Research Article

Traumatic Posterior Fossa Epidural Hematomas and Their Complications

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Abstract

Background: Traumatic posterior fossa epidural hematomas (TPFEDH) occur infrequently however their mortality and morbidity are higher than supratentorial epidural hematomas. Signs and symptoms may be silent or nonspecific, even though they may show rapid progression and deterioration from consciousness to coma, thus they would cause fatal results. Recently, practice of computerized tomography (CT) has grown up and replaced the use of direct X-ray to detect calvarial fractures and other traumatic pathologies, therefore patients with posterior fossa trauma were diagnosed earlier.

Material and Methods: We presented eight cases who suffered from TPFEDHs treated in our clinics between the years 2002 and 2006. Five cases were operated immediately however 3 cases were treated conservatively. One of the operated cases died immediately after surgery. Postoperative complications of cerebral sinus thrombosis and pseudomeningocele were observed in two cases. Alive cases were discharged a few days after surgery.

Conclusion: Mortality decreases in TPFEDHs since they could be diagnosed earlier with widespread use of CT and treated successfully. In addition, it is easier to decide whether conservative or surgical therapy is efficient because CT findings should correlate with clinical findings. However, few complications such as cerebral sinus thrombosis and pseudomeningocele occur infrequently. Furthermore these cases must be monitored carefully during postoperative period for a new neurological finding.

Keywords: Trauma, epidural hematoma, posterior cranial fossa, complication, cerebral sinus thrombosis, pseudomeningocele

Anahtar Kelimeler: Travma, epidural hematom, posterior kranial fossa, komplikasyon, serebral sinüs trombozu, psödomeningosel

INTRODUCTION

Posterior fossa epidural hematomas occur much less frequently than supratentorial hematomas generally after a traumatic condition and they are serious complications of head injury(1,4,16). Although signs and symptoms may be silent and slow at the beginning, it may cause rapid and fatal deterioration of the patient by compression of the brain stem, usually without any prior warning sign(6).

In the past, the diagnosis was difficult and rare, and the mortality was high, but since the introduction of computed tomography (CT) into clinical practice, TPFEDHs were diagnosed more easily so that a better prognosis could be achieved(4,6,8,9). Consequently, there has been an increase in the number of TPFEDH cases without mass effect and they have been treated conservatively to achieve good results(6).

The clinical presentation of patients with the compression of perimesencephalic cistern, brain stem and fourth ventricle in radiological examination deteriorate rapidly(2,4,6). Thus early surgical intervention before the development of herniation is life-saving(2,4,6,9,27).

METHODS

Between 2002 and 2006, 83 cases of traumatic epidural hematomas were admitted to our neurosurgical department. Among them, 8 patients (9.6 %) were diagnosed to have TPFEDH. Age of the cases were 8 to 36 years (mean 23.8 years) and male/female ratio was 5/3. Demographic characteristics of our cases were summarized in Table 1. They were admitted to our emergency service within 5 hours on average (1 – 13 hours) after trauma. Etiology of trauma was traffic accident in five and head trauma due to other causes in the remaining three cases. Clinical signs and symptoms of patients on admission are summarized in Table 1.

All cases were diagnosed by CT and classified as acute formation according to Hooper classification (12). Perimesencephalic cisterns were obliterated and fourth ventricle was compressed or displaced by mass effect of the hematoma in five cases. Three patients of TPFEDHs were detected to be 5 - 8 mm in size and had no mass effect. In addition, TPFEDH extended into supratentorial region in two cases. With regard to the intracranial lesions coexisting with TPFEDH, frontal contusion and subarachnoid hemorrhage were found in two and one patients respectively. In addition, X-rays revealed occipital fracture in four cases and temporal and frontal fracture in one case. One patient with a temporal fracture had paradoxical rhinorhea.
Table 1: Demographic characteristics of our cases was summarized in the table

<table>
<thead>
<tr>
<th>Case no</th>
<th>Age</th>
<th>Sex</th>
<th>headache</th>
<th>vomiting</th>
<th>deficit</th>
<th>GCS</th>
<th>Size (mm)</th>
<th>Mass effect</th>
<th>Associated lesion</th>
<th>treatment</th>
<th>GOS</th>
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<td>?</td>
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<td>6</td>
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<td>-</td>
<td>+</td>
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<td>24</td>
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</table>

