ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Study Of Role Of Computed Tomography In Head Injury Assessment.

Jitendra Uttam Deshmukh[1]*, Prajakta Nandkumar Patil[2], Devendra Kulkarni[3], and Rohit Raundal[4].

[1]Assistant Professor, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.
[2, 3]Associate Professor, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.
[4]Senior Resident, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.

ABSTRACT

Head injuries are a significant cause of morbidity and mortality worldwide, necessitating accurate and timely assessment. Computed tomography (CT) is the gold standard imaging modality for evaluating head injuries due to its rapid acquisition and detailed anatomical imaging capabilities. This retrospective study analyzed 40 patients with head injuries who underwent CT scans within 24 hours of admission over a one-year period. Data were collected from hospital records, including demographic details, mechanism of injury, clinical presentation, CT findings, and clinical management. Outcomes were assessed using the Glasgow Coma Scale (GCS) and follow-up data. The mean age of patients was 35.6 years, with a male predominance (70%). The most common cause of injury was road traffic accidents (50%). CT findings included intracerebral hemorrhages (37.5%), skull fractures (30%), and subdural hematomas (25%). Surgical intervention was required in 30% of patients. At discharge, 75% had mild GCS scores. Long-term outcomes showed 62.5% full recovery, 25% partial recovery, and 12.5% persistent deficits. Mortality was 5%. CT imaging is crucial in the assessment and management of head injuries, providing essential diagnostic information that guides treatment decisions and improves patient outcomes.

Keywords: Head injuries, Computed tomography, Glasgow Coma Scale.

https://doi.org/10.33887/rjpbcs/2024.15.5.33

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Head injuries are a significant cause of morbidity and mortality worldwide, accounting for a substantial burden on healthcare systems [1]. Accurate and timely assessment of head injuries is crucial for determining the appropriate management and improving patient outcomes. Computed tomography (CT) has emerged as the gold standard imaging modality in the evaluation of head injuries due to its rapid acquisition, high resolution, and ability to provide detailed anatomical information [2, 3]. CT imaging plays a pivotal role in identifying critical intracranial pathologies such as hemorrhages, skull fractures, cerebral contusions, and diffuse axonal injuries. These insights are essential for guiding surgical interventions, monitoring progression, and formulating prognostic evaluations [4].

The advent of advanced CT technologies, including multi-detector CT (MDCT) and dual-energy CT, has further enhanced diagnostic accuracy, allowing for more precise characterization of injury patterns and associated complications. Additionally, CT imaging facilitates the assessment of secondary injuries and potential complications such as cerebral edema, herniation, and hydrocephalus. Despite its advantages, the utilization of CT must be balanced against the risks of radiation exposure, particularly in pediatric and young adult populations. Therefore, adherence to appropriate imaging protocols and clinical guidelines is imperative to maximize the benefits of CT while minimizing potential harms. This study aims to evaluate the role of CT in head injury assessment, emphasizing its diagnostic efficacy, clinical impact, and areas for improvement [5, 6].

METHODOLOGY

Our retrospective study was conducted over a period of one year, encompassing patients who presented with head injuries to the emergency department. A total of 40 patients, who met the inclusion criteria, were selected for the study. The inclusion criteria consisted of individuals who sustained head injuries and underwent computed tomography (CT) scanning within 24 hours of admission. Exclusion criteria included patients with pre-existing neurological disorders, previous head surgeries, or those who were lost to follow-up.

Patient data were collected from hospital records, including demographic details, mechanism of injury, clinical presentation, and CT findings. Each patient underwent a non-contrast CT scan of the head using a multi-detector CT scanner. The scans were reviewed by experienced radiologists who were blinded to the clinical outcomes. The CT findings were categorized into various types of intracranial injuries, such as skull fractures, intracerebral hemorrhages, contusions, and diffuse axonal injuries.

The clinical management of patients was documented, noting whether surgical intervention was required or if conservative treatment was sufficient. Outcomes were assessed based on the Glasgow Coma Scale (GCS) at admission, during the hospital stay, and at discharge. Follow-up data were obtained from subsequent outpatient visits or telephonic interviews to evaluate the long-term effects and recovery status of the patients.

