

FREQUENCY OF EXTRADURAL HEMATOMA AMONG PATIENTS PRESENTING WITH TRAUMATIC BRAIN INJURY WITH SKULL FRACTURE

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ABSTRACT

Objective: To determine the frequency of extradural hematoma among patients presenting with traumatic brain injury (TBI) with skull fracture.

Material and Methods: This study was conducted at Neurosurgery Department, Lady Reading Hospital Peshawar, Pakistan. Descriptive cross-sectional study carried out from May 2015 to May 2017 in which a total of 370 patients were included. All patients of TBI having linear skull fracture on skull X ray or CT brain were included and those with bleeding disorder or on anticoagulant were excluded. Data was analyzed using SPSS version 20.

Results: The study revealed that mean age was 31 years having SD of ± 2.71 . Male patients were 75% and female were 25%. Mean GCS was 11 with SD ± 3.34 . 55% patients had parietotemporal bone fracture. 25% patients had temporal bone fracture. 15% patients had frontal bone fracture and 5% patient had occipital bone fracture. Moreover, the incidence of extradural hematoma was found to be 9%.

Conclusion: Our study concludes that Extradural hematoma was most common in parietotemporal and temporal site of skull fracture.

Key Words: Traumatic, brain injury, Skull fractures, Epidural haematoma.

This article may be cited as: Ghani F, Siddiq M, Idrees M. Frequency of extradural hematoma among patients presenting with traumatic brain injury with skull fracture. *J Med Sci* 2018; 26: (3) 242-245.

INTRODUCTION

Accumulation of blood between inner table of skull and endosteal layer of dura is called Extradural hematoma¹. Arterial bleeding most commonly middle meningeal artery tear causes extradural hematoma². Other arteries responsible for extradural hematoma are occipital, ascending pharyngeal, the internal carotid, maxillary artery and vertebral arteries³. Extradural hematoma is a very serious and common condition in trauma patients and carries best prognosis if diagnosed early before causing brain herniation. Early surgical evacuation is the optimal treatment for this condition⁴. The most important investigation to diagnose skull fracture and extradural hematoma is CT brain plain^{5,6} but if it is

not available, linear skull fracture can also be seen on skull x-ray⁷. Head injury patients can be assessed and categorized by Glasgow Coma Score scale (GCS) and can be divided into mild, moderate and severe head injury. Those patients with GCS 14 or 15 are included in mild, those with GCS 9 to 13 are included in moderate and patients with GCS 8 or less are included in severe head injury group.

Lucid interval is the term used for time duration between head injury and sudden deterioration of patient which is exhibited by some head injury patients. A study of 838 patients of head injury showed 25% lucid interval rest of patients presented with some focal deficit or deeply comatose immediately after head injury. Diffuse brain swelling after head injury is more common in patients with extreme of ages⁸.

The brain is surrounded by multiple protective coverings from outside to inside. These are scalp, skull bone, meninges and cerebrospinal fluid. Cerebrospinal fluid provides cushioning effect to the brain and brain

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Date Received: March 20, 2018
Date Revised: June 27, 2018
Date Accepted: Aug 20, 2018

floats in it. Scalp, underlying muscle and fascia protect skull from fracture. In a study, it was given that 10 times more force is required to fracture a skull with intact scalp than a cadaveric skull without scalp⁹.

Meningeal attachment to the inner surface of the skull can transmit shearing forces to the brain parenchyma and can cause severe brain injury. Linear fracture results from low-energy blunt trauma over a wide surface area of the skull. It runs through the entire thickness of the bone and, by itself, is of little significance except when it runs through a vascular channel, venous sinus groove, or a suture. In these situations, it may cause epidural hematoma, venous sinus thrombosis and occlusion, and sutural diastasis, respectively. Patients with linear skull fracture without underlying hematoma are mostly asymptomatic except for scalp swelling at the site of impact without disruption of scalp. Trauma is the main cause for extradural hematoma in the form of fall, road traffic accidents, assaults, sports injuries and miscellaneous^{10,11,12}. Our study is conducted to emphasize the risk of extradural hematoma in patients with skull fracture which is a serious condition and needs emergency management. So, patients who have linear skull fracture on plain X ray should be keenly observed and investigated further for development of extradural hematoma.

MATERIAL AND METHODS

This study was conducted at Neurosurgery Department of Lady Reading Hospital Peshawar, Pakistan. Descriptive cross-sectional study carried out from 14/5/2015 to 14/05/2017 in which a total of 370 patients were included. All patients of TBI having linear skull fracture on skull X ray or CT were included and those with bleeding disorder or using anticoagulant were excluded. Data was analyzed using SPSS version 20.

