Anomalous craniovertebral venous drainage: A pitfall in diagnosis of dural sinus thrombosis

Clinical History:

The patient presented with complaints of deafness of uncertain duration and an audiogram confirmed left sided sensorineuronal deafness. Routine MR examination was unremarkable and a contrast enhanced CT of the petrous temporal bones was performed.

Imaging Findings:

The patient presented with complaints of left sided deafness of uncertain duration. There was no tinnitus and no other history of trauma or infection. Clinical examination was unremarkable. The audiogram confirmed left sided sensorineuronal deafness and was normal on the right. In view of the sensorineural hearing loss, MRI of the head with high resolution turbo-spin echo T2W imaging of the internal auditory meati was performed, which was normal. Concern persisted because of the unexplained sensorineural deafness and therefore contrast enhanced dynamic multislice CT of the petrous temporal bones was performed (acquired slice thickness 0.5mm, pitch 5.0, reconstructed 2mm contiguous slices). The appearance of inner ear, middle ear and ossicles was normal on both sides. On the right side there was a normal sigmoid sinus draining into the jugular vein, through a normal jugular foramen. On the left the proximal sigmoid sinus was small and no distal sigmoid sinus was seen. Initially thrombosis of the left sigmoid sinus was suspected. However, there was anomalous drainage of the proximal left sigmoid sinus via a mastoid emissary vein into a suboccipital vein. MR venography done using a time of flight sequence confirmed these findings and excluded venous thrombosis. CT in addition showed associated hypoplasia of the jugular foramen. This venous anomaly was considered a variant anatomy not contributory to symptoms and should not be mistaken for venous thrombosis. It was concluded at follow-up that the sensorineuronal hearing loss might be related to a past history of German measles.

Discussion:

The venous drainage of the cranio-cervical region is to the internal jugular and vertebral veins. Intracranial venous drainage from the superior sagittal sinus and the deep cerebral veins is usually directed through the torcular to the sigmoid sinuses and the internal jugular veins. However there are many venous communications between the basal venous structures, resulting in a valveless and freely communicating system, which can be divided into intra- and extra-spinal components. Anteriorly, the extraspinal component receives drainage from the cavernous sinuses through the pterygoid plexus of veins. The dorsal extraspinal component is connected to the suboccipital venous plexus and the lateral sinuses communicate with the suboccipital plexus through mastoid and condylar emissary veins. The importance of these emissary veins is increasingly appreciated, as it is now proposed that in the erect
posture cerebral venous drainage is preferentially via the vertebral rather than internal jugular systems. There are many variations of the lateral and occipital sinuses documented in the region of the torcular at anatomic dissection and jugular venography. In a series of 192 retrograde jugular venograms in 163 patients, unilateral aplasia proximal to the jugular bulb was demonstrated in 1.3% of cases, and one case of bilateral aplasia was found. Aplasia of the sigmoid sinus in conjunction with a high lying jugular bulb has been described. In this patient, CT was reported to be unremarkable but retrograde jugular venography showed obstruction at the level of the jugular bulb. No sigmoid sinus was found at surgery. Kalbag and Woolf cite a few case reports of unilateral absence of the sigmoid sinus including a report by Peter in 1919 of a case recognised when a large mastoid emissary vein draining the transverse sinus was accidentally opened and bled profusely. However it is rare to recognise agenesis of sigmoid sinus and jugular bulb at cross-sectional imaging. This case illustrates the effectiveness of multislice CT in demonstrating both venous and bony variations associated with anomalous cerebral venous drainage. Though CT venography is effective, it involves ionising radiation and MR venography is regarded as the method of choice in the investigation of dural sinus thrombosis. As in this case MR Venography confirmed the anomalous venous drainage and helped to exclude dural sinus thrombosis. CT at times, can show the additional bony anatomy that will alert to the possibility of absent flow being due to an anatomical variation rather than thrombosis . In conclusion, there are several normal variants of craniovertebral venous drainage and it is important to be aware of these to avoid potential pitfalls, while making the diagnosis of dural sinus thrombosis. MR Venography is the modality of choice for dural sinus thrombosis, however CT Venography has been shown to be as reliable as MR Venography and in addition can show associated bony anomalies.

**Differential Diagnosis List:** Anomalous craniovertebral venous anatomy

**Final Diagnosis:** Anomalous craniovertebral venous anatomy

**References:**


**Figure 1**

Description: CT of petrous temporal bone (bony windows) shows hypoplasia of the left jugular foramen.

Origin:
Description: Contrast enhanced dynamic CT of petrous temporal bone shows that the left proximal sigmoid sinus is draining into a mastoid emissary vein (arrow). Origin:
**Description:** Contrast enhanced dynamic CT of petrous temporal bone shows that the left sided sigmoid sinus is absent distally with a prominent draining suboccipital vein (arrow). **Origin:**
**Description:** Venography shows aplastic left transverse and sigmoid sinuses and the prominent draining emissary vein (long arrow). **Origin:**