Article

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Do children with Glasgow 13/14 could be identified as mild traumatic brain injury?

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ABSTRACT

Objective: To identify in mild head injured children the major differences between those with a Glasgow Coma Scale (GCS) 15 and GCS 13/14. **Method:** Cross-sectional study accomplished through information derived from medical records of mild head injured children presented in the emergency room of a Pediatric Trauma Centre level I, between May 2007 and May 2008. **Results:** 1888 patients were included. The mean age was 7.6±5.4 years; 93.7% had GCS 15; among children with GCS 13/14, 46.2% (p<0.001) suffered multiple traumas and 52.1% (p<0.001) had abnormal cranial computed tomography (CCT) scan. In those with GCS 13/14, neurosurgery was performed in 6.7% and 9.2% (p=0.001) had neurological disabilities. **Conclusion:** Those with GCS 13/14 had frequently association with multiple traumas, abnormalities in CCT scan, require of neurosurgical procedure and Intensive Care Unit admission. We must be cautious in classified children with GCS 13/14 as mild head trauma victims.

Key words: adolescents, brain injuries, child, Glasgow Coma Scale, head trauma, prognosis.

Pacientes pediátricos com Glasgow 13 ou 14 podem ser identificados como traumatismo craniano leve?

RESUMO

Objetivo: Identificar as principais diferenças entre os pacientes com Escala de Coma de Glasgow (GCS) 15 e aqueles com escore 13/14. **Método:** Estudo realizado por meio da revisão de prontuários médicos de crianças vítimas de traumatismo craniencefálico leve, admitidas em Centro de Urgências Pediátricas nível I, durante um ano. **Resultados:** Incluídas 1888 vítimas; idade média de 7,6±5,4 anos; 93,7% apresentaram pontuação 15 na GCS. Naqueles com pontuação 13/14, 46,2% (p<0,001) sofreram traumas múltiplos e 52,1% (p<0,001) apresentaram alterações na tomografia de crânio. Tratamento neurocirúrgico foi necessário em 6,7% dos pacientes com GCS 13/14 e 9,2% (p=0,001) apresentaram seqüelas neurológicas no momento da alta hospitalar. **Conclusão:** Crianças com escore 13/14 apresentam maior prevalência de traumas múltiplos, alterações na tomografia de crânio, necessidade de tratamento neurocirúrgico e internação em Unidade de Terapia Intensiva. Devemos ser cautelosos ao classificar crianças com pontuação 13/14 na GCS como vítimas de traumatismo craniano leve.

Palavras-chave: adolescente, injúria cerebral, criança, Escala de Coma de Glasgow, traumatismos craniocerebrais, prognóstico.

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Head trauma is one of the most relevant public health problems throughout the world, reaching high morbidity and mortality rates. It also represents the leading cause of death and disability in children and young adults, which affects patients' quality of life and sometimes disrupts family environment[1-11] , even if they have mild traumatic brain injury (MTBI)[12]. In Brazil we notice the same problems, and children and adolescents make an important group affected by head trauma[3,5,6].

Based on Glasgow Coma Scale (GCS)[13], some authors diverge about the classification of MTBI[6,13-17]. Definition of cut off values to define MTBI varies among different guidelines, but the score 13-15 is the original one[13]. Comparison among groups and studies as well as development of recommendations and guidelines become particularly difficult when one takes in count all these different concepts regarding MTBI[16,18] .

Here we sought to identify the major differences regarding the scores that define MTBI, and try to demonstrate that we must be very cautious in classified children with GCS 13/14 as MTBI.

METHOD

This is a cross-sectional study developed to access clinical, epidemiological and demographic data of children and adolescents younger than 18 years with MTBI. We reviewed all medical records of patients admitted to the emergency room (ER) of a Pediatric Trauma Centre level I, from Salvador/Bahia, Brazil. Observation was carried through a one-year period, which started on May 2007 and ended on May 2008. Data were collected for age, gender, trauma history, GCS score on admission (including the adjustment for children under 05 years old[19,20]), modality of treatment (neurosurgical or not), cranial computed tomography (CT) scan results, length of hospital stay (in days), admission in the Pediatric Intensive Care Unit (PICU) and Glasgow Outcome Scale (GOS)[21] score at hospital discharge. We considered GOS between 2 and 4 (neurological disabilities) as worse outcomes.

