CASE REPORT

Unusual venous sinuses

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Abstract

The dural venous sinuses lie in between the two layers of the dura mater. The dural venous sinuses are important, because they receive blood from the brain and the cranial bones. All sinuses are related to the inner surface of the skull, except for the inferior sagittal and the straight sinus. The sinuses related to the inner surface of the skull produce impressions on it. During routine ostelogical teaching for undergraduate medical students, we observed an unusual oblique sinus, which connected the right and the left transverse sinuses. This unusual oblique sinus measured 2 cm and had a course from the right to the left side. The superior sagittal sinus turned onto the right but at a much higher level than the left transverse sinus. Although these sinuses communicated with each other, the normal position of the confleunce of the sinus (meeting point of superior sagittal sinus, right and left transverse sinus and the occipital sinus) was not seen. The impression meant for the posterior lobe of the left cerebral hemisphere was distinctly greater than that of the right side. The presence of such an anomaly suggests a possible developmental defect or handedness of the individual. The knowledge of the anatomical variations of the dural venous sinuses may have great clinical implications during venography, shunt surgeries and also helpful for neurologists and radiologists in addition to academic interest *(Fig. 2, Ref. 10)* Full Text (Free, PDF) *www.bmj.sk*.
Key words: dura matter, sinuses, veins, skull, variations, anomaly.

Dural venous sinuses are responsible for the drainage of the blood from the skull and the brain (1). Intracranial venous sinuses differ from the veins in having no muscular and adventitial wall. There are no valves presnt in these sinuses and the endothelial lining is continuous with the veins. The tributaries of these sinuses are the veins from the brain, the diploic veins draining the skull and the emissary veins. Developmentally, the sinuses emerge as the venous plexuses and a variable degree of plexiform arrangement, rather than the single luminal structure found in majority of these sinuses (1).

The knowledge of the dural venous sinus anatomy is important for diagnosing any dural sinus venous thrombosis. MR venography and catheter angiography have been used to study the normal and the abnormal variations of the intracranial venous channels (2). Understanding the flow gaps (aplasia) of the sinus is important during interpretationof MR angiograms (3). Interestingly, the asymmetry of the transverse sinus has been linked to the change in intraocular pressure and respiration (4, 5).

The present study, describes anomalous sinuses, found on the interior of an occipital bone and discusses its clinical implications. The presence of anomalous sinuses may be important for acedemic purpose and also beneficial for clinicians, neurosurgeons and radiologists in day to day clinical practice.

Case report

During routine osteological teaching for undergraduate medical students, we detected an occipital bone with an unusual groove for the dural venous sinuses. The grooves meant for all the dural venous sinuses were studied in detail. Morphometric measurements were taken and the specimen was photographed (Figs 1 and 2).

Observation

From the upper border of the lambdoid suture, the superior sagittal (Fig. 2a) suture measured 4 cm vertically The groove for

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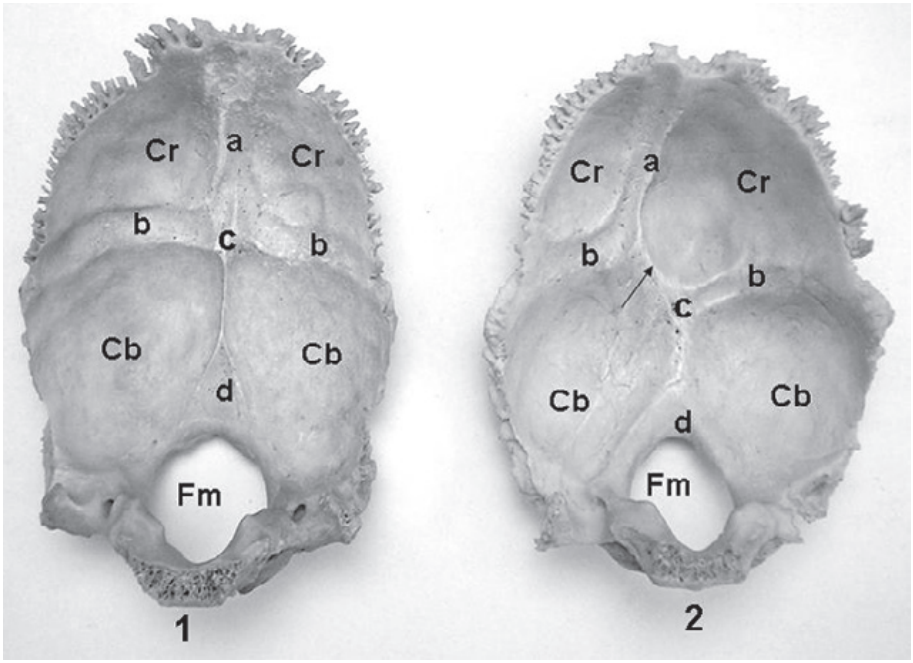

Fig. 1. Photograph of interior of occipital bone showing comparison of: 1. Normal Occipital bone & 2. Anomalous Occipital bone. Cr: Impression for lobe of cerebrum, Cb: Impression for lobe of cerebellum. a: Groove for superior sagittal sinus, b: Groove for transverse sinus, c: Confluence of sinus, d: Vermian fossa, Fm: Foramen magnum. Groove for anomalous sinus is shown with arrow (increased).

the superior sagittal sinus descended and then turned towards the right side to continue as the right transverse sinus. The groove for anomalous oblique sinus measured 2 cm in length, with an downward inclination from the right to the left side (Fig. 2c). The transverse width of the groove for right and left transverse sinus measured 3.4 cm and 4.5 cm, respectively.

