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CLINICAL CASES

Epidural hematoma of the vertex. Report of three cases

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Abstract

Introduction: *Epidural hematomas of the vertex occur after trauma that produces diastasis or fracture of the sagittal suture, accompanied by tearing of the superior sagittal sinus, diploe bleeding, or dural tear.* **Methods:** *The objective of the study was to show the different treatment options for patients with epidural hematomas of the vertex.* **Discussion and Conclusions:** *The series presented here contrasts the management offered to each patient, where the first case had a scheduled surgical resolution after medical surveillance, while the other two cases were not surgically managed and were only kept under surveillance.*

Keywords: *Vertex epidural hematoma. Skull fracture. Head injury. Epidural hematoma.*

Introduction

Epidural hematomas (EH) are extra-axial bleeding caused by hemorrhage from the middle meningeal artery in 85% of cases and, to a lesser extent, related to venous sinus tears (e.g., transverse or sigmoid sinuses in the posterior fossa)[1-6]. HE of the vertex (HEV) differs by bleeding of venous origin from the superior longitudinal sinus[1-6]. These frequently occur due to trauma that produces diastasis or fracture of the sagittal suture, accompanied by a tear of the superior sagittal sinus, bleeding from the diploe, a dural tear of the internal table of the skull, or associated diseases (e.g., vascular diseases in the skull)[1,7,8].

The incidence of HE in traumatic brain injury (TBI) is 2.5-4%, and only 8% of these correspond to the vertex; HE pre-dominates in the male population (87%), between the second and third decade of life, the main causes of which are road accidents (48%), armed robbery (21%), and falls (17%)[1-3,8-12].

The diagnosis suspicion of HEV exists due to a history of a direct impact on the vertex, the presence of diastasis, and/or fractures that cross the coronal or sagittal suture, as observed by imaging[5,11]. The prognosis is favorable even though the growth of the hematoma is rapid and its stabilization is also rapid. They have an average of 6.45 days of hospital stay and a complication rate of 2.97%.1,4 An associated mortality is estimated at 18 to 50%.

Herein, three similar cases are discussed with the aforementioned history and with complementary imaging studies with epidural hematomas of the vertex.

Case reports

Case 1

A 28-year-old man, with no significant history, denies ingestion of alcohol or recreational drugs, suffers, the previous day, a fall from his own height with direct contusion

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in the occipital region, a loss of awake state for 30 min (approximately), and does not have abnormal movements or seizures reported. Two hours after the accident, he began to experience intense headaches, dizziness, nausea, and vomiting without deterioration in alertness. The bone series of the skull and cervical spine show an image suggestive of a fracture in the cranial vault. 48 h after the event, the patient is conscious, oriented, and active, with a Glasgow Coma Scale (ECG) score of 15 points, with no alterations in the cranial nerves, locomotor system, or sensory organs. He presents pain on palpation in the right occipital and parietal regions. A simple skull tomography was performed, which shows epidural hematoma at the parietal level toward the convexity and hemorrhagic contusion in the left temporal lobe, with evidence of a linear fracture of the right frontal bone and partial diastasis of the sagittal suture (Fig. 1).

A craniotomy was performed at the vertex, leaving a subgaleal drainage. The patient evolved favorably, with resolution of headache and nausea, without neurological sequelae, and was discharged 7 days after admission.

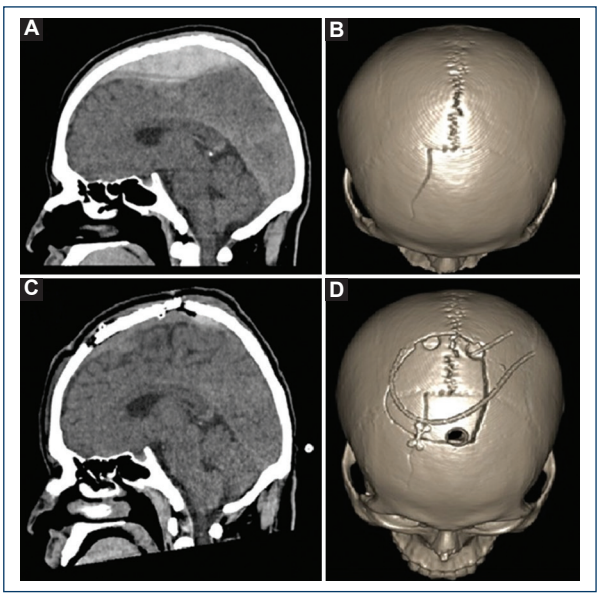

Figure 1. Simple skull tomography. **A:** sagittal sections are seen at the midline level where a hyperdense image of biconvex lenticular characteristics is observed that displaces the cerebral cortical surface from ventral to caudal. **B:** three-dimensional reconstruction, sagittal suture diastasis is seen with an irregular line drawn from posterior to anterior in the frontal bone just in front of the metopic suture. **C:** sagittal control section, post-surgical changes are observed at the level of the vertex with a residual image of smaller volume that does not displace the cerebral cortex. Adequate differentiation of sulci and gyri is seen without apparent evidence of associated pneumocephalus. **D:** three-dimensional reconstruction at the level of the vertex, craniotomy limits can be seen with the presence of a single initiating trephine, as well as the presence of osteosynthesis material at the level of the right frontal.

