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Original Investigation

Burr Hole Evacuation of Extradural Hematoma in Mass Trauma. A Life Saving and Time Saving Procedure: Our Experience in the Earthquake of 2005

Ahsan AURANGZEB[1], Ehtisham AHMED[1], Saadia MAQBOOL[2], Adil IHSAN[1], Asghar ALI[1], Sajid Nazir BHATTI[1], Nazir ALVI[1], Sajid HUSSAIN[1]

[1]Ayub Medical College, Neurosurgery Department, Abbottabad, Pakistan
[2]Women Medical College, Physiology Department, Abbottabad, Pakistan

ABSTRACT

AIM: To observe the outcome of burr hole evacuation of extradural hematoma (EDH) in mass head injury.

MATERIAL and METHODS: This study included patients of any age who sustained head injury in the earthquake of October 8, 2005, were diagnosed as EDH on computed tomography (CT) scan and were admitted in the neurosurgery ward over a period of 3 days. All patients were followed by serial CT scans and neurological assessments.

RESULTS: A total of 36 patients were included in this study. There were 25 male and 11 female patients and the age range was from 5 years to 50 years. All cases were the victim of the earthquake. All patients underwent surgery for evacuation of EDH through a single burr hole. One patient required craniotomy for EDH due to neurological deterioration on the second postoperative day, and 1 patient died.

CONCLUSION: As EDH is potentially fatal lesion, evacuation of EDH through a single burr hole has good outcome with less chances of recurrence and complications in mass head injured patients as seen with earthquakes.

KEYWORDS: Extradural hematoma, Burr hole evacuation, Mass injured patients, Computed tomography

INTRODUCTION

Head injury is a major health problem. It is reported that 1% of all deaths and 15% of deaths occurring between 15 and 24 years are secondary to head injury (12,16). The major cause of preventable deaths in head injuries is a delay in diagnosis and treatment of intracranial hematomas (16,20).

Deterioration of conscious level and developing focal neurological signs signify a rapidly growing extradural hematoma (EDH) (16). In these cases, an urgent computed tomography (CT) scan will reveal biconvex hyperdense EDH causing effacement of the ventricle and midline shift. Craniotomy/craniectomy and evacuation of the hematoma is the treatment of choise to save the life of these patients (16).

The present study was performed in patients with EDH in order to define the clinical outcome of EDH evacuated through a single burr hole.

MATERIAL and METHODS

This descriptive study was performed in the Department of Neurosurgery, Ayub Teaching Hospital (ATH), Abbottabad, Pakistan from 8th October to 12th October 2005, during the earthquake. ATH is 1000-bed hospital with a well-established unit and serving about 7 million population. We had two qualified neurosurgeons at the time of the earthquake. On the first day of the earthquake 18 patients were operated for EDH, followed by 13 patients on the second day and 6 patients on the third day.

Corresponding author: Ahsan AURANGZEB
E-mail: neuro-69@hotmail.com

A total of 36 patients were included in this study. All patients had traumatic EDH. The causes of delay to reach the hospital were the long distances the patients had to travel and the poor means of transport.

A detailed history was obtained from each patient/relative and a thorough clinical examination was done for every patient. The mode of injury, the exact time and place of injury, the details of the initial management at peripheral hospitals, the means of transport used to reach ATH and the details of the patient's conscious level from time of injury to admission in our hospital were recorded carefully. In the hospital, the classical signs of EDH such as deterioration in conscious level, pupil abnormality and neurological deficits were especially checked during the examination. The vital signs and the Glasgow Coma Scale (GCS) score were recorded at 30-minute intervals.

Table I: Age Wise Representation of Extradural Hematoma (n= 36)

Age Range	No. of Patients	Percentage
5-10 years	5	13.8%
11-20 years	7	19.4%
21-30 years	17	47.2%
31-40 years	4	11.1%
41-50 years	3	8.3%

Table II: Outcome of Burr Hole Evacuation of Extradural Hematoma (n=36)

Outcome	No. of Patients	Percentage
Recovered	34	94.4%
Re-operated	1	2.7%
Dead	1	2.7%

X-rays of the cranium and CT scan were obtained in all cases. The volume of EDH was calculated using the Peterson and Epperson equation a x b x c x 0.5, where a, b, and c represent the diameter of the hematoma in the sagittal, axial and coronal planes respectively. Once the EDH was diagnosed, the patient was shifted to the operating room for surgical evacuation through a single burr hole.

In the postoperative period, the clinical observations, neurological examination, the vital signs and the GCS score were maintained till the time of discharge. The morbidity in terms of neurological deficit was recorded for each patient at discharge. All patients were followed up for at least for six months.

RESULTS

There were 36 patients of EDH, managed surgically at ATH in a three-day period. The 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%), 31-40 years age group with 4 patients (11.1%), 41-50 years age group with 3 patients (8.3%) and patients aged less then 10 years with 5 patients (13.8%) (Table I). There were 25 (69.4%) male and 11 (30.5%) female patients.

Ipsilateral pupil dilatation is a very important neurological sign for EDH and a difference in the pupil size was noted in 18 (50%) cases in our series. In the remaining 18 (50%) patients, the pupils were equal and reacting to light at the time of admission. Hemiparesis of varying degrees was observed in 8 (22.2%) patients. Moreover, patients with EDH also presented with other signs. Vomiting was the commonest finding and it was present in 76% of the patients. Bleeding from the ear, nose and mouth was observed in 11% of the patients. Fits were seen in 9% of the patients. Headache as the sole presenting complaint was seen in13% of the patients (Figure 1).