RESULTS

This study was carried out at Neurosurgery ward, Lady Reading Hospital Peshawar -Pakistan ,to determine the frequency of extradural hematoma in, 370 patients who presented with traumatic brain injury associated with skull fracture. Gender distribution among 370 patients was observed as 278(75%) patients were male and 92(25%) were female. Age distribution among 370 patients were as 118(32%) patients were in age range 20-30 years, 104(28%) patients were 31-40 years, 82(22%) patients were 41-50 years and 66(18%) patients were 51-60 years old. Mean age was 31 years with SD ± 2.71. GCS score of 14-15 was the most

common, the details are given in Table no 1. The most common location of skull fracture among 370 patients was parietotemporal while rest of detail is given in Table no 1. Frequency of extradural hematoma among 370 patients were analyzed and extradural hematoma was found in 34(9%) patients while in 336(91%) patients, there was no extradural hematoma as given in Figure 1. The stratification of extradural hematoma with respect to site of fracture is shown in Figure 2.

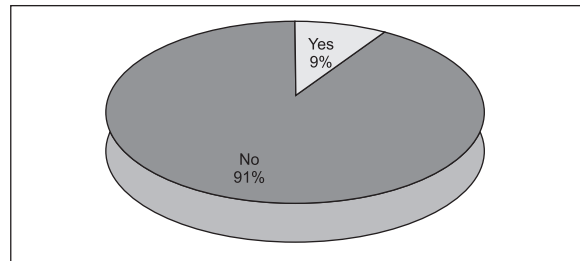


Fig 1: Frequency of Extradural hematoma (n=370)

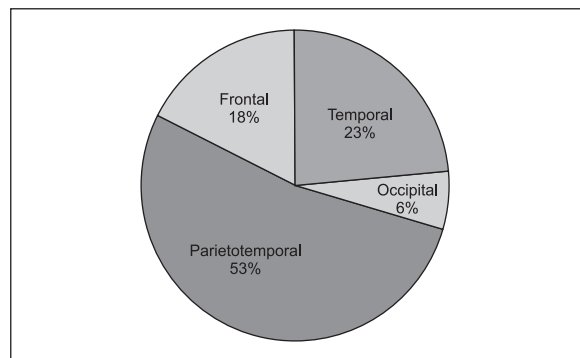


Fig 2: Stratification of Extradural hematoma with respect to site of fracture

Table 1: Results of the study(n=370)

GCS Score (n=370)		
GCS	Frequency (F)	Percentage (%)
14-15 mild	122	33%
8-13 moderate	222	60%
3-7 severe	26	7%
Total	370	100%
Mean GCS was 11 with SD ± 3.34		
Site of Fracture (n=370)		
Site	Frequency (F)	Percentage (%)
Parietotemporal	204	55%
Temporal	92	25%
Frontal	56	15%
Occipital	18	5%
Total	370	100%

DISCUSSION

Extradural hematoma is one of the most common and serious neurosurgical emergency. It is most commonly caused by falls and motor vehicle accidents. It is diagnosed clinically and radiologically. The most common tool of diagnosis is CT brain. It is a biconvex shape hyper dense lesion on CT brain located between brain parenchyma and skull. It needs immediate surgical evacuation in most cases¹³. There is variation in frequency, site, etiology and source of bleeding in different studies.

This study showed that mean age was 31 years with SD \pm 2.71. Male patients were 75% while female were 25%. Mean GCS was 11 with SD \pm 3.34. 55% patients had parietotemporal bone fracture, 25% had temporal bone fracture, 15% had frontal bone fracture and 5% had occipital bone fracture. Moreover, the incidence of extradural hematoma was found as 9% in all these patients. Similar findings were observed by other study where the frequency of extradural hematoma among patients of TBI was observed to be 8.4%. This study also found that road traffic accident was the most common cause of TBI (51.82%), followed by fall (25%), physical assault (17.7%) and other causes (5.48%)¹⁴. Similarly, another study consistent with our study reported that EDH constitutes 2.7-11% of TBIs with the most common cause was fall from height (58%), followed by assault (22%) and motor vehicle accident (20%)¹⁵. A Nigerian study also reported 69 or 8.4% of EDH in 817 patients¹⁶.

The results of this study reported 9% of extradural hematoma in patients with skull fracture while Mushtaq et al reported that there was 2.71% incidence of extradural hematoma¹⁴. In the study of McKissock et al, it was reported as 3%¹⁷. Pandey reported incidence of extradural hematoma in head injury patients as 2%¹⁸. Oertel M et al in their study revealed that extradural hematoma is more common in young males with 4:1 male to female ratio¹⁹. This study is consistent with Oertel et al for high incidence of extradural hematoma in males as compared to females due to more exposure of males to outdoor activities and physical exertion. Similar findings were observed in another study having 114 patients. The study results showed that 74.5% were male and 25.4% were female in the sample. The ages of the patients were in the range of 2 to 70 years, mean age was¹⁸. 23 ± 16.5 years. The results further showed that the most common cause of head injury was fall from height followed by road traffic accident and physical assault. The percentages for fall from height, road traffic

accident and physical assault were reported as 57%, 34.2% and 8.8% respectively.

