ORIGINAL ARTICLE

Association of Extradural Hematoma with Linear Skull Fracture: a Clinical Study of 79 Cases in a Teaching Institute

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ABSTRACT

Objectives: *To determine the frequency of extra dural hematoma in patients with linear skull fracture due to head injury.*

Material and Methods: *This cross-sectional study was conducted in the Department of Neurosurgery, Mardan Medical Complex, Mardan from June 2016 to May 2017. Patients of either gender with linear skull fracture and above 2 years of age were included in the study, while patients with bleeding disorder or on anti-coagulants and those presenting 72 hours after injury were excluded from the study. Patient's demographic profile, type of injury, location of injury and CT findings were recorded and documented on pre designed proforma. Data was analyzed using SPSS version 20.0*

Results: *Out of 79 patients, 55 (70%) were male and 24 (30.3%) were female. Age ranged from 2 years to 60 years (mean 33 years ± 2.54 years). Among these patients the most common cause of head injury was road traffic accident in 44 (55%), followed by fall from height in 20 (25.3%) and assault in 10 (12.6%) of patients. The most commonly fractures skull bone was parietal in 38 (48%) of patients, followed by temporal bone in 21 (26.5%), frontal in 12 (15.1%), and occipital in 8 (10%) of patients. The frequency of extradural hematoma in linear skull fracture was 21 (26.5%).*

Conclusion: *There is strong association of extradrual hematoma with linear skull fracture, therefore a fully conscious person having head injury with skull fracture should be highly suspected for intracranial hematoma.*

Key Words: *Extradural hematoma, Frequency, Linear skull fracture.*

INTRODUCTION

Traumatic brain injury is the leading cause of death in younger population worldwide. It occurs as a result of mechanical force on head leading to altered level of consciousness, transient memory loss and focal neurological deficit.[1,2] The incidence of Traumatic brain injury is quite high and estimated 20 per 1,00,000 people per year.[3]

Extradural hematoma (EDH) is accumulation of blood in the potential space between inner table of skull and outer endosteal layer of dura.[4] EDH is a lethal disorder, however early diagnosis and treatment reduces the mortality and improves the outcome. It occurs in approximately 1 – 3% of patients with head injuries and about 5 – 15% of patients with severe head injuries.[5,6]

Extradural hematoma most frequently occurs as result of road traffic accident, followed by fall from height. Assault, direct blow to skull, fire arm injuries, bomb blast injuries and sport injuries also contribute to the development of EDH[7,].Of these causes the direct blow to skull is highly associated with skull fracture.[8]

The presenting sign and symptoms of patients with EDH depends upon site, size, and time course of hematoma, however the cardinal feature is lucid interval in which there is initial brief loss of consciousness with recovery followed by deterioration of conscious level. Other symptoms include headache, vomiting, dilated

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pupil, focal neurological deficit, bradycardia and altered sensorium.[9,10]

The most common source of bleeding in extradural hematoma due to rupture/laceration of middle meningeal arteries in temporal region, 10% bleed may occur due to diploic veins or venous sinuses.[11] The pterion bone which overlies middle meningeal vessels is weak and prone to injury, so if there is a linear fracture in this region one should be highly vigilant to detect any intracranial pathology. Extradural hematoma is usually found on the side impacted by the blow, but on rare occasion it may be present on both side due to counter coo injury.[12,13]

A skull fracture is a direct impact or blow to skull which is strong enough to break the continuity of skull bone. A linear skull fracture are the most common, and not easy to see however, symptoms that indicate a fracture include swelling and tenderness around the area of impact, facial bruising and bleeding from nostrils. Skull x-ray and CT-scan brain are valuable tools for the assessment of head injury. In various series the incidence of skull fracture in patient with extradural hematoma reported between 63-85%[12].

Frequency of extradural hematoma in linear skull fracture varies from 17% to 21% in different studies.[14,15] Mortality rate is less than 5% for patient with presenting Glasgow coma score(GCS) 14-15 and about 10 – 20% in patient with presenting GCS less than 13.[16]

The objective of this study was to determine the association of extradural hematoma in patient with linear skull fracture in a teaching institute. The result of this study will be projected to other neurosurgeons and based upon results of this study, we can make suggestions and recommendations necessary for management of these patients.

MATERIAL AND METHODS

This descriptive (cross sectional) study was done at Neurosurgery Department of Mardan Medical Complex Mardan, from June 2016 to May 2017. Patients of either gender with linear skull fracture on X-ray and above 2 years of age were included in the study, while patients with bleeding disorder or on anti-coagulants and those presenting 72 hours after injury were excluded from the study.

The study was conducted after approval from hospital ethical and research committee. Patient fulfilling the inclusion criteria were included in study. Informed consent was taken from all the patients. After detailed history and clinical examination patients were sent to radiological investigation including X-ray skull (anterio-posterior, lateral view) and CT scan brain with bone window. Patients demographic profile, type of injury, location of injury and CT findings were recorded and documented on pre designed proforma. Data was analyzed using SPSS version 20.0 and presented in form of tables.