Abbreviations: GCS; Glasgow Coma Score, mm; millimeter, GOS; Glasgow Outcome Score

RESULTS

Three patients had TPFEDH without mass effect and were treated conservatively with repeated CT scans. These cases were monitored in intensive care unit and CT scan was performed on deterioration or twice a week. Other five patients who have mass effect due to hematomas, partial or total obliteration of the perimesencephalic cisterns, compression, and/or displacement of the fourth ventricle in CT scans were operated immediately. All cases were operated in park bench position to prevent air embolism. Suboccipital craniectomy was performed in 3 cases and occipital craniotomy was combined to this in the other two due to extension of TPFEDH to occipital region. The bleeding source, responsible for PFEDHs in patients with acute clinical course was originated from the transverse sinus in 2 cases and from leakage of meningeal vessels in 3 cases. Furthermore, dural laceration was observed and repaired with galeal graft in two cases.

One patient with a GCS score of 6 had died immediately after surgery (Figure 1). Other four cases were treated successfully with surgery. However, complications were noted in two cases: first one had pseudomeningocele and dural laceration which was repaired with a fascia lata graft. In the second case, meningitis and later transverse and sigmoid sinus thrombosis had occurred (Figure 2 and 3). Meningitis was treated by anti-infection and low molecular weight heparin (LMWH) was administered to prevent cerebral sinus thrombosis (CST) and he was prescribed to use it for six more months after being discharged.

Continued lumbar drainage system (CLDS) was applied for paradoxical rhinorrhea which ceased after four days. With the help of these supportive measures, all cases with these complications were discharged in good health.

Figure 1: CT scan revealed that fourth ventricle was compressed by TPFEDH where contiguity right cerebellar hemisphere and pneumocephalus was seen in front of mesencephalon due to basis fracture.
DISCUSSION

TPFEDHs are rare although they are classified as most commonly encountered posterior fossa traumatic hematoma. They represent 0.1–0.3% of all craniocerebral injuries and 1.2–15% of all epidural hematomas respectively (1,6). TPFEDHs are common in the third and fourth decades as well as in the pediatric age group (1,9). However signs and symptoms in the majority of cases are nonspecific for acute TPFEDHs. It may cause rapid and fatal deterioration in the patient by compression of the brain stem usually without any prior warning sign. In a minority of cases, the diagnosis could be established with clinical findings (4,6,9). Bor-Seng-Shu et al reported that radiological changes always occur earlier than clinical changes and should be monitored to predict the clinical progression (4). So, if a trauma patient has an occipital, suboccipital or retromastoid swelling, CT scanning should be performed as a routine procedure (4,5).

Figure 2 A – B: Epidural hematoma was seen on posterior fossa compressed to right cerebellar hemisphere in CT scan (A). Control CT scan showed that there were no abnormalities apart from the changes due to the operation (B).

Figure 3 A – B: MRI demonstrated thrombosis of right sigmoid (A) and transverse sinuses (B).
Likewise, some authors have suggested that CT scanning in all patients with occipital soft-tissue ecchymosed swelling or a fracture of underlying occipital bone\(^4,5,16\). We suggest that mortality could be decreased with a more frequent use of CT scan in the last decades. Moreover, brain contusions, subarachnoidal or intracerebral hemorrhages also can be revealed with CT scans\(^5,11,14,16\).

Clinical course of the traumatic TPFEDHs was classified by Hooper et al as acute, subacute, and chronic in accordance with the onset of symptoms within the first 24 h of trauma, until the 7th day, and after a week respectively\(^12\). But this classification became insufficient after the practice of CT. When CT findings correlate with clinical findings, it is easier to decide whether conservative or surgical therapy is efficient\(^6\). However, treatment of TPFEDHs was still controversial. Bozbuga et al divided TPFEDHs into two distinct groups. In Group A, there was no mass effect. Perimesencephalic cisterns were fully open and the fourth ventricle was not compressed or displaced. Hydrocephalus was not present in Group B but there was a mass effect to some degree. Group A is accepted as a conservative group and Group B was treated surgically\(^6\). In addition, CT scan helps to diagnose a TPFEDH earlier in patients without neurological symptoms and signs\(^5\). In our five cases, perimesencephalic cisterns were obliterated and fourth ventricle was compressed or displaced by mass effect of the hematoma, only one patient had no mass effect and GCS was 15. We operated on five cases whose GCS was lower than 14 and mass effect on CT scan, however three patients with a GCS of 15 had a thin hematoma without mass effect.