Surgery was done in all 36 patients, and the extradural hematoma was evacuated through a single burr hole. Among

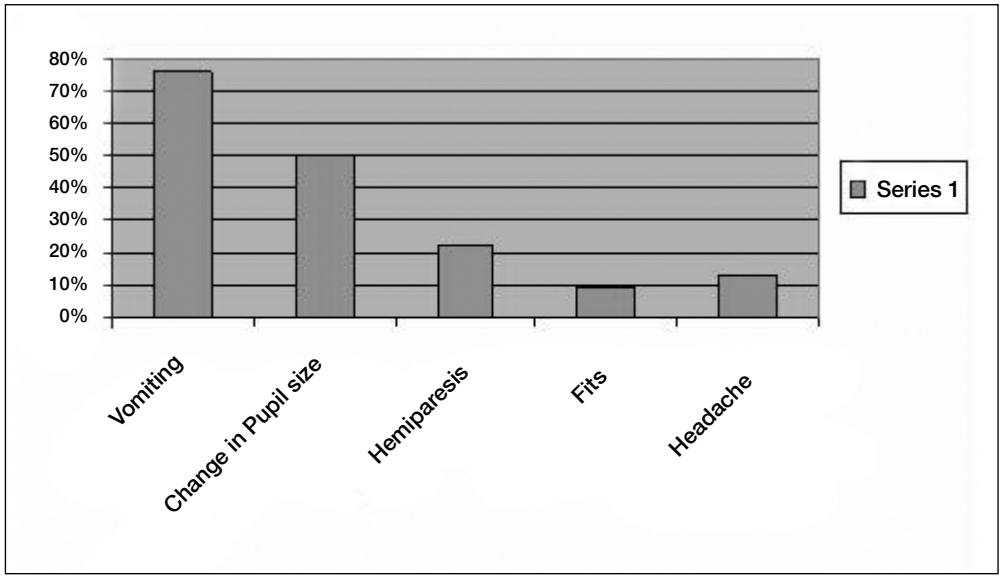

Figure 1: Percentages of Clinical Findings in Patients with Extradural Haematoma, n=36.

these, 34 (94.4%) patients recovered well with GCS 15/15 on the operation day. One patient (2.7%) was re-operated due to neurological deterioration, and craniotomy was performed on the second postoperative day. He also recovered well. One patient (2.7%) died on the operation day (Table II).

DISCUSSION

EDH is accumulation of blood between the inner table of skull and the stripped off dural membrane (1,17). EDH is mostly located in the temporoparietal region, in approximately 70-80% of the patients, and extension to adjacent frontal and occipital areas is common (10). EDH occurs in 1-2% of head injured patients (3). Adults suffer head injuries most frequently due to falls, motor vehicle crashes (82%) (19), colliding with or being struck by an object (40%) (8), and assaults.

Among the hematomas, EDHs assume the greatest importance as they can be diagnosed and treated easily (16). EDH results from blunt trauma to the skull and meninges. The pathophysiology is that the initial impact of force causes deformation or fracturing of the cranium and produces detachment of the dura directly beneath the site of the blow and injures the blood vessels, followed by filling of the extradural space with blood. Several studies indicate that this bleeding in the resulting pockets creates a hydraulic "water pressure" effect, progressively stripping the dura away from skull and thus increasing the size of EDH (6,23).

In patients with head injury, X-ray skull is a good tool for assessment (15). The incidence of skull fracture in patients operated for EDH in various series has been reported as 3-85% (2,7,14,18). An important prognostic factor is the level of consciousness which deteriorates with a delay in surgery (11) due to a delay in diagnosis and referral (9). X-rays that are readily available for the diagnosis of a skull fracture may be used as a guide for early referral to a neurosurgical facility.

CT scan was found to be a useful diagnostic technique and shows the hyperdense biconvex shadow of extradural hematoma. It helped us to diagnose EDH in all 36 patients in our series. Older studies showed the role of cerebral angiography in diagnosing EDH (4,21). However, CT scan become the investigation of choice to diagnose the volume and location of EDH, associated injuries and midline shift etc. (16). It has been reported that the mortality rate was between 29 and 33% in the pre-CT era and between 9 and 12% in the post-CT era (4,21). Persistent headache and vomiting are important indications for a CT scan after head trauma (16). In the present series, 5 (13%) patients presented with intractable headache after head trauma as the sole complaint. In the series of Cook et al (5), 40% of the patients presented with only headache and vomiting.

Blood clot evacuation through craniotomy is the accepted method for treatment of a pure traumatic EDH following closed head injury. However, in certain emergency situations where you are short of time, equipments and qualified neurosurgeons to deal with the situation, the use of craniotomy for evacuation of the blood clot may not be feasible. In such situations, the placement of a burr hole and drainage under negative pressure constitutes a rapid, life saving and safe approach to manage patients with simple EDH (13), or skull trephination can be performed in the emergency room before referring the patient to proper neurosurgical center (22).

In the earthquake of October 2005, we were short of qualified neurosurgeons, instruments, and time. Instruments were sterilized by simple dipping in savlon. All patients underwent simple burr hole evacuation of EDH, a burr hole was created at the maximum thickness of the hematoma, the main bulk of hematoma was removed with the help of suction and spatula, hemostasis was secured and the wound closed. Operating time from opening to closure of the wound was 30 minutes maximum.

Postoperative CT scan was obtained in all patients for 3 consecutive days and 34 (94.4%) showed that the hematoma, had resolved. One patient (2.7%) showed increased hematoma on the first operative day for which decompressive craniotomy was performed, and one patient (2.7%) died on the same day.

CONCLUSION

In such situations like earthquakes, where a mass of head injured patients present to you and you are short of equipment and time, even the outcome of EDH evacuated through a single burr hole is good and life saving with less chance of complications and recurrence. To ensure the safety of patients regarding this procedure, monitoring should be done by daily CT scans and decompressive craniotomy should be performed if consciousness does not improved within several hours of the procedure.

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