JOURNAL OF HEALTHCARE SCIENCES
Volume 3 Issue 8 2023, Article ID: JOHS2023000678
http://dx.doi.org/10.52533/JOHS.2023.30804
e-ISSN: 1658-8967

Review

Emergency Management of Traumatic Brain Injuries Current Guideline and New Developments

Ahmed Aljefri[1], Abdulmohsen Shaikh[2], Ziyad Alqazlan[3], Zainab Hawsawi[4], Rose Al Senan[5], Waleed Aljohani[6], Enas Barnawi[7], Ismail Alhassan[8], Rihab Khayri[9], Bassel Alghamdi[10], Muath Alhasan[8]

[1] *Department of Emergency Medicine, Al Thager Hospital, Jeddah, Saudi Arabia*
[2] *Department of Family Medicine, Quba Primary Health Care Center, Medina, Saudi Arabia*
[3] *Department of Ophthalmology, Ar Rass General Hospital, Ar Rass, Saudi Arabia*
[4] *Department of Family Medicine, Sharayie 7 Primary Health Care, Mecca, Saudi Arabia*
[5] *College of Medicine, Medical University of Warsaw, Warsaw, Poland*
[6] *College of Medicine, Al-Rayan Colleges, Medina, Saudi Arabia*
[7] *Department of Neurosurgery, King Abdulaziz Hospital, Mecca, Saudi Arabia*
[8] *General Physician, King Abdulaziz Specialist Hospital, Al Jouf, Saudi Arabia*
[9] *General Physician, Emergency Department, Raseel Medical Center, Riyadh, Saudi Arabia*
[10] *College of Medicine, Albaha University, Al Baha, Saudi Arabia*

Correspondence should be addressed to **Ahmed Aljefri**, Department of Emergency Medicine, Al Thager Hospital, Jeddah, Saudi Arabia. Email: ahmad.jefri2011@gmail.com

Received: 15 August 2023, Accepted: 21 August 2023, Published: 24 August 2023

Abstract

Annually, traumatic brain injury keeps afflicting millions of individuals around the world. Traumatic brain injury may manifest in various forms from minor changes in consciousness to persistent comatoseness and death. The entirety of the brain is impacted by a diffused type of injury and edema in the most severe form of traumatic brain injury. Depending on the degree of the injury, there are many different treatment options, ranging from regular cognitive therapy sessions to invasive surgical procedures like bilateral decompressive craniectomies. Clinical practice guidelines have been developed to standardize assessment, discharge education, and referral of traumatic brain injury patients in order to achieve best practice management. Guidelines are described as propositions derived from research and used to direct clinicians and patients in making decisions about the highest degree of care and best practices in clinical practice. In order to minimise the risk of secondary brain injury and maximise the prognosis, early detection and therapy of severe traumatic brain injury are essential. The methodical evaluation and management of life-threatening situations that result from this is followed by invasive steps to control the airway, respiratory physiology, and hemodynamics, all with the main objective of maintaining a sufficient level of cerebral perfusion. Preventing secondary injury is the fundamental goal of early therapy of severe traumatic brain injury, specifically by preventing hypotension and hypoxia. The purpose of this research is to review the available information about the emergency management of traumatic brain injury current guideline and new developments.

Keywords: *traumatic, brain, injury, management, emergency*

Introduction

Traumatic brain injury (TBI) is a global public health concern. In injured individuals, TBI results in the most fatalities and disabilities globally. The exact magnitude of the TBI is not known, but as per the 2016 Global Burden of Disease Report almost over 27 million instances of TBI annually, or a rate of 369 per 100,000 inhabitants are reported. Deriving the incidence of TBI from road traffic incidents resulted in a significantly larger global estimate of 55.9 million cases annually (1). TBI is not a disease, however, constitutes the leading cause of mortality and disability worldwide among all trauma-related injuries. About 5.48 million, 73 incidences per 100,000 persons people are predicted to suffer from severe TBI each year. TBI is the primary reason for disability under forty-years-old 15-20/100,000 populations every year (2). Among the general population, the age-adjusted hospitalisation rate for nonfatal TBI is 60.6 per 100,000, but it rises to 155.9 among older persons who are at least 65 years old (3).

