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RESEARCH ARTICLE

CLINICAL STUDY OF POSTERIOR FOSSA HEAD INJURIES

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FND- Focal Neurological Deficit.

ABSTRACT

Posterior fossa head injury is relatively less common and accounts for less than 3% of total head injuries. Among traumatic posterior fossa head injuries Extra Dural Hematoma is the most common, accounting for 10% of all Extra Dural Hematomas followed by sub dural haemorrhages (1% of head injuries) and sub-arachnoid haemorrhage with cerebellar contusion. In the days before the advent of CT scan, Posterior Fossa head injuries often escaped diagnosis in alive patients. It was very difficult to diagnose based on clinical examination alone. It is unfortunate as it is an easily preventable cause of mortality. The history of posterior fossa operations, as compared with the entire history of neurosurgical procedures, is relatively brief. This is not surprising, considering the vulnerability of the vital neural structures found in the posterior fossa. Surgical manipulation of the cerebellum, brainstem, and cranial nerves resulted in forbiddingly high mortality prior to the sophisticated techniques and operative environment available in the modern neurosurgical era. Even with the diminished risk associated with contemporary technological advancements, surgical procedures involving the posterior fossa continue to carry higher morbidity than elsewhere in the central nervous system.

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INTRODUCTION

Posterior fossa head injury is relatively less common and accounts for less than 3% of total head injuries. Among traumatic posterior fossa head injuries Extra Dural Hematoma is the most common, accounting for 10% of all Extra Dural Hematomas followed by sub dural haemorrhages (1% of head injuries) and sub-arachnoid haemorrhage with cerebellar contusion. In the days before the advent of CT scan, Posterior Fossa head injuries often escaped diagnosis in alive patients. It was very difficult to diagnose based on clinical examination alone. It is unfortunate as it is an easily preventable cause of mortality. The history of posterior fossa operations, as compared with the entire history of neurosurgical procedures, is relatively brief. This is not surprising, considering the vulnerability of the vital neural structures found in the posterior fossa. Surgical manipulation of the cerebellum, brainstem, and cranial nerves resulted in forbiddingly high mortality prior to the sophisticated techniques and operative environment available in the modern neurosurgical era. Even with the diminished risk associated with contemporary technological advancements, surgical procedures involving the posterior fossa continue to carry higher morbidity than elsewhere in the central nervous system.

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The first successful surgeries in the posterior fossa occurred at the end of the 19th century and involved drainage of cerebellar abscesses through trephine openings behind the mastoid process (Green, 1967; Macewen, 1853). In 1893 Charles McBurney, an American surgeon best known for the eponymic landmark used in diagnosing appendicitis, reported the first successful removal of a cerebellar tumor (Green, 1967; Starr, 1893). Surgical treatment of lesions in the posterior fossa has expanded since that time to include a wide spectrum of pathologies. Since years, these posterior fossa head injuries had a very high mortality and morbidity rates. With Improvement in the diagnostic tools like CT scan, updated management protocols and treatment modalities including surgery for necessary cases, there is a substantial reduction in morbidity and mortality and improvement in outcome with reduction in post-operative complication rates. This study has been undertaken to ascertain these goals in the management of posterior fossa head injuries.

Aims and objectives

To study a comprehensive analysis of Traumatic Posterior fossa head injuries with special reference to management (both surgical and conservative).

PATIENTS AND METHODS

This study was conducted on all the patients admitted with the diagnosis of posterior fossa head injuries between January 2016 and December 2017 at the King George Hospital, Visakhapatnam. As per above criteria a total number of 88 patients were enrolled in this study. All the patients admitted were clearly evaluated for their post resuscitation GCS, age, sex, presence or absence of focal neurological deficit (FND), presence or absence of other associated injuries. A complete neurological examination was conducted on all patients wherever possible and could not be examined in those cases who are completely unconscious and those need to be rushed to operation theatre. All the patients were underwent X ray of skull (AP and Lateral view) and CT scan of brain with 5 mm slide thickness slices with bone windows. All the patients had X ray cervical spine and the necessary investigations were done based on other associated injuries. All the necessary investigations were repeated whenever in need and whenever clinical scenario demands including CT Brain based on the clinical progress and condition of the patients. Those patients who were stable at initial assessment and got deteriorated subsequently were underwent CT scan of brain to evaluate for evolving pathology if any. Depending upon CT scan images location of the clot, volume of the clot (in ml), presence or absence of mass effect on 4th ventricle with or without dilatation of ventricles, occipital bone fractures and other intracranial injuries were documented in the proforma.

