Artículo Original

Traumatic brain injury for horse kicking in pediatrics: Neurosurgery brazilian experiencie

Lesión cerebral traumática en pediatría por impacto de coz de caballo: Experiencia neuroquirúrgica brasileña

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RESUMEN:

Describir una serie de casos de pacientes pediátricos con traumatismo craneal por impacto de coz de caballo; es decir, hay pocos relatos en la literatura. Este es un estudio retrospectivo de pacientes menores de 16 años, víctimas de traumatismo cráneo encefálico (TCE) por coz de caballo, en un hospital brasileño de referencia de trauma. 16 pacientes fueron analizados, predominantemente del sexo masculino, de 8 a 18 años de edad. La mayoría tenían TCE leve en la admisión. La region ósea más comprometidq fue la región frontal (62,5%). El tiempo promedio de hospitalización fue de 12,7 ± 3,94 días: no se reportó ningún caso de deterioro neurológico. No se identificaron factores de agravamiento, y la evolución clínica fue satisfactoria cuando se comparó con otras etiologías de TCE; incluso después de tres meses de seguimiento, utilizando la escala GOS-E pediátrica. En este estudio, TCE por coz de caballo, conlleva a trauma leve con evolución favorable.

Palabras claves: Lesión traumática del cerebro, pediátrica, fractura del cráneo, coz de caballo.

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ABSTRACT:

Describe a case series of pediatric patients with head injury by horse kicking, TBI cause few reported in the literature. This is a retrospective study that exposes the neurosurgical experience in patients under 16 years old, victims of TBI by horse kicking, in a Brazilian trauma reference hospital. 16 patients were analyzed, predominantly male, mean age 8.18 years-old. Most had mild TBI on admission. The most frequent involved skull region was frontal (62.5%). The average hospital stay was 12.7 ± 3.94 days, no case of neurological deterioration was reported. Determining factors of worsening outcome were not identified, and clinical outcome was satisfactory when compared to other TBI etiologies, even after three months of follow up, using Pediatric GOS-E. In this study, TBI by horse kicking show a mild trauma mechanism as well as has a possible favorable outcome.

Key Words: Brain injury, Pediatric, Skull fractures, Horse kick, Head trauma

INTRODUCCION

Traumatic brain injury (TBI) by horse kicking is an infrequent event, with few series described in the literature [1,2,3,4,5]. These events occur when the person is affected by the animal's boost generated by their legs, unlike the mechanism of animal's fall. Security measures, e.g. helmets, during sports and recreational practices - when most accidents occur [5,6] - significantly reduces this incidence [1,3,4]. However, more than 1/3 of injuries occur while the rider was not in riding activity [5].

Children are almost twice as likely to suffer injuries related to riding horses than adults (5.6 injuries in children under 16 years vs. 3.9 for over 16 years, each 10.000 people [7], with some series pointing the cephalic region with most particular risk of injury[5,8,9]. When the head injury occurs, it is considered potentially serious, due to association with sinking skull fracture, brain injuries, besides other systemic injuries, contaminated wound, often of neurosurgical treatment.

The purpose of this study is to present a specialized neurosurgery hospital experience in management of patients with up to 16 years and TBI by horse kicking and early prognosis after 3 months.

METHODOLOGY

Study design and study population

This retrospective study was carried out between January 2007 and December 2011. The period was chosen because this service was the only responsible for 14 million inhabitants until that time. Included criteria were patients under 17 years old, victims of TBI by horse kicking, undergoing surgery in Pediatric Neurosurgery Service of the main trauma hospital of the State of Bahia in Brazil. Data were collected in a prospective database service and collected using records with the approval of the local Ethics Committee.

The variables of interest criteria were: sex, age, origin, Glasgow Coma Scale (GCS) at admission and discharge, presence of facial trauma or other body segments, sequelae, complications, time of hospital stay and Pediatric Glasgow Outcome Scale Extended (P - GOSe) in three months.

Patients who were not submitted to neurosurgery treatment and history of previous neurological surgery were excluded.

Management of patients

All TBI patients admitted to the emergency room were submitted to a brain computed tomography (CT) scan, followed by a neurosurgeon evaluation. Patients with open sinking skull fracture were submitted to surgical protocol. For scalp exclusive injuries, washing with saline solution and wound dressing were realized, suture in one plan and clinical care, with supplementary anti tetanus vaccination schedule if necessary and per os antibiotic treatment.

