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Traumatic Bilateral Supratentorial and Infratentorial Extradural Hemorrhage: Tetrad of Disaster Our Experience in A Tertiary Care Trauma Centre, In Purvanchal, India

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Abstract

Extradural hematoma (EDH) is a complication of brain injury, which represents about 1% to 4% of traumatic brain injury. Posterior fossa extradural hematomas are an uncommon type of traumatic extradural hematoma (EDH). They are accounted for 1.2 to 15% of all EDHs Early Surgery with posterior fossa decompression and evacuation of hematoma and proper postoperative care is the key .In Our study of 14342 traumatic head injury patients we found out the incidence of Posterior Fossa Edh to be around 9.21% and out of which incidence of Bilateral Supra and infratentorial EDH to be around 0.13% of all traumatic brain injury Patients and 1.41% of all Posterior Fossa Edh cases .The Most Common Age Group of Presenation was 21-30 ,with Male: Female Ratio 8.5:1.most common mlode of injury being RTA and 47.36% Patients were under influence of alcohol ,Occipital bone fracture with underlying Diploic Vein Injury (52.64%) the most common source of EDH, while 21.05% cases had only Sinus injury and 26.31% cases had both the injuries. All patients underwent surgery and 1 patient had expired, he had underlying brainstem contusion with Mortality Rate being 5.26%

Keywords: Posterior fossa extradural hematoma, Posterior fossa decompression, Occipital bone fracture, Diploic Vein, Tetrad of Disaster

Introduction

Extradural hematoma (EDH) is a complication of brain injury, which represents about 1% to 4% of traumatic brain injury [1,2]. Posterior fossa extradural hematomas are an uncommon type

of traumatic extradural hematoma (EDH). They are accounted for 1.2 to 15% of all EDHs [3] However, the EDHs represent the most common traumatic lesion of the posterior fossa [4-6]. The simultaneous Presence of Bilateral Supratentorial and infratentorial EDH is very rare and very few articles have been published till date in literature. The causes are mainly attributed to fracture bleed or tear of transverse or sigmoid sinuses[7,8]

The posterior fossa is a very closed cavity in our human skull with vital structures directly underneath, If a small amount of hematoma is present, it may be catastrophic. Sudden expansion of hematoma may cause brain stem compression, tonsillar herniation, or obstructive proximal hydrocephalus. In most cases there is presence of Underlying Cerebellar Contusion and in some case even Brain Stem Contusion. Due to Supratentorial extension on both sides it is almost fatal and making it a tetrad of disaster. Early diagnosis is made by Urgent computed tomography (CT) head scans[7-9]

Early Surgery with posterior fossa decompression and evacuation of hematoma and proper postoperative care is the key step to management of these cases. Good recovery is seen following a safe intraoperative approach, adequate hematoma evacuation and proper postoperative care.

In our study we present a unique and safe approach to posterior fossa decompression which can minimize risk of injury to venous sinus and overall morbidity and mortality.

Aims and Objectives

- To find out the demographic presentation of traumatic bilateral posterior fossa supra and infratentorial EDH in our region of India.
- To assess the surgical procedure performed and it's outcome with relation to morbidity and mortality.

Materials and Methods

This is an observational study conducted in the Institute of Medical Sciences, Banaras Hindu University, Banaras. A total of 14342 Head injury Patients were treated in Trauma Centre, BHU for a period of 2 years from 1st January 2022 to 31st December 2023.All Cases underwent Urgent NCCT Head and other relevant investigations .Out of which there were total 19 cases of Posterior Fossa Bilateral Supra and Infratentorial EDH cases in our study. All Cases had been surgically treated.

In Prone Position on Horse Shoe head was placed in slight flexion and midline suboccipital craniectomy was done after localizing anatomically the transverse sinus, sigmoid sinus and Confluence of sinus. Midline Incision placed from Occiput to C2 and soft tissue dissection done. Internal Occipital protuberance palpated and two Burr holes made above transverse Sinus on both sinus for Supratentorial EDH and two burr holes made below transverse sinus for Infratentorial EDH and both the burr holes were enlarged and interconnected with Nibblers and Kerrison Punch. Adequate decompressive craniectomy and hematoma evacuation was achieved without damaging the sinuses and hemostasis was secured, followed by 14 French closed suction drain placed in the cavity and anatomical closure was done.

Postoperative scan was done on Day 1 and drain removed within 1-3 days depending upon drain output. Proper postoperative care and follow up was done until discharge or demise of the patient. Informed and written

consent was taken from Patient and patient's relatives and all the data including demographic profile, socioeconomic status was kept to our records for follow up.

Results

Table 1:

Age (Years)	Frequency
<20	7
21-30	8
31-40	2
41-50	1
>50	1

Table 1 shows most common age group of presentation was 21-30 years age with mean age of presentation being 25.6 years.

Table 2:

	Number	Percentage
Male	17	89.4%
Female	2	11.6%

Table 2 shows that in our study males were more affected than females with Male: Female Ratio 8.5:1

Table 3:

Mode of Injury	Number	Percentage
RTA	12	63.1%
Slip and fall	2	10.6%
Fall from height	5	26.3%

Table 3 shows that the Most Common Mode of Injury remained RTA with 63.1% followed by fall from height and slip and fall.

