Original Research

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Falls and Motor Vehicle Accidents as The Most Common Causes of Moderate and Severe Head Injuries in Children Age 3 and Younger

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ABSTRACT

Objective: We aimed to evaluate the most common causes of moderate and severe head injury at age 3 and younger.

Material and Methods: This is a retrospective study that included 157 children (105 males and 52 females) at 3 years of age or younger who were admitted to our emergency unit for moderate or severe head injury between June 2001 and December 2008. Data on patient age, gender, cause of trauma, clinical signs and symptoms, length of hospitalization, radiological findings, surgery, additional injuries, postoperative and late complications, and mortality were examined.

Results: The mean age of the patients was 21.05 months. The most common presentation was deterioration in consciousness. The most common cause of moderate head injury was a fall from 1–2 m at 7–12 months of age, and for severe head injury it was a motor vehicle accident at 19–24 months of age. The most common radiological finding in all groups was a linear fracture. In the moderate head injury group, 16 epidural hematomas (EDH), four subdural hematomas (SDH), two dura-brain lacerations, and two depressed fractures required surgery. In the severe head injury group, 6 SDHs and 5 EDHs required surgery. The major postoperative complications were meningitis, rhinorrhea, epileptic seizures, and subdural fluid collection. The overall mortality rate was 3.18% (5 of 157 patients).

Conclusions: In our series of moderate and severe head trauma in patients younger than 3 years, the most common cause of trauma was falling from 1–2 m. For prevention, family caregivers must watch crawlers and toddlers closely.

Keywords: child, head injuries, moderate head injury, severe head injury, under 3 years of age

ÖZET

Megapol İstanbul'da 3 yaş altı çocuklarda orta ve ağır şiddetteki kafa travma nedeni olarak; yüksekten düşme ve araba kazası

Amaç: 3 yaş altı çocuklarda orta ve ağır kafa travmasının nedenlerini ve sonuçlarını inceledik.

Yöntem: Bu retrospektif çalışmada Haziran 2001-Aralık 2008 arasında 157 çocuk (105 erkek: 52 kız) acil servise orta ve ağır kafa travması ile başvurarak yatış verilenler incelendi. Hasta yaşı, cinsiyeti, travma nedeni, klinik bulgu ve semptomlar, hastanede kalış süresi, radiolojik bulgular, cerrahi girişim, ek yaralanmalar, postop ve geç komplikasyonlar ve mortalite araştırıldı.

Bulgular: Ortalama yaş 21.05 aydı. En sık başvuru bulgusu bilinç bozukuğu idi. Orta şiddette en sık neden 1–2 m'den düşme (7–12 aylık), ağır kafa travmasında motorlu araç kazası (19–24 aylık). En sık radyolojik bulgu lineer fraktürdü. Orta kafa travmasında, 16 epidural hematom (EDH), 4 subdural hematom (SDH), iki dura-beyin laserasyonu, ve iki depresyon fraktürü cerrahi gerektirdi. Ağır kafa travmasında, 6 SDH ve 5 EDH cerrahi gerektirdi. Belli başlı postop komplikasyonlar; meninjit, rinore, epileptik nöbet, ve subdural sıvı kolleksiyonu idi. Toplam mortalite oranı 3.18% (5/157 hastada).

Sonuç: Bizim serimizde orta ve ağır kafa travması 0-3 yaşın en sık nedeni 1-2 m yüksekten düşme olarak bulundu. Önlem için çocukların anne-baba ve bakıcıları emekleme ve sıralama döneminde sıkı takip edilmesi için uyarılmalıdır. Ayrıca tekrarlayan 0-3 yaş travmalı çocuklarda çelişkili ifade veren bakıcılar çocuk suiistimali açısından dikkatle araştırılmalıdır.

Anahtar kelimeler: ağır şiddette kafa travması, çocuk 0-3 yaş travması, orta şiddette kafa travması

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Introduction

Traumatic brain injury (TBI) is the dominant cause of death (40% of fatal accidents) and morbidity in the pediatric population (1-3). An American study reported that 200-300/100,000 children experienced traumatic brain injuries annually (10% fatal) (4).

