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ARE PEDIATRIC EXTRADURAL HEMATOMAS ASSOCIATED WITH BETTER OUTCOME? AN ANALYSIS OF 120 CASES.

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ABSTRACT

AIM: To analyze the variables influencing the outcome of extradural hematomas (EDH) in the pediatric age group and management options.

MATERIALS AND METHODS: Retrospective analysis of clinical and radiological data of all patients of age between 1 and 12 years admitted in a level I trauma center with traumatic brain injury (TBI) and diagnosed to have extradural hematoma on Computed Tomography (CT).

RESULTS: Of the total 120 children, 66 were male and 54 were female. Road traffic accident was the commonest cause. The most common presenting symptom was loss of consciousness. On admission, 103 children presented with Glasgow Coma Scale (GCS) of 13-15. 73.3 % had associated skull fractures. In 14 patients the CT brain also revealed additional findings. 104 patients were managed conservatively and 16 underwent surgical evacuation. The need for surgery was based on EDH volume, midline shift, pupillary asymmetry and GCS. The overall mortality was 2.5%.

CONCLUSION: Majority of children with EDH have a good prognosis. Surgical intervention in needy cases results in a favourable outcome.

KEYWORDS : Extradural hematoma, (EDH), pediatric EDH, traumatic brain injury (TBI)

AIM

To analyze the variables influencing the outcome of pediatric extradural hematomas and management options in a level I trauma centre.

INTRODUCTION

Pediatric traumatic brain injuries (TBI) are on the rise on account of increasing number of vehicle population and the resultant high velocity accidents. Children with head injury are more frequently being encountered in the trauma centers worldwide, more so in the developing countries. Extradural hematoma (EDH) following traumatic brain injury is a serious cause requiring immediate neurosurgical attention, given the potential to spiral into a life threatening event. Up to 6% of children admitted with history of TBI are reported to have EDH. In spite of early diagnosis and timely intervention, the mortality rate ranges widely between 0 and 12%[1,2,3,4]. Road traffic accidents (RTA) and falls contribute to majority of pediatric extradural hematoma (pEDH).

Compared to adults, children with EDH are reported to have lower incidence of loss of consciousness and lesser skull fractures[1,3]. There are also significant differences in the clinical presentation, need for surgery and outcomes. Computed tomography (CT) scan of the brain is the gold standard investigation of choice.

In this paper, we analyzed the significance of various clinical factors like age, sex, mode of injury, Glasgow coma scale (GCS), pupil size, and radiological parameters such as side and site of EDH, volume, shift of midline structures, cisterns, fracture, and associated lesions.

MATERIALS AND METHODS

This retrospective study on pediatric extradural hematoma was conducted on children in the age group of 1 to 12 years admitted with traumatic brain injury and diagnosed to have extradural hematoma on computed tomography (CT) image at the Institute of Neurosurgery, Rajiv Gandhi Government General hospital, Chennai during the period of 3 years between 2013 and 2016.

The data pertaining to epidemiology, clinical presentation such as age, sex, mode of injury, Glasgow coma scale, pupillary size and radiological findings including effacement of basal cisterns, midline shift, volume/side/site of EDH, associated lesions, management and duration of hospital stay were collected and analyzed. The results were studied using SPSS software. The children were managed conservatively or surgically according to the protocol of the institute based on the Brain Trauma Foundation (BTF) Guidelines.

RESULTS

The total number of patients who were diagnosed to have EDH was 120. There were 66 male children and 54 female children.The average age was 6.1 years. RTA was the commonest cause. The other causes were falls and fall of heavy objects on head (Table-1).

Table-1: Mode of injury

Mode of Injury		
Mode of Injury	No. of Patients	Percentage (%)
Fall from Height	3	2.5
Heavy Object fall on head	5	4.17
RTA	107	89.17
Misc.	5	4.17
TOTAL	120	100

The most common presenting symptom was loss of consciousness, followed by vomiting, headache, irritability and ENT bleed. On admission, 103 children had mild head injury and presented with Glasgow Coma Scale of 13-15, 15 children had sustained moderate head injury with GCS 9-12, and 2 children had severe head injury with GCS score 3-8.

The presence of EDH on the left side was slightly more than on the right side.The main location of EDH was parietal, followed by frontal and temporal regions. Of all the children, 73.3 % had associated skull fractures (Table-2). The most common site of fracture was in parietal bones, followed by temporal and frontal bones. In 14 patients the CT brain also revealed evidence of injury to other parts of the brain, such as parenchymal contusion, subdural hematoma, pneumocephalus and diffuse axonal injury.

