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Nursing Practice in the Care of Victims of Cranioencephalic Trauma: An Integrative Review

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Abstract: Objective: to know the main nursing care provided to victims of cranioencephalic trauma. Methods: this is an integrative review, the search in the literature was carried out in the databases SciELO, LILACS, BDENF, CUMED and MEDLINE. It was established as inclusion criterion articles available in full, available in the English, Spanish or Portuguese languages, during the period between January 2004 and December 2016. Results: the review was structured through 11 articles, data analysis was conducted in a descriptive way, the studies were grouped into 3 categories. The categories are composed of the knowledge about the cranioencephalic trauma and the main interventions performed by the nurse. Conclusion: the care of victims of TBI is based on following the protocol of advanced life support, prioritizing the lesions with imminent risk of death, preventing the worsening of existing lesions and avoiding the appearance of secondary brain lesions.

Keywords: Craniocerebral Trauma, Nursing Care, Emergencies.

INTRODUCTION

The trauma, over the years, has become one of the main causes of death of the general population, losing only to cardiovascular and neoplastic diseases and always being in the first place when studied the young age group of the population, constituting with disease of epidemiological relevance [1].

Among some definitions, traumatic brain injury (TBI) can be conceptualized as any injury resulting from an external trauma, resulting in anatomical changes of the skull, such as fracture or laceration of the scalp, functional impairment of the meninges, encephalon or its vessels, resulting in In momentary or permanent cerebral alterations of cognitive or functional nature [2].

A study of brain injury related to emergency department visits, hospitalizations and deaths in the United States in the years 2007 and 2013 showed that in 2013, there were a total of approximately 2.8 million visits in the emergency department, hospitalizations and deaths related to TBI. Of this number, approximately 282,000 were related to hospitalizations, and about 56,000 to deaths. As for age, the highest rates occurred among people aged ≥ 75 years, 0-4

years and 15-24 years, with men being the main involved with higher rates of TBI compared to women [3].

Still on the previous study [3], the number and rate of hospitalizations for TBI increased among people aged ≥ 75 years from 2007 to 2013, mainly due to falls. In contrast, although motor vehicle accidents were the leading cause of TBI related deaths in 2007, both in number and rate, in 2013, intentional self-injury was the number-one cause and rate found in the study.

According to some authors the causes of TBI are related to the group of pathologies caused by external causes, the main ones being: 50% related to motor vehicle accidents, the main age group being involved, adolescents and young adults. From 15 to 24 years, traffic accidents are responsible for more deaths than all other causes combined; 30% of falls-related causes, including a large number of elderly people involved in this group; and 20% related to "violent" causes, such as gunshot wounds and white arms [4].

According to some authors [5], about 40% of emergency room visits are related to mechanical trauma, with TBI accounting for about 50% of deaths from these events. In automobile accidents, 53% of the occupants have trauma,

and, of these, about 70% have TBI. In spite of the death rates, it is necessary to highlight the indices of severe and prolonged functional impairment of the survivors.

Traumatic brain injury can cause primary and secondary lesions. The primary lesions are those that occur at the moment of trauma, while the secondary ones result from aggressions that begin after the moment of the accident, resulting from the interaction of intra and extra-cerebral factors, which add up to prevent the survival of brain cells spared by trauma initial [6].

After brain injury, the brain becomes vulnerable to a number of secondary changes that may occur within minutes, hours or days after the primary injury. Mortality may be influenced by systemic alterations, such as hypoxia, hypotension and hydroeleolitic imbalances, being of vital importance the correction of situation that may cause secondary lesions. Of the patients who survive at least 54% present neurological damage of greater or lesser severity [7]. Thus, the professionals who attend this type of patient should be familiar with the clinical features, complications and treatment of TBI [8].

The care of TBI patients should begin at the accident site, and it is extremely important that trained and up-to-date people perform the first care, which must be of quality in order to avoid and minimize sequelae caused by TBI [6]. According to some authors [9], care for TBI victims is based on the stabilization of the patient's vital conditions and care through life support with agility and objectivity, whose work process is in the fight against time to reach the vital balance.

