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ABSTRACT

Introduction: Extradural hematoma (EDH) is a unique form of traumatic brain injury. Extradural hematoma is a collection of blood between the skull and duramater due to bleeding from meningeal vessels is a common complication of head injury, often fatal if not treated in time. The incidence of EDH among traumatic brain injury patients has been reported to be in the range of 2.7 to 4%. CT was easily and widely used for confirming the diagnosis and location of the hematoma as well as for follow-up after the treatment period.

Aim of the study: Surgical outcome of extradural hematoma in relation to preoperative computed tomographic findings of extradural hematoma patients.

Keywords: computed tomographic, extradural hematoma, GCS.

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ABSTRACT

Introduction: Extradural hematoma (EDH) is a unique form of traumatic brain injury. Extradural hematoma is a collection of blood between the skull and duramater due to bleeding from meningeal vessels is a common complication of head injury, often fatal if not treated in time. The incidence of EDH among traumatic brain injury patients has been reported to be in the range of 2.7 to 4%. CT was easily and widely used for confirming the diagnosis and location of the hematoma as well as for follow-up after the treatment period.

Aim of the study: Surgical outcome of extradural hematoma in relation to preoperative computed tomographic findings of extradural hematoma patients.

Material & Methods: This prospective study was conducted in the Department of Neurosurgery, Dhaka Medical College and Hospital during the period of January 2016 to December 2017. A total of 98 patients of both sex and any age with EDH who were selected purposively.

Results: Among the total 98 patients age range was 04- 55 years. Majority, 30 (30.60%) patients were from 21- 30 years of age. The mean age was found 25.24±12.2 years. 78 (78.55 %) patients were male and 22 (22.44 %) patients were female. A male predominance was observed. It was observed that volume of hematoma (Mean ±SD=43.88±15.82ml), thickness of hematoma (Mean±SD=20.14±4.45mm) and Midline shift (Mean±SD=5.82±2.33mm). Ventricular effacement was present in almost all cases (97.97%). Associated skull fracture was present in 46.92%. Total mortality was 3(3.06%).

Conclusion: Preoperative CT findings is most important prognostic factor of surgically treated EDH patient.

Keywords: computed tomographic, extradural hematoma, GCS.

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I. INTRODUCTION

Extradural hematoma (EDH) is a unique form of traumatic brain injury (TBI). Extradural haematoma (EDH) is a collection of blood between the skull and duramater due to bleeding from *meningeal vessels* is a common complication of head injury, often fatal if not treated in time[1]. The incidence of EDH among traumatic brain injury (TBI) patients has been reported to be in the range of 2.7 to 4%[2-6]. 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[7,8]. Extradural haematoma is very rare in extremes of ages as after 60 years dura is adherent to overlying bone and even in children below 2 years as plasticity of immature calvarium[9,3].

Head injury is a major health problem. The incidence of head injury in India per 100,000 populations per year ranges from 56-430. The

overall incidence in US is around 200 per 100,000 per year[10]. Traumatic extradural hematoma (EDH) has been recognized for more than 140 years. 100 years ago, the mortality rate of EDH was as much as 86%. The overall mortality rate was 14.9% Khaled et al[3] showed patient with GCS of 3 to 5 had a mortality of 36% and patients with GCS of 6 to 8 had a mortality of only 9%.

Until the late 1970s, when angiography was used for diagnosis [the era before computed tomography (CT)], the mortality rate was 30% or high which has reduced now by introduction of CT and proper resuscitative measures and timely surgical intervention to 5 to 12%[11]. CT was easily and widely used for confirming the diagnosis and location of the hematoma as well as for follow-up after the treatment period. It is readily available, relatively inexpensive, and fast. The location of hematoma, ventricular effacement and midline shift was also noted. The presence of any other intradural abnormality was also noted. Data on the patency of basal cisterns, fractures, and hematoma density was also recorded. The "Classic" CT appearance was seen in 84% of the cases and consists of a hyper-dense, biconvex (lenticular) mass adjacent to the skull[2,6].

II. METHODOLOGY

This prospective study was conducted in the Department of Neurosurgery, Dhaka Medical College and Hospital (DMCH), during the period of January 2016 to December 2017. A total of 98 patients of both sex and any age with EDH who were selected purposively as inclusion and exclusion criteria. Preoperative computed tomography (CT) scan of brain was obtained for all patients where hyper-dense lentiform lesion under skull was identified as a case of extradural hematoma (EDH). After confirming diagnosis rapid thorough general and neurological examination was done and vital signs including GCS score, pupil status, BP, heart rate, O2 saturation etc. were assessed and documented. CT scan finding including site of hematoma, thickness of hematoma, any midline shifting, underlying brain injury, overlying skull fracture also was assessed and documented. Then rapid resuscitation was done and patient was taken to OT for surgical intervention as early as possible in the form of craniectomy or craniotomy with evacuation of hematoma on the basis of the location of hematoma. Post operatively patient was kept in intensive care unit or post-operative ward. Patient follow-up was carried out for a total of 1 month post-operatively. Follow-up of the patients was done on indoor basis up to discharge and on OPD at 1 month. During follow up the patients were assessed using the post-operative GCS, check CT and Glasgow Outcome Scale (GOS) graded with a five-point score. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., IBM and New York, USA). Prior to commencement of this study, the "Research Review Committee" & the "Ethical Committee" of DMCH, Dhaka, approved the research protocol.

