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A Study on Haematological Profile Alterations in Patients with Mild Head Injury

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Abstract

Introduction: Head injury is a common reason for an emergency room visit. A large number of people who suffer head injury are predominantly due to road traffic accidents. Other causes of head injury includes fall from height, train traffic accidents and assault. Children do get involved in RTA due to non compliance of the safety measures. Commonest presentation of head injury includes depressed skull fractures, haemorrhage including both extra axial and intra axial, and contusions along with diffuse axanol injury. Majority of the patients involved in head injury require anti-oedema measures and these patients have a significant alterations in their haematological profile post-treatment with anti-oedema measures and this leads on to poor outcome. *Aim of the Study*: To assess various haematologicalprofile in patients with mild head injury. *Materials and Methods*: This retrospective study conducted in 2016-2018 in Department of Neurosurgery, Government Mohan Kumaramangalam Medical College, Salem. 45 cases got selected based on the GCS criteria. These patients case sheets were scrutinisedand the following data's were collected from the case sheets. Age, sex, date of admission, date of surgery (if performed), diagnosis, mode of injury, history of loss of consciousness, vomiting, ENT bleed, seizures, GCS at the time of admission, associated injuries, first CT scan brain findings, other investigations done, haematological profile such as blood glucose, coagulation profile, liver function test, renal function test, and serum electrolytes variations are assessed using standard techniques. *Results*: In all the patients who were treated for mild head injury with or without anti-edema measures, the majority showed metabolic abnormalities. Electrolyte abnormality was present in 14 patients. The altered liver function was present in 15 patients out of the 45 who were treated either in the form of elevated liver enzymes or raised bilirubin levels. Deranged blood sugars were present in more than 50% of the patients and even on continuous monitoring and with insulin therapy, few cases failed to reach glycemic state. 9 Patients of them showed coagulation abnormalities in the form of raised bleeding time, clotting time and with prolonged prothrombin time and INR. Renal parameter abnormality was present in a significant group of patients. *Conclusion*: Haematological abnormality was frequently found in patients with mild head injury whether or not they were treated with anti-oedema measures. Although coagulation abnormality was thought to alter the CT findings, only one-third of the deteriorated patients with coagulation abnormality showed positive findings on a CT scan which needs further haematological studies to prove the correlation between the two.

Keywords: Blood Glucose; Coagulation Profile; Liver Function Test; Renal Function Test; CT Scan; Head Injury.

Introduction

Head injury is considered as a major health problem that is a frequent cause of death and disability and makes considerable demands on health services. In developing countries, accident rates in general and traumatic brain injury, in particular, are increasing as traffic increases besides other factors like industrialization, falls and ballistic trauma [1]. Head injuries account for one quarter to one-third of all accidental deaths, and for two-thirds of trauma deaths in hospitals, Traumatic Brain Injury is a leading cause of mortality in patients younger than 45 years accounting for more than a third of all injury-related deaths in the United States. Each year 52,000 people die and another 80,000 suffer morbidity and traumatic brain injury [2]. Although more severe injuries are

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associated with poorer outcomes, the moderately injured patients also are at risk. Road traffic injury is an increasing health problem globally and especially in South-East Asia [3]. Closed head injury is the result of a variety of mechanisms including motor vehicle and motorcycle accidents, falls from heights, assaults, and pedestrians being struck by motor vehicles. Penetrating injury is most often due to gunshots but sometimes other types of blunt objects can violate the skull. Most commonly, traumatic brain injury occurs in the presence of additional injuries to other major organ systems but it can also occur in isolation [4]. The management of head injury has been revolutionized by round the clock monitoring, carotid angiography, isotope brain scan, computerized axial tomography and monitoring of intracranial pressure. Intermittent positive pressure ventilation, dehydration therapy and better techniques of operations have made a tremendous difference in the ultimate outcome of severe brain trauma [5]. Complications from closed head injuries are the single largest cause of morbidity and mortality in patients who reach the hospital alive. Of patients who require long term rehabilitation, head trauma is usually the primary injury [6].

Materials and Methods

This retrospective study was conducted in 2016-2018 in Department of Neurosurgery, Government Mohan Kumaramangalam Medical College Salem. 45 cases got selected based on the GCS criteria. These patients case sheets were collected from the following data's were collected from the case sheets. Age, sex, date of admission, date of surgery (if performed), diagnosis, mode of injury, history of loss of consciousness, vomiting, ENT bleed, seizures, GCS at the time of admission, associated injuries, first CT scan brain findings, other investigations are done. hematological profile such as blood glucose, coagulation profile, liver function test, renal function test, and serum electrolytes variations are assessed. 5 to 8 ml venous blood was collected from patients.using a Roche Minos cell counter and automatic blood counter (Avid CELL-DYN 3500; Abbot Laboratories, Abbot Park, IL, USA) within 2 hours of sample collection all the above-mentioned parameters are analyzed.

Statistical Analysis

Statistical analysis Collected data were verified prior to computerized data entry. The Statistical Package for Social Sciences (Version 21.0; IBM Corporation, Armonk, NY, USA) was used for the statistical analysis of data. Descriptive statistics (eg, frequency, mean, and standard deviation) were applied. Pearson's correlation coefficient and tests of significance (eg, unpaired t-test) were applied. A significant P-value was considered at #0.05.