Any lesion to the brain that impairs regular brain function is referred to as TBI, which may present with a diverse number of cognitive, behavioral, motor, or sensory symptoms. According to the Glasgow Coma Scale (GCS), TBI comprises a continuum of illnesses that is categorised into mild, moderate, and severe cases. Patients are categorised as having mild TBI if their GCS is 13 to 15, moderate if it is 9 to 12, and severe if it is less than 9. About 80% of TBI injuries worldwide are categorised as mild, 11% as moderate, and 8% as severe. Mortality is reported in almost 15% of individuals with moderate TBI. Despite the 15% overall fatality rate for individuals with moderate TBI, 75% of these fatalities include patients with an initial GCS of 9 or higher. Other scales are also available for categorization. GCS also has some drawbacks associated however despite these drawbacks; the majority of the available research still employs the GCS scale to categorize TBI (1).

TBI is the leading cause of mortality and morbidity in children and young adults globally, in both developed and developing countries. It has been dubbed as the silent epidemic of modern times. A paradigm change in TBI therapy has occurred recently. Guidelines based on protocols are ideal for the treatment of severe TBI (4). Concussion, mild TBI, and minor head injury are all used interchangeably. Regardless of nomenclature differences, emergency practitioners can anticipate seeing a number of patients each shift who have had a blunt head injury of some kind. Although there are clinical recommendations available, the clinical approach to these patients varies greatly. The majority of patients will have computed tomography (CT) imaging, and the majority of results will be read as normal. Rapidly identifying the proportion of patients who have potentially fatal brain lesions is a problem for emergency clinicians, who also need to keep expenses, hospitalisations, and needless diagnostic tests to a minimum. No matter how small the injury may seem, clinicians must appropriately record a neurologic baseline for follow-up exams and give discharge instructions that inform patients and families about the potential consequences of head injury (5).

By avoiding hypotension and hypoxia and maintaining a proper cerebral perfusion pressure, which serves as a proxy for cerebral blood flow, management methods must be centred on preventing subsequent damage. Increasing mean arterial pressure, lowering intracranial pressure, or a combination of the two can sustain cerebral perfusion pressure. Euvolemia should be the target, and hypotension should be avoided. Venous thromboembolism, seizure prophylaxis, nutritional, metabolic optimization, and other aspects all need to be taken into account when treating TBI patients acutely (6). Management of patient with head injury at emergency department is illustrated in (Figure 1) (7). The purpose of this research is to review the available information about emergency management of TBI current guidelines and new developments**.**

Methodology

This study is based on a comprehensive literature search conducted on June 13, 2023, in the Web of Science, PubMed/Medline and Cochrane databases,

http://dx.doi.org/10.52533/JOHS.2023.30804

utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about emergency management of traumatic brain injuries current guidelines and new developments. There were no restrictions on date, language, participant age, or type of publication.

Discussion

For patients who have a TBI, the emergency department is frequently the initial and perhaps the only point of medical contact. Clinical practice guidelines have been developed to standardize assessment, discharge education, and referral of mild TBI in order to achieve best practice management of TBI. Guidelines are described as propositions derived from research and used to direct clinicians and patients in making decisions about the highest degree of care and best practices in clinical practice (8). Regimented care is recommended for patients with traumatic brain injury. The strategy commences with the identification of injury mechanisms and symptoms that entail a high risk of serious head injury. The methodical evaluation and management of life-threatening situations that result from this is followed by aggressive steps to control the airway, respiratory physiology, and hemodynamic, all with the main objective of maintaining a sufficient level of cerebral perfusion. After managing any threats to the patient's life, a detailed head-to-toe examination is performed to assess for serious injuries. Patients with moderate to severe brain injuries often need neuroimaging and may need to be transferred to tertiary facilities for more intensive neurological monitoring. In addition to being helpful on an individual basis, an evidence-based and standardized strategy for the management of these individuals would probably result in improved outcomes on a systemic level (1).

Evidence from literature

The most recent Brain Trauma Foundation recommendations, published in 2016, are protocol-based approaches to management intended to enhance outcomes for hospitalized TBI patients. The mainstay of TBI management is the intensive care treatment of these patients, with special attention dedicated to the airway, oxygenation, and proper hemodynamic support to prevent the subsequent injuries that are linked with events like hypoxia and hypotension (4). Dixon et al. suggested that early and proper triage is the first step in treating the brain-injured patient optimally. Patients who have mild or moderate TBI might be classified as high-risk by a thorough history and physical examination. Clinical decision rules can help in identifying low-risk patients who just need a short time of monitoring or no neuroimaging. A methodical approach centred on preventing secondary harm, such as hypotension, hypoxia, and hypoglycemia, is necessary for the management of patients with severe brain injuries. Most secondary injury prevention measures are implementable at all facility levels. Patients with severe TBI are advised to have urgent neuroimaging, followed by a consultation with a neurosurgeon and transfer to an intensive care unit (1).