Out of all 12 cases of RTA's 83.33% cases involved two wheeler colliding against 4 wheelers or fall from two wheelers, out of which 66,67% patients were not wearing helmet while riding two wheelers.

Table 4:

Days	Number	Percentage
<10	1	5.26%
10-20	16	84.21%
>20	2	10.5%

Table 4 shows the most common period of hospital stay was between 10-20 days with mean duration being12.84 days.

Table 5:

Days	Number
<5	1
5-10	2
>10	1

Table 5 shows the mean duration of ICU stay was 8 days with 4 (21.05%) patients requiring ICU stay out of total 19 patients

Table 6:

	Number	Percentage
Influence of Alcohol during incident	9	47.36%

Table 6 shows that 47.36% Patients were under influence of Alcohol during time of Incidence

Table 7:

GCS at presentation	Number	Percentage
<8	4	21.05%
9-12	9	47.36%
13-15	6	31.57%

Table 7 shows that in our study total 4 cases (21.05%) patients presented with GCS less than 8, 9 patients (47.36%) presented with GCS less 12-15 and 6 Patients (31.57%) presented with GCS more than 13-15.

Table 8:

Source Of EDH	Number	Percentage
Occipital Bone Fracture	10	52.64%

with Diploic Vein Injury		
Sinus Injury only	4	21.05%
Mixed	5	26.31%

Table 8 shows that in our study, we found out that Occipital bone fracture with underlying Diploic Vein Injury (52.64%) was the most common source of EDH, while 21.05% cases had only Sinus injury and 26.31% cases had both the injuries.

Table 9:

Complications	Number	Percentage
Surgical Site Infection	3	15.78%
RTI	1	5.26%

Table 9 shows that in our study 3 Patients (15.78%) developed Surgical Site Infection and 1 patient who had undergone Tracheostomy developed Respiratory Tract Infection

Table 10:

GCS at discharge	Number
<12	-
12-14	2
15	16

Table 10 shows that in our study, total 2 patients (10.52%) were discharged with GCS less than 15 and 16 patients (84.21%) were discharged with GCS 15.

Table 11:

Associated Brain Injury	Number	Percentage
Underlying Cerebellar Contusion	3	15.78%
Brain Stem Contusion	1	5.26%

Table 11 shows that in our study, 3 Patients (15.78%) had underlying Cerebellar Contusion and 1 Patient (5.26%) had Brainstem Contusion.

Table 12:

	Number of Patients	Percentage
Mortality	1	5.2%

Table 12 shows that in our study,1 patient had expired with Mortality Rate being 5.26%

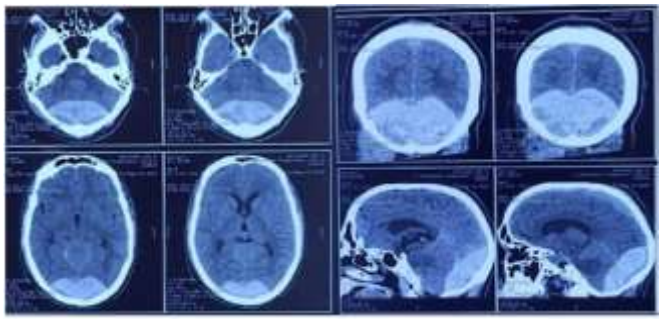

Figure 1: NCCT head showing bilateral supra and infra tentorial EDH

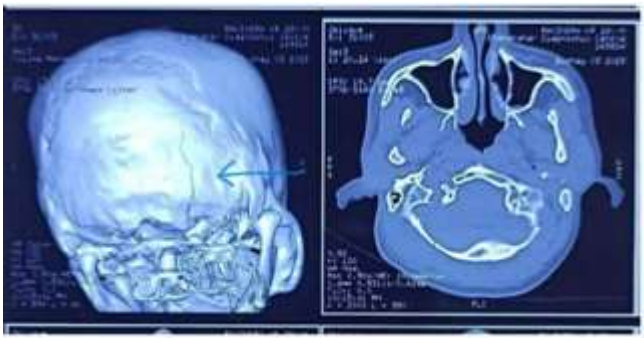

Figure 2: NCCT Head with arrow mark showing fracture line over occipital bone

Figure 3: Intraop Finding with arrow mark showing fracture line over occipital bone

Figure 4: Intraop Finding showing Posterior fossa craniectomy

Figure 5: Introp finding showing posterior fossa EDH evacuation with drain in situ.