It is evident the need to constantly update this theme, aiming at improving the conditions of prevention and treatment of the pathology, in order to function as a true prophylaxis of deaths and sequelae resulting from this type of trauma.

In view of the above and the knowledge that the nurse professional works with the multiprofessional team in the care of the trauma victim, especially the victim of TBI, the following question was elaborated: what are the main nursing care provided to victims of cranioencephalic trauma? To elucidate this questioning, it was defined as an objective to know the main nursing care provided to victims of cranioencephalic trauma.

In this perspective, this research aims to motivate new research and may contribute, so that nurses working in the care of victims of TBI can ally with theoretical foundation, leadership ability, work, discernment, initiative, teaching ability, maturity and emotional stability.

METHODS

It is an integrative review of the literature, a study that offers quick access to the relevant results of researches and evidences that base the conducts or the decision making, providing a critical knowledge [10].

This study involves six steps: the first is the elaboration of the research question; The second is the search or sampling of literature; The third is data collection; In the fourth, a critical analysis of the included studies is carried out; The fifth discusses the results and, finally, the sixth presents the synthesis of knowledge [11].

The guiding question adopted for this study was: what are the main nursing care provided to victims of cranioencephalic trauma?

The data search was carried out in the following Databases: Scientific Electronic Library Online (SciELO), Latin American and Caribbean Literature in Health Sciences (LILACS), Nursing Database (BDENF), National Medical Sciences Information Center Of Cuba (CUMED) and Medical Literature Analyze and Retrieval Sistem on-line (MEDLINE) from February 15 to March 18, 2017, using the descriptors "Cranioencephalic Traumatism" and "Nursing" in Portuguese, English and Spanish languages with interposition of the Boolean operator AND.

The inclusion criteria were: articles available in full; publication period from January 2004 to December 2016; publications in English, Spanish or Portuguese languages. Repeated and inconsistent articles on the subject were excluded from the research.

After the search of the publications, titles and abstracts were read and analyzed, according to the inclusion and exclusion criteria established. We selected 11 articles that met the established criteria and that brought important contributions to the development of the study. The selected works were recovered in full and analyzed in depth.

Subsequently, the information was grouped by collecting the characteristics of the selected studies containing the main attributes of each article: authors name, article title, study objective, periodical and year of publication.

The article was read and analyzed globally, aiming to delineate the most predominant thematic axes. Then, three thematic categories emerged that responded to the guiding question and met the proposed goal.

RESULTS AND DISCUSSION

After defining the guiding question, locating and selecting the articles, a total of 714 potentially eligible publications were identified to be included in this review. After removal of duplicate articles ($n = 250$), the abstracts of 464 records were analyzed to verify if they met the eligibility criteria and would answer the question that guides this review. After reading the abstracts, 448 articles were excluded, being read in full of 16 articles. In total, 11 articles met the inclusion criteria and answered the review question being included in the synthesis and analysis of the data.

Table 1 shows the studies that make up the integrative review sample.

Table 1: Articles included in the integrative review according to their characteristics. Belém/PA, 2017.

