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Adequate Surgical Planning for Epidural Hematoma from Sinus Transversus Bleeding: A Case Report

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Abstract: Epidural hematomas can be caused by bleeding into the dural sinuses. In an epidural hematoma case, suspected sinus transversus involvement requires a specific examination with therapeutic management involving early diagnosis, planning, and adequate surgical technique. We reported a 21-year-old woman admission with a main complaint of decreased consciousness for two hours with Glasgow Coma Scale (GCS) score 12. CT-Scan revealed an epidural hematoma in the right temporoparietooccipital region and midline shift of 5.24 mm to the left with linear fracture of the right temporal bone. Craniotomy was performed, and intraoperatively there was a distasis fracture of lambdoidea sutura, but after bone was elevated and hemmorhage was evacuated, there was still bleeding from the right sinus transversus; therefore, duramater was hang off, packed the sinus with patties and surgicell, and there was no bleeding anymore. This was a rare and difficult case due to the fracture in the lambdoidea area. The main post-operative complication was sinus thrombosis, especially after post-repair stenosis or extrinsic compression of the sinus. The patient's outcome was a better GCS than of the first admission. In conclusion, the present case and discussion highlight the many details and technical specificities to be taken into account by neurosurgeons when encountering epidural hematoma caused by sinus transversus, which are pivotal in determining the efficacy of the approach and prognosis of the patient.
Keywords: epidural hematoma; sinus transversus; Glasgow coma scale

INTRODUCTION

Head injury (trauma capitis) is a mechanical injury that directly or indirectly affects the head, which results in injuries to the scalp, skull fractures, tears of the membranes of the brain, and damage to the brain tissue itself, as well as resulting in neurological disorders.[1]

Epidural hematoma (EDH) is bleeding into the epidural space, which is a collection or accumulation of blood in the potential space between the outer layer of the duramater (the membrane covering the brain) and the inner side of the skull bone, mostly due to trauma. This bleeding is usually confined to the sutures (joints of the skull bones). The EDH is a life-threatening condition, which may require immediate intervention and can be associated with significant morbidity (disability) and mortality (death) if not treated properly.[1,2] Prompt diagnosis and evacuation is important for better outcomes. Most EDHs are located in the temporoparietal area (70-80%), while 10% of EDHs are located in the frontal and occipital areas, usually accompanied by cranial fracture (85-96%) in the same area. Bleeding commonly occurs due to tearing of the middle meningeal artery or its branches, but sometimes it can also come from a vein.[2]

The volume of EDH is usually stable, and reaches its maximum volume only a few minutes after trauma; however, in 9% of patients bleeding is found to be progressive until the first 24 hours. Epidural hematoma is one of the most common types of intracranial hemorrhage due to skull fracture due to head injury. This condition can also be caused by bleeding into the dural sinuses. In the case of an EDH, suspected dural sinus involvement requires a specific examination with therapeutic management involving early diagnosis, planning, and adequate surgical technique. In addition, post-operative examination should focus on common complications associated with the patient's condition.[3]

CASE REPORT

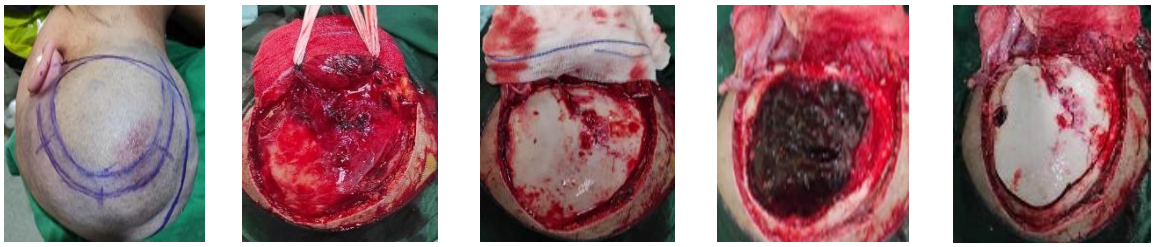
A 21-year-old woman came with a complaint of decreased consciousness for two hours from the Emergency Room. Initially, the patient was riding a motorbike because she avoided a potholed road. Unfortunately, the patient fell with her head hitting the asphalt. There was no history of fainting, no nausea, vomiting twice containing food waste, no seizures, no nose bleeding, but right ear bleeding. There was history of not wearing a helmet, however drinking alcohol was denied. The patient was then taken to Prof. Dr. R. D. Kandou Hospital for treatment.

On physical examination, the patient's condition was as follows: Glasgow coma scale (GCS) E3V5M4, round pupil isocor 3/3 mm, light reflex +/+, blood pressure: 110/70, heart rate: 74 bpm, respiratory rate 20x/min, SpO2 99% with O2 NK 3lpm, temperature: 36.8^{0}C; other physical examinations within normal limits. The axial slice of a non-contrast MSCT head scan showed the following findings: an epidural hemorrhage in the right parietal region measuring approximately 7.9 x 2.2 x 7.8 cm = 92.7 cc, accompanied by multiple foci of free air within, compressing the right parieto-occipital lobe, obliterating the posterior horn of the right lateral ventricle, and causing a midline shift to the left of 5.24 mm, and a linear fracture of the right temporal bone (Figure 1).