Only patients with GCS score known as 13, 14 or 15 were classified as MTBI[13]. Here we used the World Health Organization (WHO) definition for pediatric population[22].

Patients were classified into two groups for analysis, since hospital admission: Those with GCS score of 15 (GCS 15); Those with GCS score of 13 or 14 (GCS13/14).

The pediatricians who assisted the children in the emergency room defined which radiological exam was necessary. The reports of CT scans were provided by neurologists, neurosurgeons or radiologists.

The study was approved by the Hospital Ethics Committee under registration n° 06/07.

Statistical analysis

For data analysis, all quantitative variables are expressed as mean±SD (standard deviation). Categorical data were analyzed by using chi-square test.

RESULTS

A total of 2593 patients aged from 0 to 18 years with a history of head trauma were available within the one-year study period. A total of 1888 (72.8%) had MTBI. According age group, those between 3 and 6 years-old (28%) were the main victims. Mean age was 7.6±5.4 years. In 93.7% of the cases we observed a GCS 15 at hospital admission. Prevalence of MTBI in male kids (68.2%) was significantly higher than in female ones (31.8%) ($p<0.01$). Children with GCS 13/14 were older than those with GCS 15. Demographic data are presented in Table 1.

Regarding to possible associations with other lesions, 485 (27.4%) patients with a GCS 15 suffered multiple trauma, against 46.2% of the other group ($p<0.001$). In reference to imaging studies, 734 patients were submitted to CT scan and 205 (10.9% of all admitted patients) had abnormal findings. In the GCS 15 group, we observed 143 (8.1%) abnormal CT scans, against 62 (52.1%) in the GCS 13/14 group ($p<0.001$) (Table 2).

Neurosurgical treatment was performed in 6.7% of patients in the GCS 13/14 group and only in 2.3% of pa-

Table 1. Demographic data among 1888 children with mild head trauma in a level I Pediatric Trauma Centre of Salvador/Bahia, Brazil (2007/2008).

		Glasgow Coma Scale			
		13 or 14 (n=119)		15 (n=1769)	
Mean age		10.7±5.7		7.2±5.4	
Gender	Male	67.5%	(80)	79.0%	(1397)
Causes	Falls*	45.4%	(54)	63.9%	(1131)
	Traffic**	36.1%	(43)	18.7%	(331)
	Violence	10.9%	(13)	5.7%	(100)
	Others	7.6	(9)	11.7%	(207)

*Falls from a height and ground level falls; **Traffic accidents including motor-vehicles and vehicle-pedestrian accidents.

Table 2. Principal's differences between children with Glasgow Coma Scale 13/14 and those with score 15.

Variables	Glasgow Coma Scale	
	13 or 14 (n=119)	15 (n=1769)
Multiple trauma*	46.2%	27.4%
CT abnormalities*	52.1%	8.1%
Neurosurgical treatment **	6.7%	2.3%
PICU admission*	6.7%	0.4%
Hospital length-of-stay*	4.2 days±6.7	0.8 days±2.0
Morbidity (GOS between 2-4)*	9.2%	0.8%

*p value <0.001; **p=0.007; CT: cranial computed tomography; PICU: pediatric intensive care unit; GOS: Glasgow Outcome Scale with neurological disabilities.

tients in the GCS 15 group (p=0.007). Patients in the GCS 13/14 group were admitted to a PICU more often than victims in the GCS 15 group (6.7% and 0.4%; p<0.001). Mean length of hospital stay was 4.2 (±6.7) days among children in the GCS 13/14 group whereas the majority (93%) of children with GCS 15 was discharged from the hospital within the first 24 hours (Table 2).

On hospital discharge, GOS score of 2, 3 or 4 (neurological disabilities) was observed in 9.2% of patients in the GCS 13/14 group, against 0.8% of patients in the GCS 15 group (p=0.001) (Table 2).

