

## Original Research Article

# A study on various clinical presentations of extradural hemorrhage, factors affecting treatment and early outcome

Ch. Surendra Kumar\*, K. Satyavara Prasad, B. Rajasekhar, B. V. S. Raman

Department of Neurosurgery, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

**Received:** 19 January 2017

**Revised:** 21 January 2017

**Accepted:** 23 February 2017

**\*Correspondence:**

Dr. Ch. Surendra Kumar,

E-mail: rajboddapati@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** In India 11% of deaths are due to trauma and 78% of injury deaths are due to head injury. The aim of this study was to analyse the clinical spectrum and to evaluate the postoperative outcome in patients with head injury with an extradural hematoma.

**Methods:** This was a retrospective observational study which included 100 patients admitted in King George hospital, Andhra medical college, Visakhapatnam, Andhra Pradesh, India over the past two years (01/10/2014 to 30/09/2016) with head injury, diagnosed to have traumatic extradural hemorrhage. A detailed clinical history, physical examination and CT scan was performed in all patients. For patients who were subjected to surgery operative and post-operative findings were noted.

**Results:** The maximum patients suffering from EDH are in the age group of 21-30 years (28%) with male predominance (95%). The most common mode of injury is RTA (58%) under the influence of alcohol. Majority of cases reached hospital within 6 hours from time of injury (44%). 95% of patients with EDH presented with LOC followed by vomiting in 68% of cases, followed by Headache in 42% of cases. 53% of the cases presented with mass effect over brain parenchyma with frontal EDH as most common location. Out of 100 cases, surgical approach was considered in 57 patients while remaining 47 patients were managed conservatively. Recovery from clinical and functional morbidity was satisfactorily acceptable, following treatment.

**Conclusions:** Early presentation with mild to moderate GCS has good clinical outcome with minimal disability.

**Keywords:** Epidural hematoma, Glasgow coma scale, Loss of consciousness

### INTRODUCTION

India is undergoing major economic and demographic transition coupled with increasing urbanization and motorization. Among the top ten causes of mortality in the country, head injury was the tenth cause two decades back. But with the increasing urban expansion and life style changes, trauma will occupy the fifth position in the list of major killers and third position among causes of disease burden in 2020. In India 11% of deaths due to non-communicable diseases are due to trauma and 78%

of injury deaths are due to head injury. It is the leading cause of mortality for young adults of less than 45 years and a major disease burden across all age groups. Some of the factors that increase the risk of road crashes in India are unsafe traffic environment, poor road infrastructure and encroachments that restrict safe area for pedestrian's lack of safety engineering measures, traffic mix and an increasing number of motorized vehicles. Unsafe driving behavior and lack of valid driving licenses or fake driving licenses. Head injury is one of the leading causes of severe disability and death in

the modern world among individuals under 45.<sup>1</sup> Traumatic brain injury (TBI) accounts for approximately 70% of these traumatic deaths and most of the persisting disabilities in accident survivors.<sup>2</sup> Traumatic extradural hematomas (EDH) comprise 1 to 3% of all head trauma admissions.<sup>3</sup> The peak incidence of extradural haematoma (EDH) is in the second decade of life and mean age of patient with EDH in different series is between 20 and 30 years of age.<sup>4,5</sup> Mortality rate vary from 10-40% and is an index of alertness and efficiency of health care and hospital setup in a country.<sup>6</sup> The integrated disease surveillance project of the ministry of health and family welfare recognizing this problem proposes to include the injury module as an additional component. There is, however, a need to develop and test a model for surveillance of trauma for inclusion in the health information systems. Risk factors for patients with EDH are advanced age, intradural lesions, temporal location, increased hematoma volume, rapid clinical progression, pupillary abnormalities, increased intracranial pressure (ICP) and low Glasgow coma scale (GCS).<sup>7</sup> But others found the most significant factors associated with unfavorable outcome were higher age, lower GCS, and higher EDH volume.<sup>14</sup> Surgical mortality has rapidly decreased since Hutchinson described extradural haemorrhage as an emergency situation in 1867. 100 years ago, the mortality rate of EDH was as much as 86% and traumatic EDH remains a true neurosurgical emergency.<sup>8</sup> With the introduction and wide availability of cranial CT, early diagnosis and timely surgical intervention for EDH is an attainable gold standard.<sup>9,10</sup> Indeed, the treatable nature of EDH has led some authors to suggest that “towards zero mortality” is an achievable target with respect to this condition.<sup>11,12</sup> While zero mortality is common in non-comatose patients, 25% to 71% of comatose patients undergoing surgery have a fatal outcome.<sup>13</sup> Many reports on extradural hematoma have drawn attention to avoidable factors implicated in preoperative deterioration, such as delayed transportation to the hospital and delayed diagnosis, but less consideration has been given to the specific factors that influence the outcome of patients who arrive comatose in the operating room.<sup>13</sup> EDH remains even now a serious neurological condition.<sup>15,16</sup>