Case 2

A 29-year-old man, with no significant history, suffered aggression by a blunt object with multiple impacts to the head and had an apparent loss of consciousness of undefined evolution, associated with intense headaches and vomiting on three occasions, without convulsive seizures. On physical examination, the patient was conscious, with an ECG at 15 points, bipalpebral ecchymosis, 3 mm pupils, photomotor and consensual reflexes present, cranial nerves without alterations, and motor and sensory systems without alterations. Head without evidence of depression on palpation, without breaks in the scalp; extremities with bruises on the upper limbs.

The tomography showed a skull fracture in the right frontoparietal region associated with right frontal contusion and subdural hemorrhage (Fig. 2A and B).

Due to his stable neurological status, expectant management was decided, with no neurological changes or targeting data. The control computed tomography scan 4 days after his injury showed no changes compared to the previous one (Fig. 2C). After 9 days of monitoring, there was a remission of symptoms without complications.

Case 3

A 36-year-old man with road accident caused by a motor vehicle ejected three meters away. He has no loss of wakefulness, seizures, nausea, or vomiting. On ECG examination of 14 (O3V4M6) non-cooperative, 4 mm normoreflex pupils, facial symmetry, adequate hearing, shoulder symmetry, overall strength 5/5 in MRCs, and preserved sensation.

The simple skull tomography (Fig. 3) performed 1 day after the accident showed a complex bilateral parietal fracture with sagittal suture diathesis and subsidence, HEV < 15 mm, right laminar frontoparietal acute subdural hemorrhage, left frontal and temporal punctate hemorrhagic contusion, and pre-dominantly post-traumatic subarachnoid hemorrhage. in the posterior fossa at the level of the left optic-carotid cisterns, ambiens, crural, left lateral prepontine, and lateral pre-bulbar, as well as in the quadrigeminal plate Greene 2. The patient was treated with mannitol, diphenylhydantoin, buprenorphine, haloperidol

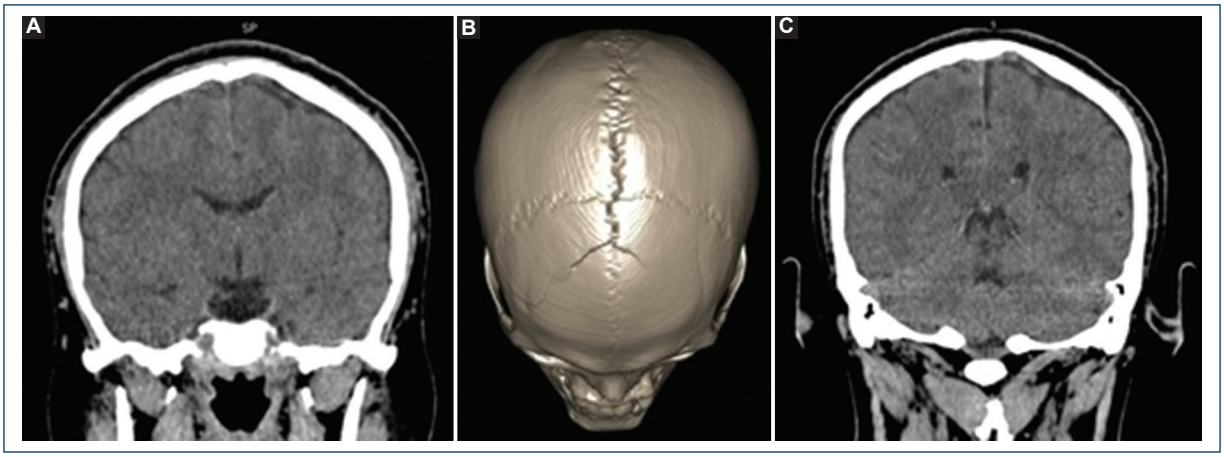

Figure 2. Simple skull tomography and three-dimensional reconstruction. **A:** coronal sections at the level of the frontal horns where a laminar image of minimal volume can be seen at the level of the vertex, which does not affect the mass effect. No dilation and/or morphological changes are seen at the level of the ventricular system. **B:** three-dimensional reconstruction, a linear trace is seen in the direction of the sagittal suture from posterior to anterior that covers the midline and is directed toward both sides in relation to pre-dominance on the right side. **C:** coronal cuts after 9 days of hospital stay. A well-known laminar image is observed without changes in relation to the previous tomography.