Authors	Article title	Purpose of the study	Journal / Year
López-Morales AB, Calderón-Dimas C, Rodríguez-Benítez G, López-Castillo R, García-Sandoval A.	Guía de práctica clínica. Intervenciones de enfermería en la atención del adulto con traumatismo craneoencefálico grave	Make available to the recommendations of the nursing team based on the best evidence the intention to standardize the attention actions of the adult with severe head trauma.	Rev Enferm Inst Mex Seguro Soc/ 2015.
Oliveira DMP, Pereira CU, Freitas ZMP.	Scales for assessing the level of consciousness in brain trauma and its relevance to the practice of nursing in neurosurgery	Carry out a review of the literature on scales for assessing the level of consciousness in patients with cranioencephalic trauma, drawing attention to its importance in nursing practice.	Arq. bras. neurocir/ 2014.
Quiroga A, Ávila J, Badillo G, Cleves O, Garavito M, Huertas L, Matallana L, Soto J.	Intervenciones de enfermería en trauma craneoencefálico en urgencias	To determine the interventions that should be performed in patients with TBI to create a protocol of nursing interventions that improves care.	Repertorio de Medicina y Cirugía/ 2009.
Vázquez JTG, Rodríguez PB, Vergara EH, Villa KF.	Cranioencephalic injury	To identify the incidence of TBI in children and their mechanisms of production more frequent, mortality, sex, more vulnerable age groups, need for mechanical ventilation and specific nursing care.	Rev Cubana Enfermer/ 2004.
Pérez AD, Valdés VA, Álvarez RP, Caballero JLC.	Revisión sobre el manejo del trauma cráneo encefálico en La Unidad de Cuidados Intensivos Emergentes. Matanzas	Perform a review on the initial management of TBI in emergent intensive care units.	Rev méd electrón/ 2011.
Hernández BT, Montejo JM, Muñoz FG.	Comportamiento de la presión intracraneal en niños con traumatismo craneoencefálico severo	To evaluate the performance of intracranial pressure in children with TBI.	Rev Cubana Enfermer/ 2005.
Olson DM, McNett MM, Lewis LS, Riemen KE, Bautista C.	Effects of Nursing Interventions on Intracranial Pressure	To examine the relationship between intracranial pressure and specific nursing interventions in routine care.	Am J Crit Care/ 2013.
Amorim CF, Menezes Júnior JE, Alves TEA, Araújo DP, Gúzen FP, Cavalcanti JRLP.	Neurological evaluation performed by nurses in cranioencephalic trauma victims	To analyze the understanding of the nurses who work in the Intensive Care Unit on the neurological evaluation in victims of Cranioencephalic Trauma.	Rev Neurocienc/2013.
Pereira N, Valle ARMC, Fernandes MA, Moura MEB, Mesquita GV.	Nursing care for traumatic brain injury victims: a literature review	To analyze the main nursing care provided to victims of traumatic brain injury.	Interdisciplinary Journal NOVAFAP/ 2011.
Cunha ANC, Araújo LM, Vieira MIAC.	Nurses' performance to traumatic brain injury victims: a review	To analyze the characteristics of the nurses' performance to victims of TBI, to address the pathophysiology of TBI and to demonstrate the benefits of the nurses' performance to the victims of this pathology.	Electronic journal of the Faculty of Ceres-REFACER/ 2015.
Agnolo CMD, Haerter DR, Gil NLM.	Nursing care in severe traumatic brain injury (TBI)	Carry out a bibliographic review regarding the care of patients with TBI.	UNINGÁ Review/ 2011.

It was observed that, in relation to the year of publication, there were three articles (27.27%) in 2011, two (18.18%) in 2013 and 2015 (18.18%), the remainder with one article (9.09%) in 2004, 2005, 2009 and 2014, totaling 36.36%. The countries that produced the most studies on this subject were Brazil with 45.45%, and the other Cuba 27.27%; Mexico 9.09%; Colombia 9.09%, and USA 9.09%.

The articles are original and review research published in 10 different journals, and the Cuban Journal of Nursing published two articles on this theme, with 18.18% of the publications. When the research designs were analyzed, 6 review articles (54.54%), a descriptive with a quantitative approach (9.09%), two retrospective descriptive studies (18.18%), and a multicenter observational study (9, 09%) and a descriptive study with a qualitative approach (9.09%).

From the guiding question, reading and analysis of the articles, it was possible to raise three categories: knowing the traumatic brain injury, initial interventions to the victim of traumatic brain injury and interventions to maintain intracranial pressure. They are presented as follows:

KNOWING THE TRAUMATIC BRAIN INJURY

Cranioencephalic trauma is one of the leading causes of death and disability in the United States and accounts for

about 30% of all injury deaths. Every day, 153 people die in the United States from injuries that include TBI [3]. This type of injury can lead to incapacities due to neurological sequelae due to lack or delay in care, as well as inadequate treatment of the professionals involved [12].

Those who survive TBI may experience effects that last a few days or the rest of their lives. These effects may include thoughts or impaired memory, movement, sensation (eg, vision or hearing) or emotional functioning (eg, personality changes, depression). It should be noted that they affect not only individuals, but they can be lasting on families and communities [13] making it important that these victims be adequately handled from the scene of the event so that temporary or permanent sequelae can be minimized or prevented.