Figure 1. Axial CT slice of a non-contrast MSCT head scan with finding of an EDH

There was also acute intraparenchymal hemorrhage with perifocal edema or cerebral contusion in the right temporal lobe with a diameter of approximately 0.5 cm. Additional findings included fractures of the right parietal and temporal bones extending to the right mastoid, a mastoid hematoma on the right side, a subgaleal hematoma in the right parietal region, and bilateral sphenoid sinusitis.

A craniotomy was performed, and intraoperatively there was diastasis fracture of lambdoidea sutura. After the bone was elevated and hemmorhage was evacuated, there was still bleeding from right sinus transversus. Therefore, the duramater was hang off, the sinus was packed with patties and surgicell, and then there was no bleeding anymore (Figure 2).



A B C D E

Figure 2. Surgical technique. A) Design incision; B) Skin flap; C) Bone defect return; D) Epidural hematoma; E) Lambdoidea fracture

Figure 2 illustrates a complex procedure often performed in cases of head trauma to reduce intracranial pressure, manage bleeding, and repair skull fractures. A series of head surgery procedures involving the diagnosis and management of cranial conditions such as skull fractures and epidural hematoma were as follows: A) Design incision that involved planning the location and shape of the incision on the scalp using guide lines drawn beforehand. It was performed to ensure that the surgical site corresponded precisely to the pathological area. B) Skin flap: After making the incision, the skin and soft tissue were lifted in the form of a flap to provide access to the skull (cranium); C) Lambdoidea fracture: This stage revealed a fracture in the bone at the lambdoid suture, located at the back of the head, identified after exposing the skull; D) Epidural hematoma: At this point, an epidural hematoma was discovered, which was a collection of blood between the duramater and the skull, potentially causing increased pressure on the brain; E) Bone defect return: After the hematoma was removed and the area was cleaned, the previously removed bone (during the craniotomy) was returned to its original position to reconstruct the skull.

DISCUSSION

Cerebrum venous drainage presents the unique feature of venous channels lined by endothelium, situated between two layers of dura mater, called dura mater sinuses. Most of these sinuses have a triangular cross-section, walls that are stiffer than veins, and generally do not collapse when resected, being situated principally along the points of insertion of the folds of the dura mater. The dural venous sinuses can become damaged both in traumatic head injuries - penetrating or cranial fractures due to blunt trauma - and by accidental lesions or those planned during craniotomy.[4]

Although most cases of epidural hematoma are caused by arterial injury, particularly the middle meningeal artery, in some cases it can be caused by injury to the dural venous sinuses, leading to a poorer prognosis and greater complications. In a trauma, injury to the dural venous sinuses can cause severe head injury, especially involving the superior sagittal sinus[3]. To date, the literature contains a certain number of EH with detachment of the dural sinuses. Yilmazlar et al[5] described a frequency of 25% of nonarterial EH in their series of 30 patients, among whom 60% were caused by rupture of dural sinuses. Four patients with dural sinus tear were reoperated on because of recurrent hemorrhage. They reported a higher recurrence of bleeding in patients

harboring dural sinus hematomas and propose ligation of the anterior third of the SLS if necessary. It is common practice to expose the sinus in order to facilitate the use of hemostatic agents and eventually repair the lacerations.

In these situations, the source of bleeding may vary depending on the site of injury, mechanism and severity. In this case is a rare and difficult case, because there is a fracture in the lambdoidea area, so the process is more difficult than expected.[6] The main post-operative complication is sinus thrombosis, especially after post-repair stenosis or extrinsic compression of the sinus, e.g. in cases of depressed bone fractures. Sinus thrombosis can lead to increased intracranial pressure, diffuse cerebral edema, intraparenchymal hemorrhages and venous infarctions, constituting an important complication to avoid. Currently, the patient is outcome with a better GCS than when first admission.[4] Currently, the patient is outpatient with a better GCS than when the patient came. In a case reported in Brazil, they performed a right parietal craniotomy with a horseshoe-shaped incision that extended into the occipital region which allowed expansion of the craniotomy into the posterior fossa if necessary.[7] The patient is placed in the dorsal decubitus position and with an additional bolster under the right shoulder and head supported on the horseshoe headrest. After the craniotomy and hematoma were drained, a small lesion of the right transverse sinus was detected, and the wall of the right transverse sinus was sutured using 5-0 polypropylene suture in a simple whipstich technique, without the use of special devices. The approach to intraoperatif management has remained largerly unchange over the past few decades, unlike the increased accessibility of CT head scans. The effective management of hypovolemic shock at accident scenes appears to be so successful that it does not significantly impact the prognosis of patients with EDH.[8] After the surgical procedure, the patient was transferred to the ICU and the postoperative CT scan showed satisfactory hematoma drainage. And the patient is progressing well and undergoing outpatient follow-up from the initial GCS.[9] The analysis of cases in another study shows a high mortality rate in case with dural sinus injuries then other injuries.[10]

CONCLUSION

The present case and discussion highlight the many details and technical specificities to be taken into account by neurosurgeons when encountering EDH caused by dural venous sinus injury, and which are pivotal in determining the efficacy of the approach and prognosis of the patient. Thus, successful surgical management entails early diagnosis, preparation of the anesthesia team, patient position on the operating table, the ideal craniotomy, the individualized choice of ligation or repair, and the best technique applicable for the patient. In any event, clinicians should remain alert to the greater risk of dural sinus thrombosis during the postoperative period.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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