Childhood head injuries are caused by motor vehicle accidents (occupant or pedestrian), falls, walking-chair accidents, pulling/rolling objects (televisions and cupboards) on to oneself, bicycle accidents, being hit by projectile toys, and being dropped by a caretaker (3,5,6).

Head injuries are classified as mild, moderate, or severe according to the severity of trauma, accounting for approximately 90.4%, 9%, and 0.6% of the injuries, respectively (5). In children younger than 36 months, the most common cause of head injury is falls (75%) (7).

The data obtained from larger studies are needed for children younger than 3 years of age. Data are limited in terms of etiology and prognostic predictors in moderate/severe trauma because the literature focuses on inflicted/non-accidental head injuries (8-10,11-16).

We aimed to analyze etiological, clinical, historical (data collected during time elapsed since injury; seizure, physiological shock, anisocoria, early sedation/intubation), and radiological predictors/findings leading to surgical or conservative treatment while consulting other related disciplines for safe recovery.

Methods

Our study design included children under 3 years of age with Glasgow Coma Scale (modified for children) score of less than 13 at inpatient admission, focal neurological signs, penetrating injury, depressed skull fracture, high-energy trauma, prolonged lethargy/irritability/vomiting with linear fracture, and infants with massive scalp hematoma. Mild head injuries (GCS:15-13) were not included in this study. Also excluded were children who died during acute admission or whose primary injury was not neurosurgical.

We retrospectively analyzed the clinical data of 131 children younger than 3 years (mean age 20.83 months, range 2 days-36 months) admitted to the emergency department for moderate head injury (GCS:13-9) and 26 children younger than 3 years (mean age 23.69 months, range 4-36 months) admitted to our intensive care unit for severe head injury (GCS:8-3) between June 2001 and December 2008.

After first examination, our decision to hospitalize the children was based on CT findings and neurological deterioration.

Radiological data, fractures/hematoma/edema as evidence of moderate or severe head injury was repeated after 3 hours. The cause of trauma was obtained from the medical records and parents'/witnesses' reports. The presenting symptoms on admission, age, gender, cause of trauma, length of hospitalization, computed tomography (CT) findings, surgery, additional injuries requiring consultation by other surgical disciplines, postoperative and late complications, and mortality were also noted.

Results

Information was collected on 157 head-injured children under 3 years of age between June 2001 and December 2008. The inclusion criteria were hospitalized patients with moderate or severe head injuries according to the Modified Pediatric Glasgow Coma Scale (GCS under 13) (17). In terms of head injury severity, 83.4% (n=131) were classified as moderate and 16.6% (n=26) as severe head injuries (Table 1).

Trauma Etiology

The etiology of the trauma changed according to age. Thus we grouped the patients by their ages into 6-month periods. The largest age group was 7–12 months (n=35, 26.7%) for the moderate head injury group and 19–24 months (n=9, 34.6%) for the severe head injury group.

Overall 66.8% (n=105) of the patients were male, although the gender dominance varied with age (Table 1). The moderate head injury group comprised 86 males and 45 females and the

Table 1: Moderate and severe injury groups according to gender

	Moderate	Severe	Total
Male (n/%)	86 (65.6%)	19 (73%)	105 (66.8%)
Female (n/%)	45 (34.4%)	7 (27%)	52 (33.2%)
Total (n/%)	131 (83.4%)	26 (16.6%)	157 (100%)

severe head injury group 19 males and 7 females. Male dominance was significant for both the 7-12 and 13-18 months of age groups in the moderate head injury group ($p<0.05$) (Table 2).

The injury causes by age and gender are displayed in Table 2. Overall, in the moderate head injury group, the major cause of head injury was falls 87% (n=114). Among falls, the most common type was a fall from 1-2 m (n=61/131, 46.5%). The largest age group was 7-12 months (n=35) and male dominance (30 males vs. five females) was significant ($p<0.05$) (Table 2). In the severe head injury group, the most common cause of head injury was motor vehicle accident (n=15; 57.6%) and most were in the 19-24-month age group (n=9/26, 34.6%) (Table 2).