RESULTS

Out of 79 patients, 55 (70%) were male and 24 (30.3%) were female. Age of the patients ranges from 2 years to 60 years with mean a 33 years ± 2.54 years.

In our study the most common cause of head injury was Road traffic accidents in 44 (55%) patients, followed by fall from height of 10feet in 20(25.3%), assault in 10 (12.6%) and other causes like bomblast injuries and sport injuries in 5 (6.3%) patients, as shown in table 1.

Table 1: *Mode of Trauma (n = 79).*

Mode of Trauma	Frequency	Percentage
Road traffic accident	44	55%
Fall	20	25.3%
Assault	10	12.6%
Others	5	6.3%

The source of bleeding in our study was middle meningeal artery in 38 (48%) patients, middle meningeal vein in 20 (25%) of patients, dural sinus in 10 (12.6%) of patients and diploic vein in 6 (7.5%) of patients, in 5 (6.3%) patients the source of bleeding was not identified, as shown in table 2.

Table 2: *Source of Bleeding (n = 79).*

Source of Bleeding	Frequency	Percentages
Middle meningeal artery	38	48%
Middle meningeal vein	20	25%
Dural sinuses	10	12.6%
Diploic veins	6	7.5%
No identifiable source	5	6.3%

The most commonly fractures skull bone was parietal in 38 (48%) of patients, followed by temporal bone in 21 (26.5%), frontal in 12 (15.1%), and occipital in 8 (10%) of patients. Frequency of extradural hematoma among parietal fractures was in 10 (26.3%) of patients, among temporal bone was in 6 (28.5%) of patients, among frontal bone fracture was in 3 (25%) of patients, among occipital fractures was in 2 (25%) of patients. So extradural hematoma among skull fracture was common in parietotemporal region in 16 (54%) cases. In our study the frequency of extradural hematoma in linear skull fracture was 21 (26.5%).

Table 3: *Frequency of Extradural Hematoma in Tabulation with Linear Skull Fracture (n = 79).*

Fracture Site	Linear Fracture		Extradural Hmaematoma	
	Frequency	Percentage	Frequency	Percentage
Parietal bone	38	48%	10	26.3%
Temporal bone	21	26.5%	6	28.5%
Frontal	12	15%	3	25%
Occipital	8	10%	2	25%

DISCUSSION

Trauma is a grave problem both in developing and developed countries. Head injury is leading cause of morbidity and mortality in younger population.[17] Over the past few decades the management of head injury has evolved due to advancement in knowledge to prevent secondary brain damage and facilities of imaging tools like computed tomography (CT) scan and magnetic resonance imaging (MRI).[13]

After head trauma a fully conscious patient may deteriorate, and one of the common cause of such deterioration is extradural hematoma (EDH). EDH is a lethal disorder, however early diagnosis and treatment reduces the mortality and improves the outcome. Mortality in various studies reported to be 5-30% however there are certain risk factors that leads to high mortality in patient with extradural hematoma which include time lapse between trauma and surgery, advance age, size of hematoma, site of hematoma, progressive neurological deterioration and presenting low Glasgow coma score.[18]

In our study male population was common with male to female ratio 3:1 which is similar to study done by Sunay et al,[19] observed male to female ratio 2.93:1. Several other national and international studies also concluded that male population was more prone to develop head injury because they are more expose to traffic and outdoor activities as compared to female.[12,20]

In our study the most common cause of head injury was Road traffic accident 44 (55%) patients, followed by fall from height 20 (25.3%) and assault in 10 (12.6%) of patients. Bavil MS[21] and Igun GO[22] both showed road traffic accident the most common cause of head injury while a study done by Ahsan Aurangzeb et al in Abbotabad studied 114 patients and concluded the fall from height was the most common cause in almost 57%, this contradicts our result as in this study majority of patients were from hilly areas.[23]

Nouman C et al[24] reported that the most common fracture site was temporoparietal (33%), followed by frontal in 23% of patients, occipital in 1% and posterior fossa in 0.98%, almost similar results were observed in our study. Pathak A et al[25] also showed that parietotemporal region was most commonly involved in skull because this region of skull has minimum thickness and more prone to get injured.

Sunay et al[14] and Servadi et al[15] concluded that the frequency of extradural hematoma with linear fracture were 21% and 17.2%. In our study the frequency is slight high 26% because in our study most of the cases were due road traffic accident and fracture site is temporoparietal which overlies middle meningeal vessel and tearing of such vessel result in extradural hematoma. While the fracture site in aforementioned studies was frontal bone, another study conducted at Shifa International Hospital, Islamabad stated that there is strong association of skull fracture with extradural hematoma but a normal X-ray does not rule out extra dural hematoma.[12]

There were several limitations in our study. Firstly, the sample size was small. Secondly, the patients should have been followed in order to know which treatment modality they received, Thirdly, only Mardan Medical Complex was the study place, extension of the study to the other hospitals of same locality could have given us better impression about the frequency of this condition in that particular area.

CONCLUSION

There is strong association of extradural hematoma with linear skull fracture, therefore normal looking person having head injury with skull fracture should be highly suspected for intracranial hematoma and referred to neurosurgical unit for proper treatment without any delay in order to reduce morbidity and mortality.

