Original Research Article

Recovery Degree in Pediatric Patients with Antecedent Severe Traumatic Brain Injury in Mexico

ABSTRACT

Aims: To determine the recovery degree in pediatric patients with antecedent severe traumatic brain injury.
Study design: Prospective, analytical and relational.
Place and Duration of Study: Pediatrics Intensive Care Area of the "Hospital para el Niño Poblano" from March 2014 to February 2015.
Methodology: Patients aged 2 to 192 months, both sexes, with antecedent severe traumatic brain injury. The degree of recovery was determined with the Glasgow Outcome Score (GOS) at hospital discharge and one year after. Descriptive and inferential statistics were used data analysis.
Results: The study consisted of 23 patients, of which 69.56% were men. The mean age was 73.17±50.33 months. The predominant age group was middle childhood (34.78%). The main mechanism of injury was run over by a vehicle (39.13%). The group of toddler remained hospitalized for 17.50±8.58 days. Moreover, GOS at hospital discharge (p=0.391) and at one year (p=0.789) was not associated with sex. Additionally, an association of GOS at hospital discharge was found with GOS at one year of care (p=0.003), with greater improvement being observed, in those cases with less initial damage brain.
Conclusion: The degree of recovery at one year after hospital discharge in pediatric patients with antecedent severe traumatic brain injury is associated with the degree of recovery at hospital discharge. Middle childhood, being the group at greatest risk. The complications can reduce the recovery of the patient. Rehabilitation therapy provided by the public health services and the family is of vital importance.

Keywords: critical care, Glasgow Outcome Scale, GOS, head injury, neurotrauma

1. INTRODUCTION

Traumatic brain injury is defined, as any physical injury or functional impairment of the cranial content secondary to a sudden exchange of mechanical energy [1] or as physical injuries produced on brain tissue that temporarily or permanently alter brain function [2]. The categorization is established from the Glasgow Coma Scale as mild (3-8), moderate (9-13) and severe (14-15) [3]. In recent years, traumatic brain injury has become a major public health problem [4] as it represents, the leading cause of death and disability worldwide among all trauma-related injuries [5]. In the United States, an estimated 500-800 new cases per 100,000 people. However in Mexico, was identified a lifetime prevalence of traumatic brain injury of around 15% [6]. Traumatic brain injury in pediatric patients is common in the emergency department [7]. Nevertheless, does not carry serious consequences. Despite this, in the general population, it is the leading cause of mortality and disability in children older than 12 months in high-income countries, estimating that about 10% of the children

under 18 years of age will suffer some type of head trauma during this stage, with a mortality rate twice as high in children under 12 months [8].Traumatic brain injury can cause cell death, neurotoxicity mediated by alteration in neurotransmission, cerebral edema, vasospam and compromised angiogenesis, causing secondary lesions with potential irreversibility and neurological disability [9]. Glasgow Outcome Scale (GOS) is recommended, as an instrument to measure the degree of recovery from traumatic brain injury. It is simple to apply and has reliability, validity and stability in its results [10], categorizing patients in death, neurovegetative status, severe disability, moderate disability and good recovery [11]. The objective of this paper, is to determine the recovery degree in pediatric patients with antecedent severe traumatic brain injury.

2. METHODOLOGY

Prospective, analytical and relational study in patients, aged 2 to 192 months, both sexes, with antecedent severe traumatic brain injury in Pediatrics Intensive Care Area of the "Hospital para el Niño Poblano" during March 2014 to February 2015. Patients were classified in: infancy (28 days-12 months), toddler (13-24 months), early childhood (25-71 months), middle childhood (72-132 months) and early adolescence (133-198 months) [12]. The degree of recovery was obtained by Glasgow Outcome Score (death (1); neurovegetative state (2); severely disabled (3); moderately disabled (4); and good recovery (5); at hospital discharge and one year after [13]. Descriptive and inferential (Student´s t test, Chi square, V Cramer) statistics were used data analysis, with a confidence interval 95%, using the statistical program SPSS Ver. 25.

3. RESULTS AND DISCUSSION

The study was carried out with 23 patients, of which 21 (69.56%) were men. The mean age did not present a statistical difference between the sexes ($p = 0.090$), being higher in men (84.94 ± 55.39 months) than in women (46.29 ± 20.12 months), which coincides with other studies related to pediatric severe traumatic brain injury [14,15] (Table 1). The predominant age group as well as, in other investigations [16] were, middle childhood (34.78%) with a mean age of 91.13 ± 22.16 months, followed by early childhood (21.74%) (Table 2).

The principal injury mechanisms, were run over by vehicle (39.13%), fall at the same level (13.39%), fall at different levels (13.04%) and car accident (8.34%), data similar were reported in other studies [17, 18]. The length of hospital stay with respect to gender did not display significant differences ($p = 0.550$), with a mean of 12.48 ± 5.62 days (Table 3). The toddler group stayed longer (17.50 ± 8.58 days), followed by early adolescence (12.25 ± 3.77 days), which differs from other investigations, probably due to, the availability of resources and the complications presented in each patient [19] (Table 4).

