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Evaluation of Infants Undergoing Cranial Computed Tomography in the Emergency Department Due to Head Trauma

Ramazan Ünal[1], Dilek Atik[2], Bensu Bulut[1], Ahmet Erdur[1], Hasan Çam[1], Salih Fettahoğlu[1], Ramazan Güven[1], Başar Cander[1]

[1]Sağlık Bilimleri Üniversitesi Kanuni Sultan Süleyman Eğitim ve Araştırma Hastanesi, Acil Tıp Kliniği, İstanbul
[2]Yozgat Bozok Üniversitesi, Tıp Fakültesi, Acil Tıp Anabilim dalı, Yozgat

Abstract

Pediatric head trauma is one of the most important public health issues worldwide and is one of the most common causes of morbidity and mortality in this age group. In infants, trauma of the same severity with adults bring different outcomes as the body structure is different compared to adults. Imaging methods are frequently used in infants presenting with trauma, since children in the 0-2 age group cannot express themselves, their neurological examination is limited and families of infants cannot provide clear information about trauma. The best imaging method for trauma is cranial computed tomography (CCT). In this study, patients aged 0-2 years who applied to an emergency department of a training and research hospital in Istanbul between January 1, 2018 and January 31, 2018 were examined retrospectively. The aim of this study was to determine a clinical pathway by evaluating cranial computed tomography imagings of 0-2 year-old pediatric patients brought to the emergency department for head trauma. In our study, 523 patients aged 0-2 years were admitted for trauma between the specified time period and 166 of these patients underwent CCT. Of the patients who underwent CCT, 9% (n=15) were found to have pathology due to trauma. Ten of these patients underwent follow-up CCT. One of 15 patients was found to have bone fracture. The other 14 patients were suspected of contusion. Of the patients who underwent CCT, 3.1% (n=5) were admitted to the ward for follow-up. When the patients were evaluated in terms of clinical course, hospitalization or discharge in our study, they were found to correlate with pathologies detected on CCT. Due to the intensity of the patients in the emergency department, sufficient time cannot be allocated for the examination and informing of patients. It was observed that Cranial CT request frequency increased especially between 16: 00-00: 00 hours when emergency department intensity increased. In infant trauma patients, imaging studies should be determined considering the severity and mechanism of trauma.

Keywords: head trauma, infant, computed tomography, emergency department

Introduction

Head trauma is a trauma cause with high mortality and morbidity in developed and developing countries.Pediatric head trauma is one of the most important public health issues worldwide and is one of the most common causes of morbidity and mortality in this age group[1,2]. Head trauma clinics exhibit mild to severe outcomes. Since the head region is like a closed box, diagnostic examinations are required in addition to neurological evaluations. In infants, trauma of the same severity with adults bring different outcomes as the body structure is different compared to adults. Although the incidence of intracranial pathology in children with head trauma varies between 3-5%, the incidence is slightly higher in infants[3,4]. Imaging methods are frequently used in infants presenting with trauma, since children in the 0-2 age group cannot express themselves, their neurological examination is limited and families of infants cannot provide clear information about trauma. The best imaging method for trauma is cranial computed tomography (CCT)[5]. The aim of this study was to determine a clinical pathway by evaluating CCT imagings of 0-2 year-old pediatric patients brought to the emergency department for head trauma.

Materials and Methods

This study retrospectively analyzed patients aged 0-2 years who were admitted to the emergency department of Istanbul Health Sciences University, Kanuni Sultan Suleyman Training and Research Hospital for head trauma between January 1, 2018 and January 31, 2018 and underwent CCT. In this study, patients who were above 2 years of age and who did not have isolated head trauma and whose data were incomplete were excluded from the study as the exclusion criteria. As statistical analyses, compliance with the parametric test criteria was evaluated by performing normality test for all variables. Demographic analysis of the patients was determined by basic descriptive statistics. For correlations between the data, the Spearman's rank-order correlation was

Corresponding Author: Ramazan ÜNAL **e-mail:** dr.ramazanunal@gmail.com
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used in non-parametric data and the Pearson correlation in parametric data.

Results

In our study, 523 patients aged 0-2 years were admitted for trauma between the specified time period and 166 of these patients underwent CT. Of these patients, 89 (54%) were male and 77 (46%) were female. When the hours of admission to the emergency department were evaluated, of the patients, 32.5% (n=54) were admitted between 08:00-16:00 hours, 59% (n=98) between 16:01-00:00 hours, 8.4% (n=14) were admitted between 00:01-07:59 hours (Figure 1). When the admission types were evaluated, of the patients, 92.8% (n=154) were admitted as outpatient and 7.2% (n=12) were brought to the emergency department by ambulance. When the admission days of were evaluated, it was found that of the patients, 13.2% (n=22) were admitted on Monday, 19.2% (n=32) on Tuesday, 10.2% (n=17) on Wednesday, 11.4% (n=19) on Thursday, 13.8% (n=23) on Friday, 14.4% (n=24) on Saturday and 11.4% (n=19) were admitted on Sunday, respectively. Of the patients, 81.9% (n=136) were readmitted to the emergency department. Of the patients who underwent CCT, 9% (n=15) were found to have pathology due to trauma (Figure 2). Ten of these patients underwent follow-up CCT. One of 15 patients was found to have bone fracture. The other 14 patients were suspected of contusion. Of the patients who underwent CCT, 12.7% (n=21) were consulted with neurosurgery with clinical findings and CCT results. Of the patients who underwent