Table-2: Skull Fracture

Fractures		
	No. of Patients	Percentage
Fractures	88	73.33
No Fracture	32	26.67
TOTAL	120	100

Of the 120 patients who had extradural hematoma, 104 patients were managed conservatively and 16 underwent surgical evacuation. The

need for surgery was based on EDH volume of more than 30cc, midline shift of more than 5mm, effacement of basal cisterns and anisocoria. Two patients among the conservatively managed group and one patient among operated group expired (Table-5).The overall mortality was 2.5%. The average length of hospital stay for survivors was 7.8 days.

DISCUSSION:

In our study the total number of patients was 120 in the age group of 1 to 12 years, the mean age being 6.06 years. Of them 66 were males and 54 females. Similar male predominance is supported by studies by Umerani, Chowdhury, Nath and Khan[1,5,6,7]. As regards the mode of injury, the majority were road traffic accidents (89.16%) and fall of objects and fall from height contributed to a minority only and is in concurrence with studies by Umerani and Khan[5,7].

On admission, the children presented with loss of consciousness (56.67%), vomiting (35%), and headache (5.8%). Altered sensorium, ENT bleed, seizure, irritability and/or incessant cry were seen only in a few. Khan has reported a similar common presentation, and has recorded loss of consciousness to be the present in 70.8% and vomiting in 45.8% of the subjects in his study[7]. The most common presenting symptom as reported by other studies are: vomiting by Umerani and Nath, headache by Zhong and irritability by Paiva [5,6,8,9].

We classified the traumatic brain injury as per BTF guidelines into mild, moderate and severe in accordance with GCS of 14-15, 9-13 and 3-8 respectively. Initial neurological assessment based on GCS showed TBI to be mild in 103 children (85.83%), moderate in 15 (12.5%) and severe in 2 (1.67%) and concurs with the finding of majority of patients in the mild head injury group in the studies by Zhong, Nath, Umerani, Paiva and contrasts the study by Khan who has reported a 50% incidence of severe head injury[8,6,5,9,7].

Pupillary asymmetry was one of the indicators for surgical intervention. Sixteen children (13.3%) had anisocoria, and were managed with surgery. Fifteen of them recovered and one died. Umerani and Khan have reported pupillary asymmetry in 16.5 % and 37.5% respectively[5,7].Khan and Ben Abraham have associated pupillary asymmetry with poor prognosis in their studies[7,10].

CT Findings: The extradural hematoma was found on the left side in 63 (52.5%), right side in 56 (46.7%) and bilaterally in one (0.8%). Our study concurs with Nath's and differs from Paiva's who has reported a right predominance and Jung's, who found it to be equally distributed[7,9,4].

EDH was found to be in the parietal location in 37, followed by frontal in 22, temporal in 20 and frontoparietal in 13. Umerani, Gerlach, and Ben Abraham have also reported the most common site of EDH to be parietal region[5,2,10].

Skull fractures were seen on CT in 88 patients (73.3%) and were distributed almost equally on both sides, with bilateral fracture found in one case. Parietal bone was the most common site of fracture, followed by temporal and frontal bones. The reported incidence of skull fractures ranged from 33% (Umerani) to 90% (Pasaoglu, Rocchi, Ciurea) in various studies[5,11,12,13].

Other associated lesions were detected in 14 of the 120 cases, accounting for 11.7%, and is consistent with most studies, though a high incidence of 63% has been reported by Binder[15].Pneumocephalus (n=3), SDH (n=2), parenchymal contusion (n=5), brainstem contusion (n=1), diffuse axonal injury (n=2) and diffuse cerebral edema (n=1) were the other associated lesions detected. One child with associated parenchymal contusion, one with brain stem contusion and one with diffuse cerebral edema expired, and the association was statistically significant, as has been observed by Bullock, who had described worse outcomes in such children[16]. Chowdhury and Jamjoom have also reported worser outcomes in children with associated contusions[1,3].

The volume of the EDH was calculated by the conventional Peterson and Espersen formula for volume estimation on CT scanning : $A \times B \times C / 2$, where A,B and C represent the largest diameters in the sagittal, axial and coronal planes, and found to be less than 30cc in 104 cases and more than 30cc in 16 cases[14]. All children with EDH volume of more than 30cc were operated as per institutional protocol and a similar management has been reported by Nath [6].

Other radiological parameters of importance in the management were midline shift of more than 5mm and effacement of basal cisterns. Both were found in 16 patients (13.3%) and were managed surgically, of whom one died.

Management

Of 120 patients 104 (86.7%) were managed conservatively and 16 (13.3%) were operated based on evidence of anisocoria, EDH volume of more than 30ml, effaced cisterns and associated contusions. 117 (97.5%) had favorable outcome and compares with the outcome reported by Zhong[8].