Results

Table 1: Electrolytes

Electrolyte Abnormality	Frequency	Percentage
Sodium	1	2.2
Potassium	8	17.8
Sodium and Potassium	5	11.1
Absent	31	68.9
Total	45	100.0

In all the patients who were treated for mild head injury with or without anti-edema measures, the majority showed metabolic abnormalities. Electrolyte abnormality was present in 14 patients. (Table 1).

Table 2: Renal Function Test

RFT abnormalities	Frequency	Percentage
Present	11	24.4
Absent	34	75.6
Total	45	100.0

Renal parameter abnormality was present in a significant group of patients. (Table 2).

Table 3: LFT

LFT abnormality	Frequency	Percentage
Present	15	33.3
Absent	30	66.7
Total	45	100.0

The altered liver function was present in 15 patients out of the 45 who were treated either in the form of elevated liver enzymes or raised bilirubin levels (Table 3).

Table 4: Blood Glucose Level

Altered blood sugars	Frequency	Percentage
Present	25	55.6
Absent	20	44.4
Total	45	100.0

Deranged blood sugars were present in more than 50% of the patients and even on continuous monitoring and with insulin therapy, few cases failed to reach euglycemic state (Table 4).

Table 5: Coagulation

Coagulation abnormalities	Frequency	Percentage
Present	9	20
Absent	36	80
Total	45	100.0

Out of the 45 patients, nine of them showed coagulation abnormalities in the form of raised bleeding time, clotting time and with prolonged prothrombin time and INR. Worsening of CT scan findings and the majority had to resolve findings of the initial injury signifying the cause of deterioration was extracranial.

Discussion

Incidence varies widely for TBI from 49 to 90%. Many go unnoticed as many being managed at nonhospital settings. Approximately 3% of these patients with mild head injury required neurosurgical procedures [7]. The most common causes of TBI across all studies were motor vehicle accidents, fall injury, assaults and in western countries a significant. The number is due to sports-related injuries although this number has not reached to that extent levels in developing countries probably due to lack of reporting [8]. Association of neurological symptoms may not be simply because of the fractures. Focal injuries are those visible injuries limited to a well-circumscribed part of the brain whereas diffuse injury is one in which there is no visible macroscopic structural damage to the brain, but associated with widespread dysfunction of the brain [9]. Even in its mildest form, the diffuse injury may be assisted only with alterations in neuronal excitability, neurotransmission-related injuries and/or receptor-related injuries. In its more severe cases, it may be associated with structural damage at microscopic levels without any visible mass lesion [10]. Coagulation abnormality is the next common cause ($p<0.018$) for the mortality by the order of statistical significance in our study Mina AA et al. [29] in 1992 concluded in their study 'Delayed brain injury after head trauma: significance of coagulopathy' that presence of anyone clotting abnormality among prothrombin time, activated partial thromboplastin time or decreased platelets at the time of admission increases the risk of delayed deterioration by more than 80% [11]. While his study showed only 9% of those patients with coagulation abnormality who deteriorated had to resolve findings or noncontributory findings on CT scans, our study showed more than 18% of patients with coagulation abnormalities with noncontributory CT findings. Frequent monitoring of the coagulation factors should be done [12].Renal parameter abnormalities, associated injuries, and comorbidities carry a nearly equivalent risk by CHI-square test while by Binomial testing RFT abnormality has a P value of <0.001 while associated injuries have a P value of <0.025. Early detection ofantioedema measures has a potentially deleterious effect on kidney function and hence adequate monitoring is of paramount importance [13]. The association of syndrome of inappropriate antidiuretic hormone (SIADH), diabetes insipidus and cerebral salt wasting has to be identified early in hypothalamic injury and correction to be started at the earliest to prevent morbidity. Presence of associated injuries has driven a significant number of patients deathbeds in our study [14]. Predominant among them was associated with lung and pleural injuries, although diagnosed at the time of admission and treated appropriately, were the cause of death. All these patients need close monitoring, frequent investigations, and multimodality treatment. Any minor complains has to be seriously investigated to rule out missed injuries. As a protocol, a certain battery of investigations including CT chest and abdomen along with brain in all suspected cases or in whom any external injury is present, x-ray of all long bones would prevent these missed injuries [15]. Electrolyte abnormality was found to influence death in a single way with $p<0.033$ in CHI-square test and $p<0.016$ by binomial testing Peck KA et al. in his study on 'Serum electrolyte derangements in patients with traumatic brain injury' has stated that sodium was the most common electrolyte found to be deranged in head injury patients followed by potassium [16]. Although electrolyte abnormality was commonly associated with antioedema measures including hypertonic saline, mannitol or oral glycerol and furosemide, early monitoring and correction will save this subgroup of patients [17]. Glycemic control in head-injured patients is of paramount importance. Although it has not reached a statistically significant range ($p<0.551$), preventing hypoglycemia and efficient management of hyperglycemia [18].

Conclusion

Secondary brain damage occurs as a result of different types of primary injuries and includes hypoxic and ischemic damage, delayed evolution or expansion of a contusion or cerebral edema and its complications like raised ICP. Other insults like

hypoxia, respiratory insufficiency, hypotension, electrolyte imbalance, and infection may add up to the list causing further damage to the brain. Coagulation abnormality was frequently found in these patients who deteriorated, but only one-third of the deteriorated patients with coagulation abnormality showed positive findings on a CT scan. This needs further hematological studies to prove the correlation between the two. In contrary to our understanding that hyperglycemia causes brain injury and increases the morbidity and mortality in head injury, Early clinical detection, appropriate investigations, and early interventions can reduce these mortalities and morbidities in a great way.

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