After evaluation, the patients in the study (all types of injuries) were divided into three sections namely,

Section I - Immediate surgical management initially
Section II - Medical / Conservative management
Section III - Initially planned for conservative/medical management but subsequently needs surgical intervention.

Section I contains 60 patients: (30 cases of extra dural hematoma, 2 cases of sub dural hematoma, 15 cases of sub dural hematoma with cerebellar contusion, 5 cases of isolated cerebellar contusion, 8 cases of cerebellar contusion with hydrocephalus)

Section II contains 21 patients: (5 cases of extra dural hematoma, 2 cases of sub dural hematoma, 3 cases of sub dural hematoma with cerebellar contusion, 3 cases of isolated cerebellar contusion, 8 cases of brain stem contusion)

Section III contains 7 patients: (5 cases of extra dural hematoma, 2 cases of sub dural hematoma with cerebellar contusion)

Those patients who need immediate surgery (Section I) were assessed for fitness of anaesthesia based on hemodynamic status and routine blood parameters. They were subjected to surgery as soon as possible. A standard sub occipital craniectomy and evacuation of clot was performed. All the Intra-operative notes for all the cases was entered in the proforma. All the patients in Section II were planned for conservative management and periodic assessment of GLASGOW COMA SCALE (GCS), development of fresh Focal Neurological Deficit, Blood Pressure recording,

Table 1. Incidence of total posterior fossa injuries

Extra Dural Hematoma	Isolated Sub Dural Hematoma	Sub Dural Hematoma With Cerebellar Contusion	Isolated Cerebellar Contusion	Isolated Brain Stem Contusion	Cerebellar Contusion With Hydrocephalus	Total
30	4	20	8	8	8	88

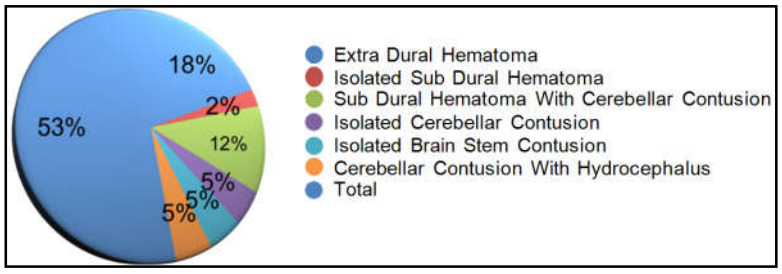
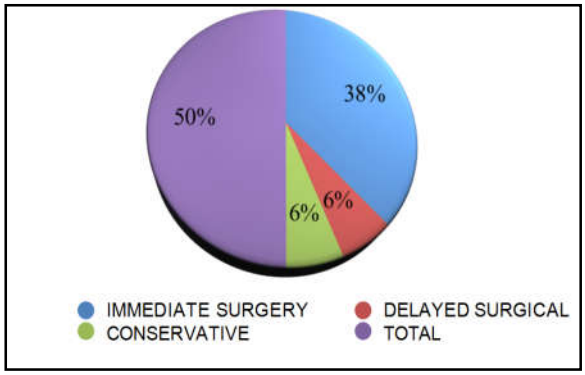