Hospital Stay

The mean duration of hospitalization was 3.62 (range 1-20) days and 6.91 (range 1-21) days in the moderate and severe head injury groups, respectively.

Symptomology

The most common symptom in our moderate head injury series was lethargy/change in consciousness (n=127, 97%), followed

Table 2: Moderate head injury group according to gender and 6-month age groups with the cause of trauma: MVA, motor vehicle accident; M, male; F, female. Total 131 (86 M, 45 F).

	0-6 M	0-6 F	7-12 M	7-12 F	13-18 M	13-18 F	19-24 M	19-24 F	25-30 M	25-30 F	31-36 M	31-36 F
MVA (n=12)												
Occupant 7	1	1	1		1		1		1			1
Pedestrian 5					1			1			2	1
Falls (n=114)												
< 1 m (38)	1	2	10	2	2	1	4	5		1	3	7
1-2 m (61)	1	1	15	3	7	1	9	3	1	2	12	6
> 2 m (15)	1	2	3		3	1	3	1		1		
Dropped (n=3)												
By adult (2)	1	1										
By child (1)			1									
Pulled object onto self (n=2)												
TV (1)											1	
Cupboard (1)												1
Total	5	7	30	5	14	3	17	10	2	4	18	16

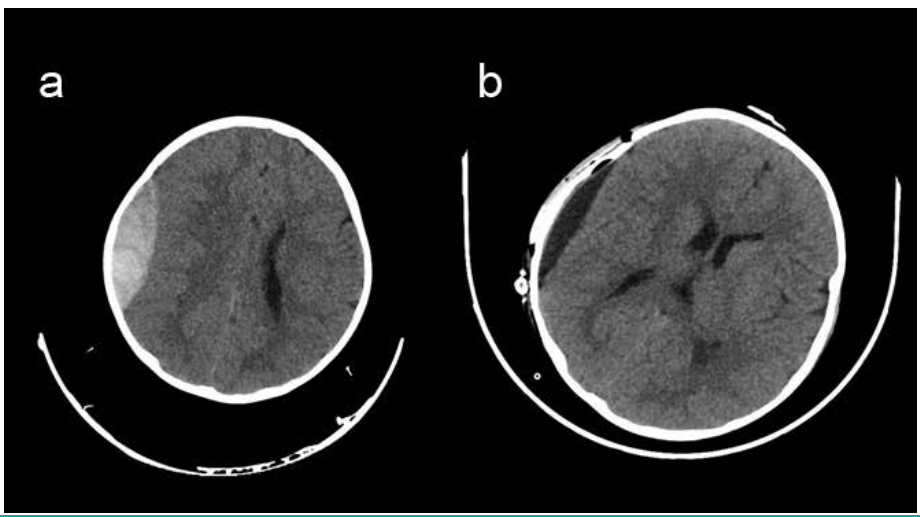

Figure 1: Sample Case: 3 year old boy has fallen from bed 2 days ago, on admission GCS 12 with recurrent vomiting and a very large epidural hematoma on axial CT scans a) pre-op b) Post-op

Table 3: Radiological findings of the moderate head injury and severe head injury group operated on and not operated on: EDH, epidural hematoma; SDH, subdural hematoma; ICH, intracerebral hematoma; IVH, intraventricular hematoma,SAH (Subarachnoid hemorrhage),ICU:intensive care unit, CL:Neurosurgery clinic

