

## TRAUMATIC EPIDURAL HEMATOMAS IN POSTERIOR CRANIAL FOSSA

Bogdan Ašanin

University Department of Neurosurgery, Medical Faculty, University of Montenegro, Podgorica, Montenegro

**SUMMARY** – Epidural hematoma of the posterior cranial fossa (EHPCF) is a rare complication in head injuries. Furthermore, nonspecific clinical signs and the rare occurrence of this lesion in craniocerebral injuries make the establishment of a diagnosis more difficult. The aim of the paper is to point to the advantages of early diagnosis. During the 1982-2008 period, 18 patients with EHPCF were operated on at University Department of Neurosurgery, Clinical Center of Montenegro in Podgorica. The clinical picture, neuroradiological examination findings and outcome of operated patients were retrospectively analyzed. In our patient series, EHPCF accounted for 0.11% of craniocerebral injuries or 7.9% of epidural hematomas recorded. In 11 cases, the injury was inflicted in traffic accidents and in 7 patients it was caused by fall. Linear fracture of the occipital bone was detected by radiographic investigation in 12, isolated diastasis fracture of lambdoid suture in four, and linear fracture of the occipital bone with diastasis fracture of lambdoid suture in two patients. Glasgow Coma Scale of 8 and less was present in three, 9-12 in seven, and 13-15 in eight patients. The majority of cases (90%) were detected within 24 hours. In all cases, the diagnosis was made by computed tomography. Mortality rate was 11.11%. Early computed tomography of the head in combination with clinical picture and timely surgical intervention could reduce the mortality and morbidity in these lesions.

*Key words: Cranial fossa, posterior – injuries; Hematoma, epidural – diagnosis; Hematoma, epidural – etiology; Accidental falls; Accidents, traffic*

### Introduction

The incidence of epidural hematomas ranges from 1% to 3% of craniocerebral injuries (CCI). Epidural hematoma of the posterior cranial fossa (EHPCF) is less frequent than supratentorial hematoma and accounts for 0.10%-0.30%<sup>1</sup> of all CCIs or around 10% (between 1.46% and 12.9%) of all cases of epidural hematomas<sup>1-5</sup>. They are usually associated with linear fracture of the occipital bone, diastasis fracture of lambdoid suture, or both. Diagnostic difficulties are caused by atypical clinical pictures and rare occurrence of these hematomas. Symptoms can develop slowly, but the condition may deteriorate suddenly with fatal outcome unless evacuated in

a timely manner<sup>2,6</sup>. Today, fast computed tomography (CT) diagnostics leads to better outcomes.

### Material and Methods

The study included patients with traumatic epidural hematomas that were treated and operated on at University Department of Neurosurgery, Clinical Center of Montenegro in Podgorica, during the 1982-2008 period. The rate of EHPCF was analyzed in relation to other CCIs, epidural hematomas of other localizations, sex, age, state of consciousness and therapeutic outcome.

### Results

During the 1982-2008 period, 16,320 patients with head injuries were treated at Department of Neurosurgery, Clinical Center of Montenegro in Podgorica. There

Correspondence to: *Prof. Bogdan Ašanin, MD, PhD*, Medical Faculty, University of Montenegro, 81000 Podgorica, Montenegro  
E-mail: [asanin@cg.yu](mailto:asanin@cg.yu)  
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were 228 epidural hematomas, accounting for 1.39% of CCIs. EHPCF was diagnosed in 18 patients, i.e. 0.11% of CCIs, or 7.9% of epidural hematomas of all localizations (Table 1).

Table 1. Distribution of epidural hematoma of posterior cranial fossa according to age

|                     | 0-14 yrs | 15-50 yrs | Total (%) |
|---------------------|----------|-----------|-----------|
| Number of cases     | 7        | 11        | 18 (100%) |
| Sex                 |          |           |           |
| Male                | 5        | 9         | 14 (78%)  |
| Female              | 2        | 2         | 4 (22%)   |
| Mechanism of injury |          |           |           |
| Traffic accident    | 2        | 9         | 11 (61%)  |
| Fall                | 5        | 2         | 7 (39%)   |
| Skull fractures     |          |           |           |
| Linear              | 4        | 8         | 12 (67%)  |
| Linear + diastasis  | 1        | 1         | 2 (11%)   |
| Diastasis           | 2        | 2         | 4 (22%)   |
| GCS                 |          |           |           |
| 13-15               | 5        | 3         | 8 (44%)   |
| 9-12                | 2        | 5         | 7 (39%)   |
| ≤8                  | 0        | 3         | 3 (17%)   |
| Recovery            |          |           |           |
| Good                | 7        | 9         | 16 (89%)  |
| Death               | 0        | 2         | 2 (11%)   |

GCS = Glasgow Coma Scale

Eleven patients sustained injuries in traffic accidents and seven patients were injured by fall. The injured persons were between 5 and 50 years of age, and the male to female ratio was 14:4. Glasgow Coma Scale (GCS) of 8 and less was present in three, 9-12 in seven and 13-15 in eight patients.