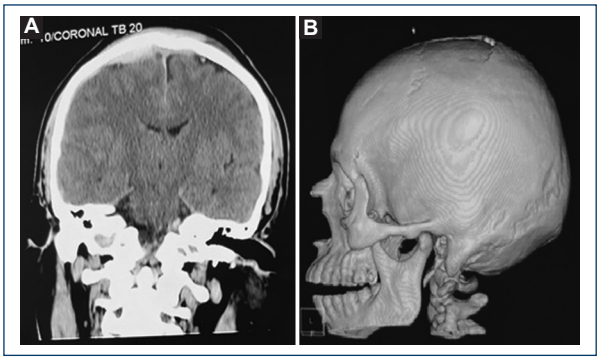

Figure 3. Simple skull tomography. **A:** coronal section where a laminar hyperdense image is observed at the parietal level that crosses the midline with bilateral distribution. In addition, there is probable soft tissue edema and/or evidence of subgaleal hematoma at the vertex level on the right side of the head. **B:** three-dimensional reconstruction lateral view. Fracture-sinking is observed at the level of the cranial vertex.

hypertonic solutions, and ondansetron. He presents a favorable evolution and is discharged after a week of surveillance.

Discussion

The case series presented here is consistent with the clinical and epidemiological characteristics known through current medical literature reports. Although HEVs are already a known entity, the objective of this document was to recapitulate the topic due to its diagnostic difficulty that still represents a diagnostic and therapeutic challenge, due to the technical limitations associated with the lack of efficient tomographs within some second-level hospital units.

The clinical evolution with an initial loss of awake state is well known, followed by a period of lucidity to again suffer neurological deterioration in almost half of patients with HE; however, the clinical course of HEV is variable.

The clinical manifestations vary from rapid neurological deterioration to a slow and progressive onset of symptoms, where most of the symptoms will depend on the location, the most common being an intense headache associated with nausea or vomiting that may be accompanied by paraparesis that is related to compression of the motor cortex. In addition, there may be secondary manifestations due to blockage of arachnoid granulations such as hydrocephalus and intracranial hypertension associated with visual alterations, papill-edema, or anisocoria related to a mortality rate of 29.7%. On the other hand, the cranial nerves usually do not present alterations. However, paralysis of the first, third, fourth, and sixth cranial nerves has been reported[2,3,5,6,8,10,13-17].

The difficulty of imaging diagnosis is described due to the confusion of the isodensity of the hematoma with the adjacent bone and the alignment of the hematoma

along the tomographic section. Furthermore, the different tomographic projections of thick sections (commonly 10 mm) prevent or limit visualization of the hematoma. Today, there are more improved diagnostic tools whose software makes 3D reconstructions of bone structures possible. Likewise, there are alternatives such as angiography, which provides information on the location of the hematoma, which is why its use has been suggested in head trauma when there are signs of intracranial hypertension without tomographic alterations. Another less invasive diagnostic tool is magnetic resonance angiography, which, unfortunately, is not accessible in all medical units[5,6,8,15].

Treatment should be individualized according to the patient's neurological conditions, lesion volume, location, and clinical evolution. Thus, small hematomas with no symptoms may not require surgical intervention. The current indications for surgery, according to the Brain Trauma Foundation (BTF), are HE > 30 cm^3 without considering the ECG, and surveillance can be maintained in HE < 30 cm^3 and < 15 mm thick with < 5 mm deviation of the midline (MLD) in patients with ECG > 8 without focal deficits. Follow-up with simple tomography should be considered within the first 6 or 8 h for those in whom expectant treatment is chosen[4-6,18].

Surgical management is recommended by means of a wide decompressive craniectomy through the MLD, which includes the margins of the hematoma, its evacuation, and control of bleeding. The craniectomy approach is performed at the vertex with a single flap or bilaterally parasagittally. There are less-used alternatives, such as percutaneous aspiration, unilateral craniectomy, or trephine drainage. The most common and important complication is associated with blood loss that occurs when exposing the superior sagittal sinus on which the hematoma sits and air embolism[5-7,11].

High mortality is also influenced by scores < 8 in the ECG assessment at hospital admission. It has been observed that the results are favorable in 54.3% of cases if there is drainage of the hematoma within the first 70 min after the appearance of mydriasis[1,2].

The series of cases presented here contrasts the management offered to each of the patients, where the first case had a scheduled surgical resolution after medical surveillance. This was due to the persistence of symptoms suggestive of intracranial hypertension. On the other hand, the other two cases did not require surgical management; they were only kept under surveillance with symptomatic management due to the increase in symptoms and signs that could lead to neurological deterioration. The surgical approach in the first case was performed through a craniotomy that contained the margins of the HEV, with a satisfactory evolution.

Conclusions

In this series of cases with HEV, the different most common etiologies were presented (accidental falls, skull contusions, and traffic accidents); all cases presented headache as the pre-dominant symptom. Likewise, in all of them, a skull fracture is demonstrated, which includes the coronal or sagittal sutures and the presence of subsidence in the third case. Only the third case had moderate TBI at the time of the initial evaluation; however, it did not require surgical management, which demonstrates the correct use of the BTF criteria.

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Conflicts of interest

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript or for the creation of images, graphics, tables, or their corresponding captions.

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