	Non-operated		Operated		Total		Exitus	
	ICU	CL	ICU	CL	ICU	CL	ICU	CL
Linear fracture	13	41		20	13	61		
Depressed fr	0	2		2	4			
Multiple fr	6	5		2	6	7		
Bazal fracture	5	26				26		
Diastatic fr	2				2			
EDH	3	2	5	16	8	48		1
SDH	4	17	6	4	10	21		
SAH	2				5			
Brain edema	5	1		1	1			
Cerebral cont		4				4		
Spinal injury	1				1			
ICH	2	1			2	1		
IVH	2				2			
Axonal injury	3				3			
Pneumocephalus	3	10			3	10		
Dura-brain laceration				2		2		

by vomiting (n=72, 55%), scalp swelling/bruising/bleeding (n=68, 52%), otorrhagia (n=18, 13.8%), periorbital edema (n=16, 12.3%), seizures (n=10, 7.6%), and apnea (n=3, 2.3%). In the severe head injury group, all of the patients had deterioration of consciousness, followed by scalp swelling/bruising/bleeding (n=14, 51.8%), periorbital edema (n=5, 18.5%), apnea (n=5, 18.5%), seizures (n=5, 18.5%), cardiopulmonary arrest (n=3, 11%), and otorrhagia (n=3, 11%).

Radiological Findings

The most common radiological finding in the moderate head injury group was simple linear fractures (n=61, 20 with associated hematoma), followed by basal fractures (petrosal or frontobasal) (n=26), multiple fractures (n=7), depressed fractures (n=4), and dura-brain lacerations (n=2). The most common hematoma radiologically in the moderate head injury group was an epidural hematoma (n=48, 16 operated on) (Figure 1 Sample Case), followed by subdural hematoma (n=21, 4 operated on), and one intracerebral hematoma, plus 1 case of brain edema and 10 of pneumocephalus associated with fractures. There was one case of epidural hematoma without a fracture (Table 3).

In the severe head injury group, there were 13 linear fractures, 6 multiple fractures, 5 basal fractures, and 2 diastatic fractures. Considering hematomas, the most common was subdural hematoma (n=10, 6 operated on), followed by epidural hematoma (n=8, 5 operated on), subarachnoid hemorrhage (n=5), intracerebral hematoma (n=2), and intraventricular hematoma (n=2), plus cerebral edema (n=5), axonal injury (n=3), and pneumocephalus (n=3) (Table 3).

Seven patients with moderate head injuries (fall from >2m) deteriorated. One 6-month-old male progressed to bilateral EDH requiring surgical evacuation and died during surgery. A 6-month-old female developed status epilepticus and died on the third day of hospitalization. Five other patients had enlargement of epidural hematomas requiring surgical evacuation with uneventful recovery. The severe head injury group included patients with multiple trauma from motor vehicle accidents and falls from more than 2 m. Two patients died on the day of admission. One patient died on day 20 of hospitalization.

Associated Injuries

Additional injuries included three extremity fractures, two maxillofacial traumas, and one finger amputation in the moderate head injury group and six intra-abdominal hemorrhages, five hemo/pneumothoraxes, three extremity fractures, three lung contusions, and one spinal cord injury in the severe head injury group. Postoperative complications included five patients with seizures, five subdural fluid collections, three cases of hydrocephalus, and one case with both meningitis and rhinorrhea-cerebrospinal fluid leak. Late complications included two skull fractures, and one case both with ataxia, abducens paralysis, and facial diplegia (Table 4).

Table 4: Signs and symptoms (most frequent), radiological findings(Number in moderate-severe group), associated trauma

SİGNS&SYMPTOMS	RADIOLOGICAL FINDINGS	ASSOCIATED TRAUMA
Lethargy/deterioration in consciousness	Linear fracture:61-(20 associated hematoma)-13	Extremity fractures:3
Vomiting (3 or more)	Basal fracture:(26-5)	Maxillofacial fractures:2
Skalp swelling/bruising/bleeding	Multiple fracture:7-6	Finger amputation:1
Otorrhagia	Depressed fracture:4-0	Lung kontusion:3
Periorbital edema	Epidural hematoma:48(16 operated)-8(5 operated)	Spinal cord injury:1
Seizures	Subdural hematoma: 21(4operated)-10(6 operated)	Optic nevre injury:1
Apnea	Intracerebral hematoma:1-2 Brain edema:1-4 SAH(Subarachnoid haemorrhage):0-5	Intraabdominal hemorrhage:6

Discussion

This study examined the epidemiology of moderate and severe head injury in hospitalized children younger than 3 years. The records of all children under 3 years of age who were hospitalized with a head injury over a 7-year period were examined retrospectively.