Table 2. Surgical vs Conservative therapy in extra dural hematomas

Immediate surgery	Delayed surgical	Conservative	Total
30	5	5	40



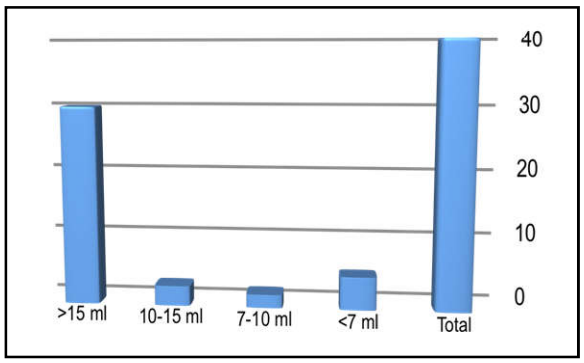
bradycardia and respiratory abnormality were done. Routine repeat CT scan of brain was taken whenever a new clinical sign of deterioration developed. (ex. low GLASGOW COMA SCALE, bradycardia, Focal Neurological Deficit or bradypnoea, pupillary abnormalities).

OBSERVATIONS AND RESULTS

All those brain stem injury cases with poor glasgow coma scale score on admission were found dead in this study and all of them were found to have abnormal respiratory pattern with bradypnoea and abnormal pupillary response.

Table 3. Volume of hematoma in posterior fossa extra dural hematomas

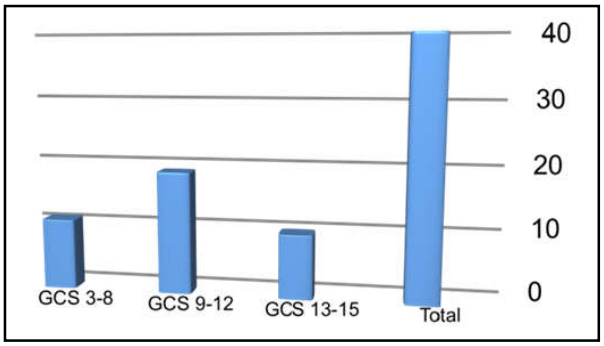
>15 ml	10-15 ml	7-10 ml	<7 ml	Total
30	3	2	5	40



Most of the extra dural hematomas were found to have a clot volume of more than 15 ml and invariably all of them were found to have a Glasgow coma scale score of less than 12.

Table 4. Relation of posterior fossa extra dural hematomas with glasgow coma scale

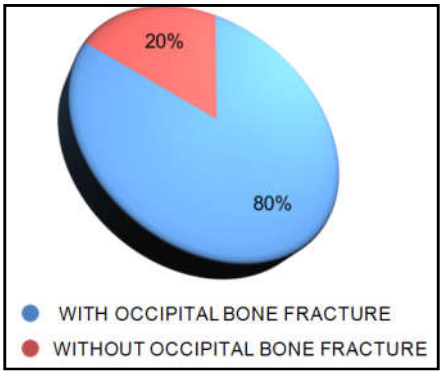
GCS 3-8	GCS 9-12	GCS 13-15	Total
11	19	10	40



All the cases with a Glasgow coma scale score of less than 12 were operated immediately by sub occipital craniectomy and evacuation of hematoma.

Table 6. Relation of occipital bone fractures with cervical spine injury

With Occipital Bone Fracture	Without Occipital Bone Fracture
32	8



Atlanto-axial instability	2
C2/C3 Traumatic subluxation with cord contusion	2
Isolated cord contusion (extending from Cranio-vertebral junction to C4 level)	1
Isolated C2 and C3 spinal process fractures	3