According to some definitions, the Centers for Disease Control and Prevention (CDC) [14] says that TBI is caused by a collision, blow, or shaking to the head that disrupts normal brain function and that not all of these events in the head result in TBI. It also says that the severity of an TBI can range from "mild" (a brief change in mental state or consciousness) to "severe" (a prolonged period of unconsciousness or memory loss after injury). Most TBIs that occur each year are mild, commonly called concussions.

On severe TBI, some authors say that it occurs due to a direct injury in cranial, encephalic or meningeal structures resulting from a great exchange of mechanical energy caused by an external physical agent and that causes functional deterioration to the patient [15].

This lesion can occur after the accident and can assume two different aspects: primary and secondary brain injury. Primary brain injury can be conceptualized as a direct trauma in the brain associated with vascular structures that occur at the time of the initial aggression. It includes bleeding, lacerations and other direct damage to the brain, its vessels and membranes. While secondary brain injury refers to the continuous lesion processes triggered by the primary lesion. At the time of injury, the pathophysiological processes that continue to damage the brain for hours, days and weeks after the initial aggression begin. The primary focus of the conduct before the TBI is to identify and limit or interrupt these mechanisms of secondary injury [16].

Some factors are related to the emergence of secondary brain injury as hypotension, hypoxia, anemia, fever, hyperglycemia, hyponatremia, sepsis, coagulopathy, hematoma, cerebral edema, increased intracranial pressure, cerebral herniation, vasospasm, hydrocephalus, infections, seizures and vascular lesions cerebrais [17].

Some authors reinforce the need for early recognition of TBI signs and symptoms in order to contribute to the reduction of worsening of existing lesions, prevention of sequelae or secondary lesions and consequently reduce morbidity and mortality, thus providing a better quality of life for survivors [18]. Thus, it emphasizes the importance of the health professional, especially the nurse in the care of these victims from the prehospital to the hospital.

INITIAL INTERVENTIONS TO THE VICTIM OF TRAUMATIC BRAIN INJURY

Among the literature studied, it was found that the nurse is the professional who has an important role in the care of the victim of TBI, since it is necessary that he is able to obtain a brief history of the patient, perform physical examination, performing the immediate treatment and worrying with the maintenance of life. This professional must link the theoretical knowledge to the capacity of leadership, initiative, assistential and teaching skills. In addition, it needs to be reasoned quickly, since it is responsible for the coordination of a nursing team, being a vital and integral part of the emergency team [17].

Still, according to the authors mentioned above, the nurses are the key element of the team responsible for providing care to the trauma patient during each phase of the care provided. And it must continually seek its improvement in relation to the leadership skills and at the same time to update itself in the molds established by the specific educational programs to act in this service area [17].

Before initiating patient assessment, the nurse at the trauma site should collect information about the occurrence of the trauma by questioning the patient, family, or witness by collecting data about the trauma mechanism: When did it occur? What caused the injury? High Speed Projectile? Did

an object collide with the head? Which gives? What direction and force of the impact? [16]. These questions help nurses to prioritize care according to the severity of the event, because through the mechanism of injury it is possible to tell which injuries and severity the victim of TBI is exposed and thus treat it more specifically and quickly, minimizing eventual sequelae of the accident [17].

The pre-hospital evaluation of the patient has as main objective to establish the condition of the patient, deciding in which state is found the probability of life or death. The patient with severe trauma needs an hour of time from the moment it suffered the injury so that treatment is instituted, and the scene can not be exceeded in ten minutes. This is called the golden hour [19].

Evaluation of the patient is established by the primary evaluation or initial evaluation followed by the secondary evaluation. The components of the primary and secondary assessment should be memorized and the initial assessment must be automatic looking at conditions that threaten the patient's life. It must still be orderly, fast and efficient on the way to hospital [19].

The TBI should be treated like any other severe trauma, taking into account that about 40-50% there are other traumatic injuries associated. In the initial care of these victims follows the Advanced Trauma Life Support (ATLS) recommendations of the American College of Surgeons, which are presented in the following five stages [19]:

- A. Permeability of airways and control of the cervical spine.
- B. Breathing and ventilation.
- C. Control external bleeding and maintain blood pressure.
- D. Assessment of neurological status.
- E. Exposure with control of hypothermia.