Crowe et al. stated that the highest rate of moderate head injury under 3 years of age was at 0–6 months, and 23% were caused by fall from the caregiver's arms (5). Margulies et al. proposed that in the first 6 months of life, the infant skull has a limited ability to resist or absorb energy from trauma (18). In our series, in the moderate head injury group the highest rate was at 7-12 months, the most common cause being falls from beds or stairs. In the severe head injury group, it was at 19-24 months, with the most common cause being falls from high stairs or balconies.

Demographically, Crowe et al. found that the gender distribution was fairly equal in the younger age group, whereas males predominated in 24-36-month-old children with mild, moderate, and severe head injuries under 3 years of age (5). We found a female dominance at 0-6 and 25-30 months in the moderate head injury group (not significant, $p>0.1$). All the other age groups showed male dominance, which was significantly six-fold greater in the 7-12 month age group ($p<0.05$). In severe head injury, male dominance was seen in all age groups; the greatest majority of males being in the 19-24 months age group (not significant, $p>0.1$).

Falls were the major cause of moderate head injuries in many studies (most frequent falls from cradles, couches, beds, changing tables, kitchen tables and benches, stools, top-bunks, highchairs, shopping trolleys, balconies, stairs, windows, and walls) (10,14,16,17). Some of the causes of these moderate head injuries (falls from furniture and pulling heavy objects onto oneself) might result from environmental risks or poor parental supervision (5). Falls account for 25-34% of all pediatric trauma admissions in major urban trauma centers, and Musemeche et al. found that 25% of 1463 pediatric trauma cases were the result of falls (6,19). Agranet al. reported different mechanisms for each 3-month period of the first 2 years of life:

being dropped from a height (0-2 months); other falls from battering (3-5 months); falls from furniture (6-8 months); falls from stairs (9-11 months); and falls from buildings (24-26 months) with the incidence of each cause peaking at different ages (20). Oral et al. stated that the most common mechanisms included falls from furniture (0-9 months), falls from stairs (10-12 months), tripping while running/walking (13-18 months), and falls during play activities (19-24 months) (21). In our study, in the moderate head injury group, falls generated the majority of the causes, particularly falls from 1-2 m height (114 falls, 61 falls from 1-2 m). In the severe head injury group, motor vehicle accidents as either occupants or pedestrians were the most important cause of trauma (n=15). Causes also included falls from beds, couches, sofas, pull sofas, stairs, while being thrown in the air, and from swinging on a linen sheet. Higher falls included falls from balconies or from stairs without a barrier or with inadequate railings, bars or banisters in new apartments in Istanbul for which there is no regulated building code. As Bulut et al. stated, the laws governing the construction

of balconies in buildings (the barrier height should be at least 90 cm) are insufficient and controls are inadequate, so falls from balconies remain a threat to child safety in Turkey, especially in the younger age group (<5 years of age) (6).

Radiological Findings

In clinical practice, cranial computed tomography is the gold standard for evaluating children with head injuries. The importance of depressed fractures depends on their location, depth, and scalp rupture overlying the fracture. Surgical elevation is recommended if the depression involves the entire thickness of the skull. Direct violation of the brain parenchyma, cerebrospinal fluid leakage from an open wound, and cosmetic defects in the forehead also require surgical elevation and dura repair. In each trauma case, the properties of the brain tissue underlying the bone pieces of the depressed fracture and surgical treatment priority should be considered (3). In our moderate head injury series, two of four depressed fractures were operated on. If basal fractures are observed, the clinician should consider cranial nerve injuries, meningitis, and cerebrospinal fluid leakage (otorrhea and rhinorrhea). In our moderate head injury patients, there were 98 cranial fractures, and these were associated with 48 epidural hematomas, 21 subdural hematomas, 10 cases of pneumocephalus, 2 dura-brain lacerations, and 1 intracerebral hematoma. In our severe head injury group, there were combinations of various pathologies, including 13 linear fractures, 6 multiple fractures, 2 diastatic fractures, 5 basal fractures, 8 epidural hematomas, 10 subdural hematomas, 5 subarachnoid hemorrhages, 2 intracerebral hemorrhages, 2 intraventricular hemorrhages, 3 cases of pneumocephalus, 3 axonal injuries, and 5 cases of diffuse cerebral edema (Table 4).