Siasios et al. narrated that every head injury case has its initial medical evaluation by a general surgeon, who additionally conducts an immediate neurological examination and reports the patient's GCS. To rule out the likelihood of a fractured skull, every patient undergoes a regular radiological evaluation of the skull with an X-ray. In patients with GCS: 15/15 and subjective TBI symptoms, a neurologist performs a separate neurological evaluation and decides whether to perform a CT scan, if necessary, in coordination with the general surgeon. A head CT scan is required in every instance where a patient exhibits neurological symptoms during an initial neurological assessment or a GCS of less than 15. Patients who undergo CT scans and require surgery due to pathological results are referred to a neurosurgeon (7). Godoy et al. described that it is standard practise to postpone initial imaging for patients with mild and moderate

http://dx.doi.org/10.52533/JOHS.2023.30804

TBI in lieu of an observational period in the emergency room with the necessary preventive measures. If the patient's clinical state worsens or does not get better, further imaging is considered. There are presently no guidelines to identify which adult patients need imaging and which are safe to observe, delay, or avoid neuroimaging in patients who do not fulfil criteria to avoid imaging and appear to have mild to moderate TBI (9).

Patients with severe TBI, who by definition have a depressed level of consciousness, require the utmost airway protection. For airway preservation and to ensure adequate oxygenation and ventilation in patients with severe TBI, intubation should be performed. Only in situations where endotracheal intubation is impractical and following the failure of simple airway procedures like a jaw push, supraglottic airway devices should be explored for airway management (10, 11). Additionally, hypoxia can cause cerebral oedema and is a significant factor in subsequent brain damage. If blood gas monitoring or intubation are not options, pulse oximetry monitoring of oxygenation should be used instead. Supplemental oxygen should be given if necessary. PaO2 should be kept above 60 mm Hg if serial blood gas measurements are available (10, 12). Furthermore, since simultaneous cervical spine injury has been demonstrated in 4%-8% of patients with brain injuries, cervical spine immobilization should be maintained (13).

Hawryluk et al. described that the management of individuals with severe TBI revolves around the treatment of elevated intracranial pressure. Due to haemorrhage, cerebral edema, and hydrocephalus after a TBI, the volume of the intracranial contents frequently increases. This may result in a dangerous brain shift referred to as herniation. Furthermore, the increased volume inside the hard skull may raise intracranial pressure, which could result in a compartment syndrome that hinders or stops blood flow to the brain. Disability or death may eventually occur from the resulting cerebral ischemia. Decompressive craniectomy, a procedure that temporarily removes a significant section of the skull, has long been a tool in the arsenal of neurosurgeons for managing intracranial pressure rise caused by TBI (14).

Vedin et al. described that majority of the emergency department visits are contributed by brain trauma injuries. Guidelines have been developed to assist clinicians in treating patients with head trauma. While guidelines aid in risk management, they do not provide details specific to the patient at hand. The physician may decide to prescribe a CT even though the risk is modest because he is focused on the patient in front of him, or he may decide not to follow the criteria at all. Since they have been in use, guidelines for treating TBI in emergency rooms have undoubtedly helped day-to-day clinical practice. However, when following these recommendations, queries arise if too many CT head scans are being requested and how strictly these recommendations are being followed (15). Carney et al. recommended that application of specific treatments is not a factor in the management of TBI patients. There is not a treatment or management strategy that is not dependent on other strategies or on the ecology. Future research needs to be designed in a way that is compatible with this clinical reality in order to be meaningful and effective. The brain trauma community must participate in a systematic process for formulating a research agenda that starts with deliberative discussions on scope, themes, management settings, and research methodologies. The procedure should include selection and improvement of study topics that could fill significant gaps in the guidelines; enhancement of study designs; and incorporation of cutting-edge techniques for synthesis of literature, evaluation of bodies of evidence, and creation of guidelines (12). There is need of generalized and comprehensive guidelines to ensure efficacy and optimal outcomes in clinical practice for the management of TBI and further clinical research would be highly beneficial in this regard and can additionally aid in development of more innovative management strategies.