Data analysis was performed using statistical software. Descriptive statistics were used to summarize the demographic and clinical characteristics of the patients. The association between CT findings and clinical outcomes was analyzed using chi-square tests for categorical variables and t-tests for continuous variables.

RESULTS

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	Number of Patients (n=40)
Age (years)	
- Mean (SD)	35.6 (12.4)
- Range	18-65
Gender	
- Male	28 (70%)
- Female	12 (30%)
Mechanism of Injury	
- Road Traffic Accident	20 (50%)

- Fall	10 (25%)
- Assault	6 (15%)
- Other	4 (10%)
Glasgow Coma Scale (GCS)	
- Mild (13-15)	25 (62.5%)
- Moderate (9-12)	10 (25%)
- Severe (3-8)	5 (12.5%)

Table 2: CT Findings in Head Injury Patients

CT Finding	Number of Patients (n=40)
Skull Fracture	12 (30%)
Intracerebral Hemorrhage	15 (37.5%)
Subdural Hematoma	10 (25%)
Epidural Hematoma	5 (12.5%)
Cerebral Contusion	8 (20%)
Diffuse Axonal Injury	6 (15%)
No Significant Findings	7 (17.5%)

Table 3: Clinical Management of Head Injury Patients

Management Type	Number of Patients (n=40)
Conservative Treatment	28 (70%)
Surgical Intervention	12 (30%)
- Craniotomy/Craniectomy	8 (20%)
- Burr Hole Surgery	4 (10%)

Table 4: Patient Outcomes Based on GCS and Follow-Up

Outcome	Number of Patients (n=40)
Glasgow Coma Scale at Discharge	
- Mild (13-15)	30 (75%)
- Moderate (9-12)	6 (15%)
- Severe (3-8)	4 (10%)
Follow-Up Status	
- Full Recovery	25 (62.5%)
- Partial Recovery	10 (25%)
- Persistent Deficits	5 (12.5%)
- Mortality	2 (5%)

DISCUSSION

The role of computed tomography (CT) in the assessment of head injuries is crucial due to its ability to rapidly provide detailed images of intracranial structures. Our study, conducted over one year with a sample size of 40 patients, aimed to evaluate the effectiveness of CT in diagnosing various types of head injuries and to correlate these findings with patient outcomes. The results underscore the significant impact of CT imaging in the clinical management and prognostication of head injury patients [6-8].

The demographic data revealed that the mean age of patients was 35.6 years, with a standard deviation of 12.4 years, and the age range spanned from 18 to 65 years. A higher incidence of head injuries was observed in males (70%) compared to females (30%), which is consistent with previous studies indicating that males are more prone to head injuries due to higher exposure to risk factors such as road traffic accidents and physical assaults. Road traffic accidents were the most common cause of head injuries (50%), followed by falls (25%), assaults (15%), and other causes (10%). This distribution aligns with global patterns, where vehicular accidents are a leading cause of head trauma. The Glasgow Coma Scale (GCS) at admission showed that the majority of patients had mild head injuries (62.5%), while 25% had moderate and 12.5% had severe head injuries. The GCS is a critical tool for assessing the level of

consciousness and predicting outcomes in head injury patients. The predominance of mild head injuries in our sample suggests that many patients may have benefited from conservative management, which is supported by our findings.

CT findings revealed a variety of intracranial injuries, underscoring the diagnostic capabilities of CT in identifying critical pathologies. Intracerebral hemorrhage (37.5%) was the most common finding, followed by skull fractures (30%), subdural hematomas (25%), cerebral contusions (20%), diffuse axonal injuries (15%), and epidural hematomas (12.5%). Notably, 17.5% of the patients had no significant findings on CT, highlighting the importance of clinical assessment in conjunction with imaging [9].

The identification of intracranial hemorrhages and skull fractures is particularly important as these injuries often necessitate surgical intervention. In our study, 30% of patients required surgical management, with craniotomy/craniectomy being the most common procedure (20%), followed by burr hole surgery (10%). The decision for surgical intervention is often guided by CT findings, which can provide detailed information on the location, size, and extent of hemorrhages and fractures [10].

The high percentage of patients managed conservatively (70%) reflects the efficacy of non-surgical approaches in cases with less severe injuries or stable clinical conditions. Conservative management typically includes close monitoring, supportive care, and follow-up imaging to detect any delayed complications.