In pediatric falls from heights, several authors have reported multi-organ trauma, including trauma to the extremities (14.5%), abdomen (2-9%), pelvis (2%), and spine (0.7%) (6,19,22). In our series, the moderate head injury group included three extremity fractures, two cases of maxillofacial trauma, and one finger amputation. The severe head injury group included five cases of hemo/pneumothorax, three extremity fractures, three lung contusions, six intra-abdominal hemorrhages, one spinal cord injury, and one foreign object in the eye and a palpebral cut.

The reported mortality rate due to head injury in children is 2-4% (23,24). Some authors report a direct relationship between falls from >2 m and mortality (6,25). Agalar et al. reported a significant relationship between the Injury Severity Score, age, fall height, and mortality (26). In our moderate head injury group, two deaths occurred: one from severe brain edema giving rise to status epilepticus, and one bilateral epidural hematoma resulting in cardiopulmonary arrest during surgery. In the severe head injury group, two multiple trauma patients from motor vehicle accidents (one pedestrian and one occupant) died on the day of admission. A patient who fell from a fifth-floor balcony died from cerebral edema 20 days after admission.

Conclusion

Head injury in children younger than 3 years of age is frequent and is a major cause of childhood disability. Typically, these injuries are caused by falls from 1-2 m. Moderate head trauma caused by falls was most frequent in children age 7-12 months, while severe head trauma caused by motor vehicle accidents was most common in children age 19-24 months. There were no reports regarding inflicted trauma or child abuse in our series. However, doctors should warn family caregivers to observe crawlers and toddlers closely. In addition, in cases with inconsistent explanations and conflicting findings related to the reported trauma, clinicians should suspect poor parental care or child abuse.

Contribution Categories	Name of Author
Development of study idea	A.C.
Methodological design of the study	M.I., E.C.
Data acquisition and processing	A.C., M.I.
Data analysis and interpretation	E.C.
Literature review	A.C.
Manuscript write-up	M.I., A.C.
Manuscript review and revision	E.C.

