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Case Report

Traumatic acute epidural hematoma caused by injury of the diploic channels

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ABSTRACT

Background: Traumatic acute epidural hematomas (EDHs) commonly develop by rupture of the meningeal arteries. EDH caused by an injury of the diploic channel (DC) has not been reported.

Case Description: A 21-year-old man suffered a head injury while falling off the skateboard. At presentation, the patient was drowsy but did not exhibit any focal neurological deficits. Cranial computed tomography (CT) revealed a biconvex intracranial hematoma with 18-mm thickness in the high parietal region and a linear fracture that involved both the outer and inner tables and passed above the hematoma. A well-developed and large DC was observed near the hematoma. Patient's consciousness level decreased at 12 h after admission with considerable growth of the hematoma. A frontoparietal craniotomy revealed an EDH. The dura mater and the meningeal arteries underneath the hematoma were intact. The medial bone cut caused brisk bleeds from the large DC. Postoperative CT revealed the cut of the DC and other finer DCs exhibiting air density and lying near the fracture. Based on these findings, we assumed that the EDH was developed by an injury of the DCs.

Conclusion: Traumatic EDH can develop by an injury of the DCs. Careful observation of patient's neurological status and precise interpretation of neuroimages is important to identify venous EDHs.

Keywords: Acute epidural hematoma, Diploic channel, Traumatic, Venous hemorrhage

INTRODUCTION

Traumatic acute epidural hematomas (EDHs) are well-known entities that develop in approximately 2% of all head injuries, with mortality rates ranging from 1.2% to 33%.[5] They are more commonly observed in young males involved in traffic accidents and fall from a height.[4] EDHs are generally visible on computed tomography (CT) performed immediately after the injury. However, in 30% of the cases, they may be discovered at a later CT. In such cases, they are termed delayed EDHs.[1] Traumatic acute EDHs usually develop secondary to meningeal arterial bleeding, while venous EDHs have little been documented.[2] Diploic channels (DCs) are distinct venous pathways formed in the diploe of the calvarium.[6] The anatomofunctional implications of DCs are elusive with infrequent association with pathological conditions.[7] We present a unique case of acute EDH that was assumed to develop by an injury of the DCs.

CASE PRESENTATION

A 21-year-old, previously healthy man, suffered a head injury while falling off the skateboard and was transported to our hospital. The patient lost consciousness for 1 min immediately after the injury. At

presentation, the patient was drowsy and exhibited a Glasgow Coma Scale (GCS) score of 13 without any focal neurological deficits. Cranial CT revealed a biconvex intracranial hematoma with 18-mm maximum thickness in the left high parietal region and a linear fracture coursing parallel to the sagittal suture [Figure 1]. The fracture line involved both the outer and inner tables and passed above the thickest part of the hematoma. A well-developed and large DC was present near the hematoma [Figure 2]. The GCS score of the patient decreased to 11 at 12 h after admission. CT scan showed considerable growth of the hematoma with an increased thickness of 25 mm [Figure 3]. The patient underwent an emergent hematoma evacuation. On reflecting the scalp flap, egress of venous blood was noted along the fracture. A frontoparietal craniotomy revealed a dark red-colored, solid EDH. The dura mater and the meningeal arteries lying underneath the hematoma were intact. The medial bone cut caused brisk bleeds from the large DC. The bleeds were readily controlled by plugging with bone wax [Figure 4]. The postoperative course of the patient was uneventful. CT performed immediately after surgery revealed a complete cut of the large DC, in addition to other finer DCs lying near the fracture line and exhibiting air density [Figure 5].