Table 7. Outcome of extra dural hematoma in releation to Glasgow coma scale

Glasgow coma scale	3-8	9-12	13-15	Total
Survived	6	19	10	35
Dead	5	0	0	5

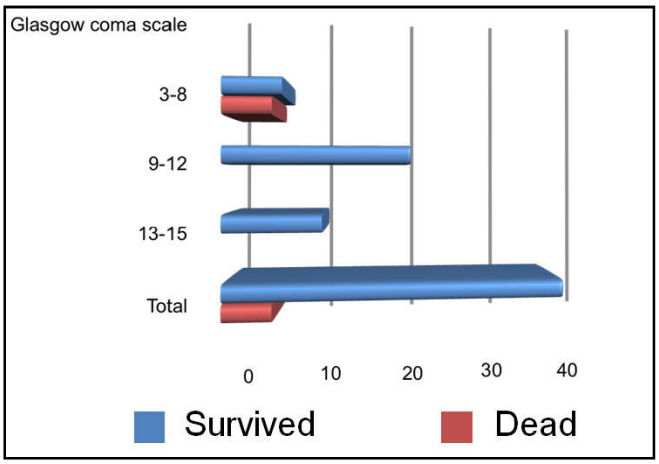


Table 8. Outcome of extra dural hematoma in relation to clot volume

	>15 ml	10-15 ml	7-10 ml	<7 ml	Total
Survived	25	3	2	5	35
Dead	4	1	0	0	5

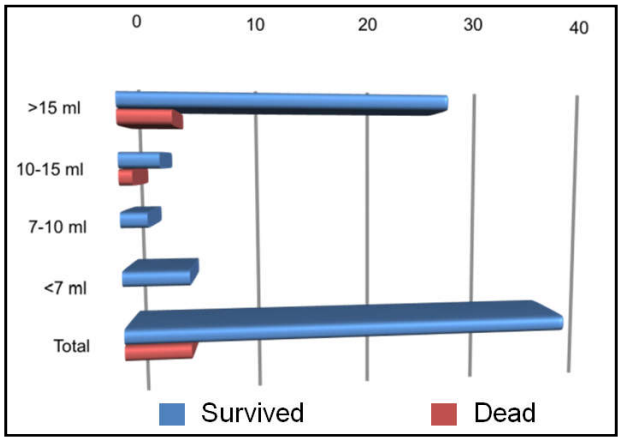


Table 9. Relation of Glasgow coma scale with posterior fossa sub dural hematoma

Glasgow coma scale score	3-8	9-12	13-15	Total
Isolated sub dural hematoma	2	0	0	2
Sub dural hematoma with Cerebellar contusion	16	2	0	18

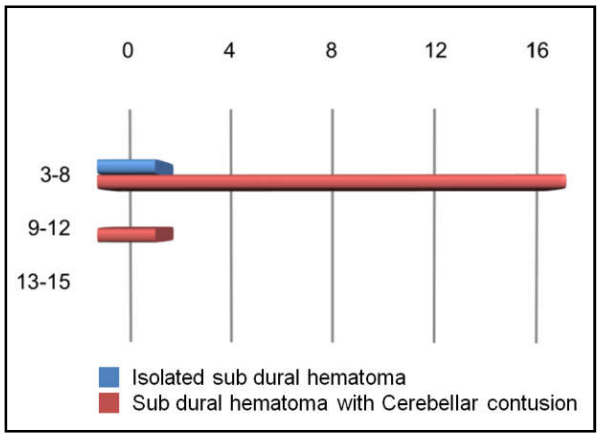


Table 10. Relation of brain stem contusions with glasgow coma scale score

Glasgow coma scale	3-8	9-12	13-15	Total
Brain stem contusion	6	2	0	8

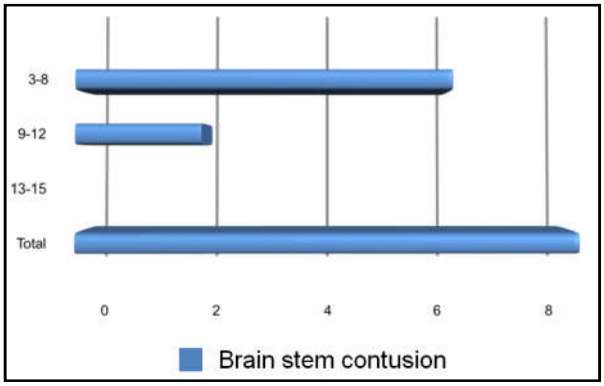
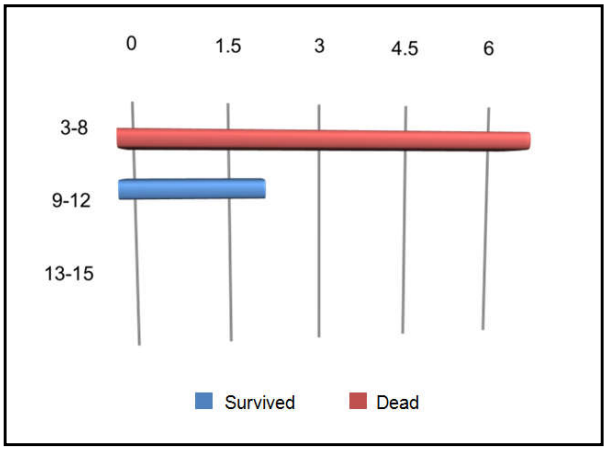


