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Patterns and outcomes of posterior fossa extradural hematoma-six years study in emergency hospitals of Erbil city

Gulshan Talat Muhammed*
Sameer Hassan Aboud**

Abstract

Background and objectives: Posterior fossa extradural hematoma is rare , however, in clinical practice it may represent a top emergency. The aim of study was to find the proportion of posterior fossa extradural hematoma to other extradural hematomas, its age incidence, main causes and factors that affect surgery and outcomes. **Methods:** Thirty five cases of posterior fossa extradural hematoma were diagnosed and treated over 6 years period, from 2012 to 2018. The patients were evaluated regarding age, type of trauma, cranial computer tomography, Glasgow coma scale score, treatment and follow-up over the period of 3 months. **Results:** Thirty five patients (1.8%) with posterior fossa extradural hematoma were treated. Their mean age + SD were 16.81 + 14.58 years, ranging from 2 to 65 years. The causes of head trauma in a decreasing order were fall from height (57.1%) (Twenty patients), and road traffic accident (42.9%) (Fifteen patients). Glasgow coma scale score was 13-15 in the majority (62.9) (twenty-two cases). About fifty-four point three percent were treated conservatively, and surgical intervention was done in forty-five point seven percent. Around sixty- five point seven percent were alive without deficit, and only five point seven percent died. Among those with hematoma (< 10 mL), sixteen patients were alive without deficit compared with seven with (> 10 mL). The proportion of alive patients without deficit were treated conservatively (seventeen patients) compared with six patients treated surgically.

Key words: Computed tomography, Glasgow coma scale score, Posterior fossa extradural hematoma.

Introduction

Extradural Hematoma (EDH) have been known for almost 120 years and results are promising when they are treated promptly. The posterior fossa is a rare location for traumatic injury, in general, including EDH[1,2]. Posterior fossa epidural haematoma (PFEDH) is less frequently observed, accounting for only 1.2% to 12.9% of all EDH cases[3]. In the literature PFEDH have been considered to be a lesion of young people probably owing to the higher frequency of occipital fractures in childhood[4]. The incidence of occipital skull fractures associated with pediatric PFEDHs, such as Sencer et al.[3] series (87.5%) has been frequently published. In normal circumstances, no epidural space is present because of the firm attachment of the outer dural layer to the inner table of skull[5]. Epidural hematoma is when bleeding occurs between the tough outer membrane covering the brain (dura mater) and the skull[6]. The expanding hematoma strips dura from the skull but is usually confined to the epidural space and does not cross the suture line (coronal or lambdoid suture) in adults. Venous EDH, on the other hand, results from bleeding from the meningeal or diploic veins or the dural sinuses. Posterior fossa is characterized by " rule of three" whereby the brain stem presents three parts , cerebellum presents three surfaces, three cerebellar peduncles, three fissures, three main arteries (superior cerebellar artery, anterior inferior cerebellar artery, posterior inferior cerebellar artery) and three main venous drainage groups[7]. Clinical progress may be silent and slow, but the deterioration may be sudden. Diagnosis is typically by a CT scan or MRI[8]. A non-contrast CT is the best imaging modality for evaluation because of rapidity of acquisition and its ability to detect even smaller hematomas, in addition to identifying associated lesions[3]. However, the magnetic resonance imaging has recently been used with an increasing frequency in head injuries. The aim of study was to find the

* M.B.Ch.B F.K.B.M.S(Neurosurgery)
** M.B.Ch.B FRCS(Neurosurgery) Rojawa Emergency Hospital/ Neurosurgery Department
Corresponding author: Gulshan Talat Muhammed. Email: gulshan_talat@ yahoo.com

proportion of posterior fossa extradural hematoma to other extradural hematomas, its age incidence, main causes and factors that affect surgery and outcomes.

