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Outcome of Conservatively Managed Supra-Tentorial Extradural Hematoma with and Without Linear Fracture In Pediatric Population

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ABSTRACT

Objective: To compare the outcome of conservatively managed supra-tentorial extradural hematoma in pediatric patients with and without linear fracture

Study Design: Comparative cross-sectional study

Place and Duration of Study: Neurosurgery Department, Ayub Teaching hospital Abbottabad. September 2020 to May 2022

Methodology: A total 200 children with confirmed diagnosis of supra-tentorial extradural hematoma who were managed conservatively in our neurosurgery unit during the study period were included in the analysis. They were divided into two groups on the basis of presence of linear skull fracture and both the groups were observed closely by clinical team for 48 hours. Increase in size of hematoma, drop in Glasgow coma scale score, critical care unit admission and requirement of surgical excision within 48 hours were the parameters compared in both groups.

Results: Out of 200 children included in the study, 127(63.5%) were male while 73(36.5%) were female. Mean age of the study participants was 7.4 6±5.65 years. 138(69%) had linear fracture along with extradural hematoma while 62(31%) had no linear fracture. Statistical analysis revealed that outcome parameters like increase in size of hematoma, drop in Glasgow coma scale score and requirement of surgical excision were found more in patients who had no linear fracture as compared to those who had extradural hematoma and linear fracture (p-value<0.05).

Conclusion: Conservative management was seen more successful in patients with linear fracture as compared to those who had no linear fracture along with extradural hematoma in terms of increase in size of hematoma, drop in Glasgow coma scale score and requirement of surgical excision.

Keywords: Linear fracture; Outcome; Pediatric patients; Supra-tentorial extradural hematoma

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INTRODUCTION

Traumatic injuries account for high number of individuals either losing their lives or having serious injuries across the globe.[1] Trauma to vital parts specially head and neck region can have more grave consequences especially in pediatric population.[2] Supra-tentorial extradural hematoma is not an uncommon finding in children presenting with head injury and it may or may not be accompanied by skull fracture.[3] Mode of treatment after the diagnosis is determined by neurosurgical team after taking into account number of factors.

Surgical evacuation is usual mode of treatment in patients with hematoma in brain due to any cause.[4] Conservative management is also preferred in some cases but this decision depends upon number of factors in patient's profile and type of hemaotoma.[5] Surgeons in various settings have developed protocols to improve the outcome of patients managed with hematoma in brain by any mode.[6] Various other complications along with presence of hematoma may affect the outcome of the patients therefore clinicians should make an accurate assessment at initial stage to screen for high risk cases.

Outcome of extradural hematoma has been studied in various settings. Spazzapan et al. in 2019 published a systematic review to evaluate various risk factors associated with poor outcome in children managed for extradural hematoma.[7] They revealed that in most of the settings outcome was excellent. Even complex cases with poor initial signs showed remarkable recovery. Only GCS score below 8 at the time of presentation was associated with poor outcome in children evaluated in studies they included in their analysis. A study published on paediatric patients managed for extradural hematoma in Iraq in 2019 concluded that both conservative and surgical approaches were associated with good

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outcome. However, they emphasized that conservative approach should be opted cautiously and only in those centres which could manage emergency conversion to surgical approach when required.[8] Umerani et al. in 2018 published a study regarding outcome of paediatric extradural hematoma. They came up with the findings that patients with post traumatic injury should be at high suspicion of extradural hematoma and those with fractures should be offered surgical management plan instead of conservative for better outcome.[9]

Neuro and trauma surgery usually go hand in hand and most of trauma surgery burden in Pakistan is shared by orthopedic and neurosurgeons as trauma surgery is still not a separate specialty in our part of the world. A recent local study generated data regarding statistics of extradural hematoma in patients managed for skull fracture after head trauma.[10] Limited local data exist for pediatric patients in Pakistan and that too about outcome of conservative management in this age group for this potentially life threatening condition. We therefore planned and conducted this study with the rationale to compare the outcome of conservatively managed supra-tentorial extradural hematoma in pediatric patients with and without linear fracture at neurosurgery department of Ayub teaching complex.