DISCUSSION

Traumatic acute EDHs usually develop by ruptures of the meningeal arteries. However, based on the time course of the patient's neurological status and neuroimaging and intraoperative findings, we assumed that the present EDH developed by injuries of the DCs. Direct anatomical connections between a well-developed and large DC that was cut during the medial bone cut and finer DCs lying near the fracture line were not demonstrated. However, postoperative CT images were highly suggestive of such connections. These DCs are presumed to correspond with the previously documented, the occipitoparietal route of the calvarial DCs that consistently connect the superior sagittal sinus and transverse sinus-sigmoid sinus junctional region.[6]

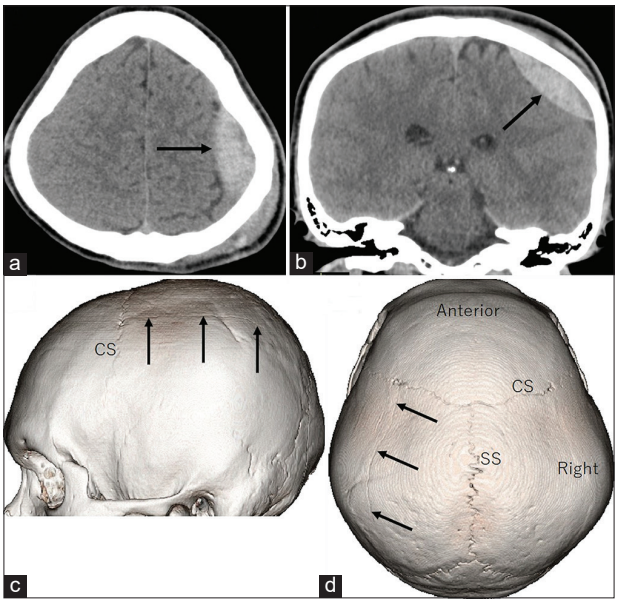

Figure 1: Axial (a) and coronal (b) computed tomography scans at presentation show a biconvex hematoma with 18-mm thickness in the left high parietal region (arrow). Lateral (c) and superior (d) views of the three-dimensional computed tomography scans show a linear fracture in the left parietal bone passing parallel to the sagittal suture. CS: coronal suture.

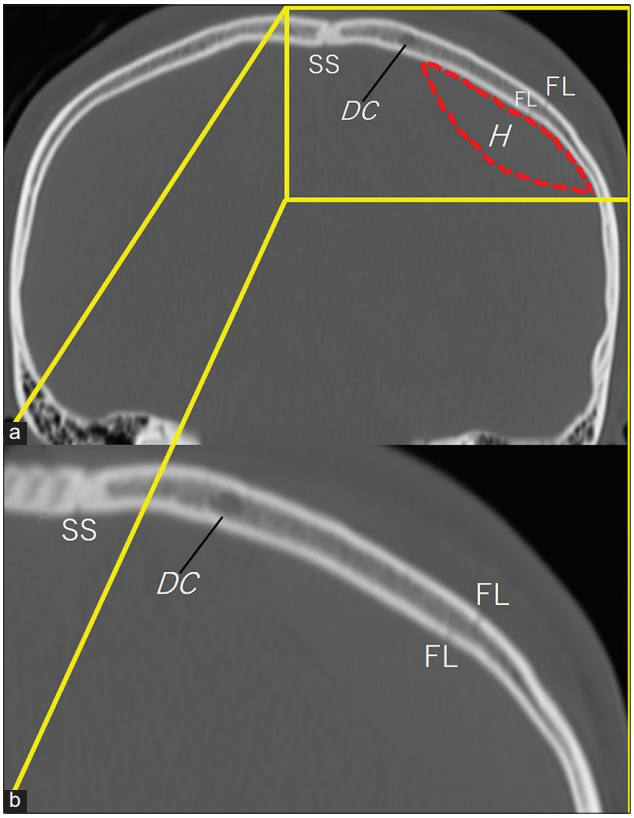

Figure 2: (a) Bone target coronal computed tomography scan show a fracture line passing above the thickest part of an intracranial hematoma (h). A well-developed and large diploic channel is observed near the hematoma. (b) Bone target coronal computed tomography showing the magnified view of the boxed area in A. SS: Sagittal suture. DC: Diploic channel, FL: Fracture line, H: Hematoma

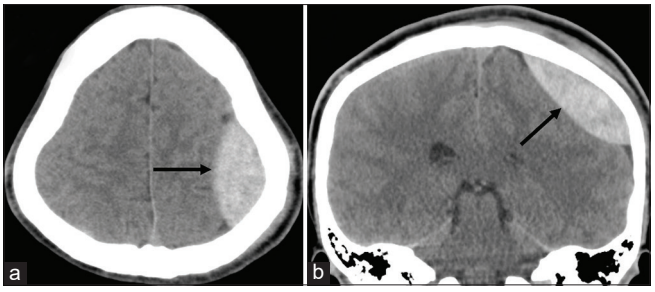

Figure 3: Axial (a) and coronal (b) computed tomography scans performed 12 h after the admission showing the growth of the hematoma with an increased thickness of 25 mm (arrow).