Hospital stay / days

Hospital stay in days ranged from one to 30 days, average being 7.6 days, and compares with the finding by Umerani[5].

Mortality

Of the 104 patients managed conservatively one had primary brainstem injury and the other had diffuse cerebral edema and succumbed. Both presented with poor GCS score. Of the 16 patients who underwent surgical intervention, one child died.The overall mortality rate was 2.5%. Zhong, Nath and Umerani had reported a mortality rate of 1.1%, 7.69% and 8.3% respectively[8,6,5].

CONCLUSIONS

Extradural hematomas in children have a favorable outcome in majority of cases. The factors which influence the outcome of pediatric EDH are, admission GCS, pupillary asymmetry, midline shift, volume and effacement of basal cisterns. Surgical interventions in appropriate cases as per the institutional protocol based on clinical and radiological parameters, is rewarded favorably.

Conflict of interest

Nil.

REFERENCES

1. Chowdhury SN, Islam KM, Mahmood E, Hossain SK. Extradural haematoma in children: Surgical experiences and prospective analysis of 170 cases. Turk Neurosurg. 2012;22:39–43.
2. Gerlach R, Dittrich S, Schneider W,Ackermann H, Seifert V, Kieslich M.Traumatic epidural hematomas in children and adolescents: Outcome analysis in 39 consecutive unselected cases. Pediatr Emerg Care.2009;25:164–9.
3. Jamjoom A, Cummins B, Jamjoom ZA. Clinical characteristics of traumatic extradural hematoma: A comparison between children and adults. Neurosurg Rev. 1994;17:277–81.
4. Jung SW, Kim DW. Our experience with surgically treated epidural hematomas in children. J Korean Neurosurg Soc. 2012;51:215–8.
5. Umerani MS, Abbas A, Aziz F, Shahid R, Ali F, Rizvi RK. Pediatric extradural hematoma: Clinical assessment using king's outcome scale for childhood head injury. Asian J Neurosurg 2018;13:681-4
6. Nath PC, Mishra SM, Das S, Deo RS. Supratentorial extradural hematoma in children: An institutional clinical experience of 65 cases. J Pediatr Neurosci. 2015; 10(2): 114–118
7. Khan MB, Riaz M, Javed G, Hashmi FA, Sanaullah M, Ahmed SI. Surgical management of traumatic extra dural hematoma in children: Experiences and analysis from 24 consecutively treated patients in a developing country. Surg Neurol Int. 2013;4:103.
8. Zhong W, Sima X, Huang S, Chen H, Cai B, Sun H et al. Traumatic extradural hematoma in childhood. Childs Nerv Syst. 2013 Apr;29(4):635-41
9. Paiva WS, Andrade AF, Mathias Junior L, Guirado VM, Amorim RL, Magrini NN, et al. Management of supratentorial epidural hematoma in children: Report on 49 patients. Arq Neuropsiquiatr. 2010;68:888–92.
10. Ben Abraham R, Lahat E, Sheinman G, Feldman Z, Barzilai A, Harel R, et al. Metabolic and clinical markers of prognosis in the era of ct imaging in children with acute epidural hematomas. Pediatr Neurosurg. 2000;33:70–5.
11. Pasaoglu A, Orhon C, Koç K, Selçuklu A, Akdemir H, Uzunoglu H.Traumatic extradural haematomas in pediatric age group.Acta Neurochir (Wien) 1990;106:136-9.
12. Rocchi G, Caroli E, Raco A, Salvati M, Delfini R. Traumatic epidural hematoma in children. J Child Neurol 2005;20:569-72.
13. Ciurea AV, Kapsalaki EZ, Coman TC, Roberts JL, Robinson JS 3rd, Tascu A, et al. Supratentorial epidural hematoma of traumatic etiology in infants. Childs Nerv Syst 2007;23:335-41.
14. Paterson OF, Espersen JO. Extradural hematomas : Measurement of size by volume summation on CT scanning.Neuroradiology 1984;26:363-7.
15. Binder H, Majdan M, Tiefenboeck TM, Fochtmann A, Michel M, Hajdu S, Mauritz W,Leitgeb J. Management and outcome of traumatic epidural hematoma in 41 infants and children from a single center . Orthopaedics & Traumatology: Surgery & Research 2016;102(6):769-774
16. Bullock MR, Chesnut R, Ghajar J, Gordon D, Hartl R, Newell DW, et al. Surgical management of acute epidural hematomas. Neurosurgery 2006;58 3 Suppl:S 7-15