The initial care to the patient victim of TBI by means of a protocol facilitates the work developed by the nurse. In a timely manner, the professional will have more security in the conducts to be performed thus favoring a good prognosis of the victim [17].

The main goal in treating the victim of TBI is to establish a patent airway and keep cervical spine immobilized by placing the patient in the supine position and inserting a cervical collar. Must maintain patent airway due to the sensitivity of the brain to hypoxia, further aggravating the neurological deficit. An obstructed airway retains CO₂ (carbon dioxide), causes hypoventilation, dilates cerebral vessels and elevates intracranial pressure [20].

In order to ensure the permeability of the airways, it is necessary to perform orotracheal aspiration, since, depending on the intensity of the cranioencephalic trauma, there is loss of consciousness and obstruction of the upper airways due to emesis, oropharyngeal secretion and tongue fall. In case of obstruction due to tongue dropping in the unconscious patient, the guedel cannula should be introduced, in case the patient rejects it or returns to consciousness, it should not force its introduction [15,19]. Stage B consists of maintaining adequate cerebral oxygenation to avoid hypoxia and possible complications

[21], that is, maintaining normoventilation (PCO₂ between 35 and 40mmHg), especially in the first hours of evolution of a brain injury [19,22]. And the nurse professional has the scientific knowledge about the management of devices, requirements and ventilatory volumes according to the clinical condition of the patient [23].

According to the researched literature, it is necessary to evaluate the respiratory status of the patient, in case of abnormal breathing, oxygen (4l / min and 28%) should be provided by means of a mask according to clinical situation. If breathing is absent or there is extreme bradypnea, ventilate with a resuscitation pouch connected to an oxygen reservoir at 10-12 l / min [19].

A study performed in an emergency department of a third-level hospital with 29 TBI patients showed that during the care offered to the patients, oxygen had been provided by auxiliary staff and a high index was not given oxygen therapy, being one of the main requirements. In all patients with TBI [21].

The nurse should pay attention to the circulation of the victim of TBI, noting the presence of possible signs of hypovolemic shock and external bleeding, thus favoring the conduct to be taken.

Hemorrhage control is achieved according to the severity of the lesion, with measures of pressure in the external hemorrhage or by surgical hemostasis in the internal hemorrhage [21]. The professional should evaluate the capillary filling, the color of the skin, the body temperature, and the handling. Of external bleeding should apply direct pressure to the wound using gases. Hemorrhages occurring in the skull should not be tightly compressed [16,19].

An episode of hypotension doubles a patient's risk of mortality. The risk of secondary cerebral ischemia is avoided by maintaining systolic blood pressure above 90 mmHg by fluid administration [15].

Volume restitution can be achieved with the use of large caliber catheters (14-16 French) in two peripheral veins, preferably the upper extremities. The recommendation is to use isotonic saline solutions, as they reach acceptable pressure values (mean arterial pressure of not less than 80 mmHg) and to recover normal pulse characteristics. In order to monitor the patient, the placement of a pulse oximeter is indicated [15,16].

Once the patient's cardiopulmonary status is stabilized, prompt and directed neurological evaluation is performed. It consists of determining the coma scale of Glasgow and the pupillary response. These instruments are significant and reliable on the severity of the brain injury, with repeated evaluations to determine improvement or deterioration of the state [21].

Thus, the neurological evaluation of the subjects under study becomes an essential element in the daily practice of nursing, emphasizing the need for standardization of this examination so that all nurses follow a protocol at the time of evaluation [24].

The level of consciousness is one of the important parameters to identify the deterioration of the TBI patient that requires specific knowledge and preparation. The team, especially the nurse, should be able to evaluate it with skill, precision and safety, so knowing the existence of a scale of evaluation of the level of consciousness is necessary [25].

The Glasgow Coma Scale (GCS) defines the level of consciousness by observing behavior, based on a value. It is considered a gold standard for evaluation of patients with TBI, helping to determine the severity of the trauma, interpretation of the clinical status and prognosis of the patient, and clinical nursing research [25].

Each component of the three parameters (visual, verbal and motor) on the Glasgow scale receives a score varying from 3 to 15, being the best score 15 and the lowest score 3. A score of 13 to 15 indicates mild head injury or cerebral concussion; 12-9, moderate head injury; and 8-3, severe trauma [16].