The impression for the posterior lobe of the left cerebral hemisphere, was greater than that of the right (Fig. 1Cb). Thus, it was clearly observed that the left cerebral lobe was of bigger size than that of the right. The confluence of sinus was not observed in its usual position i.e. at the junction of superior sagittal, transverse sinus and the occipital sinuses.

Discussion

According to standard anatomy description, all the venous sinuses except the inferior sagittal and straight sinus are found to be located in between the two layers of the dura matter (6). These venous sinuses are responsible for drainage of blood from the brain and the skull bone (1, 6). The superior sagittal sinus grooves the parietal bone along the midline of the vault of the skull with 3–4 lakes of blood projecting laterally from it (6). The superior sagittal sinus usually turns to the right at the internal occipital protuberance (6) but in the present case, it did turn to the right, but much above the internal occipital protuberance. There was an absence of confluence of sinus which is at the meeting point of the sagittal, transverse and the occipital sinuses. These suggest a possible developmental defect or may be linked to the handedness of the individual.

The impression for the posterior part of the left cerebral hemisphere, as observed in the present case, was much larger than the

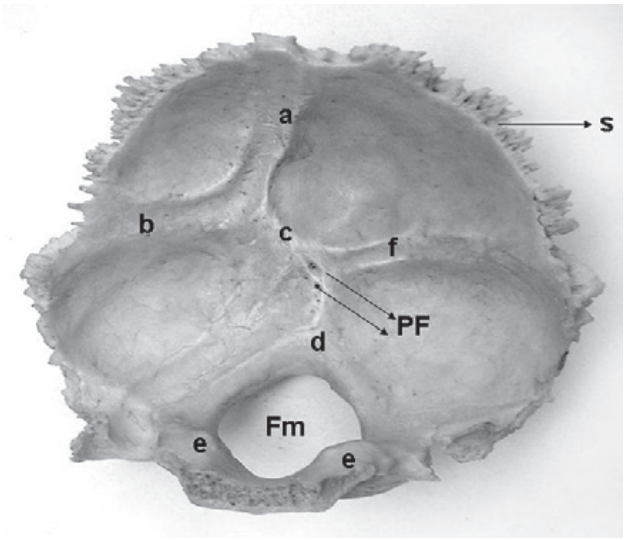

Fig. 2. Photograph of interior of anomalous occipital bone showing: a: Groove for superior sagittal sinus, b: Groove for right transverse sinus, c: Anomalous sinus, f: Left transverse sinus, s: Lambdoid suture, PF: Parietal Foramen, d: Vermian fossa, e: Jugular tubercle, Fm: Foramen magnum.

right side and it was impinging on the right cerebellar hemisphere (as seen in ‚2' in Fig. 1). We presume, this may have resulted in causing neurological defects. In the absence of the history of the individual, no such fact could be corraborated.

In the absence of proper confluence of sinus, there might be a possibility that the venous tributaries from the nearby cerebral and cerebellar hemisphere may have anomalous drainage pattern. According to standard anatomy text book description, the right transverse sinus is usually larger than the left transverse sinus (6) but in the present case, we noticed the left transverse sinus to be more in length when compared to the right. Considering the fact, that often when the usual surface anatomy of the transverse sinus is described, as a horizontal line from the external occipital protuberance to the top of mastoid process, one may arrive at an erroneous conclusion in presence of such anomalies.

The incidence of hypoplasia of the left transverse sinus is more as compared to the right transverse sinus (7). In the present case, we noticed the right transverse sinus to be less in dimension as compared to the left. The anomaly may be considered as a rare entity based on the findings which usually deviate from that of the existing literature. It is very essential to appreciate the flow gaps or aplasias. The normal anatomical variations of the venous sinuses are to be clearly understood, in order to avoid misdiagnosis of cerebral venous thrombosis (7).

An earlier research study, had defined the straight sinus to exhibit different types with associated variations of confluence of sinus (8). Asymmetry of the transverse sinus is important while observing the flow gaps or aplasias (3). A proper knowledge of these gaps are important for correct diagnosis of dural sinus thrombosis. Interestingly, the asymmetry of the transverse sinus has been found to be linked to intraocular pressure (4). It has been documented that if a transverse sinus is larger on one side, then the venous drainage would be greater on that side with the resultant intraocular pressure decreased on that side (4). In the present study, we speculate that there might have been decreased intraocular pressure on the right side as the transverse sinus on the right side was smaller in dimension.

Research reports have also described the asymmetrical transverse sinus being linked to the jugular venous oxygen saturation and this makes the clinical importance of such anomalies more important. (5).

Cerebral venous drainage dominance assumes immense clinical importance and should be carefully considered before any for surgical interventions involving radical neck dissection, removal of tumors in the neck that invade the internal jugular vein or tumors of the glomus jugulare, which may require ligation of the internal jugular vein(9) .

Anatomical knowledge of the venous sinuses are also important as inadvertant injury during any intracranial surgery may cause exceesive bleeding. Neuro surgeons operating on the tentorium cerebelli may also benefit from any prior kowledge about the venous sinuses present in the tentorium cerebelli (10).

We as anatomists opine that anomalous dural venous sinuses, if present, may pose a challenge to the neuro-surgeons, who should be aware of the normal and the abnormal variants to have a pre-operative plan. Presence of abnormal dural venous sinuses may also be important for clinicians diagnosing dural sinus thrombosis and radiologists performing MR studies.

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