### ***Aim of the study***

The aim of this study was to analyze various causes, clinical presentations, factors influencing presentations and to evaluate the postoperative outcome in patients with head injury with an extradural hematoma before surgery and to formulate recommendations for improvement of therapy and suggestions for the future.

### **METHODS**

This is a prospective observational Study which included 100 patients admitted in King George hospital, Andhra medical college, Visakhapatnam over the past two years

(01/10/2014 to 30/09/2016) with head injury, diagnosed to have traumatic extradural hemorrhage.

### ***Inclusion criteria***

- All patients between age groups of 5 to 70 years were included.
- Study included evaluation of traumatic extradural hemorrhage.

### ***Exclusion criteria***

- All patients <5 years and >70 years were excluded.
- Non-traumatic causes were excluded.
- Head injury patients without extradural hemorrhage were excluded from the study.
- Long term outcome excluded.
- Patients bearing associated injury to chest, abdomen and extremities were excluded.

### ***Methods***

- A detailed history with regards to
  - a. Time of incident
  - b. Alcohol influence
  - c. Mode of injury
  - d. Time of arrival to hospital.
- All patients subjected to thorough initial clinical examination.
- All patients were subjected to emergency and follow up CT Scan- Brain.
- Patients were operated, operative finding noted, post operatively records were analyzed.
- The study evaluated initial outcome, excluding long term outcome.

### **RESULTS**

Total 100 cases were included in the study.

#### ***Age distribution***

This study revealed that maximum patients suffering from EDH were in the age group of 21-30 years (28%). The details of age incidences are given in Table 1.

#### ***Sex distribution***

This study showed that males were predominant as compared to females. Out of 100 cases, 95 were males (95%) whereas only five cases were female (5%), (Table 2).

#### ***Mode of injuries***

This study revealed that most common mode of injury was RTA (58%). And 63% of cases occurred under the influence of alcohol. The details of mode of injuries is shown in Table 3.

**Table 1: Age distribution.**

Age group (year)	Number N=100	%
5-10	6	6
11-20	22	22
21-30	28	28
31-40	26	26
41-50	12	12
51-60	4	4
61-70	2	2

**Table 2: Sex distribution.**

Sex	Number N = 100	%
Male	95	95
Female	5	5

Males predominantly affected.

**Table 3: Mode of injuries.**

Mode of injury	Number N=100	%
RTA	58	58
With alcohol	37	37
Without alcohol	21	21
Accidental fall	27	27
With alcohol	17	17
Without alcohol	10	10
Assaults	10	10
With alcohol	9	9
Without alcohol	1	1
Others	5	5

Road traffic accidents (58%) and influence of alcohol (63%).

**Table 4: Time of arrival.**

Time of arrival	Number N= 100	%
<6 hours	44	44
6-12 hours	37	37
>12 hours	19	19

56 % of cases are reaching hospital >6 hours duration.

**Time of arrival**

Majority of cases reached hospital in >6 hours from time of injury (56%), shown in Table 4.

**Symptomatology**

Majority of patients with EDH presented with LOC in 95% of cases followed by vomiting in 68% of cases, followed by headache in 42% of cases, Shown in Table 5.

**Level of GCS**

Majority of cases were presented with mild to moderate level of GCS i.e. 46% next followed by GCS 15 i.e. 40%, shown in Table 6.