DISCUSSION

Children between 3 and 6 years-old composed the main group in this study, and fall from a height represented the leading cause of head trauma in those patients, probably due to the discovery of new activities such as climbing trees, beds, chairs and walls. Similarly to previous studies, we observed boys as the main victims of MTBI, which is in agreement with the relevant exposure of this group to some traumatic agents[6,11,23]. We also showed here that children with GCS 13/14 are older than those with a GCS 15, maybe because those are exposed and involved in more severe accidents, such as traffic ones.

In reference to the most important causes of traumatic brain injury, our results are similar to those in previous studies, which define falls and vehicle-pedestrian accidents as the leading mechanisms of injury in children and adolescents[6,11,23]. These data corroborate the need for new traffic safety education policies in our city. Furthermore it is important to think about these accidents as a consequence of caregivers' possible lack of attention regarding to some children activities in high places and streets.

We verified that children with a GCS 13/14 were more often involved in multiple traumas than those with GCS 15. The same was observed regarding to abnormal findings on CT scans, PICU admission and neurological disabilities at hospital discharge. Perhaps these differences between both groups show the severity of trauma in those with GCS 13/14, the higher risk of brain damage and the possible worse outcome. Some authors propose modifications regard including those with GCS13/14 as MTBI as they have worse evolution and require major attention[24].

We agree with previous authors with regard to the need of performing CT scans in multiple trauma victims and in those with GCS score of 13 or 14[14,15,18,25,26] who have had more severe mechanisms of injury. Nevertheless, we must keep in mind that some children with GCS 15 must be submitted to CT scans as well, regarding some neurological findings[14,15,18,25-27].

We observed here different modalities of treatment among children and adolescents with MTBI in confluence to previous studies[14-16,25]. Children that needed neurosurgical procedures were composed mainly by the GCS 13/14 group, which shows, once again, the need of reviewing this group as MTBI. As it has already been observed by other authors, MTBI occurred with a much higher frequency than others head traumas, no neurosurgical treatment is generally necessary, and the patient just remains in observation at hospital or, sometimes, at home[5,6,8,14,16,28]. We noticed that this benign evolution was more frequent among victims with a GCS 15, as verified by others authors[17,24,29]. All these data point to the main differences among MTBI, and show us that we must be aware when including patients with a GCS 13/14 as MTBI victims. Our results could be corroborate by The Brazilian Society of Neurosurgery[15] regarding the importance to take apart victims with MTBI according the risk in developing post traumatic brain lesion.

We noticed that children with MTBI compose a heterogeneous group, with different risk of brain injury and prognosis according to GCS score on admission. We know that it will be very difficult to provide only one appropriate guideline to manage these children but, due to our results in confluence with others references, since they have different characteristics and prognosis, we think that we must be very careful in considering all children with MTBI in the same category as mild trauma.

REFERENCES

1. Colli BO, Sato T, De Oliveira RS, et al. [Characteristics of the patients with head injury assisted at the Hospital das Clinicas of the Ribeirão Preto Medical School]. Arq Neuropsiquiatr 1997;55:91-100.
2. Kay A, Teasdale G. Head injury in the United Kingdom. World J Surg 2001;25: 1210-1220.
3. Koizumi MS, Lebrao ML, Mello-Jorge MH, Primerano V. [Morbidity and mortality due to traumatic brain injury in São Paulo City, Brazil, 1997] Arq Neuropsiquiatr 2000;58:81-89.
4. MacKenzie EJ. Epidemiology of injuries: current trends and future challenges. Epidemiol Rev 2000;22:112-119.
5. Melo JR, Silva RA, Moreira ED, Jr. [Characteristics of patients with head injury at Salvador City (Bahia - Brazil)]. Arq Neuropsiquiatr 2004; 62:711-714.
6. Melo JR, de Santana DL, Pereira JL, Ribeiro TF. [Traumatic brain injury in chil-