Patient outcomes were assessed based on GCS at discharge and follow-up status. At discharge, 75% of patients had a mild GCS score, 15% had a moderate score, and 10% had a severe score. This distribution indicates that most patients experienced an improvement in their level of consciousness during hospitalization, which can be attributed to appropriate medical and surgical management.

Long-term outcomes showed that 62.5% of patients achieved full recovery, 25% had partial recovery, 12.5% had persistent deficits, and there was a 5% mortality rate. The high rate of full recovery is encouraging and suggests that timely CT imaging and appropriate management can significantly improve the prognosis for head injury patients. However, the presence of persistent deficits in a subset of patients highlights the need for ongoing rehabilitation and support to address long-term impairments.

Despite the valuable insights provided by our study, several limitations must be acknowledged. The sample size of 40 patients is relatively small, which may limit the generalizability of our findings. Additionally, the retrospective design of the study may introduce selection bias, and the reliance on hospital records may result in incomplete data capture.

CONCLUSION

CT imaging is crucial in the assessment and management of head injuries, providing essential diagnostic information that guides treatment decisions and improves patient outcomes.

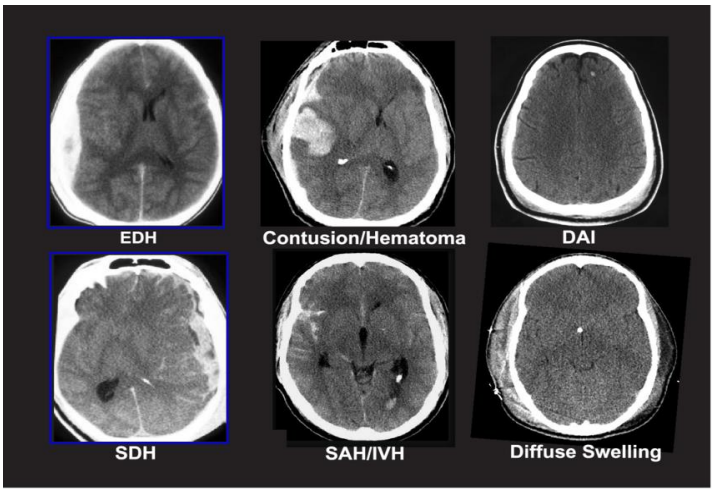

Figure 1: CT image – Head injury

ISSN: 0975-8585

REFERENCES

[1] John Haaga Daniel Boll. CT and MRI of the whole body - 5th edition Elsevier 2008. pp 295.
[2] Miller EC, Holmes JF, Derlet RW. Utilizing clinical factors to reduce head CT scan ordering for minor head trauma patients. J Emerg Med 1997;15(4):453-457.
[3] Kelly AB, Zimmerman RD, Snow RB, Gandy SE, Heier LA, Deck MD. Head trauma: comparison of MR and CT-experience in 100 patients. Am J Neuroradiol 1988;9(4):699-708.
[4] Glauser J. Head injury: which patients need imaging? Which test is best? Cleve Clin J Med 2004;71(4):353-357.
[5] Jones TR, Kaplan RT, Lane B, Atlas SW, Rubin GD. Single versus multi detector row CT of the brain: quality assessment. Radiol 2001;219(3):750-755.
[6] Yealy DM, Hogan DE. Imaging after head trauma. Who needs what? Emerg Med Clin North Am 1991;9(4):707-717.
[7] Ambrose J, Honsfield G, Computed axial tomography. British J Radiol 1973;46(542):148-149.
[8] Asaleye CM, Famurewa OC, Komolafe EO, Komolafe MA, Amusa YB. The pattern of Computerized Topographic findings in moderate and severe head injuries in ILE- IFE, Nigeria. West Afr J Radiol 2005; 12:8-13.
[9] Zimmerman RA, Bilaniuk LT, Hackney DB, Goldberg HI. Head injury: Early results of comparing CT and high field M.R. Amj Neuro Radiol 1986;147(6):1215-1222.
[10] Satish Prasad BS, Shama M Shetty. Evaluation of craniocerebral Trauma Using Computed Tomography. J Dental and Med Sci 2014;13(9):57-62.