**Table 5: Symptomatology.**

Symptom	Number N=1000	%
With loc	95	95
With out loc	5	5
Headache	42	42
Vomiting	68	68
Ent bleeding	42	42
Convulsion	11	11
Facial weakness	2	2%
Hemi -paresis	11	11%

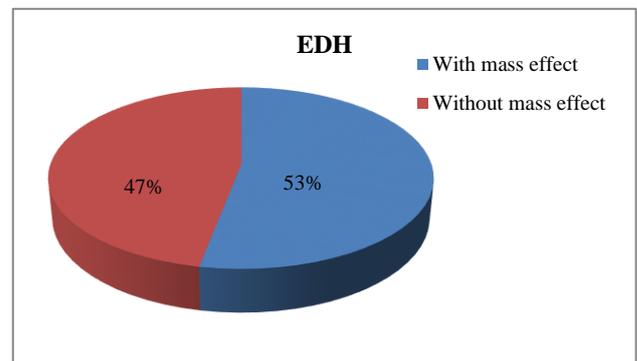
**Table 6: Level of GCS.**

Level of GCS	Number N=100	%
15	40	40%
13-14	25	25 %
9-12	21	21 %
5-8	8	8 %
3-4	6	6 %

Patients of GCS 15 accounts for - 40%. Mild to moderate GCS (i.e. in between 9-13)- 46%.

**EDH with or without mass effect**

Out of 100 cases, 53% of the cases presented with mass effect over brain parenchyma, shown in Figure 1.



53% of cases presented with mass effect on brain parenchyma.

**Figure 1: Percentage of EDH causing mass effect.**

**Presentation of EDH**

Out of 100 cases, 45% of the cases presented as pure isolated EDH. 40% of cases presented with associated fracture. Remaining 15% of cases presented with associated brain parenchymal injury. shown in table 7.

**Table 7: Presentation of EDH.**

EDH	Number N= 100	%
Pure EDH	45	45
Associated #	40	40
Associated brain injury	15	15

### Pupil status

Majority of cases presented with equally reacting pupils at time of presentation to hospital i.e. 76%. Details are shown in Table 8.

**Table 8: Pupil status.**

Pupil status	Number N=100	%
Equal/reactive	76	76
Unequal/non-reactive	13	13
Bil dilated/ non-reactive	11	11

### EDH location

The dominant type of EDH observed in the study was frontal presenting in 36% cases followed by temporal in 21% cases next only is Temporal parietal in 10% cases. Posterior fossa EDH presentation was relatively less found in 5% as occipital shown in Table 9.

**Table 9: Location of EDH.**

Location of EDH	Number N=100	%
Frontal	38	38
Temporal	21	21
Occipital	5	5
Parietal	7	7
Fronto-temporal	4	4
Fronto-temporo-parietal	2	2
Temporo-parietal	10	10
Parieto-occipital	5	5
Fronto-parietal	8	8

Frontal EDH is most common i.e. 38%.

### Treatment

Out of 100 cases, surgical approach was considered in 57 patients while remaining 47 patients were managed conservatively.

**Table 10: Glasgow outcome scale.**

Glasgow out come scale	Number N=100	%
Good recovery	79	79
Moderate disability	11	11
Severe disability	2	2
Vegetative state	0	0
Death	8	8

### Outcome

Outcome of patients during the period of study was assessed with Glasgow outcome scale. Good recovery was seen in 79% of Patients. Moderate disability was seen in 11% of patients. Severe disability, vegetative state and death accounted only 10% of the cases. Details shown in table 10.

### DISCUSSION

A total of 100 cases of extradural hemorrhage were registered during the period of study and out of these 58% cases were of RTA, 27% cases were of fall from height, 12% cases were of assault and rest are other traumas. In this study, the commonest age was 21-30 years (28%). Incidence of head injury was more in age range of 21 to 30 years with 28% cases as compared to both extremes of life. The study was compared with various other studies conducted across India, described in Table 11.<sup>17,18</sup>

**Table 11: Various studies showing age and sex determinants.**

Study	Male	Female	Age group
Saxena et al <sup>17</sup>	86%	14%	20-40 years Mean 28 years
Iqbal et al <sup>18</sup>	81%	19%	21-30 years Mean 21 yrs
Present study	95%	5%	21-30 years Mean 23 yrs

Males were more prone to EDH comprising 95% compared to females which accounts for making a Male: Female ratio of 19:1.

### Mode of injury as determinant

When compared with other studies, present results are similar in mode of injury i.e. RTA followed by falls and next is assaults, which are compared and shown in Table 12.

**Table 12: Mode of injury as determinant.**

Mode-study	RTA	Fall	Assaults	Others
Saxena et al <sup>17</sup>	72%	17%	5%	6%
Iqbal et al <sup>18</sup>	40%	44%	14%	2%
Present study	58%	27%	10%	5%

64% of RTA, 63% of accidental falls and 90% of assaults happened under alcohol influence

64% of RTA, 63% of accidental falls and 90% of assaults happened under alcohol influence. Influence of alcohol plays significant role in head injury causation almost doubling the common occurrence as evident from study.