Table 11. Mortality in brain stem contusions with relation to glasgow coma scale score

Glasgow coma scale score	3-8	9-12	13-15	Total
Survived	0	2	0	2
Dead	6	0	0	6



All those brain stem injury cases with poor glasgow coma scale score on admission were found dead in this study and all of them were found to have abnormal respiratory pattern with bradypnoea and abnormal pupillary response.

DISCUSSION

Traumatic brain injury (TBI) is a critical public health and socioeconomic problem throughout the world. It is the leading cause of mortality and disability among young individuals in high-income countries and can have profound effects across the lifespan. Worldwide, the incidence of TBI is rising sharply, mainly because of increasing use of motor vehicles in low- and middle-income countries. In the present study, there were 74 males and 14 females i.e 84.09% males and 15.9% females. The incidence of posterior fossa head injuries was more in male compared to female population which is in accordance with (Takeuchi *et al.*, 2012). This may be due to

- More exposure of the male population to injuries than females.
- Females are seeking less of medical advice.

The incidence of posterior fossa head injuries was more common among the economically active segment of the society that is around the age group between 25-55 years of age (90.9%). The youngest case presented was a 8 yrs male child diagnosed with Posterior fossa extra dural hematoma. The youngest case presented was a 31 yrs male patient diagnosed with isolated cerebellar contusion. This may be due to greater time spent on travelling and subsequent increased chance of road traffic accidents in males. This was in contradiction with Roozenbeek *et al.* (2013) which reported increased incidence in children's and elderly patients. Out of 594 cases of traumatic brain injury 88 cases suffered posterior fossa injuries. Out of 88 cases of posterior fossa injuries 40 cases were diagnosed as Posterior fossa extra dural hematomas, 4 cases were diagnosed as isolated posterior fossa sub dural hematomas, 20 cases were diagnosed as posterior fossa subdural hematomas with cerebellar contusion, 8 cases were diagnosed as isolated cerebellar contusions, 8 cases were diagnosed as cerebellar contusions with hydrocephalus and 8 cases were diagnosed as isolated brain stem contusions. Which was in accordance with Takeuchi *et al.* (2012) which reported 18 cases of Posterior fossa extra dural hematomas, 10 cases of posterior fossa sub dural hematomas and 17 cases of cerebellar contusions. The final diagnosis was made using non contrast CT scan of brain.

In our study, 67 cases (76.13 %) of head injuries were due to road traffic accidents, 14 cases (15.9 %) were due to falls and 7 cases (7.9 %) were due to assault with heavy objects over head. Hyder *et al.* (2007) reported history of road traffic accidents in 62% of all cases which is in accordance with our study. The study was reported based on worldwide context and difference in etiological factors may be due to cultural differences. In our study, most common symptom at presentation was loss of consciousness which was observed in 71 patients (80.68 %), history of trauma was seen in all the cases, history of seizures in 36 patients (40.9 %), history of headache was seen in 82 (93.18 %) and history of vomiting in 50(56.8 %) patients. Associated supratentorial bleeds were seen in 9 (10.22 %) patients. All of them were operated and 1 case was found to be dead post operatively due to poor

glasgow coma scale score and unequal, non reactive pupils at admission. Skull fractures were seen in 32 (36.36 %) patients. This is less then Takeuchi *et al.* 2012 which reported skull fractures in 86% of patients. In our study most of the Posterior fossa extra dural hematoma cases were associated with occipital bone fractures.