Patients and methods

In this study, all patients had initial resuscitation. Detailed history was taken. Physical examination included a thorough evaluation for evidence of trauma sequelae and Glasgow Coma Scale (GCS) score with associated neurological deficits. Surgery was indicated when there was large volume of hematoma (> 10 ml, the volume of hematoma was measured on axial CT slices which were obtained at 15degree angle to the orbitomeatal line with a section thickness of 5 mm for the posterior fossa. Supratentorial sections were obtained in neutral position with 10 mm section thickness) or when there is low GCS or deterioration in GCS. Operation immediately was carried out when there were signs of increased volume of hematoma or herniation. All patients underwent a final evaluation using GCS score. The location of PFEDH was classified to 2 groups infratentorial and mixed (infratentorial and supratentorial). Glasgow Coma Scale was used to evaluate the level of consciousness. According to GCS patients were grouped into 3 groups; mild head injuries (GCS 13-15), moderate head injuries (GCS 8-12) and severe head injuries (GCS3-7). Outcome of patients was assessed at discharge, after 1 month and after 3 months of follow up clinically and radiologically.

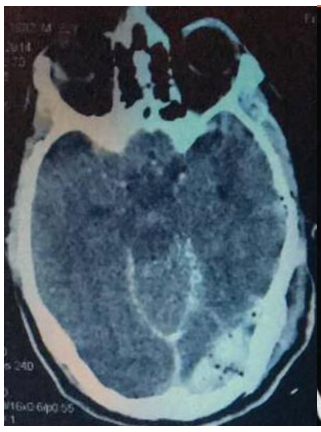

Figure (1): Posterior fossa extradural hematoma with occipital fracture.

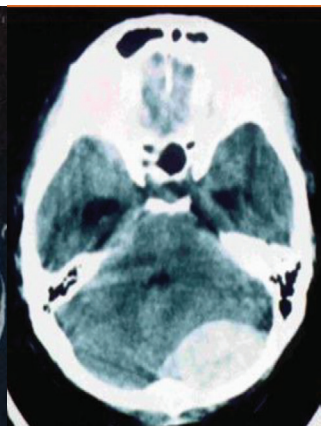

Figure (2): Posterior fossa extraduralhematoma.

Results

Age, neurological and radiological findings, rate of skull fracture, hematoma volume, pre-operative GCS and site of hematoma were analyzed in Tables (1), (2) & (3). Thirty five patients with posterior fossa extradural hematoma had been included in this study. Sixteen patients were treated surgically in which two of them were operated after the deterioration of GCS and nineteen were treated conservatively. Table (1) show that more than one quarter (31.4%) of the patients is aged less than six years old, and 34.3% aged 18 years old or more. Fall from height was the cause of trauma in 57.1% of the patients, and the other main cause was the road traffic accident (42.9%). The GCS of the majority (62.9%) of patients was 13-15.

Table (1): Patient characteristics.

Characteristics	No.	%
Age (years)		
<6	11	31.4
6-11	6	17.1
12-17	6	17.1
≥ 18	12	34.3
Cause of trauma		
Fall from height	20	57.1
Road traffic accident	15	42.9
Clinical features		
GCS 13-15	22	62.9
GCS 8-12	8	22.9
GCS<8	5	13.9
Total	35	100.0

Table (2) showed that more than half (54.3%) of the patients had been treated conservatively, and surgical intervention was done for 45.7% of the patients. Around two thirds (65.7%) of the patients were alive with no deficit, and only 5.7% died.

Table (2): Type of treatment and outcomes.

Type of treatment & outcomes	No.	%
Type of treatment		
Conservative	19	54.3
Surgery	16	45.7
Outcomes and complications		
-Alive with no deficit	23	65.7
-Alive with 3 months neurological deficit	7	20.0
-Alive with 6 months neurological deficit	2	5.7
-Alive with > 6 months neurological deficit	1	2.9
-Death	2	5.7
Total	35	100.0

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Table (3) Shows that the site of hematoma was in the infratentorial region in 54.3% of the patients, and mixed (infratentorial and supratentorial) in 45.7% of the cases. The volume of the hematoma was less than 10 ml in 51.4% of the patients, and more than 10 ml in 48.6% of the patients. More than one third (40%) of the patients with PFEDH had no other radiological findings, and 22.9% had intra-cranial hemorrhage.