The dominant type of EDH observed in the study was frontal presenting in 36% cases followed by temporal in 21% cases next only is temporal parietal in 10% cases. Posterior fossa EDH presentation was relatively less found in 5% as occipital.

Pathak A et al reported from their study that the dominant type of EDH observed was temporo parietal in 43% cases followed by temporal in 21% of cases followed by Frontal in 17% of cases. Posterior fossa EDH presentation was relatively less found in 1% of cases in a

study conducted by Singh G et al.<sup>21-23</sup> We observed in present study that in 45% cases EDH presented as isolated finding, as per explanation by Charles Bell, that concussion injury causes stripping of dura aggravated further by negative intracranial pressure found at the antipode of compression force of skull. 40% cases presented with associated skull bone (64% Pathak A et al) fracture both linear and comminuted. 15% cases brain parenchyma injury in the form of (10% Saxena et al) contusion, IVH (intraventricular Hemorrhage) subdural hemorrhage, brainstem contusion. Excluding bony fracture together constituting 55% (75% Pathak A et al).

In present study among 100 cases, 44% of cases could reach the treating hospital within 6 hours and 37 % cases between 6-12 hours of trauma and remaining 19% cases after 12 hours. The study throws light in the significance of golden period in the management of extradural hemorrhage.<sup>19-24</sup>

They presented with almost 95% cases with symptom of loss of consciousness. The next prominent symptom being vomiting observed in 68% cases and head ache in 42% cases are better indicators of raised intracranial pressure, ENT bleeding constitutes 42%. 11% had convulsion and weakness symptoms. On initial clinical examination 40% cases had Glasgow coma scale score of 15/15 (asymptomatic), 25% with range of 13-14 (mild head injury), 21% with range of 9-12 (moderate head injury), 8% with range of 8-5 (severe head injury), 6% with range of 3-4 (moribund state), 76% had normal equally reacting pupils, 12% unequal and non-reacting, 11% bilateral dilated and fixed status shown in Table 13.

**Table 13: Comparison of clinical determinant with other studies.**

Study	GCS-score			Pupil-status	
	15-9	5-8	3-4	E/R	Di/NR
Saxena study <sup>17</sup>	54%	35%	12%	73%	27%
Present study	86%	8%	6%	77%	23%

After initial resuscitation in appropriate cases, an emergency CT scan was obtained in all cases and found to have positive finding which was added by follow up CT scan. 53% cases presented with mass effect fulfilling radiological criteria for emergency surgery. 57% cases of varying GCS score and under clinic-radiologic indication underwent emergency decompressive craniotomy and evacuation of blood clot. Remaining 43% treated conservatively as per medical line of management.

- 79% cases achieved good recovery as per Glasgow outcome score.
- 11% sustained moderate disability in the form of delayed recovery with residual paresis, 2% cases suffered severe disability in the form of hemiplegia.
- In 8 cases (13% Gurupreeth et al) the head injury presenting as EDH was so severe that the victim

could not survive even after emergency surgical intervention. They all presented to emergency ward >12 hours of trauma with associated brain parenchyma injury and poor GCS score.

## CONCLUSION

The present study concludes that, road traffic accident was the commonest mode of causative agent for EDH accounting for 58 percent. And also, warns alcohol influence had a significant correlation in the causation, revealed by present study series and proved a social evil. And also 95% cases had history of loss of consciousness, “the hallmark symptom of extradural hemorrhage” which should be seriously considered while taking history. Majority of patients obtained medical attention more than six hours of incident (56%), so the onset of trauma and delay in the treatment had greatly influenced the patient outcome. So, golden one hour concept should be made aware among all medical people. The degree of brain injury and the GCS difference were notable factors that were significant in determining the functional outcome of EDH. So, early presentation to hospital with mild to moderate GCS has good clinical outcome with minimal disability.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Khan MJ, Shaukat A, Khalid M, Aziz MA. Surgical management and outcome analysis of extradural hematoma at combined military hospital Rawalpindi. Pakistan Armed Forces Med J. 2009;59(1):1-4.
2. Taussky P, Widmer HR, Takala F, Fandino F. Outcome after acute traumatic subdural and epidural haematoma in Switzerland: a single centre experience. 2008;138:281-5.
3. Yurt I, Bezircioglu H, Ersahin Y, Demircivi F, Kahraman M, Tektas S. Extradural haematoma: analysis of 190 Cases. Turkish Neurosurg. 1996;6:63-7.
4. Bullock MR, Chesnut R, Ghajar J, Gordon D, Hartl R, Newell DW, et al. Surgical management of acute epidural haematomas. Neurosurgery. 2006;58:52-7.
5. Pozzati E, Frank F, Frank G, Gaist G. Subacute and chronic EDH, A study of 30 cases. J Trauma. 1980; 20(9):795-9.
6. Babu MI, Bhasin SK, Kumar A. Extradural hematoma- an experience of 300 cases. JK Science 2005;7:205-7.
7. Husain M, Ojha BK, Chandra A, Singh A, Singh G, Chugh A, Rastogi M, Singh K. Contralateral motor deficit in extradural hematoma: Analysis of 35 patients. Indian J Neurotrauma. 2007;4(1):41-44.