- Inclusion Criteria
  - ➢ Extradural hematoma patients who were admitted into DMCH of any age and sex.
  - ➢ Extradural hematoma patients who were treated surgically.
- Exclusion Criteria
  - ➢ Posterior fossa extradural hematoma patients
  - ➢ Extradural hematoma patient treated conservatively

III. RESULTS

In this study, 98 patients were included; they were divided into 6 age groups. Age range was 04-55 years. Majority, 30 (30.60%) patients were from 21- 30 years of age. The mean age was found 25.24±12. 2 years (Table I). Among the 98 patients majority, 78 (78.55 %) were male and 22 (22.44 %) patients were female. A male predominance was observed. Majority had a history of motor vehicle accident 44 (44.90 %), 29 (29.60 %) were suffering from assault, 20 (20.40%) patients were fallen from height and other 04 (04.0%) patients had history of fall of heavy wt. overhead (Table II). Among the 98 patients, 82 (83.67%) had vomiting, 72(73.46%) patients had presented with loss of consciousness or altered level of consciousness. 60 (61.22%) patients had headache (Table Ill). Preoperative

GCS 14-15 were found in 40 (40.81%) cases, GCS 9-13 were found in 39 (39.79%) cases and GCS 3-8 were found in 19 (19.38%) cases (Table IV). It was observed that majority 25 (25.50%) patients were had parietal lobe involvement. It was observed that volume of hematoma (Mean± SD=43.88±15.82 ml), thickness of hematoma (Mean±SD=20.14± 4.45mm) and Midline shift (Mean ±SD=5.82± 2.33mm) (Table VI). 92 (92.0 %) patients had underwent Craniotomy. Post-operative GCS 14-15 were found in 44 (44.90%) cases in 1st POD, 61 (63.60%) cases in 3rd POD and 85 (88.50%) during discharge. Hospital stay of the study patients, it was observed that majority of patients 78(79.59%) stayed in hospital for 5-8 days. Total mortality was 3(3.06%).

Table I: Distribution of the Study Patients by Age (n=98)

Age in years	Frequency (n)	Percentage (%)
≤10	18	18.36
11-20	24	24.48
21-30	30	30.60
31-40	16	16.36
41-50	8	8.16
51-60	2	2.04
Total	98	100.0
Mean ±SD 25.24±12.2		
Min-Max(04-55)		

Table II: Distribution of the Study Patients by Mode of Injury (n=98)

Mode of injury	Frequency (n)	Percentage (%)
Motor vehicle accident	44	44.90
Assault	29	29.60
Fall from height	20	20.40
Fall of heavy wt. over head	4	4.08
Unknown	1	1.01
Total	98	100.0

Table III: Distribution of the Study Patients by Clinical Presentation (n=98)

Clinical presentation	Frequency (n)	Percentage (%)
Headache	60	61.22
Loss of consciousness/ Altered level of consciousness	72	73.46
Lucid interval	19	19.38
Vomiting	82	83.67
Convulsion	3	3.06

Table IV: Distribution of the Study Patients by Preoperative GCS (n=98)

Preoperative GCS	Frequency of GCS score (n=98)		Mean ±SD	Median
	N	%		
3-8	19	19.38	11.53±3.47	12
9-13	39	39.79		
14-15	40	40.81		
Total	98	100.0		

Table V: Distribution of the Study Patients by Location of Hematoma (n=98)

Location of hematoma	Frequency (n)	Percentage (%)
Frontal	23	23.46
Parietal	25	25.50
Temporal	5	5.10
Occipital	4	4.08
Temporo-parietal	24	24.48
Fronto-parietal	13	13.26
Parieto-occipital	4	4.08
Total	98	100.0

Table VI: Distribution of the study patients CT scan finding (n=98)

CT scan finding	Frequency (n)	Percentage (%)	Mean ±SD
Volume of hematoma(ml)			
≤30	11	11.22	43.88±15.82
31-60	79	82.65	
61-90	4	4.08	
90-120	4	4.08	
Thickness of hematoma(mm)			
0-10	0	0.0	20.14±4.45
11-20	68	71.42	
21-30	26	26.52	
31-40	4	4.08	
Midline shift(mm)			
0-5	22	22.44	5.82±2.33
6-10	43	43.86	
11-15	11	11.22	
16-20	22	22.44	
Ventricular effacement			
present	97	98.97	
absent	1	1.01	
Skull fracture			
present	46	46.92	
absent	52	53.08	

IV. DISCUSSION

It was observed that the incidence of EDH is highest (30.60%) in the third decade of life (21 to 30 years), followed by 2nd decade of life (11-20years) with a mean age of 25.24±12.2 years and range from 4 to 55 years which is similarly observed by Khaled et al[3]. Emejulu et al[9] observed the peak age incidence was 21 to 30 years (42%), with a mean age of 23 years. Aurangzeb et al[7] observed that greatest representation was found in the 21-30 years age groups with 17 patients (47.2%), closely followed by the 11-20 years age group with 7 patients (19.4%).