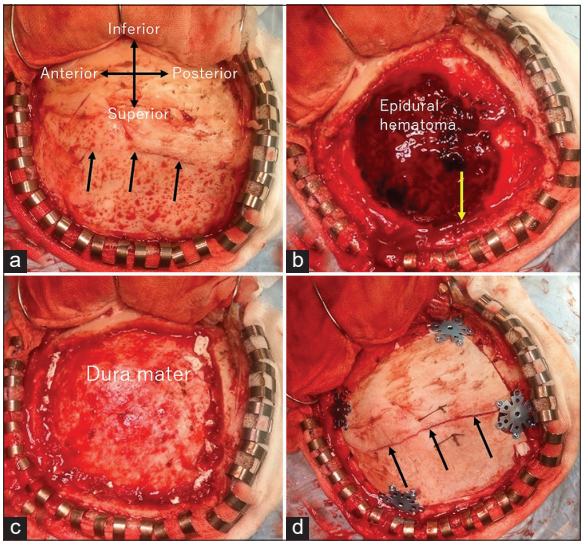

Figure 4: Intraoperative photographs on reflecting the scalp flap (a), immediately after removal of the bone flap (b), after the evacuation of the epidural hematoma (c), and after fixing the bone flap back into the original place (d) are depicted. Abnormal vasculature or injury of the dural arteries is not observed. Arrow in (b) indicates the site of a large diploic channel that was cut by the medial bone fracture caused brisk bleeds. Arrows in (a) and (d) indicate the fracture line.

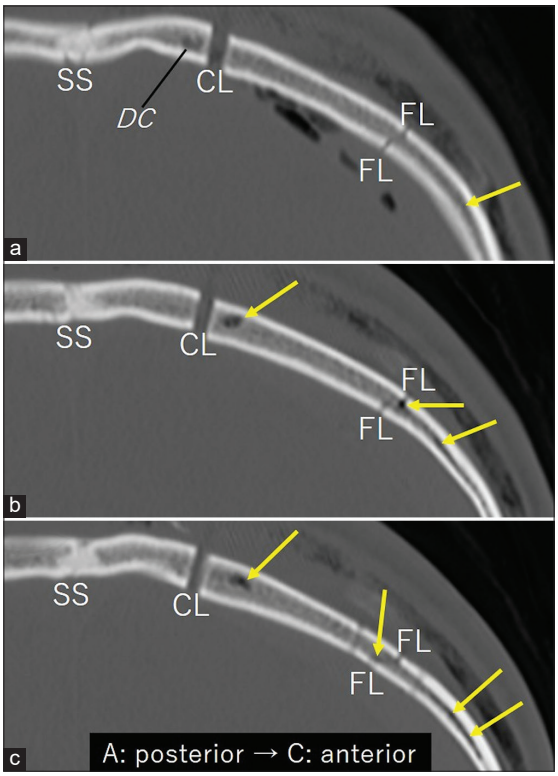

Figure 5: (a-c) Serial bone target coronal computed tomography scans performed immediately after surgery shows the cut of a large diploic channel (DC) by the medial bone cut and other finer DCs lying in the bone flap and exhibiting air density (arrows). CL: craniotomy line, FL: fracture line, SS: sagittal suture.

Anatomically, the part of the meningeal artery coursing through the high parietal region is a fine peripheral vessel that transmits a tiny amount of blood flow.[3] Furthermore, in the present case, the meningeal arteries lying underneath the hematoma were intact. Therefore, we assumed that an arterial origin was unlikely in the present EDH.

CONCLUSION

Traumatic EDH can develop by injury of the DCs. Careful observation of patient's neurological status and precise interpretation of neuroimages is important to identify venous EDHs.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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