8. Hutchinson J. Effusion of blood between bone and duramater. *Lond Hosp Rep.* 1867;4:51.
9. Cheung PS, Lam JM, Yeung JH, Graham CA, Rainer TH. Outcome of traumatic extradural haematoma in Hong Kong. *Injury.* 2007;38:76-80.
10. Agrawal A, Agrawal CS, Kumar A, Adhikari S. Outcome of traumatic extradural haematoma managed surgically: our experience. *Nigerian J Ortho Trauma.* 2007;6(2):74-6.
11. Paterniti S, Fiore P, Macri E, Marra G, Cambria M, Falcone F, Cambria S. Extradural haematoma report of 37 consecutive cases with survival. *Acta Neurochir (Wien).* 1994;131:207-10.
12. Bricolo AP, Pasut LM. Extradural hematoma: toward zero mortality- prospective study. *Neurosurgery.* 1984;14:8-12.
13. Lobato RD, Rivas JJ, Cordobes F, Alted E, Perez C, Sarabia R, et al. Acute epidural hematoma: an analysis of factors influencing the outcome of patients undergoing surgery in coma. *J Neurosurg.* 1988;68:48-57.
14. Dubey A, Pillai SV, Sastry KVR. Does volume of extradural hematoma influence management strategy and outcome? *Neurol India.* 2004;52:443-5.
15. Mishra A, Mohanty S. (2011). Contre-coup extradural haematoma. A short report. *Neurol India.* 2011;49(1):94-5.
16. Cook RJ, Dorsch NW, Fearnside MR, Chaseling R. Outcome prediction in EDH. *Actaneurochir (Wein).* 1988;95(3-4):90-4.
17. Saxena RC, Bilodi AKS, Mane SS, Kumar A. Study of pterion in skulls of awadh area-in around Lucknow. *Kathmandu Univ Med J.* 2003;1(1):32-3.
18. Iqbal Z, Arshad M, Yasin M. Acute traumatic extradural hematoma-A study of 80 cases. *Pak J Neurol.* 1999;5:36-40.
19. Kalayanaraman S, Ramamurthi K, Ramamurthi B. Analysis of 2000 cases of head injury. *Neurology India* 1970;18:3-11.
20. Jamesson KG. Extradural and subdural haematoma, changing pattern and requirement of treatment in Australia. *J Neurol.* 1970;33:632.
21. Baykaner K, Alp H, Ceviker N. Observations of 95 patients with extradural haematoma and review of literature. *Surg Neurol.* 1988;30:339.
22. Metellus P, Dufour H, Mauera L, Fueufes S. Spontaneous Vertex EDH: Considerations about causes, case report and review of literature. *J Neurosurg.* 2001;94(4):633-6.
23. Carroll TA, Smith K, Jaubowski J. Extradural haematoma following temporomandibular joint arthrocentesis and lavage. *Br J Neurosurg.* 2000;14(2):152-4.
24. Bae DH, Choi KS, Yi HJ, Chun HJ, Ko Y, Bak KH. Cerebral infarction after traumatic brain injury: incidence and risk factors. *Korean J Neurotrauma.* 2014;10:35-40.

**Cite this article as:** Kumar CS, Prasad KS, Rajasekhar B, Raman BVS. A study on various clinical presentations of extradural hemorrhage, factors affecting treatment and early outcome. *Int J Res Med Sci* 2017;5:1288-93.