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References

1. Durdag E, Baykaner MK. Pediatric head injury: Skull fracture and growing skull fracture. Turkiye Klinikleri J Pediatr Sci 2007;3(1):8-16.
2. Ceviker N, Baykaner K, Keskil S, Cengel M, Kaymaz M. Moderate head injuries in children as compared to other age groups, including the cases who had talked and deteriorated. Acta Neurochir (Wien) 1995;133(3-4):116-121. **[CrossRef]**
3. Onal SC. Pediatric Head Injury. Turkiye Klinikleri J Neurosurg-Special Topics 2008;1(1):72-82.
4. Ward JD. Pediatric head injury. In Neurotrauma, Narayan RK, Willgerger JE, Povlishock JT (editors). New York: McGraw Hill, 1996:859-867.
5. Crowe LM, Catroppa C, Anderson V, Babl FE. Head injuries in children under 3 years. Injury 2012;43(12):2141-2145. **[CrossRef]**
6. Bulut M, Koksal O, Korkmaz A, Turan M, Ozguc H. Childhood falls: characteristics, outcome, and comparison of the Injury Severity Score and New Injury Severity Score. Emerg Med J 2006;23(7):540-545. **[CrossRef]**
7. Doppenberg EMR, Ward JD. Pediatric Head injury. In Youmans Neurological Surgery, Winn HR (editor). 5th ed., Philadelphia: Pennsylvania W.B. Saunders, 2004:3473-3480.
8. Kraus J, Rock A, Hemyari P. Brain injuries among infants, children, adolescents, and young adults. Am J Dis Child 1990;144(6):684-691. **[CrossRef]**
9. Crowe L, Babl F, Anderson V, Catroppa C. The epidemiology of pediatric head injuries: data from a referral centre in Victoria, Australia. J Paediatr Child Health 2009;45(6):346-350. **[CrossRef]**
10. Falk AC, Klang B, Paavonen EJ, von Wendt L. Current incidence and management of children with traumatic head injuries: the Stockholm experience. Dev Neurorehabil 2007;10(1):49-55. **[CrossRef]**
11. Barlow K, Thompson E, Johnson D, Minns RA. The neurological outcome of non-accidental head injury. Pediatr Rehabil 2004;7(3):195-203. **[CrossRef]**
12. Keenan HT, Runyan DK, Marshall SW, Nocera MA, Merten DF, Sinal SH. A population-based study of inflicted traumatic brain injury in young children. JAMA 2003;290(5):621-626. **[CrossRef]**
13. Kieslich M, Marquardt G, Galow G, Lorenz R, Jacobit G. Neurological and mental outcome after severe head injury in childhood: a long-term follow-up of 318 children. Disabil Rehabil 2001;23(15):665-669. **[CrossRef]**
14. Duhaime AC, Alario AJ, Lewander WJ, Schut L, Sutton LN, Seidl TS, et al. Head injury in very young children: mechanisms, injury types, and ophthalmologic findings in 100 hospitalized patients younger than 2 years of age. Pediatrics 1992;90(2 Pt. 1):179-185.
15. Johnson K, Fischer T, Chapman S, Wilson B. Accidental head injuries in children under 5 years of age. Clin Radiol 2005;60(4):464-468. **[CrossRef]**
16. Marton E, Mazzucco M, Nascimben E, Martinuzzi A, Longatti P. Severe head injury in early infancy: analysis of causes and possible predictive factors for outcome. Childs Nerv Syst 2007;23(8):873-880. **[CrossRef]**
17. Hahn YS, Chyung C, Barthel MJ, Bailes J, Flannery AM, McLone DG. Head injuries in children under 36 months of age. Demography and outcome. Childs Nerv Syst 1988;4(1):34-40.
18. Margulies SS, Thibault KL. Infant skull and suture properties: measurements and implications for mechanisms of pediatric brain injury. J Biomech Eng 2000;122(4):364-371. **[CrossRef]**
19. Musemeche CA, Barthel M, Cosentino C, Reynolds M. Pediatric falls from heights. J Trauma 1991;31(10):1347-1349. **[CrossRef]**
20. Agran PF, Anderson C, Winn D, Trent R, Walton-Haynes L, Thayer S. Rates of pediatric injuries by 3-month intervals for children 0 to 3 years of age. Pediatrics 2003;111(6 Pt 1):683-692. **[CrossRef]**
21. Oral R, Floryanovich A, Goodman J, Turkmen M. Characteristics of household falls in children under 2 years of age. Turk J Pediatr 2007;49(4):379-384.
22. Roshkow JE, Haller JO, Hotson GC, Sclafani SJ, Mezzacappa PM, Rachlin S. Imaging evaluation of children after falls from a height: review of 45 cases. Radiology 1990;175(2):359-363. **[CrossRef]**
23. Moini M, Rezaishiraz H, Zafarghandi MR. Characteristics and outcome of injured patients treated in urban trauma centers in Iran. J Trauma 2000;48(3):503-507. **[CrossRef]**
24. Meller JL, Shermeta DW. Falls in urban children. A problem revisited. Am J Dis Child 1987;141(12):1271-1275. **[CrossRef]**
25. Goodacre S, Than M, Goyder EC, Joseph AP. Can the distance fallen predict serious injury after a fall from a height? J Trauma 1999;46(6):1055-1058. **[CrossRef]**
26. Agalar F, Cakmakci M, Sayek I. Factors effecting mortality in urban vertical free falls: evaluation of 180 cases. Int Surg 1999;84(3):271-274.