In our study, 8 cases of cervical spine injuries were noted among 32 cases of occipital bone fractures. Among them, 2 cases have Atlanto - axial instability presented with quadriparesis, 2 cases have C2/C3 traumatic subluxation presented with quadriparesis, 1 case had Isolated traumatic spinal cord contusion extending from CV Junction to C4 level with quadriparesis without any vertebral injury, 3 cases have C2, C3 spinous process fractures without any quadriparesis. Surprisingly, all of these spinal injury cases were found to be associated with posterior fossa extra dural hematoma only and 3 cases among them were operated to evacuate the hematoma taking care of the spinal stability. Fortunately, all these 3 cases were found not to have any quadriparesis at presentation as they have only injury over spinous processes without any spinal cord injury. Even though a considerable proportion of the occipital bone fracture cases were associated with cervical spinal injury, there is no such correlation found in this study. Cervical spine injury in association with posterior fossa head injury had no influence on management but was an indicator of poor prognosis due to the effect of quadriparesis in some cases and also due to the early development of pulmonary complications. One of the most important associated risk factors seen was the history of chronic alcoholism seen in 60 (68.18%) patients. The volume of hematoma in posterior fossa head injury was the single most significant indicator in the management options. All posterior fossa hematomas with a volume of more than 15 ml were operated immediately by sub occipital craniectomy and evacuation.

All hematomas with a volume between 10-15 ml (7.5 % of extra dural hematomas) were closely monitored and followed up using CT brain in cases of new onset signs of focal neurological deficit. 3 cases with a volume of 10-15 ml and 2 cases with volume of 7-10 ml were found to develop altered sensorium and bradypnoea subsequently and were re evaluated with CT scan of brain which showed increased volume of clot relatively since the time of admission and were operated to evacuate the clot. One among such cases of delayed surgery were found to deteriorate post operatively and rest of all have improved well. Hence, we conclude that a volume of more than 7 ml should be considered for evacuation whenever present with signs of raised intra cranial pressure to improve the outcome. All the patients in Section I had a hematoma volume of 15 ml and above. This is in continuity with the existing literature. Group III patients had initial clot volume between 10 ml and 15 ml. (i.e. the group which was initially put on conservative therapy and subsequently deteriorated and were operated to evacuate the hematoma). Those patients who present with mass effect in CT scan because of hematoma, invariably required immediate surgical decompression and had significantly poor outcome especially in section I and III.

Initial assessment of Glasgow coma scale score was done for all patients at admission and was serially followed. Initial GCS was found to be a prognostic factor for outcome in both surgical and conservative cases among all modalities of posterior fossa bleeds. Among 88 cases of various types of posterior fossa injuries in this study, 35 cases were found to be daed and all of them were found to have poor glasgow coma scale score on admission. This was in accordance with Roukoz B. Chamoun *et a*l., who postulated that A low Glasgow Coma Scale (GCS) score on presentation in patients with severe traumatic brain injury due to blunt trauma has been recognized as a bad prognostic factor (Roukoz *et al.*). Patients who presented with focal neurological deficit either on admission or those who developed it in late stages invariably had higher clot volume which needs immediate surgical decompression and evacuation of hematoma. In our study, 11 cases were found to have unequal and non reactive pupils at admission and majority of them had poor outcome even after surgical intervention as postulated by Ritter AM (Ritter *et al.*). And also, 6 cases of brain stem contusions in this study were found to have bradypnoea and all cases had poor outcome and hence made us to conclude bradypnoea as a sign of poor prognosis in blunt head injury. Mahajan *et al.* (1993), studied retrospectively nineteen surgically treated Posterior fossa EDH patients with relevance to clinical characteristics and final outcome.