Further, this study reported 55% patients had parietotemporal bone fracture, 25% had temporal bone fracture, 15% had frontal bone fracture and 5% had occipital bone fracture. Previous study reported percentages of site of skull fracture in parietotemporal, frontal and occipital bones as 43%, 24.6% and 21.1% respectively²⁰. A recent study also reported that the most common site was temporal (36%), followed by temporoparietal (24%) and frontal (14%)¹⁵. Temporal bone fracture is most commonly associated with extradural hematoma because it is comparatively thin, middle meningeal artery penetrates and forms a groove on the inner surface of this bone. So, temporal bone can be easily fractured which can lead to tearing of middle meningeal artery or its branches. A study demonstrated 70% incidence of extradural hematoma in temporal bone fracture secondary to head injury. Temporal bone fracture is less commonly associated with extradural hematoma in pediatric patients because middle meningeal artery has not yet grooved this bone. Another study reported incidence of extradural hematoma is almost equal in occipital, parietotemporal and frontal bone fracture. While it is less common in vertex or parasagittal area²¹.

CONCLUSION

Extradural hematoma was most common in parietotemporal and temporal site of skull fracture.

REFERENCES

1. Araki T, Yokota H, Morita A. Pediatric traumatic brain injury: characteristic features, diagnosis, and management. *Neurol Med Chir.* 2017;57(2):82-93.
2. Bir SC, Maiti TK, Ambekar S, Nanda A. Incidence, hospital costs and in-hospital mortality rates of epidural hematoma in the United States. *Clin Neurol Neurosurg.* 2015;138:99-103.
3. Snell R. *Clinical neuroanatomy for medical students.* 9th ed. Boston/Toronto: Little Brown and Company; 2012.
4. Haines DE, Frederickson RG. The meninges. In: Al Mefty O, editor. *Meningiomas.* New York: Thieme; 2011.
5. Shin DS, Hwang SC, Kim BT, Jeong JH, Im SB, Shin WH. Serial brain CT scans in severe head injury without intracranial pressure monitoring. *Korean J Neurotrauma.* 2014; 10(1):26-30
6. 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. *OrthopTraumatolSurgRes.* 2016;102(6):769-74.
7. Choi HJ, Lee JI, Nam KH, Ko JK. Acute spontaneous subdural hematoma due to rupture of a tiny cortical arteriovenous malformation. *J Korean Neurosurgical Society.* 2015;58(6):547-49.
 8. Ganz JC. The lucid interval associated with epidural bleeding: evolving understanding: Historical vignette. *J Neurosurg.* 2013;118(4):739-45.
 9. Brinker T, Stopa E, Morrison J, Klinge P. A new look at cerebrospinal fluid circulation. *Fluids Barriers CNS.* 2014;11(1):10-26.
 10. Jung SW, Kim DW. Our experience with surgically treated epidural hematomas in children. *J Korean Neurosurg Soc.* 2012;51(4):215-218.
 11. Soon WC, Marcus H, Wilson M. Traumatic acute extradural haematoma: indications for surgery revisited. *Br J Neurosurg.* 2016;30: 233-34.
 12. Cheung PS, Lam JM, Yeung JH, Graham CA, Rainer TH. Outcome of traumatic extradural haematoma in Hong Kong. *Injury.* 2007;38(1):76-80.
 13. Kumar J, Prakash A, Harsh V, Kumar A. Vertex extradural hematoma: a diagnostic dilemma. *Asian J Neurosurg.* 2017;12(4):718-720.
 14. Mushtaq, Rehman L, Zaman K. Association of outcome of traumatic extradural hematoma with Glasgow Coma Scale and hematoma size. *Ann Pak Inst Med Sci.* 2010;6(3):133-8.
 15. Atci IB, Yilmaz H, Yaman M, Baran O, Türk O, Solmaz B, Kocaman U Ozdemir NG, Demirel N, an Kocak A. Incidence, hospital costs and in-hospital mortality rates of surgically treated patients with traumatic cranial epidural hematoma. *Romanian Neurosurg.* 2018; 32(1): 110-5.
 16. Mezue WC, Ndubuisi CA, Chikani MC, Achebe DS, Ohaegbulam SC. Traumatic extradural hematoma in Enugu, Nigeria. *Niger J Surg.* 2012;18(2):80-4.
 17. Khan IU, Nadeem M. There is high incidence of skull fracture associated with extradural hematoma in patients with head injury. *Rawal Med J.* 2008;33(2):228-30.
 18. Pandey S, Sharma V, Shinde N, Sharma M. Bilateral occipital extradural hematoma in a child. *JPediatric Neuro Sci.* 2015;10(3):270-272.
 19. Oertel M, Kelly DF, McArthur D, Boscardin WJ, Glenn TC, Lee JH, Gravori T. Progressive hemorrhage after head trauma. *J Neurosurg.* 2002; 96: 109-16.
 20. Aurangzeb A, Afridi EAK, Khan SA, Muhammad G, Ihsan A, Hussain L, et al. Frequency of extradural haematoma in patients with linear skull fracture. *J Ayub Med Coll Abbottabad.* 2015;27(2):1-4.
 21. Hamlat A, Heckly A, Adn M, Poulain P. Pathophysiology of intracranial epidural haematoma following birth. *Med Hypotheses.* 2006;66(2):371-74.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

AUTHOR'S CONTRIBUTION

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

- Ghani F:** Review of research on the topic , article writing, data collection analysis & comparison with previous studies.
- Siddiq M:** Correction in article & statistical analysis.
- idrees M:** Data collection

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.