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Pediatric trauma score: is it reliable in predicting mortality?

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Abstract. The Pediatric Trauma Score (PTS) is rapidly gaining acceptance for use in prehospital triage. This study examines its reliability in predicting mortality. The charts of the 533 trauma patients hospitalized between 1984–1989 were reviewed and the PTS was calculated for each. There were 3 deaths in 370 patients with PTS >8, while 24 of 163 children with PTS ≤8 died. Size categorization was found to be overemphasized because of the low mortality (7.7%) in children smaller than 10 kg, although their mean PTS (6.4 ± 2.1) was significantly lower than the mean PTS (9.0 ± 2.2) of children over 10 kg. Forty-nine of 71 surgically treated patients having intra-abdominal organ injuries had a PTS >8. The existing parameters of PTS did not have equal relationships to mortality, and may even all be inadequate in the correct triage of children with blunt abdominal trauma.

Key words: Pediatric trauma – Trauma scoring – Mortality

Introduction

Trauma is the leading cause of death in the pediatric population in many developed countries. The Trauma Commitee of the American Pediatric Surgical Association and the Commitee on Trauma of the American College of Surgeons reported that more childhood deaths had resulted from trauma than from all other causes combined during the last decade [6].

In trauma-system organization, hospitals are categorized into levels according to their personnel and equipment, teaching and research activities, locations, and interests. Patient triage gains more importance in such a system, which is now being adopted in many developed countries. The Pediatric Trauma Score (PTS) is one of the methods generally accepted for triage in the United States (Table 1) [6]. PTS is a combined anatomic/physiologic scoring system that can be used for triage and to predict severity of injury. The authors indicated 0% mortality in patients with a PTS >8, whereas 30% mortality was predicted in patients with a PTS ≤8 [6].

The aim of this study was to assess the ability of the PTS to predict mortality in pediatric trauma victims. Pediatric trauma patients hospitalized over a given time period were evaluated retrospectively to analyze the relationship between PTS and mortality.

Patients and methods

During the years 1984–1989, 533 injured children less than 17 years of age were admitted to the Department of Pediatric Surgery, Ege University Hospital, İzmir. Children sustaining burns, penetrating trauma, and pure central nervous system injuries were excluded. PTS was calculated for each patient according to the physical findings noted in charts at the time of hospitalization. Student's *t*-test was used in the statistical evaluation of significance while comparing the means and mortality rates.

Results

There were 375 males and 158 females, a male/female ratio of 2.3/1. Mean age (± SD) was 7.1 ± 3.9 years (4 months–17 years). Most of the patients had PTS values between

Table 1. Pediatric trauma score

Component	Category		
	+2	+1	−1
Size	>20 kg	10–20 kg	<10 kg
Airway	Normal	Maintainable	Unmaintainable
Systolic blood pressure	>90 mmHg	90–50 mmHg	<50 mmHg
Central nervous system	Awake	Obtunded/LOC	Coma/decerebrate
Open wound	None	Minor	Major/penetrating
Skeletal	None	Closed fracture	Open/multiple fractures

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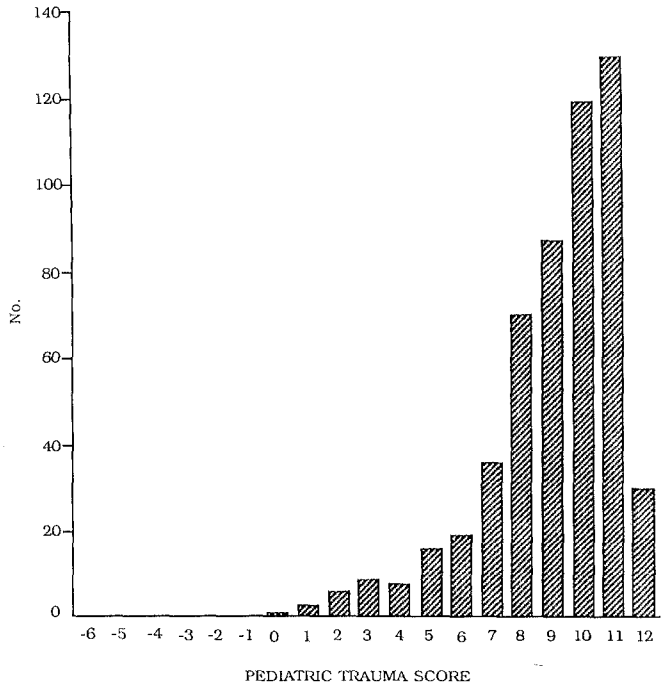