Majority, 76 (77.55 %) patients were male and 22 (22.44 %) patients were female. Male-female ratio was 3.45:1. A male predominance was observed which reflects male are more exposed to outside world. In one case series in Hong Kong Cheung et

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al[11] observed male predominance (78.7%). Similar observations regarding the male predominant were also observed by Aurangzeb et al[7], Cheung et al[11], Emejulu et al[9], Husain et al[12], Khaled et al[3], and Soon et al[13].

In most of the cases the mode of injury was motor vehicle accident 44 (44.88 %) followed by assault 29 (29.58 %) and fall from height 20 (20.40%). Motor vehicle accident was the commonest cause of injury comparable with many other published series Aurangzeb et al[7]; Cheung et al[11]; Emejulu et al[9]; Gurer et al[14]; Khaled et al[3]; Moon et al[5].

Regarding clinical presentation, 82 (83.67%) patients had vomiting, 72 patients (73.46%) presented with altered level of consciousness or with loss of consciousness, 60 patients (61.22%) with headache, 3 patients (3.06%) with history of convulsion. Khaled et al[15] observed features altered sensorium (61%), headache/vomiting (56%), seizure (13%). 42.84% patients was found during admission and 40.81% preoperatively within GCS 14-15, 40.81%, 39.78% within GCS 9-13 and 16.32%, 19.38% patients within GCS 3-8 during admission and preoperatively. Mean GCS was 11.83±3.3 and 11.53±3.47 during admission and preoperatively. Gerlach et al[16] observed 61.5% patients within GCS 13-15, 15.4% within GCS 8-12 and 23% within GCS 3-8. Khan et al[17] observed presenting GCS in 50% cases within 14-15, 33.3% within 9-13 and, 16.7% within 3-8, which are almost consistent with the current study.

According to the CT scan findings location of hematoma was 25.50% in parietal, 23.46% in frontal, 24.48% in temporoparietal, 13.26% in frontoparietal region and only 2% in posterior fossa. Hematoma location was parietal in 49%, frontal in 36%, temporal in 10% and occipital in only 5% observed by Gerlach et al[16]. In another study of 610 cases of EDH, temporo-parietal site was involved in 33.45% (n = 204) followed by frontal region in 23.28 % (n = 142) and six patients (0.98%) had EDH in posterior fossa Khaled et al[3]. Volume of hematoma (>30 ml) in 88 (89.92%) patients (Mean±SD=43.88±15.82 ml), thickness of hematoma (Mean±SD=20.14± 4.45 mm) and Midline shift (Mean±SD=5.82± 2.33 mm). Ventricular effacement present in almost all cases (97.97%). Associated skull fractures were present in 46.92% patients but 62% observed by Khaled et al[15].

Majority, 92 (93.87%) patients had Craniotomy, 5 (5.10%) patients had Craniotomy and only one patients (1.0%) underwent decompressive craniectomy due to peroperative brain swelling that was almost similar with previous study, craniotomy 87%, craniectomy (8.5%) and burr hole trephination (4%) observed by Jeong et al[18]. 79.59% patients were stayed in hospital for 5 to 8 days with mean length 6.57±2.57 days maximum 15 days similar with previous study Bir et al[8] observed mean length of hospital stay 6.45 days and 10.4 days by Cheung et al[11].

Mortality was 3(3.06%), all of them belongs to GCS 3-8. No mortality was found between GCS 9-13 and 14-15. Gerlach et al[16] observed 0% mortality. Cheung et al[11] observed that mortality was 4.4% in surgically treated EDH, 3.3% in GCS 3-8 and 1.1% in GCS 13-15. Emejulu et al[9] observed that total mortality was 14.9% among them 2.1% in awake patients, 2.1% in obtunded patients, 10.6% in comatose patients managed both surgically and conservatively. Khan et al[17] observed 3%, 12.5% and 11.5% mortality respectively.

The study was limited by population selected from one hospital in Dhaka city in a short period so that the results of the study may not reflect the exact picture of the country.

V. CONCLUSION

The availability of computed tomography (CT) has increased the diagnosis of extradural haematoma. The mortality rate reduced now by introduction of CT. Preoperative CT findings is most important prognostic factor of surgically treated EDH patient.

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