There is a correlation between hematoma volume and prognosis\(^3,15\). However, Van den Brink et al noted that the relation between prognosis and the growing potential of the mass is not so simple and they suggested that surgical indication should not be given by hematoma volume only\(^24\). On the other hand, Cayli et al reported that conservative treatment is adequate for asymptomatic supratentorial epidural hematomas with a midline shift of less than 10 millimeters or a hematoma thickness less than 30 millimeters\(^7\). With the help of these data, together with the clinical picture, we suggest that thickness of hematoma is the critical parameter to handle these patients. This neuroradiological classification, as described by Bozbuga et al, correlated with neurological findings. We believe that conservative therapy is suggested for patients with GCS score greater or equal to 14, without mass effect and/or associated lesions. Level of consciousness, neurological findings, evidence of compression to fourth ventricle and brain stem on CT scans together with hematoma thickness parameter should be taken into account as major indications of surgical treatment.

Mortality ranges between 4% and 26.5% in the literature and lower GCS is correlated with higher mortality rate\(^2,4,6,9,16\). In addition, early diagnosis and treatment absolutely affect mortality and morbidity rates. The case with mortality was admitted 13 hours after the accident with a calculated GCS score of six points.

More than 50% of patients with TPFEDH had other intracranial lesions. Zucarello et al reported 87.5% incidence of these associated lesions\(^27\). These were brain contusions or intracerebral haematomas in the frontal and temporal regions due to a countercoup mechanism\(^20,27\). Similarly, skull fractures and pneumocephalus were announced by Bozbuga et al\(^6\). They reported that cerebrospinal fluid (CSF) leakage to be noticed in two cases of who had associated basal skull fracture. In this series, the case with temporal fracture had paradoxical rhinorrhea from temporal bone to middle ear through Eustachian tube. Generally, traumatic leakages spon-
taneously cease within the first 48 hours however prolonged leakage is the main reason of increased risk of infection such as meningitis\(^{(10,26)}\). Because of this fatal complication, CLDS was inserted to this patient for four days and resulted in successful cessation of leakage.

Various traumatic lesions, such as epidural or subdural haematoma, intracerebral or subarachnoid haemorrhage and cerebral contusion could be evident in a patient who had head injury\(^{(18,21,23,25)}\). Rarely, CST may occur in a patient with head injury. Suggested mechanisms for this entity are the alteration in the coagulation systems after head injury, disturbances in the blood flow or damage to the capillary endothelium\(^{(22,25)}\). One or more of these mechanisms may predispose and lead to thrombosis which can cause CST after head injury. In addition, epidural hematoma might obstruct the blood flow in a patent dural sinus. Owler and Beser have reported a case in which extradural haematoma caused venous sinus obstruction\(^{(18)}\). Furthermore, surgery and meningitis could be a cause of CST\(^{(13,21)}\). We suggest that the cause of CST in our series is multifactorial. It is probable that the mechanisms mentioned above could occur simultaneously. Partial obstruction of the sinuses by hematoma, trauma related to surgical treatment, presence of meningitis and other unknown aspects of head injury are suspected. If a complicated patient with meningitis had additional symptoms of diplopia and lateral gaze paresis, advanced clinical studies should be carried on to exclude the diagnosis of CST or another intracranial disorder.

Generally, dural laceration occurs in penetrating head trauma, however it is also a complication of closed skull fracture. On the other hand, dura is incised in surgical treatment of Chiari I malformation or following neuro-otologic procedures\(^{(17,19)}\). This incision or laceration has to be repaired with a watertight closure with or without dural graft. If duraplasty is unsuccessful, a complication namely pseudomeningocele could be encountered and cause symptoms such as headache, nausea or vomiting. These patients must be reoperated and duraplasty has to be performed again.

**CONCLUSION**

Extensive use of CT decreased the mortality and morbidity of TPFEDH. However, it should be used particularly for patients with trauma over occipital region and an associated traumatic cephalhematoma. Therefore, TPFEDH cases could be diagnosed earlier or a necessity of a surgical procedure could be evaluated better with the use of CT scan. Conservative therapy is suggested for patients with a GCS score greater or equal to 14, without mass effect and/or associated lesions. These cases have to be monitored carefully during post-operative period for a possible new neurological finding. Thus, mortality and morbidity related to the complications could be prevented.

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