Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 948 – 952
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4263

Role of Multi-Detector Computed Tomography in Evaluating Traumatic Brain Injuries in Taif City, Kingdom of Saudi Arabia

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Abstract

Traumatic brain injury (TBI) represents a major percentage of admissions to hospital due to frequent trauma to this region and is considered a life-threatening situation because of that, MDCT is necessary to provide rapid diagnosis and best management that leads to successful treatment. Multi-detector Computed Tomography (MDCT) has a critical and significant rule for early evaluation and patient triage. This study aimed to evaluate the findings that occur due to head injuries using MDCT. An analytical retrospective study of 200 patients with head injuries were examined by CT, the study extended from January 2024 to September 2024. 128 slice CT systems (Siemens Medical system) were applied to investigate patients with head trauma at King Abdul-Aziz Specialist Hospital (KAASH) in Ta'if City, Saudi Arabia. Results: A total of 200 head trauma 136 (68%) males and 64 (32%) females, were examined via head CT and presented with various types of trauma. The findings have noticed that brain injuries were significantly higher in the male population (68%) than in the female population (32%). Based on age groups, the incidence percentage of TBI was 34%, occurring in the age group 18-27 years. The most common cause of injury in patients presenting with head trauma was road traffic accidents, comprising 63% of cases. The isolated skull fracture was most frequently seen 35% of cases. Our study reveals that Subdural hematoma (52%) was the most frequent lesion noted in traumatic patients, Non-enhanced computed tomography (NECT) is considered the gold standard and the most informative diagnostic modality in the evaluation of Traumatic brain injuries and it is essentially to triage patients to observation, surgical, or medical management.

Keywords: *Traumatic Brain Injury (Tbi), Trauma, Rta, Mdct, Fractures, Head Injury.*

Introduction

Multi-detector Computed Tomography (MDCT) is a crucial modality that provides detailed and accurate information regarding normal and abnormal that may occur in the human being which help in the diagnostic field and guide the physician team to plan and decide the best patient's treatment in a fast and easy way. MDCT is considered a significant and proper modality that is used in the case of a traumatic patient because of less time it takes to scan the patient especially those who are considered as lifesaving.

In head injury, Computed Tomography is the single most informative diagnostic modality in the evaluation of head trauma. Besides facilitating rapid implementation, it can demonstrate significant primary traumatic injuries. Additionally, the Contribution of CT is crucial to complete injury assessment

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and forms the basis of patient management [1]. Early recognition of treatable injuries is critical to reduce mortality and CT of the head is the keystone for rapid diagnosis [2]. Traumatic brain injury (TBI) represents a major percentage of admissions to hospital due to frequent trauma to this region and is considered a life-threatening situation because of that, MDCT is necessary to provide rapid diagnosis and best management that leads to successful treatment [3].

Road traffic accident One of the common causes that lead to brain injury which has been reported by the World Health Organization (WHO) that road traffic crashes make up to 25% of all injuries and is one of the major contributors to mortality and morbidity, accounting for more than 1.27 million deaths internationally [4,5]. In the Kingdom of Saudi Arabia (KSA), RTAs contribute to 81% of deaths of hospitalized patients [8]. Furthermore, a study revealed that brain injuries account for 30% of all injuries, contributing to 26% of deaths in KSA [6]. Currently, MDCT is the optimal procedure over MRI because it is faster and more readily available and it more easily accommodates emergency equipment and can easily enable the recognition of blood during the acute period [7]. Head CT is a significant method to assess the extent of cerebral injury and it is an essentially aid to triage patients to observation, surgical, or medical management. Furthermore, MDCT reveals the pattern and severity of structural brain damage after head injury. For this, the study intended to evaluate TBI by using MDCT in Ta'if City, KSA, and determine the common causes of these traumas.

General Objectives

• Determine the role of Multi-Detector Computed Tomography in evaluating traumatic brain injuries.

• Determine the common causes that led to traumatic brain injuries.

Specific Objectives

• Determine and identify the commonest hemorrhage.

• To identify the most affected age group and gender.

Material and Methods

A retrospective analytical study was conducted on 200 Patients suffering from head injury including both genders (male and female) with their ages ranging from 18 to 67 years old. All these patients were examined by 128 slice CT systems (Siemens Medical System) MDCT head in the radiology department of King Abdul-Aziz Specialist Hospital (KAASH) in Taif city, KSA. The duration of this study is from 1 January 2024 to 30 September 2024. The protocol of the CT examination was started by AP and lateral tomogram from vertex down to skull base for the planning of the area of the exam. And the scan covered all the areas of the injury. The data was analyzed professionally by using excel version 16 program and statistical program, Statistical Package for the Social Sciences (SPSS) version 23 and presented in the form of a table and appropriate graphs.

Inclusion Criteria

- Trauma patients with brain injuries.
- The patient's age ranges from 18 years to 67 years old.
- Demographic features include (age and gender).

Exclusion Criteria

- Normal patients and patients with a history of trauma or who had an operation before.