METHODOLOGY

This comparative cross-sectional study was conducted in the Departments of trauma and neurosurgery, Ayub teaching hospital from September 2020 to May 2022. Sample size was calculated by using the WHO sample size calculator by keeping population prevalence proportion of extradural hematoma in patients of linear skull fracture as 73.5% and margin of error as 10%.[11] Data for this study was collected via non probability purposive sampling technique.

Inclusion Criteria: The study included children of both genders (1 to 12 years) who were confirmed to have supra-tentorial extradural hematoma on CT scan brain by consultant radiologist and neurosurgeon and were managed conservatively. Thickness of hematoma was less than 4mm with a volume less than 30mls and midline shift of less than 5mm.

Exclusion Criteria: Patients with any malignant conditions or autoimmune disorders were excluded from the study. Those who or their caregivers refused to undergo surgery or they were taken to any other public or private facility were excluded from the study. Patients who required multiple surgeries at the time of presentation were excluded as well those with combined sub Dural and extra Dural hematomas were not recruited as well. Patients which at initial stage had plan for surgical intervention were excluded.

After written informed consent of parents, pediatric patients who fulfilled above mentioned inclusion/exclusion criteria were included in the study. Supra-tentorial extradural hematoma was diagnosed by consultant neurosurgeon on the basis of relevant clinical and neuro-radiological findings.[12] Linear fracture of skull was also diagnosed at time of presentation by the team members on basis of clinical data mainly CT scan bone window.[13] Patients were divided into two groups; one with linear fracture and one without linear fracture. Outcome parameters included increase in size of hematoma, drop in Glasgow coma scale score, critical care unit admission and requirement of surgical excision within 48 hours.[14]

Statistical Package for the social sciences (SPSS) version 23:00 was used by the team to carry out statistical analysis for this study. Mean and standard deviation was calculated for age of patients. Frequency along with percentage was calculated for gender and other demographic and outcome variables. Pearson chi-square test was used to assess the statistical difference in outcome parameters in patients with and without linear fracture by keeping the *p*-value less than or equal to 0.05 as significant.

RESULTS

Out of 200 children included in the study, 127(63.5%) were male while 73(36.5%) were female. Mean age of the study participants was 7.4 6±5.65 years. Table-I summarized the general characteristics of study participants. 138(69%) had linear fracture along with extradural hematoma while 62(31%) had no linear fracture.

Table-II showed the results of statistical analysis. It was revealed that outcome parameters like increase in size of hematoma, drop in Glasgow coma scale score and requirement of surgical excision were found more in patients who had no linear fracture as compared to those who had extradural hematoma in addition to linear fracture (*p*-value<0.05).As per our study results, increase in size of hematoma was observed more (26- 41.9%) in patients without linear skull fracture compared to other group with linear skull fracture (16- 11.6%) and showed a *p*-value of <0.001. A significant number of 14(22.6%) children without linear skull fracture developed drop in GCS

while only 9(6.6%) children in linear skull fracture group dropped GCS. Same number of patients (n=08) in both groups required transfer to intensive care unit and p-value calculated was 0.098. In our study, 18(29.1%) patients without linear skull fracture required surgical intervention in 48hr window of conservative management while only 02(1.5%) patients required intervention who had linear skull fracture along with extradural hematoma with calculated *p*-value of <0.001.