Table (3): Characteristics of the hematoma and the asso-

Characteristics of the hematoma	No.	%
Site of hematoma		
Infratentorial	19	54.3
Mixed	16	45.7
Volume of hematoma		
< 10 ml	18	51.4
>10 ml (upper value in our research was 13 ml)	17	48.6
Associated radiological findings		
Hydrocephalus	1	2.9
Intra-cranial hemorrhage	8	22.9
Sub-dural hematoma	2	5.7
Occipital fracture	5	14.3
Others	5	14.3
No any	14	40.0
Total	35	100.(

Table (4) showed that there was no statistical significance between age of patient and outcome (p-value = 0.092). No significant association was detected between the outcomes and type of trauma (p-value = 0.537), but there was significant association between site of hematoma and the outcomes (p-value = 0.022). There was a positive association between the outcome and GCS (p-value = 0.01). There was a significant association between outcome and the volume of hematoma (p-value = 0.003). No significant association was detected between the radiological findings and outcomes (p-value = 0.281). Significantly high proportion of alive patients was detected when the treatment was conservative (89.5%) compared with 37.5% when the treatment was surgical (p-value < 0.001).

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Table (4): Patients' outcomes by the studied variables.

Variables	Outcomes							
Age (years)	Alive (no deficit)		Alive with deficit		Death		Total	
<6	10	99.9%	1	9.1%	0	0.0%	11	100%
6-11	4	66.7%	1	16.7%	1	16.7%	6	100%
12-17	3	50.0%	2	33.3%	1	16.7%	6	100%
≥ 18	6	50.0%	6	50.0%	0	0.0	12	100%
Fall from height	12	60.0%	6	30.0%	2	10.0%	20	100%
Road traffic accident	11	73.3%	4	26.7%	0	0.0%	15	100%
Site of hematoma								
Infratentorial	15	78.9%	2	10.5%	2	10.5%	19	100%
Mixed	8	50.0%	8	50.0%	0	0.0%	16	100%
Clinical features								
GCS 13-15	20	99.9%	2	9.1%	0	0.0%	22	100%
GCS 8-12	2	25.0%	5	62.5%	1	12.5%	8	100%
GCS<8	1	20.0%	3	60.0%	1	20.0%	5	100%
Volume of hematoma								
< 10 ml	16	88.9%	1	5.6%	1	5.6%	18	100%
>10 ml	7	41.2%	9	52.9%	1	5.9%	17	100%
Hydrocephalus	0	0.0%	1	100%	0	0.0%	1	100%
Intra-cranial hemorrhage	5	62.5%	2	25.0%	1	12.5%	8	100%
Sub-dural hematoma	0	0.0%	2	100%	0	0.0%	2	100%
Occipital fracture	3	60.0%	2	40.0%	0	0.0%	5	100%
Others	4	80.0%	1	20.0%	0	0.0%	5	100%
No any	11	78.6%	2	14.3%	1	7.1%	14	100%
Type of treatment								
Conservative	17	89.5%	2	10.5%	0	0.0%	19	100%
Surgery	6	37.5%	8	50.0%	2	12.5%	16	100%

Table (5) shows a positive association between volume of hematoma and type of treatment (p-value< 0.001). There was a significant association between GCS and type of treatment (p-value < 0.001). No significant association was detected between associated radiological findings and the outcome (p-value = 0.942).

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Table (5): Management of patients by the size of hematoma, clinical features and other associated radiological findings.

Variable	Conservative management		Surgical management		Total	
Volume of hematoma						
< 10 ml	16	88.9%	2	11.1%	18	100%
>10 ml	3	17.6%	14	82.4	17	100%
Clinical features						
GCS 13-15	18	81.8%	4	18.18%	22	100%
GCS 8-12	0	0.0%	8	100%	8	100%
GCS<8	1	20%	4	80%	5	100%
Associated radiological findings						
Hydrocephalus	0	0.0%	1	100%	1	100%
Intra-cranial hemorrhage	5	62.5%	3	37.5%	8	100%
Sub-dural hematoma	1	50.0%	1	50.0%	2	100%
Occipital fracture	3	60.0%	2	40.0%	5	100%
Others	2	40.0%	3	60.0%	5	100%
No any	8	57.1%	6	42.9%	14	100%