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- Patients who are unstable and require emergency treatment.
- Enhanced image with contrast media.

Result

This section offers the result of a retrospective study conducted in KAASH hospital in Taif City, KSA, on a total of 200 patients that referred to the radiology department for traumatic brain injury and requested do CT brain between 1 January 2024 to 30 September 2024. Our study reveals that brain injuries were significantly higher in the male population (68%) than in the female population (32%). Based on age groups, the incidence percentage of TBI was 34%, 17%, 16%, 22.5% and 9.5% for age ranges 18-27 years, 28-37 years, 38-47 years, 48-57years and 58-67 years, respectively with a mean age of 40. (See Table 1)

Table 1 Distribution of the study sample according to gender and age

Variable	Frequency	Percent %
Gender		
Male	136	68 %
Female	64	32 %
Age range (years)		
18-27 y	70	34 %
28-37 y	34	17 %
38-47 y	32	16 %
48-57y	45	22.5 %
58-67y	19	9.5 %
Mean age	40	20 %
Standard deviation (SD)	± 17	

According to statistical analysis, RTA was found to be the frequent mode of head injury with an incidence of 126 (63%) followed by other modes of injury such as falls with an incidence of 36 patients (18%), assaults 26 (13%) and miscellaneous 12 patients (6%). (See Table 2)

Table 2 Incidence of different modes of injury

Type of Injury	No. of Cases	Percentage
RTA	126	63 %
Fall down	36	18 %
Assault	26	13 %
Other	12	6 %

Distribution of the study sample according to the Association of Fractures in patients of traumatic head injury demonstrates 70 isolated skull fractures, 62 linear, 47 depressed fractures and 54 fractures associated with Pneumocephalus. (See Figure 1)

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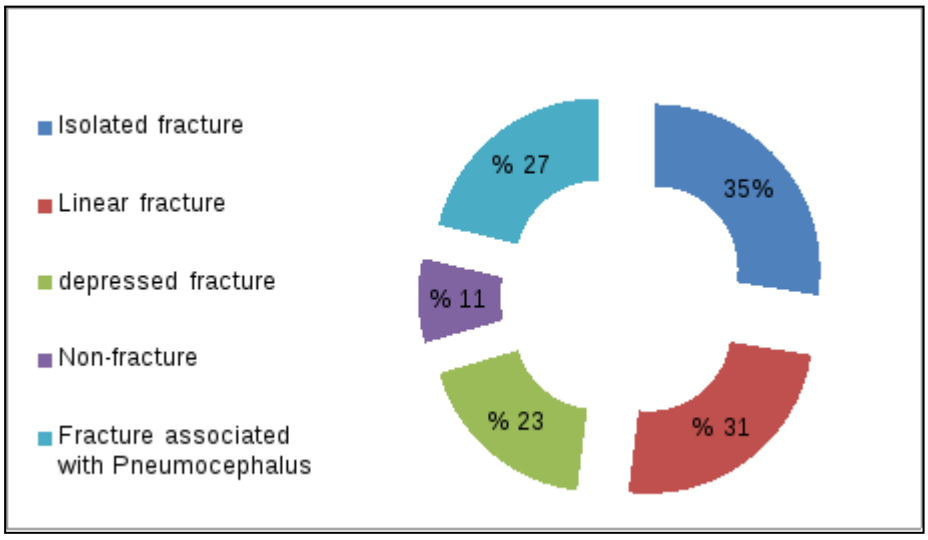

Figure 1 Distribution of the study sample according to the association of fractures in patients of traumatic head injury

According to the present study, subdural hematoma (52%) was the most common lesion noted in traumatic patients, followed by subarachnoid hemorrhage (32%). Epidural hemorrhage (8.5%) was the least common lesion noted in these patients. (See Table 2)

Table 3 Incidence of various hemorrhages in patients

Type of hemorrhages	No. of Cases	Percentage
Epidural hematoma	17	8.5 %
Intracerebral hematoma	39	19.5 %
Intraventricular hematoma	26	13 %
Subdural hematoma	104	52 %
Subarachnoid hemorrhage	64	32 %

Discussion

Traumatic brain injury (TBI) represents a major percentage of admissions to hospital due to frequent trauma to this region and is considered a life-threatening situation because of that, MDCT is necessary to provide rapid diagnosis and best management that leads to successful treatment [3]. Moreover, MDCT plays a significant role in the Diagnosis and management of TBI subsequently patient outcomes will improve add to that it's the optimum tool for fast and accurate revealing of hemorrhage in the early stage. Furthermore, MDCT is recognized as the investigation of choice since it precisely recognizes intracranial hemorrhage including extra-axial hemorrhage (epidural, subdural and subarachnoid hemorrhage) as well as intra-axial hemorrhage (contusion, intra-parenchymal hematoma and shear injury). It also identifies the evolution of hemorrhage and signs of secondary injury due to its quick results, easy availability and sensitivity to haemorrhage [8]. Hence, the impact and contribution of CT are crucial to complete injury assessment and form the basis of patient management that will help to get Early recognition of treatable injuries consequently that will reduce sequels and mortality [1,2].