Head CT and skull radiographs verified linear fracture of occipital bone in 12 patients, isolated diastasis fracture of lambdoid suture in four, and linear fracture of occipital bone with diastasis fracture of lambdoid suture in two patients. All patients were operated on by standard approach with wide suboccipital craniectomy, two (11.11%) of them with lethal outcome.

## Discussion

EHPCF is a rare traumatic substrate with a poor clinical picture. The patients can be conscious and their state may deteriorate unexpectedly due to herniation of cerebellum tonsils in foramen magnum with lethal

outcome. They arise after an injury of a venous blood vessel, which causes slower clinical course and better prognosis, or by affection of an arterial branch with fast clinical course and high mortality. According to the speed of the clinical picture development, EHPCF can be divided into acute (with symptom onset within the first 24 hours of injury), subacute (with symptom onset from two to seven days of injury) and chronic (with symptom onset after seven days of injury)<sup>2</sup>. CT scanning is a successful diagnostic method by means of which this type of bleeding is detected. The prognosis depends on the clinical course, state of consciousness and time of surgical intervention. It is evident that in our material epidural hematomas occurred more frequently in men. Injury is the most common and almost the only cause of EHPCF<sup>3,7</sup>, as around 90% of injuries cause direct blow to the occipital region<sup>8</sup>. The rate of occipital bone fracture or diastasis fracture of lambdoid suture ranges from 40% to 86%<sup>9</sup>. In our series, linear fracture of occipital bone above the hematoma was present in 12, linear fracture of occipital bone with diastatic fracture of lambdoid suture in two, and isolated diastasis fracture of lambdoid suture in four patients. EHPCF is more common in 20-47 age groups than in childhood<sup>4,8</sup>. Interestingly, in our series none of the patients was aged over 50 and they were evenly distributed up to this age. Unlike epidural hematomas in the anterior and middle cranial fossa, EHPCFs are usually without any characteristic clinical symptoms. Swelling of soft tissues of epicranium in the occipital and retromastoid region was observed in all our patients, vomiting was present in seven and headache in ten patients. Consciousness disturbance appears depending on the size and speed of hematoma formation and on additional intracranial injuries. In a series of 19 extradural hematomas of posterior fossa, Mahajan *et al.*<sup>10</sup> recorded a lucid interval in nine (42.10%) cases. The incidence of additional intracranial lesions may be up to 87.5%. They include brain contusion, intracerebral hematomas of the contrecoup type in frontal and temporal regions, supratentorial epidural hematomas, subarachnoid hemorrhage, subdural hygroma, subdural hematoma, and others<sup>1,4,11</sup>. Small space in the posterior cranial fossa and the presence of brain stain that can be compressed with tonsils of the cerebellum can lead to sudden deterioration of consciousness and coma with decerebration in foramen magnum, so that urgent surgical intervention is sometimes without any success. Mortality rate in these hematomas is significant and it ranges from 12.00% to 20.00%<sup>3</sup>. In our series, such a de-

velopment of clinical picture and lethal outcome were recorded in two (11.11%) patients.

Injury of the arterial blood vessel leads to fast filling of the hematoma with fast development of symptoms and worse prognosis. Injury of the venous blood vessel with gradual bleeding below the fracture leads to slower formation of the hematoma and to gradual development of symptoms with good prognosis after surgical intervention<sup>2,4</sup>.

In our series, 15 patients had isolated CCIs. In six patients, signs of brain contusion were verified on CT scans. These patients had more extensive disturbances of consciousness, sopor (GCS 9-12) in three patients and state of coma (GCS below 8) in three patients. In four cases, the hematoma also spread into supratentorial space. In nine patients, brain CT did not indicate any other intracranial substrate.

Early diagnosis is the basis of good recovery, so some authors recommend CT scan for all patients with soft tissue ecchymotic swelling above the occipital bone fracture<sup>2</sup>. On CT scan, epidural hematoma appears as a hyperdense biconvex lens of 5-30 mL volume. When the epidural hematoma is greater than 30 mL, it spreads into the supratentorial space (Fig. 1). In a series of 89 EHPCF cases, Lui *et al.* found 30 "pure" EHPCFs and 59 "mixed" cases with the hematoma spread above the transverse sinus into the occipital region<sup>8</sup>. Gelbert *et al.*<sup>12</sup> describe bilateral EHPCF. Also, CT scan revealed mass effect caused by hematoma with partial or total obliteration of the perimesencephalic cistern, compression and/or dislocation of the fourth brain chamber. In our three cases, the CCI with EHPCF was associated with injuries of other parts of the body. In one case EHPCF was combined with compressed fracture of the first lumbar vertebra. In another case there was a combination of hematoma of this localization with bilateral rib fracture, hemothorax and lung contusion. Apart from neurosurgery, this patient underwent surgical intervention by a thoracic surgeon. The first two cases had a favorable outcome. In the third patient, the EHPCF was combined with brain contusion, fracture of the skull base, fracture of the fourth rib, and multiple fractures of the right upper and lower leg. In this case, the outcome was fatal.