Fig. 1. Pediatric Trauma Score distribution

Table 2. Surgically treated organ injuries after blunt abdominal trauma

	No.
Spleen laceration	32
Liver laceration	14
Bowel perforation	12
Kidney rupture	4
Spleen and liver laceration	2
Spleen and bowel laceration	2
Multiple bowel lacerations and perforations	2
Spleen and pancreas laceration	1
Spleen and bladder rupture	1
Liver and bowel laceration	1
Total number of cases	71

8 and 11 (Fig. 1); the mean PTS was 8.9 ± 2.2. Twenty-seven patients died; the mortality for the whole group was 5.0%.

There were 24 deaths in 163 patients (14.7%) with a PTS ≤ 8. The other 3 were from the group of 370 patients having PTS >8, a mortality of 0.8%. The mean PTS ($\pm$ SD) in the dead patients was 5.1 ± 3.1, in the survivors 9.1 ± 2.0.

Discussion

Appropriate triage of the injured child is gaining more importance, concomitant with increasing efforts at regionalization of trauma care. In this connection, Tepas et al. (1987) developed the PTS, which is rapidly gaining acceptance for use in prehospital triage [5].

The demographic values in our study group appeared to parallel those in similar studies [4, 5]. The mortality and mean PTS for the entire group were also comparable, but there were 3 deaths in patients with PTS scores greater than 8. Two were due to accompanying head injuries and the other to intra-abdominal hemorrhage.

One of the most strongly emphasized parameters of the PTS is patient size. The primary purpose of this size categorization was reported to be the selection of the very small child, who was presumed to be at greater risk of morbidity and mortality for a given injury than the older child [5]. The number of patients weighing less than 10 kg was 26 in our group. None of them had a PTS greater than 8, and the mean PTS was significantly lower (6.4 ± 2.1) compared to the mean PTS (9.0 ± 2.2) of children weighing more than 10 kg ($P < 0.001$). However, the mortality was unexpectedly low (7.7%) when compared to the mortality of all patients with PTS ≤ 8 (14.7%, $P < 0.05$) and was extremely low if compared to the predicted 24%–30% mortality for patients with PTS ≤ 8 [1, 3]. Therefore, these findings raised questions in our minds about the importance of patient size in pediatric trauma scoring.

Considerable improvements have been made in the diagnostic techniques and management of blunt abdominal trauma [2]. However, those new modalities are not in wide use except in higher-level hospitals. Therefore, the physical examination may still suffice in the initial assessment of most cases. On the other hand, intra-abdominal hemorrhage has very few symptoms leading to diagnosis, and except for a decrease in systolic blood pressure, none of them is included in the parameters of the PTS. Moreover, it takes considerable time before the blood pressure begins decreasing due to the patient's compensatory mechanisms. In our study period 71 emergency laparotomies were performed for traumatic visceral injuries (Table 2). The mean PTS for this surgically treated group was 8.8 ± 2.3 and the mortality was 11.3%. Forty-nine of 71 patients (69.0%) treated surgically had PTS scores greater than 8; 50 of these seriously injured children (70.4%) needed 20 ml/kg or more blood transfusion. There seems to be a discordance between PTS values and the outcome of those patients.

In conclusion, the existing parameters of PTS did not have equal relationships to mortality and morbidity, according to our study. We still believe that even in the patients with PTS >8, children with suspected visceral injury should be sent to a higher-level hospital regardless of their trauma score until a more realistic pediatric trauma scoring system is established.

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