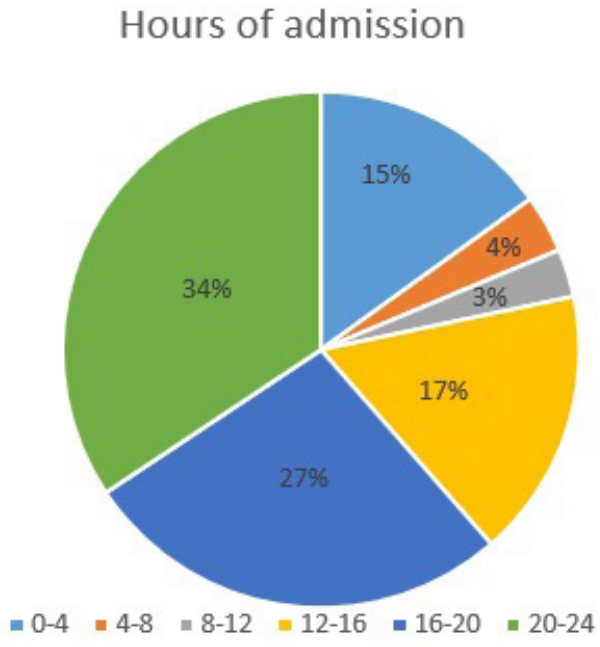

Figure 1.

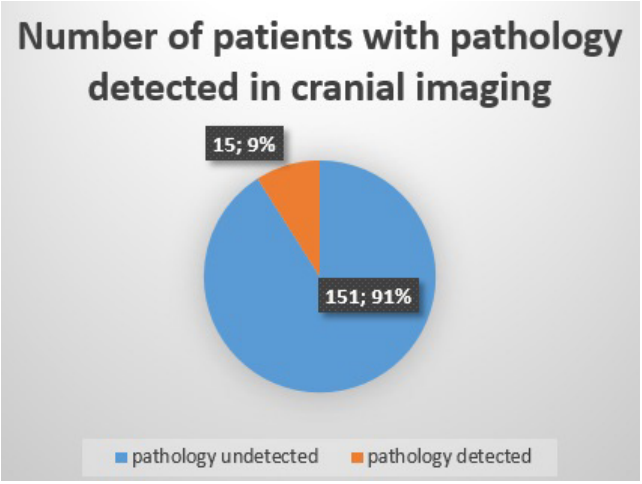

Figure 2.

CCT, 3.1% (n=5) were admitted to the ward for follow-up and 96.9% (n=161) were discharged after examination and follow-up. Ten of the 15 patients who were found to have pathology were discharged after emergency department follow-up on consulting physician's recommendation. A total of 17 patients underwent follow-up CCT; although 7 of these had no pathology on their first CCT, follow-up CCT was considered necessary due to clinical suspicion during the emergency department follow-up. No pathology was visualized on follow-up CCT of these patients and they were discharged. It was found that mortality did not develop in any of the patients included in the study within the following 1 year. In our study, a moderate positive correlation was found in terms of the follow-up CCTs of the patients and the clinical course (r: 0.405, p=0.000). In our study, a moderate positive correlation was found in terms of performing consultation and the clinical course (r: 0.462, p=0.000).

Discussion

In the United States (USA), more than 500,000 children are admitted to emergency departments for head trauma each year[1,6]. Head traumas account for the vast majority of childhood injuries[7,8]. In a study conducted on adults, it was reported that young males in our country carry a high risk for head trauma[9,10,11]. Since our study involves the 0-2 age range, the difference between genders is not seen in our study. In our study, the admission times and days of the infant patients presented with head trauma were analyzed and an intensity was observed between 16:00-00:00 hours. Patients presenting with trauma do not show difference between days of the week.

Computed tomography is preferred as the diagnostic examination for trauma cases to evaluate inside the head. Although the presence of subcutaneous hematoma in the head region under the age of 1 increases the likelihood of bone fracture, it is not clinically sufficient and radiological

imaging is recommended in these patients[12,13].In some studies, the rate of ordering cranial CT as a diagnostic examination in children with head trauma varies between 5-50%[9]. In our study, the rate of cranial CT order was 31.7%, which is similar to previous studies. Especially in infants, CT-induced radiation exposure increases the risk of malignancies and associated mortality[14,15].In our study, the percentage of the patients presented with head trauma and found to have pathology was approximately 1%. The hospitalization percentage of the patients for follow-up is similar to previous studies[16]. In a study on head traumas, no surgical intervention was required for patients similarly to our study[17]. In the study by Da Dalt et al. on infant head trauma, there were patients with fatal outcome. This differs from our study. When the patients were evaluated in terms of clinical course, hospitalization or discharge in our study, they were found to correlate with pathologies detected on CCT.

Conclusion

The limitation of neurological examination in infant and pediatric traumas and inability to express themselves lead us to diagnostic imaging examinations in emergency departments. Due to the intensity of the patients in the emergency department, sufficient time cannot be allocated for the examination and informing of patients. However, the anxious attitude of infant families especially causes medico-legal concerns in physicians and forces the physician to work examination-weightedly. These concerns become more pronounced, especially during the hours when the intensity of emergency department increases. In our study, it is seen that CCT was ordered especially between 16:00-00:00 hours. In terms of ordering a diagnostic examination, a more selective attitude should be adopted for diseases that may further develop and it is thought that imaging examinations should be ordered considering the severity and mechanism of occurrence in infant traumas.

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