinaa LG Donahue DJ. Acute identification of cranial burst fracture: comparisim between CT and MRI findings. American Journal of Neuroradiology, 2000; 21: 795-801.
12. Hofman PA ,Nelman P , Kemerink GJ, Wilmink JT. Value of radiological diagnosis of skull fracture in the management of mild head injury .Journal of Neurology-Neurosurgery-psychiatry, 2000; 68(4): 416-22.
13. Bordignon KC, Arruda WO. CT findings in mild head trauma. Arquivos de Neuro-psiquiatria, 2002; 60: 2-3-7-10.
14. Suresh HS, Praharaj S, Indira DB, Shukla D, Sastry KR Prognosis in children with head injury. Neurology india, 2000; 51: 16-18.
15. Abu Judeh HH, Parker R, Aleksic S, Singh M, Naddaf S, Atay S, et al. SPECT brain perfusion findings in mild or moderate traumatic brain injury. Alasbimn journal, 2000; 2(6): 4.
16. Levitt MA .CT scanning in head truma patients .Academic Emergency Medicine, 2002; 9(5): 491.
17. Mandera M Wencel T Bazowski P, Krauze. How should manage children after mild head injury Childs-nervous –system, 2000; 16(3): 156-60.
18. Sousa J, Sharma R., Pawar SJ, Mahapatra SD, Lad SD. Long term outcome in patients with sever head injury and bilateral fixed dilated pupils. Neurology India Bioline international, 2002; 50(4): 430-435.
19. Boto GR, Lobato RD, Rivas JJ, Gomaz PA Dela A, Lagares A. Basal ganglia hematoams in severly head injured patients. Journal of neurosurgery, 2001; 94(2): 224-32.
20. Atzema C, Mower WR, Hoffman JR Killian AJ, Wolfson AB. Prvelance and prognosis of traumatic intraventricular hemmorrhage in patients with blunt head trauma Public.