http://dx.doi.org/10.52533/JOHS.2023.30804

Conclusion

Rapid and appropriate triage, immediate diagnosis of TBI, and prompt stabilization of the critically ill trauma patient are the first steps in the care of TBI patients. The cornerstone of TBI care in the emergency unit is a high index of suspicion for TBI along with an understanding of the risk factors, symptoms, and indications that are most likely to need surgical surgery or cause long-term neurocognitive sequelae. Prevention of any further complications is of utmost importance and adherence to the developed guidelines is necessary.

Disclosure

Conflict of interest

There is no conflict of interest

Funding

No funding

Ethical consideration

Non applicable

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

References

1. Dixon J, Comstock G, Whitfield J, Richards D, Burkholder TW, Leifer N, et al. Emergency department management of traumatic brain injuries: A resource tiered review. African journal of emergency medicine : Revue africaine de la medecine d'urgence. 2020;10(3):159-66.

2. Iaccarino C, Carretta A, Nicolosi F, Morselli C. Epidemiology of severe traumatic brain injury. Journal of neurosurgical sciences. 2018;62(5):535-41.

3. Heydari F, Golban M, Majidinejad S. Traumatic Brain Injury in Older Adults Presenting to the Emergency Department: Epidemiology, Outcomes and Risk Factors Predicting the Prognosis. Advanced journal of emergency medicine. 2020;4(2):e19.

4. Dash HH, Chavali S. Management of traumatic brain injury patients. Korean journal of anesthesiology. 2018;71(1):12-21.

5. Haydel M. Management of mild traumatic brain injury in the emergency department. Emergency medicine practice. 2012;14(9):1-24.

6. Vella MA, Crandall ML, Patel MB. Acute Management of Traumatic Brain Injury. The Surgical clinics of North America. 2017;97(5):1015-30.

7. Siasios J, Foutzitzi S, Deftereos S, Karanikas M, Birbilis T. The traumatic brain injury: diagnosis and management at emergency department by general surgeon. A retrospective critical analysis on the use of the CT head scan. Turkish neurosurgery. 2011;21(4):613-7.

8. Brown AM, Twomey DM, Wong Shee A. Evaluating mild traumatic brain injury management at a regional emergency department. Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention. 2018;24(5):390-4.

9. Godoy DA, Rubiano A, Rabinstein AA, Bullock R, Sahuquillo J. Moderate Traumatic Brain Injury: The Grey Zone of Neurotrauma. Neurocritical care. 2016;25(2):306-19.

10. Mittal R, Vermani E, Tweedie I, Nee PA. Critical care in the emergency department: traumatic brain injury. Emergency medicine journal : EMJ. 2009;26(7):513-7.

11. Segal N, Yannopoulos D, Mahoney BD, Frascone RJ, Matsuura T, Cowles CG, et al. Impairment of carotid artery blood flow by supraglottic airway use in a swine model of cardiac arrest. Resuscitation. 2012;83(8):1025-30.

12. Carney N, Totten AM, O'Reilly C, Ullman JS, Hawryluk GW, Bell MJ, et al. Guidelines for the

http://dx.doi.org/10.52533/JOHS.2023.30804

Management of Severe Traumatic Brain Injury, Fourth Edition. Neurosurgery. 2017;80(1):6-15.

13. Holly LT, Kelly DF, Counelis GJ, Blinman T, McArthur DL, Cryer HG. Cervical spine trauma associated with moderate and severe head injury: incidence, risk factors, and injury characteristics. Journal of neurosurgery. 2002;96(3 Suppl):285-91.

14. Hawryluk GWJ, Rubiano AM, Totten AM, O'Reilly C, Ullman JS, Bratton SL, et al. Guidelines for the Management of Severe Traumatic Brain Injury: 2020 Update of the Decompressive Craniectomy Recommendations. Neurosurgery. 2020;87(3):427-34.

15. Vedin T, Edelhamre M, Karlsson M, Bergenheim M, Larsson PA. Management of Traumatic Brain Injury in the Emergency Department: Guideline Adherence and Patient Safety. Quality management in health care. 2017;26(4):190-5.

http://dx.doi.org/10.52533/JOHS.2023.30804