Discussion

Traumatic posterior fossa EH is a rare lesion constituting < 10% of all EDHs [9] and 1.8 % in this study (35 cases of PFEDH out of 1900 cases of EDH). The patient can be conscious and their state may deteriorate unexpectedly. Cranial CT examination has earned a place as an effective imaging method by having a short acquisition time, allowing demonstration of occipital fractures that are associated with great majority of PFEDHs, defining the size and mass effects of the hematoma and providing visualization of possible supratentorial conditions that are reported to be associated with half of the cases in the literature[9] .The patients, in whom CT scan was already carried out early, will need a repeat CT scan after 6h if there is a clinical suspicion3. The majority of the PFEDH cases are traumatic. The various scenarios in the order of incidence are falls, road traffic accidents, and sporting activities [9]. Rarely PFEDH is seen in association with other bleeding diathesis, systemic illness, after cardiac surgery, and malignancies such as angiosarcoma[10]. In this study; fall from height was the primary cause, while road traffic accident was the second cause. Occipital bone fractures or diastasis of lambdoid sutures is seen in 40-86%; swelling of soft tissue in occipital and retromastoid region is seen in almost all the patients[11]. In this series, linear fracture of occipital bone above the hematoma was presented in 14.3%. The PFEDH may be associated with coexisting supratentorial injuries such as hematoma or contusion. In the literature, supratentorial pathologies associated with PFEDH have been reported in as high as 50%-87.5% [12]. In this series the incidence of additional intracranial lesions was 60%. Jang et al., [13] published the review of 34 patients with 96 months follow-up. Nineteen patients underwent surgical evacuation with 73.7% having a good recovery and 5.3% mortality in this series such lethal outcome was recorded in two patients (5.7%). Early diagnosis is the basis of good recovery, Neubauer et al.[14] observed that patients showing an acute course were significantly older than those with a subacute course. In supratentorial bilateral haematomas, Franck et al[15] pointed out that separate haematomas are produced when the dura mater is detached at two locations by a single direct force and in most cases bleeding originates from venous oozing. In a series of 89 PFEDH cases, Lui et al. found 30 " pure" EHPCFs and 59 " mixed" cases of hematoma spread above the transverse sinus 16. In this series there were 19 patients with pure infratentorial, and [16] patients with mixed type. The traditional treatment of PFEDH is surgical evacuation, although an increasing number of patients are currently conservatively treated. Sencer et al[3] reported 40 cases of patients with good outcomes. There were no mortalities among the surgically treated patients. In addition, enlarging haematomas and neurological deterioration are indications for surgical management[3]. In this series, sixteen patients underwent surgery and 37.5 % had good recovery while 50 % had some deficits for first few months. Two of these patients underwent surgery after showing clinical deterioration and both died (12.5%) because of rapid decrease in GCS however the patients at beginning were conscious and their first CT didn't show any significant PFEDH. In patients who were treated conservatively the outcome was generally good (89.5% had good recovery

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while 10.5% had some deficits). Conservative management should be tried under close clinical and radiological supervision only in centers with intensive-care facilities, pediatric intenseivists and round-the clock access to CT imaging[3,17]. A negative CT scan does not rule out the possibility of PFEDH nor does the absence of occipital fracture. Pozzati and colleagues detected PFEDH on the second CT scan after neurologic deterioration in two patients whose initial CT scans were negative[18]. However; in this study such condition was present in one patient only. In general, poor GCS at admission, older age and associated subdural and intracranial hematoma (the bleeding profile was not taken in our study because they were not recommended on emergency scenarios due to limitation of time) are associated with a poorer outcome[12]. Regarding the coincidental findings only the patient with associated subdural hematoma needed second operation after evacuation of PFEDH because it increased in size and had more mass effect. In this series one patient had hydrocephalus which resolved immediately after surgery, while Sencer et al.[3] Observed hydrocephalus in six cases, and Prasad et al.[9] Did not observe any cases of hydrocephalus. In these cases, hydrocephalus was resolved immediately after surgery. Other findings were resolved with time and the type of treatment was chosen according to individual scenario. The management of PFEDH remains controversial. The recommended treatment is surgery immediately after diagnosis. However, Kawakami et al reported two PFEDH patients who were neurologically intact with a mass effect seen on CT[19]. They treated the patients conservatively and obtained good results. In this study there were three cases with such scenarios.

Conclusions

Posterior fossa extradural hematomas are rare. Glasgow Coma Scale on admission as well as volume of hematoma were the main indicators of surgery and outcome. Site of hematoma was also significant. Both cranial CT- scan and standard neuro-observation services are essential and mandatory in management of PFEDH. Early diagnosis and emergent evacuation lead to good outcome.

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