Road traffic accident One of the common causes that lead to brain injury has been reported by the World Health Organization (WHO) that road traffic crashes make up to 25% of all injuries and is one of the major contributors to mortality and morbidity, accounting for more than 1.27 million deaths internationally [4,5]. In the Kingdom of Saudi Arabia (KSA), RTAs contribute to 81% of deaths of hospitalized patients [8]. Furthermore, a study revealed that brain injuries account for 30% of all injuries,

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contributing to 26% of deaths in KSA [6]. However, TBI may be caused by interpersonal trauma, fall and workplace accident, and sports injury.

In the present study a total of 200 patients were referred with head trauma and injuries were found to be more common in the male population about 136 (68%) of cases compared to females 64 (32%) with a male: female ratio of 2.1 and common mode of injury was RTA. This result was in agreement with Suryapratap Singh Tomar et al. and the incidence of TBIs in our study was common among 18-27 years (34%) age group followed by 48-57 years age group (22.5%) and less common in 58-67 years age group (9.5%) related to the study done by Venkata DRR et al.

Our study reveals that subdural hematoma (52%) was the most frequent lesion noted in traumatic patients, followed by subarachnoid hemorrhage (32%) while Epidural hemorrhage (8.5%) was the least common lesion noted in these patients. Our findings were consistent with similar studies [14] whereas Ashley et al. found intracerebral hematoma as the most intracranial bleed [14]. According to the present study, the common fracture was observed isolated skull fractures which represent 35%, followed by linear and depressed fractures which represent 31% and 22% retrospectively. Whereas fractures associated with Pneumocephalus represented 27% which is consistent with studies conducted by Nithesh N et al.

Recommendation

In case of TBI, the best neuroimaging modality that can be used is MDCT which provides detailed and accurate information that assists the physician to triage patients and guide them for proper management. Hence, this study as many studies recommended doing NECT brain even the trauma was mild if clinically indicated.

Conclusion

Non-enhanced computed tomography (NECT) in TBI is considered as gold standard and the most informative diagnostic modality in the evaluation of these injuries. Besides facilitating rapid implementation, it can demonstrate significant primary traumatic injuries. Furthermore, MDCT is essentially to triage patients to observation, surgical or medical management. Add to that MDCT reveals the pattern and severity of structural brain damage after head injury.

References

1. Riegor J, Linesenmaier U, Pfeifer M. Radiological diagnosis in acute craniocerebral trauma. Radiologe. 2002;42(7):547-55.
2. Servadei F, Murray GD, Penny K, et al. The value of the "worst" computed tomographic scan in clinical studies of moderate and severe head injury. European Brain Injury Consortium. Neurosurgery. 2000;46:70-7.
3. Ahmad K, et al. Multidetector computed tomographic evaluation of maxillofacial trauma. Asian J Med Sci. 2014;5(4):39-43.
4. Naeem Z. Road traffic injuries – Changing trend? Int J Health Sci (Qassim). 2010;4.
5. Ansari S, Akhdar F, Mandoorah M, Moutaery K. Causes and effects of road traffic accidents in Saudi Arabia. Public Health. 2000;114:37-9.
6. Bokhari K. Pattern of maxillofacial injuries in road traffic accidents: review & recommendations. 2015. Available from: https://www.researchgate.net/publication/291246892_Pattern_of_Maxillofacial_Injuries_in_Road_Traffic_Accidents_Review_Recommendations. [Last accessed on 2018 Mar 22].
7. Stein SC, Fabbri A, Servadei F. Routine serial computed tomographic scans in mild traumatic brain injury: when are they cost-effective? J Trauma. 2008;65:66-72.
8. Currie S, Saleem N, Straiton JA, Macmullen-Price J, Warren DJ, Craven IJ. Imaging assessment of traumatic brain injury. Postgrad Med J. 2016;92(1083):41-50.
9. Newberg AB, Alavi A. Neuroimaging in patients with head injury. Semin Nucl Med. 2003;33:136-47.
10. National Institute for Health and Care Excellence (NICE). Head injury: Triage, assessment, investigation and early management of head injury in children, young people and adults. NICE Guidelines (CG176). 2014.
11. Hassan Z, Smith M, Littlewood S, et al. Head injuries: a study evaluating the impact of the NICE head injury guidelines. Emerg Med J. 2005;22:845-9.
12. Ismail A, Azez E. Role of computed tomography (CT) in diagnosis of urgent head trauma in adults. Rom J Neurol. 2018;17(2):84-98. doi:10.37897/rjn.2018.2.6.

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13. Kim AK, Loevner LA. In: Radiology Secrets Plus. 3rd ed. Philadelphia: Elsevier; 2011. p. 327-35.
14. Ogunsheyinde AO, Obajimi MO, Ogundare SM. Radiological evaluation of head trauma by computed tomography in Ibadan, Nigeria. West Afr J Med. 1999;18:33-8.