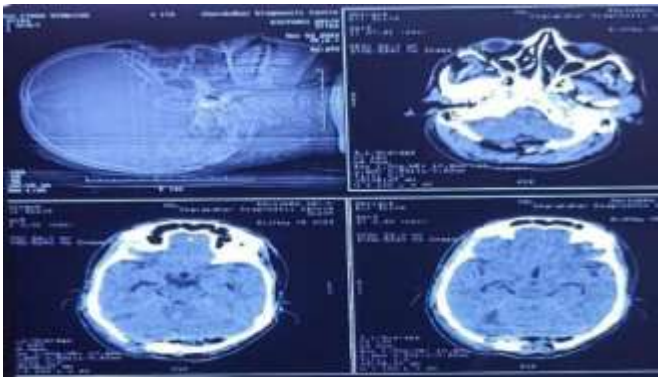

Figure 6: Showing Post Op NCCT Head with adequate decompression and hematoma evacuation

Discussion

In Our study of 14342 traumatic head injury patients we found out the incidence of Posterior Fossa Edh to be around 9.21% and out of which incidence of Bilateral Supra and infratentorial EDH to be around 0.13% of all traumatic brain injury Patients and 1.41% of all Posterior Fossa Edh cases which makes it extremely rare entity. Roka YB, Kumar P et al found the incidence of Posterior Fossa Edh to be around 10% [10]

The Most Common Age Group of Presenation was 21-30 years age with mean age of presenation being 25.6 years. In Our Study Males were more affected than females with Male: Female Ratio 8.5:1 . There were 7 (87.5%) male and 1 (12.5%) female patients, aged between 16 and 56 years (mean age 34 ± 14.02 years) in the study contucted by Davide Nasi, Corrado Iaccarino et al [11]

The Most Common Mode of Injury remained RTA with 63.1% followed by Fall from height and slip and fall.

Out of all 12 cases of RTA's 83.33% cases involved two wheeler colliding against 4 wheelers or fall from two wheelers, out of which 66,67% patients were not wearing helmet while riding two wheelers ,Similar results were found by Roka YB et al in their study.[10]

The most common period of hospital stay was between 10-20 days with mean duration being12.84 days. 47.36% Patients were under influence of Alcohol during time of Incident.

In our Study, we found out that Occipital bone fracture with underlying Diploic Vein Injury (52.64%) was the most common source of EDH, while 21.05% cases had only Sinus injury and 26.31% cases had both the injuries. Jang et al.[12] identified the source of bleeding in all 12 patients treated with surgery. In 6 cases, the bleeding originated from oozing of the small venous meningeal vessels or fractured bone and in rest 6 cases bleeding was secondary from sigmoid sinus (5 patients) or transverse sinus (1 patient) injury. Xiaoyu et al.[13] reported the transverse sinus detachment as source of bleeding in 3 cases, bone fracture with diploe bleeding in 18 cases, and venous meningeal blood vessel leakage in the last 4 patients out of 25 cases. Nasi et al. described the sources of bleeding in SIEDH as follows: venous bleeding from bone fractures with diploic bleeding

accounts for 50%, injury to the transverse/ sigmoid sinus for 22%, oozing from meningeal venous vessels for 8%, and detachment of the transverse sinus without wall injury for 6%, with the remaining cases being of unknown cause.[14]

In our Study total 4 cases (21.05%) patients presented with GCS less than 8, 9 patients (47.36%) presented with GCS less 12and 6 Patients (31.57%) presented with GCS more than 13-15.

In Our Study, 3 Patients (15.78%) had underlying Cerebellar Contusion and 1 Patient (5.26%) had Brainstem Contusion.

In Our Study, 1 patient had expired, he had underlying brainstem contusion with Mortality Rate being 5.26%

Similar results with respect to GCS at presenation, and mortality has been presented in the table below.

Table 13:

Study	Pozzati et al,[15]	Edson et al[16]	Roka YB et al[10]	Our Study
Total Patients	32	43	43	14342
Pure PFEDH	16	21	27	19
GCS 13-15	11	31	29	6
GCS 9-12	11	7	12	9
GCS less than 8	10	5	2	4
Mortality	15%	20%	7%	5.26%

Conclusion

Posterior Fossa EDH in itself is a very rare entity among traumatic brain injury patients, to add to it Bilateral Supra and infratentorial EDH in the same patient is even rarer. In our study of 2 years we could manage to find only 19 cases out of total 14342 patients of head injury in our centre which caters to a large population in India. Occipital fracture remains the most common cause of EDH and direct impact on the bone is a one of the most common mechanism of trauma which we have found in our study as such it is better for all to wear helmets while riding two wheeler vehicles. Early diagnosis with Prompt CT head is the cornerstone to management after intial stabiliazation .Since the Posterior fossa is a closed compartment so even a small amount of collected blood can prove detrimental to the patient's life and to this since all four compartments are involved due to pressure in the closed chamber there may be sudden death due to brainstem compression and hydrocephalus. Vigilant monitoring of ICP and early Surgical intervention remain the mainstay of treatment. In our study we have described a relatively safe procedure using minimum newer machinery techniques that can avoid dangerous dural sinus injury during surgery and reduce overall morbidity and mortality of patients. The Take home message from our study remains simple and clear to all is to wear helmets while riding two wheeler vehicles and safe driving while using four wheelers, avoid being under influence of alcohol and other intoxicants while driving, comply to road safety rules to avoid any kind of dangerous traumatic brain injury.

Limitation Of our study remains that since traumatic bilateral supra and infra tentorial edh in itself very rare ,there isn't much study alone for this entity published in literature hence we could compare our study with published literature of Posterior fossa EDH.

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