Table-I: Characteristics of Children Managed with Extradural Hematoma

Study parameters	n(%)
Age (years)	
Mean + SD	7.4 6±5.65 years
Range (min-max)	1 year - 12 years
Gender	
Female	73(36.5)
Male	127(63.5)
Linear fracture	
Yes	138(69)
No	62(31)
Cause of hematoma	
Road traffic accident	83(41.5)
Fall	77(38.5)
Physical assault	29(14.5)
Others	11(5.5)
Outcome parameters Increase in size of hematoma	
Drop in Glasgow coma scale score	42(21)
Shift to critical care unit	23(11.5)
Surgical intervention	16(8)
Death	20(10)
	02(1)

Table-II: Difference in Various Outcome Parameters in Both Groups

Socio demographic factors	Linear fracture n= total number (%)	No linear fracture n= total number (%)	*p*-value
Increase in size of hematoma			
No	122(88.4%)	36(58.1%)	<0.001
Yes	16(11.6%)	26(41.9%)	
Drop in Glasgow coma scale score			
No	129(93.4%)	48(77.4%)	0.002
Yes	09(6.6%)	14(22.6%)	
Shift to critical care unit			
No	30(94.2%)	54(87.1%)	0.098
Yes	08(5.8%)	08(12.9%)	
Surgical intervention required			
No	136(98.5%)	44(70.9%)	<0.001
Yes	02(1.5%)	18(29.1%)	

DISCUSSION

Children with extradural hematoma with linear fracture had better outcome with conservative management as compared to those without linear fracture. Head trauma is a serious neurosurgical scenario which can be potentially life threatening. Things become more complicated when they involve patients with extremes of ages. Children can have head injury due to various reasons and neuroimaging is difficult to carry out in some cases. Surgical and anesthesia difficulties can also complicate the clinical picture for this vulnerable age group of patients. Conservative management for extradural hematoma is always an option. We conducted this study to compare outcome with conservative management in children diagnosed with supra-tentorial extradural hematoma with and without linear fracture.

Aji *et al.* in 2018 published a case series and discussed relevant cases from existing literature as well regarding extradural hematomas secondary to traumatic injuries.[15] They revealed that patients with extradural hematomas especially with linear fractures usually warrant early surgical intervention as clinical condition of patient can go downhill very quickly. Our findings suggested that conservative treatment may not be very good option for patients of extradural hematoma without linear fractures as outcome in these patients was significantly worse with conservative management when compared to paediatric patients with linear fracture.

Sixty-two cases of extradural hematoma were studied and published by Zwayed *et al.* in 2018 and revealed that conservative treatment was a better option for those who had good Glasgow coma scale score at time of presentation and smaller size of hematoma and relatively less midline shift.[16] We also included presence of linear fracture and outcome of conservative management in patients with and without linear fracture and concluded that patients without linear fracture did not show very good outcome with conservative management.

Children with traumatic extradural hematomas were studied by Kandregula et al. in 2019. They studied 201 children and found out that pupillary asymmetry, pyramidal signs, low GCS at presentation, fracture of skull and associated parenchymal injuries affected outcome inversely.[17] Our study results revealed that conservative management was seen more successful in patients with linear fracture as compared to those who had no linear fracture along

with extradural hematoma in terms of increase in size of hematoma, drop in Glasgow coma scale score and requirement of surgical excision.

Tariq *et al*. published data of a hospital from Peshawar in 2021 regarding outcome of patients managed for traumatic extradural hematoma.[18] They concluded that outcome was generally good in most of the patients but size of hematoma at time of presentation was strong predictor of poor outcome in their study participants. We used change in size of hematoma as outcome parameter but main objective was to look for conservation management outcome in patients with and without linear fracture and concluded that absence of linear linear fracture was associated with poor outcome.

LIMITATION OF STUDY

Patients were only studied for 48 hours and short term outcome was documented for this study therefore it cannot be concluded that conservative management is better for patients without linear fractures as compared to those with linear fractures. Other the presence of fracture, multiple factors could lead to increase in size of hematoma, shift to critical care or drop in GCS score therefore with this study design it is difficult to ascertain that patients without linear fracture had better outcome as compared to those with linear fracture.

CONCLUSION

Conservative management was seen more successful in patients with linear fracture as compared to those who had no linear fracture along with extradural hematoma in terms of increase in size of hematoma, drop in Glasgow coma scale score and requirement of surgical excision.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

ZM & MH: Data acquisition, data analysis, critical review, approval of the final version to be published.

AAK & SUR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

EAKA & IA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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