Surgical protocol

Under general anesthesia in the operating room, strict antisepsis was realized. Expansion of traumatic skin lesion to view the limits of sinking skull fracture. Craniectomy for bony edges regularization. Esquirolectomy with microsurgical technique for cases of intracerebral bone fragments. Simultaneous hematoma drainage when existing (epidural, subdural and/or intraparenchymal), followed by hermetic duroplasty.

Cases with open sinking skull fracture involving frontal sinus: coronal incision, wide exposure of the skull base, front or bifrontal craniotomy, sinus skeletization, correction of the sinking and the skin lesion. In bone defects eligible for cranioplasty correction was performed until four months later.

Antibiotics for 7-10 days: in patients with dura mater's lesions; Ceftriaxone + Oxacillin + Metronidazole. For patients without dural lesion, first generation Cephalosporin for seven days.

Statistical analysis

Patient characteristics matched the quantitative variables (age, length of hospital stay) were presented as mean ± standard deviation. Categorical variables (Glasgow Coma Scale,

proportion of sex, origin, CT scan classification, associated trauma, complications, Pediatric Glasgow Outcome Scale extended and causes of poor outcome) were considered as nominal variables, and were expressed as proportions with a confidence interval of 95% and compared using Chi-Square Test and T Student test. The mean value was given if p value < 0.05. Some independent variables were dichotomized into binary variables for age under 10 years, facial trauma associated and presence of intracerebral hemorrhage. The relative risk for each variable was estimated for the 95% CI and p value < 0.05.

RESULTS

Population

Sixteen patients with open skull fracture sinking, 8.18 ± 4.99 years-old (range 2 to 16 years), with male predominance (M/F 4.3: 1) were analyzed *(Table 1)***.** Fifteen patients were admitted with mild TBI; there were no severe TBI (GCS <9). A six-years-old child was admitted numb due to TBI by a frontal horse kicking, with open skull fracture sinking and intracerebral hematoma *(Figure 1 and Figure2)***.** The most frequent involved skull region was frontal (62.5%), followed by parietal (31.25%) and temporal (18.75%). There were no cases of occipital injuries.

TABLE 1 - Characteristics epidemiologic

CHARACTERISTICS	N
Sample – Total of Patients	16
Age – Mean (± SD)	8,18 (±4,99)
Child (0-9)	9
Adolescent (10-16)	7
Sex	
Male	13
Female	3
Procedence	
Capital	1
Countryside	15
Glasgow in Admission – Mean (± SD)	14 (±1,03)
Mild TBI (GCS 14-15)	14
Moderate TBI (GCS 9-13)	2
Severe TBI (GCS 3-8)	0
Findings in Tomography of Head	
Epidural Hematoma	0
Subdural Hematoma	0
Intracerebral Hematoma	1
Sinking	16
Facial Trauma	6 (37,5%)
Presence of extracranial injuries*	0
Presence of Sequels	0
Complications	0
Pediatric Glasgow Outcome Scale Extended – Mean (±SD)	1±0,47
Length of Stay – Mean (±SD)	12,7 ± 3,94
Mortality	0

***Abdomen, Thorax, Upper Extremity and Lower Extremity**

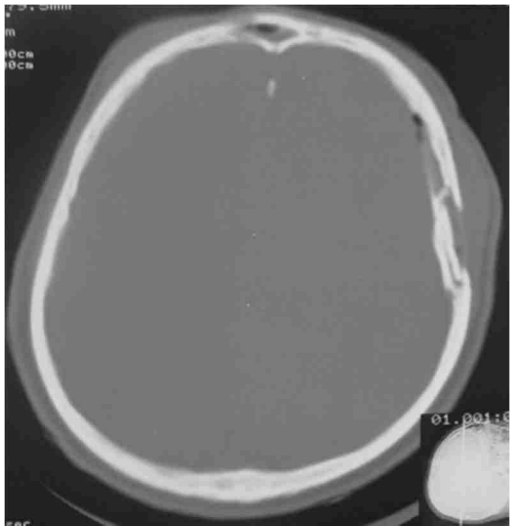
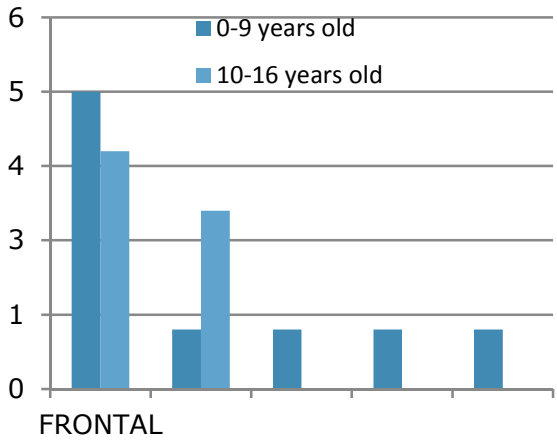


Figure 1: Parietal sinking skull fracture in a 08 years-old girl

Figure 2: 06-year-old patient and fronto-temporal sinking with intracranial hypertension by frontal brain hematoma.