In a report by Wang *et al.*<sup>13</sup>, 77% of 13 EHPCF patients presented within 24 hours, and in our series 90% of hematomas were detected within 24 hours.

Decision on surgical or conservative treatment was based on clinical and radiological parameters. Born-Seng-

Shue *et al.*<sup>2</sup> report on a series of 43 EHPCF patients; 40 patients were surgically treated, whereas three patients without clinical signs of compression of the brain stem or hypertension in the posterior cranial fossa were treated conservatively with attentive follow up of the neurological status and control CT scanning. In our series, all patients underwent surgical treatment because their clinical status and radiological findings indicated clearly the urgency of such an approach.

The time elapsed from injury to surgery ranged from 3 to 72 hours, and in one case the surgery was performed after 6 days (due to gradual deterioration of consciousness, the patient was referred from surgical department of a local hospital to our University Department of Neurosurgery for additional treatment). The patients with GCS 13-15 have a good prognosis. On the contrary, only 30% of patients with GCS below 8 have a good prognosis.

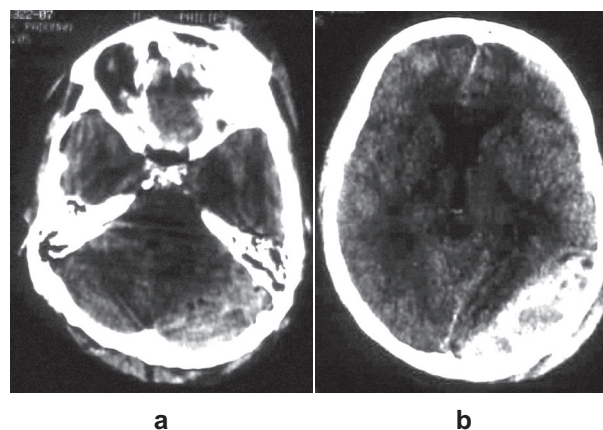


Fig. 1. "Mixed" epidural hematoma: (a) part of hematoma in cranial posterior fossa; (b) part of hematoma in occipital region.

## Conclusion

Epidural hematoma in the posterior cranial fossa is a rare traumatic substrate with poor clinical picture. It occurs more often in younger persons, mainly men, with obligatory presence of a fracture. Early CT scan is recommended in combination with observation of characteristic signs, i.e. injury of soft tissues in the occipital region, somnolence, fracture of occipital bone or diastasis fractures of lambdoid suture. The prognosis depends on the patient's state of consciousness, clinical course, additional cranial injuries and time of surgical intervention.

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## Sažetak

## TRAUMATSKI EPIDURALNI HEMATOMI U STRAŽNJOJ LUBANJSKOJ JAMI

B. Ašanin

Epiduralni hematom stražnje lubanjske jame (EHSLJ) je rijetka komplikacija kod povrede glave. Nespecifični klinički znaci i rijetkost ove lezije kod kranocerebralnih ozljeda dodatno otežavaju dijagnozu. Cilj rada je ukazati na prednosti rane dijagnoze. U razdoblju od 1982. do 2008. godine na Neurohirurškoj klinici Kliničkog centra Crne Gore u Podgorici operirano je 18 bolesnika s EHSLJ. Izvedena je retrospektivna analiza kliničke slike, nauroradiološkog ispitivanja i ishoda operiranih bolesnika. U našem nizu bolesnika EHSLJ je utvrđen u 0,11% kranocerebralnih povreda ili 7,9% u skupini epiduralnih hematoma. U 11 slučajeva ozljeda je nastala u prometnoj nesreći, a kod 7 bolesnika uslijed pada. Radiografskim ispitivanjem otkriven je izolirani linearni prijelom okcipitalne kosti kod 12, linerni prijelom udružen s dijastazom lambdoidne suture u 2 te izolirani dijastatski prijelom lambdoidne suture u 4 bolesnika. Vrijednost Glasgovske ljestvice za komu bila je 8 i manje kod 3, 9-12 kod 7 te 13-15 kod 8 bolesnika. Najveći broj slučajeva (90%) otkriven je unutar 24 sata. Kod svih slučajeva dijagnoza je postavljena kompjutoriziranom tomografijom. Stopa smrtnosti je bila 11,11%. Rana kompjutorizirana tomografija glave u kombinaciji s kliničkom slikom i brzom kirurškom intervencijom mogla bi smanjiti pobol i smrtnost kod ovih ozljeda.

Ključne riječi: *Lubanjska jama, stražnja – ozljede; Hematom, epiduralni – dijagnostika; Hematom, epiduralni – etiologija; Nesretan pad; Nesreće, prometne*