dren and adolescents at Salvador City, Bahia, Brazil]. Arq Neuropsiquiatr 2006; 64:994-996.
7. Ducrocq SC, Meyer PG, Orliaguet GA, et al. Epidemiology and early predictive factors of mortality and outcome in children with traumatic severe brain injury: experience of a French pediatric trauma center. Pediatr Crit Care Med 2006;7:461-467.
8. Lacerda Gallardo AJ, Abreu PD. [Traumatic brain injury in paediatrics. Our results]. Rev Neurol 2003;36:108-112.
9. Perez-Andrade MA, Poblano-Luna A. [Aphasia and hypoacusis secondary to traumatic brain injury in children and adolescents]. Rev Neurol 2007;45: 62-64.
10. Leon-Carrion J. Dementia Due to Head Trauma: an obscure name for a clear neurocognitive syndrome. Neuro Rehab 2002;17:115-122.
11. Sala D, Fernandez E, Morant A, Gasco J, Barrios C. Epidemiologic aspects of pediatric multiple trauma in a Spanish urban population. J Pediatr Surg 2000;35:1478-1481.
12. Perea-Bartolome MV, Ladera-Fernandez V, Morales-Ramos F. [Mnemonic performance in mild traumatic brain injury]. Rev Neurol 2002;35:607-612.
13. Teasdale G, Jennett B. Assessment of coma and impaired consciousness: a practical scale. Lancet 1974;2:81-84.
14. The management of minor closed head injury in children. Committee on Quality Improvement, American Academy of Pediatrics. Commission on Clinical Policies and Research, American Academy of Family Physicians. Pediatrics 1999;104:1407-1415.
15. Brazilian Society of Neurosurgery. Diagnóstico e conduta no paciente com traumatismo craniano leve – Projeto Diretrizes, 2001. 2008. Available at http://www.projetodiretrizes.org.br/projeto_diretrizes/104.pdf. Accessed: October 10, 2008.
16. Brell M, Ibanez J. [Minor head injury management in Spain: a multicenter national survey]. Neurocirugia (Astur) 2001;12:105-124.
17. Munoz-Sanchez MA, Murillo-Cabezas F, Cayuela A, et al. The significance of skull fracture in mild head trauma differs between children and adults. Childs Nerv Syst 2005;21:128-132.
18. Hsiang JN, Yeung T, Yu AL, Poon WS. High-risk mild head injury. J Neurosurg 1997;87:234-238.
19. Marcoux KK. Management of increased intracranial pressure in the critically ill child with an acute neurological injury. AACN Clin Issues 2005;16:212-231.
20. Orliaguet GA, Meyer PG, Baugnon T. Management of critically ill children with traumatic brain injury. Paediatr Anaesth 2008;18:455-461.
21. Jennett B, Bond M. Assessment of outcome after severe brain damage. Lancet 1975;1:480-484.
22. World Health Organization (WHO). Avaliable at http://www.who.int. Accesed October 10, 2008.
23. Parslow RC, Morris KP, Tasker RC, Forsyth RJ, Hawley CA. Epidemiology of traumatic brain injury in children receiving intensive care in the UK. Arch Dis Child 2005;90:1182-1187.
24. Gomez PA, Lobato RD, Ortega JM, De La CJ. Mild head injury: differences in prognosis among patients with a Glasgow Coma Scale score of 13 to 15 and analysis of factors associated with abnormal CT findings. Br J Neurosurg 1996; 10:453-460.
25. Borczuk P. Mild head trauma. Emerg Med Clin North Am 1997;15: 563-579.
26. Melo JR, Reis RC, Lemos-Junior LP, et al. Skull radiographs and computed tomography scans in children and adolescents with mild head trauma. Arq Neuropsiquiatr 2008;66:708-710.
27. Falimirski ME, Gonzalez R, Rodriguez A, Wilberger J. The need for head computed tomography in patients sustaining loss of consciousness after mild head injury. J Trauma 2003;55:1-6.
28. Aitken ME, Herrerias CT, Davis R, et al. Minor head injury in children: current management practices of pediatricians, emergency physicians, and family physicians. Arch Pediatr Adolesc Med 1998; 152:1176-1180.
29. Valovich McLeod TC. The prediction of intracranial injury after minor head trauma in the pediatric population. J Athl Train 2005;40:123-125.