In an another study in India by Mohanty *et al.* (1995), conducted on 24 surgically treated Posterior Fossa Extra Dural Hematoma. There are certain differences the way child's brain responds to injury, as compared to that of an adult. In adults the edema is more often due to increased water content, otherwise called vasogenic edema. In children the swelling is intractable and the brain volume increases rapidly, and the condition is termed as malignant brain edema (Bruce *et al.,* 1981; Lang *et al.,* 1991). A Large study by Lui *et al.* 1983, based on surgically treated Posterior Fossa Extra Dural Hematoma patients, concluded that mortality was inversely related to pre-operative Glasgow Coma Scale and directly related to the age of the patient. Presence of other associated injury was associated with a higher mortality. Another study of 73 surgically and non-surgically managed Posterior Fossa Extra Dural Hematoma, conducted by Bozbuga *et al.* (1999) reviewed surgical decision making based on CT criterias. Karasawa *et al.* 1997, in a class III study evaluated surgically treated patients with presence or absence of hydrocephalus and its impact on the final outcome. Pozatti *et al.* 1982 study comprising of 32 surgically and non - surgically treated patients concluded that presence of associated intra-cranial lesions correlated with poor outcome when compared with pure Posterior Fossa Extra Dural Hematomas. Brambilla *et a*l (1983) in his study on surgically treated Posterior Fossa Extra Dural Hematoma patients concluded that Brainstem and Basal ganglia injury resulted in higher mortality, as they were associated with disuse axonal injury. A similar study by Ciurea *et al.* 1993 observed the same conclusion.

Holzschuch and Schunknecht *et al.* (1989) evaluated the clinical and radiologic characteristics of Posterior Fossa Extra Dural Hematoma with outcome and concluded that all patients with clinical signs of occipital trauma should be subjected to CT SCAN of Brain in order to diagnose or rule out Posterior Fossa Extra Dural Hematoma as early as possible to prevent morbidity and mortality. Thus it is seen from our study that the safe volume for Posterior fossa bleed is 7 ml rather than the usually accepted 15 ml, because some of these patients who deteriorated and underwent surgery had poor outcome, when compared to conservatively managed Group or even compared to the Group which underwent immediate surgery. The concept of critical volume index i.e., ratio of posterior fossa bleed volume to the posterior fossa volume was not assessed in this

study. In our study, we found 8 cases (9.09 %) of isolated cerebellar contusions and 8 cases (9.09 %) of cerebellar contusions with hydrocephalus. 5 cases of isolated cerebellar contusions and all the cases of cerebellar contusions with hydrocephalus were found to present with a glasgow coma scale score of less than 8. Majority of the bilateral cerebellar contusions and vermian contusions were found to have hydrocephalus and also had poor outcome. In this study, we presented 4 cases of isolated posterior fossa sub dural hematomas and 20 cases of posterior fossa sub dural hematomas with cerebellar contusions.1 case among the 2 operated cases of isolated sub dural hematomas survived and the mortality was found to be due to the delayed presentation to the casualty after head trauma. 12 cases of posterior fossa sub dural hematomas with cerebellar contusions were found dead in post operative period and all of them presented with poor glasgow coma scale score on admission.

Conclusion

1. Gender, posterior fossa volume, occipital bone injury had no impact on final outcome.
2. Most head injuries were seen in male population of the society.
3. Majority of head injuries were seen in economically active segment of the society.
4. Presence of associated high cervical injury though did not influence the management, but constitute significantly to poor outcome due to quadriparesis and early development of respiratory complications and urinary tract infections .
5. Mass elect on 4th ventricle or dilatation of ventricles and focal neurological deficit invariably required surgery and most of the patient usually had poor outcome.
6. Patient with GCS less than 8 had poor outcome irrespective of the modality of injury they have.
7. All the patient with GCS more than 13 had better outcome.
8. In conservative group patients with GCS of 9 to 13 constitute a high risk group for deterioration and poor outcome, if not subjected to surgery as an initial mode of management.
9. Clot volume of more than 10 ml had poor outcome irrespective of other factors.
10. Clot volume of less than 7 ml had better outcome.
11. In conservative group patients with clot volume of more than or equal to 10 ml had higher chance of deterioration and subsequently had poor outcome if not subjected to surgery as an initial mode of management.
12. Patients who present early to the casualty after the injury had better outcome post operatively.
13. Patients with associated contiguous supratentorial extra dural hematoma had poor outcome.
14. Patients with sub dural hematoma associated cerebellar contusion had poorer prognosis even when surgically intervened early.
15. Cerebellar contusions with hydrocephalus have poor prognosis.
16. Most of the cerebellar contusions which were bilateral and also vermian were associated with hydrocephalus and also had poor outcome.
17. All cases of brain stem contusions with bradypnoea had low glasgow coma scale score and also had poor outcome.