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REFERENCES

1. Reballi R, Kasimanhanti SP. Neurophysciatric complication of traumatic brain injury and orthopedic injury: a comparative study. APJ Psychol Med. 2014; 15 (2): 228-34.
2. Moppet K. Traumatic brain injury: assessment, resuccitation and early management. Br J Anesth. 2007; 99 (1): 18-31.
3. Husson EC, Ribbers GM,Willmse-van Son AH, Verhagen AP, Stam HJ. Prognosis of six month functioning after moderate to severe traumatic brain injury: A systemic review of prospective cohort studies. J. Rehabil. Med. 2010; 42: 425-36.
4. Agarwa A, Agarwal CS, Kumar A, Adhikari S. Outcome of experience of 300 cases. Nigerian J Ortho Trauma. 2007; 6 (2): 74-6.
5. Servadei F, Naani A, Nasi MT, Zappi D, Vergoni G, Giuliana G, et al. Evoloving brain lesion in the first 12 hour after head injury: Neurosurgery, 1995; 37: 899-907.
6. Lobato RD, Alen JF, Pervez-Nunez A, Alday R, Gomez PA, Pascual B, et al. value of CT scanning and intracranial pressure monitoring for detecting new intracranial mass effect in severe head injury patients showing lesion type-I-II in the initial CT scan . Neurociurgia. 2005; 16: 217-34.
7. Greenwald RM, Gwin GT, Chu JJ, Crisco JJ. Head impact severity measures for evauluating mild traumatic brain injury risk. Exposure Neurosurgery, 2008; 62 (4): 789-98.
8. Uzkan U, Kemalogulu S, Ozates M, Guzel A, That M, Analyzing extradural hematoma: A retrospective clinical investigation Dicle Tip Dergisi. 2007; 34 (1): 14-19.
9. Baykaner K, Alp H, Ceviker N et al. Observation of 95 patients with extradural hematoma and review of literature. Surg Neurol. 1988; 30: 339-44.
10. Ibanez J, Arikan F, Pedraza S et al. reliability of clinical guidelines in the detection of patients at risk following mild head injury: result of prospective study. J Neurosurg. 2004; 100 (5): 825-34.
11. Jamison KG, Yelland JDN. Extradural hematoma. Report of 167 cases. J Neurorosurg. 1968; 20: 227-30.
12. 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: 228-30.
13. Khan MJ, Shaukat A, Khalid M, Aziz MA. Surgical Management and outcome analysis of extradural hematoma at combined military Hospital Rawalpindi. Pak Arm Forc Med J. 2009; 59 (1): 70-3.
14. Sunay YM, Mahmut A, Gurcel C, Yasemin GB, Muzaffer A. The correlation between skull fractures and intracranial lesions due to traffic accidents. Am J Foren Med Pathol. 2003; 24 (4): 339-45.
15. Servadei F, Ciucci G, Pagano F, Rebucci GG, Ariano M, Piazza G, Giast G. Skull fracture as a risk factor of intracranial complications in minor head injuries: a prospective CT study in a series of adult patients. J Neurol Neurosurg Psychiat. 1988; 32 (1): 526-8.
16. Juan J, Rivas MD, Ramiro D, Lobato MD, Rosario S, Francisco C, Antonio C, Pedro G. Extradural hematoma: analysis of factors influencing the courses of 161 patients Neurosurgery, 1988; 23 (1): 44-51.
17. Ghajar J. Traumatic brain injury. Lancet. 2000; 356: 923-9.
18. Hussain M, Ojha B, Chandra A, Singh A,Singh G, Chugh A, et al. contralateral motor deficit in Extradural hematoma: analysis of 35 patients, Indian J Neurotrauma, 2007; 4 (1): 41-4.
19. Chattopadhay S, Tripathi C. Skull fracture and hemorrhagic pattern among fatal and non fatal head injury assault victims. A critical analysis. J Inj Violence Res. 2010; 2 (2): 99-103.
20. Tataranu L, Ciubotaru V, Paunescu D, Spatarui A, Radoi M. Extradural hematoma- is surgery always mandatory. Rom J Leg Med. 2014; 22 (1): 45-50.
21. Bavil MS. Autopsy findings in patients with severe head injury. Res J Med Sci. 2008; 2 (4): 190-2.
22. Igun GO. Predictive indices in traumatic intracranial hematomas. East Afr Med J. 2000; 77 (1): 9-12.
23. Aurangzeb A, Khan EA, Khan AS, Muhammad G, Ihsan A, Hussain I, et al. Frequency of extradural hematoma in patient with linear skull fracture J Ayub Med Coll Abbottabad, 2015; 27 (2): 314-7.
24. Chowdhury NK, Raihan MZ, Chowdury FH, Asadullah ATM, Sarkar MH, Hossain SS. Surgical management of traumatic extradural hematoma: experience with 610 patients and prospective analysis Indian J of Neurotrauma, 2008; 5 (2): 75-9.

25. Pathak A, Desania NL, Verma R, Profile of road traffic accidents and head injury in Jaipur (Rajasthan). J Indian Acad Forensic Med. 2004; 30 (1): 6-9.

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