The pupillary evaluation evaluates the size, symmetry and photoreaction [12]. Anisocoria greater than 2 mm, for example, with a unilateral mydriasis is indicative of involvement of the third cranial nerve [12,16] and both fixed and dilated pupils reveal lesion and impairment of the brainstem, indicating a negative prognosis [18].

Regarding the exposure of the victim, to facilitate the full assessment, including the back area, the patient should be completely naked. It is advisable to cut clothing for greater visibility of body structures [15]. However, insofar as it is evaluated, control of hypothermia is necessary.

The last stage in the evaluation comprises performing the complete physical examination in the detection of lesions that were previously not seen. According to the literature, it is worth noting that the prognosis in mild or severe TBI is not safe when it is only established on the Glasgow scale score, being the relevant the complete physical examination to verify findings that allow to evaluate the real condition and to determine the treatment and prognosis [21].

Continuous vital signs (temperature, heart and respiratory rate and blood pressure) are also highlighted, which are indicators of the patient's functional status, and may report complications such as respiratory failure, shock or sepsis. Adequate and timely interpretation helps the nurse and the physician to decide management practices [21,26].

INTERVENTIONS TO MAINTAIN INTRACRANIAL PRESSURE

Signs of elevated intracranial pressure include decreased heart rate (bradycardia), increased systolic blood pressure, and increased pulse pressure. With increased brain compression, respirations get faster, blood pressure can decrease, and the pulse slows down. Tachycardia and hypotension may indicate that bleeding is occurring somewhere in the body [17].

High intracranial pressure can shift the brain to areas with less pressure and thus generate the hernia syndrome, with the most common types being uncal, transtentorial, and

infratentorial. In addition, it can be said that it is the main intracranial cause of secondary brain injury after severe head injury and is related to mortality and the results are unfavorable [15].

The nurse should focus on the care of the possible complications inherent to this serious entity, such as fever, which often decompresses intracranial pressure, and thus the importance of maintaining normothermia [15]. It is also necessary for the nurse to control vital signs such as heart rate, blood pressure and respiratory rate, hypotension and, therefore, hypoxemia also contributes to aggravate the stability of intracranial pressure. In addition, restore adequate ventilation and oxygenation, effective blood volume and blood pressure as much as possible, and maintenance of normothermia [27].

Hypoxia should be avoided and adequate monitoring of oxygen saturation and capnography should be performed when adequate ventilation is provided. Pain, agitation, non-adaptation to the ventilator contribute to increase intracranial pressure, so sedation-analgesia becomes critical in the treatment of these patients. For analgesia, fentanyl or morphine chloride and midazolam are recommended as sedation, all in continuous infusion [19].

A multicenter study of the relationship between nursing interventions and intracranial pressure of inpatients found that nursing interventions, such as facilitating family members to communicate with or around the neurologically compromised patient, administration of sedatives / analgesics, and repositioning of the patient in the bed were associated with a decrease in intracranial pressure 5 minutes after the intervention [28].

CONCLUSION

In the face of what was found, there is the importance of nursing actions in care for brain injury victims, either in pre-hospital or in-hospital. Since, being an essential member of the multiprofessional team, it has the competence, ability to act in the initial and secondary evaluation of the patient victim of trauma, recognizing and stabilizing mainly the injuries that compromise the life of these individuals with speed and efficiency, besides acting as leader, leading the nursing team.

Care for traumatic brain injury victims is based on following the advanced life support protocol, prioritizing injuries with imminent risk of death and stabilizing the patient in preventing the worsening of existing injuries at the time of the traumatic event and avoiding or minimizing Secondary brain lesions that may compromise the quality of life of the individual and its family.

In a database search, we found a relatively small number of researches related to the nurses' performance in patients with traumatic brain injury. Thus, it is essential to expand studies on this subject so that the professional can carry out his functions in an adequate, effective, competent and more up-to-date manner.

It is hoped by this study, discussions on the nursing practices to the victims of TBI and the contribution to the

production of knowledge that makes possible a better training of the professional nurses in the care of these victims.

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