Despite frontal lesions predominance in patients under 6 years-old and parietal in over 10 years old, this prevalence was not significant. In 06 cases, they were associated with facial trauma - 05 of them with frontal fracture sinking (Graph 1)

GRAPH 1 – Location of head sinking x age group



Surgical Management and Outcome Hospital

All patients underwent at least one surgical technique: correction of the open skull fracture sinking. No closed skull trauma patients were operated in this series. Despite the occurrence of subarachnoid hemorrhage, hemorrhagic petechial, small collections of epidural and/or subdural hematoma adjacent to the skull fracture, in only one case, the patient underwent the surgical treatment of intracerebral hematoma associated with frontal sinking, without precocious functional neurological impairment.

Dichotomized independent variables for analysis of worse clinical outcome, younger than 10 years, simultaneous facial trauma and intracerebral hemorrhage showed no statistical relationship. The presence of intracerebral hemorrhage increased

hospitalization period, but could not be listed as factor of worse outcome.

The average time of hospitalization was 12.7 ± 3.94 days ranging between 6 and 20 days. There were no cases of neurological deterioration. Antibiotics were used for at least 7 days. Late bleeding, ischemia, seizures, wound infection, abscess or meningitis did not occur in this group. After 03 months all children were with P - GOSe 1-2.

DISCUSSION

Accidents linked to riding animals are common in some societies even today. Children are almost twice as likely than adults to experience secondary equestrian activity injury [7] and in over a third of the cases the severe injuries had taken place with the rider not mounted [3]. Grandin affirms the risk of serious injury appears more cumulative of exposure than the rider expertise [10]. This information ratifies our findings, in which more than 90% of accidents were caused in the countryside where riding animals presence is a daily part of these rural populations.

Children are particular risk for head injury by larger head size compared to the body, and smaller stature compared to riding animals [3]. Further, the absence of helmets and safety equipment in management and approach of these animals (stage where the rider is behind or beside the animal), makes this series the most expressive with pediatric patients undergoing neurosurgery due TBI caused by animal hoof kicking. Females predominate in literature, likely regarding the riding activity [5]. However in activities not ruled in domestic environment, boys are more affected; data cited in Fontan [2] and confirmed in our series. Fontan, as well as other authors, highlight a peak incidence in adolescence, around 13 years old [2,5,11,12]. However, our study shows that in neurosurgical patients by horse kicking, that age drops to around 8 years-old. Possible reason for this reduction in the age group operated is no presence of danger sense among middle childhood children and smaller than young teens.

In our series, extra cranial injuries were not reported. This apparent discrepancy with the literature can be explained by the fact that our data is based only on patients who require hospital care for specialized services in neurosurgery: other type of injuries like abdominal and orthopedic injuries were carried out in less complexity in another hospital service. Further, abdominal trauma is more common in falling accidents [5]. There were no cases of TBI and abdominal trauma in the same time and patient.

The absence of factors associated with worse clinical outcome may have occurred because of the small the number of patients studied. At age less than 10 years-old, facial trauma and intracerebral hemorrhage were not worse outcome predictors in this group. Subdural or subarachnoid hemorrhage did not result in worse clinical outcome; all patients have been discharged with good neurological recovery (P – GOSe ≤

2) after 03 months, confirming the abscense of relationship between the admissional GCS and posterior GOSe. In the case of 06-year-old patient and fronto-temporal sinking with intracerebral hypertension by frontal brain hematoma, increased hospitalization time, but no worse clinical outcome. In addition, hoof kicking TBI considered high impact accidents with low rotational movement energy[1,3], with a pathophysiological behavior similar to traumatic brain epidural hematomas. Such behavior helps to explain the favorable neurological outcome, by direct injury only at the impact site, absence of counterblow injury, swelling and edema more common in subdural and intracerebral hematomas with worst prognosis.

The authors recognize methodological limitations to the study for a real analysis of factors related to clinical and neurological outcome in this group of patients. However, understanding that even this neurosurgical head trauma has a possible favorable outcome, there is the need the adoption of educational measures especially for parents and guardians to reduce the children `s exposure to this type of injury with its physical and psychological consequences.

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