REFERENCES

Bozbuga, M., Izgi, N., Polat, G., Gurel, I. 1999. Posterior fossa epidural hematomas Observations on a series of 73 cases. *Neurosurg Rev.,* 22:34-40.

Brambilla, G., Rainoldi, F., Gipponi, D., Paoletti, P. Extradural haematoma of the posterior fossa: A report of eight cases and a review of the literature. *Acta Neurochir.,* (Wien) 80:24-29,

Bruce, D.A., Alavi, A., Bilanink, L, *et a*l. 1981. Diffuse cerebral swelling following head injuries in children. The syndrome of "malignant brain oedema". *J Neurosurg.,* 1981;54:170-8.

Ciurea, A.V., Nuteanu, L., Simioneseu, N., Georgesea, S. 1993. Posterior fossa extra-dural hematomas in children: Report of nine cases. *Childs Nerv Syst.,* 9:224-228.

Green, R.E. 1967. Surgery of the posterior fossa. In: Waler AE, ed. A History of Neurological Surgery. New York: Hafner, 1967:114–133

Holzschuh, M. Schuknecht, B. 1989. Traumatic epidural haematomas of the posterior fossa: 20 new cases and a review of the literature since 1961. *Br J Neurosurg.,* 3:171-180.

Hyder, A.A., Wunderlich, C.A., Puvanachandra, P., *et a*l. 2007. The impact of traumatic brain injuries: a global perspective. *Neurorehabilitation*, 22, 341-353

Karasawa, H., Furuya, H., Naito, H., Sugiyama, K., Ueno, J., Kin, H. 1997. Acute hypdrocephalus in posterior fossa injury. *J Neurosurg*., 86:629-632.

Lang, D.A., Teasdale, G.M., *et a*l. 1991. Diffuse brain swelling after head injury, more often malignant in children than adults. *J Neurosurg.,* 80:875-80.

Lui, T., Lee, S., Chang, C., Cheng, W. 1993. Epidural hematomas in the posterior cranial fossa. *J Trauma.,* 34:211-215.

Macewen, W. 1893. Meningitis, abscess of the brain, infective sinus thrombosis. In: Pyogenic Infective Diseases of the Brain and Spinal Cord. Glasgow: *J. Maclehose & Sons,* 354

Mahajan, R., Sharma, B., Khosla, V., Tewari, M., Mathuriya, S., Pathak a, Kak, V. 1993. Posterior fossa extradural aematoma - Experience of nineteen cases. *Ann Acad Med Singapore*., 22:410-413.

Mohanty, A., Kolluri, V., Subbakrishna, D., Satish, S., Mouli, B., Das, B. 1995. Prognosis of extradural Haematomas in children. *Pediatr Neurosurg.,* 23:57-63.

Pozzati, E., Grossi, C., Padovani, R. 1982. Traumatic intracerebellar hematomas. *J Neurosurg.,* 56:691-694, 1982.

Roozenbeek, B., Maas, A.I., and Menon, D.K. 2013. Changing patterns in the epidemiology of traumatic brain injury. *Nat Rev Neurol.,* 9,231-236

Roukoz, B. Chamoun, M.D., Claudia S. Robertson, M.D., and Shankar P. Gopinath, M.D. Ritter AM1, Muizelaar JP, Barnes T, Choi S, Fatouros P, Ward J, Bullock MR.

Starr, M.A. 1893. Brain Surgery. New York: William Wood, 295

Takeuchi S, Takasato Y, Wada K, Nawashiro H, Otani N, Masaoka H, Hayakawa T. J Trauma Acute Care Surg. 2012 Feb;72(2):480-6.

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