Glasgow Outcome Scale (GOS) at hospital discharge, was not associated with sex ($p = 0.391$). Men in this stage showed lower values than women, with 56.25% they found in GOS 2 and GOS 3 (Table 5). GOS one year after hospital discharge, was not associated with gender ($p = 0.789$). An association of GOS at discharge was found with GOS, one year after hospital discharge ($p = 0.003$), observing greater improvement, in those cases with less damage. The most frequent hospital discharge was with GOS 4 (52.17%), followed by GOS 3 (39.13%) and GOS 1 (8.7%). One year after hospital discharge, GOS 5 (56.52%) and GOS 4 (34.78%) predominated. Improvement was observed, in all patients studied (Table 6). These results are consistent with other investigations, by the degree of injury and the presence of complications such as, early multi-organ dysfunction and decrease the probability of a favorable recovery [20,21].

Table 1. Age in months with respect to the sex of the patients.

Sex	P value	N	Mean	Standard deviation	Minimum value	Maximum value
Man	0.090	16	84.94	55.39	2	168
Woman		7	46.29	20.12	24	80
Total		23	73.17	50.33	2	168

Table 2. Classification of patients respect age stage.

Clasification	N	Mean	Standard deviation	Minimum value	Maximum value
Infancy	2	6.00	5.66	2	10
Toddler	4	18.75	6.08	13	24
Early childhood	5	51.00	9.35	36	59
Middle childhood	8	91.13	22.16	71	132
Early adolescence	4	153.00	11.49	144	168
Total	23	73.17	50.33	2	168

Table 3. Hospital stay in days respect to sex.

Sex	P value	N	Mean	Standard deviation	Minimum value	Maximum value
Man	0.550	16	12.00	4.00	5	20
Woman		7	13.57	8.60	5	28
Total		23	12.48	5.62	5	28

Table 4. Hospital stay in days respect to age stage.

Clasification	N	Mean	Standard deviation	Minimum value	Maximum value
Infancy	2	10.50	2.12	9	12
Toddler	4	17.50	8.58	7	28
Early childhood	5	10.00	6.32	5	21
Middle childhood	8	12.13	4.26	5	20
Early adolescence	4	12.25	3.77	8	17
Total	23	12.48	5.62	5	28

Table 5. Glasgow Outcome Scale (GOS) in hospital discharge and one year after, respect to sex.

Sex	GOS hospital discharge	GOS one year after hospital discharge

	1	2	3	4	5	Total	1	2	3	4	5	Total
Man	-	2	7	7	-	16	-	-	1	6	9	16
Woman	-	-	2	5	-	7	-	-	1	2	4	7
Total	-	2	9	12	-	23	-	-	2	8	13	23

Table 6. Glasgow Outcome Scale (GOS) in hospital discharge and one year after, respect to age stage.

Grupo de edad	GOS hospital discharge						GOS one year after hospital discharge					
	1	2	3	4	5	Total	1	2	3	4	5	Total
Infancy	-	-	2	-	-	2	-	-	-	1	1	2
Toddler	-	-	2	2	-	4	-	-	1	1	2	4
Early childhood	-	-	2	3	-	5	-	-	-	2	3	5
Middle childhood	-	1	1	6	-	8	-	-	-	2	6	8
Early adolescence	-	1	2	1	-	4	-	-	1	2	1	4
Total	-	2	9	12	-	23	-	-	2	8	13	23

4. BASIC MANAGEMENT OF ADMISSION OF PATIENTS WITH SEVERE TRAUMATIC BRAIN DURING THE SARS-CoV-2 PANDEMIC

The SARS-CoV-2 pandemic has modified hospital admission protocols, and even more so in pediatric emergency services [22]. In pediatric patients, with severe traumatic brain injury, it is important to rule out any added conditions, that may represent serious complications [23]. In hospital admission, the presence of chronic diseases, heart disease, Cancer, neuromuscular and immunological disease should be investigated [24]. Likewise, corroborate the presence of respiratory distress, oxygen saturation, data on tissue hypoperfusion and arterial hypotension [25]. Diagnostic tests for COVID-19 are ideally PCR, radiography or tomography chest [23,24,25]. Proper management of patients with severe traumatic brain injury and ruling out COVID-19, at the time of hospital admission will be reflected in an important recovery.

5. CONCLUSION

The degree of recovery at one year after hospital discharge, in pediatric patients with antecedent severe traumatic brain injury is associated with the degree of recovery at hospital discharge. Middle childhood was the group at greatest risk. The complications can reduce the recovery of the patient, currently those produced by the COVID-19 pandemic, therefore, diagnostic studies by PCR, radiography or chest tomography should be mandatory previously, admission in order to reduce risks additional that may compromise, the recovery patient. Rehabilitation therapy provided by the public health services and the family are of great importance. Therefore, it is recommended continue with research related to the subject, in order to propose management alternatives.

CONSENT

All authors declare that written informed consent was obtained from the patient´s parents for publication of this paper.

ETHICAL APPROVAL

The research work was examined and approved by the hospital research and ethics committee.

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