Giant parietal foramina
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Clinical History:

Clinical examination in a young baby girl demonstrated large anterior and posterior fontanelles. No other clinically worrying features were seen and the child was doing well. At the age of 4 months skull radiographs were performed to look for possible skeletal dysplasia or craniosynostosis.

Imaging Findings:

Skull radiographs at 4 months of age (Figure 1) demonstrate a large midline defect at the posterior aspect of the parietal bones with a single parasagittal focus of ossification within the centre of this defect.

As there were no clinical concerns, follow-up imaging with MRI was performed after a 1 year interval in the now 16 month old girl (Figure 2). The bilateral parietal osseous defects in the skull are seen without herniation of brain parenchyma or meninges.

Hypoplasia of the straight sinus and anomalous venous drainage through a persistent falcine sinus is seen flowing into the sagittal sinus.

Further follow up with plain film imaging was performed at ages 3 and 4 (Figure 3) with progressive closure of the large midline defect but persistent bilateral parietal foramina.

At age 5, a CT scan of the skull bones (Figure 4) is performed as pre-operative planning for cranioplasty.

Discussion:

Giant parietal or frontal foramina are remnants of arrested fetal cranial development and can be very large and midline at birth. Parasagittal islands of ossification are often present and the underlying brain is covered by a membrane of dura and pericranium. They usually close during mid-childhood, leaving only paired foramina in the parietal or frontal bones, which may persist through life. The overlying scalp is intact [1].

As is the case in this patient, associated brain anomalies have been described, particularly abnormal venous drainage through a persistent falcine venous sinus [2].

The falcine sinus is an embryonic vessel that normally closes after birth. It develops from the mesenchyme in the mesencephalic flexure. It is located between the two layers of the falx cerebri and drains the galenic system into the superior sagittal sinus. Associated abnormalities of the straight sinus, which can be hypoplastic or absent have been well described [3].

Persistence of the falcine sinus was considered a rare entity although a more recent study discovered an incidence of 2.1% in an adult population [4]. The entity has been described with various congenital disorders as vein of Galen malformation, arteriovenous malformation, occipital encephalocele, absence of the corpus callosum, Apert’s
syndrome, osteogenesis imperfecta, Chiari II malformation [3] and more recent with Duane syndrome [5]. Recanalisation of the sinus after venous sinus thrombosis or obstruction of the straight sinus due to extrinsic compression has also been described [3].

A strong genetic predisposition exists for giant parietal foramina as they are caused by a heterozygous mutation in the homeobox genes ALX4 and MSX2 located at 5q34-35 and 11p11 respectively [6]. Treatment for enlarged parietal foramina is generally conservative but with a persistent large defect, operative closure may be indicated. Cranioplasty with autologous calvarial bone grafts or mesh plating systems is recommended for those at risk for penetrating injury in the unprotected cerebrum, such as active young children or patients with seizure disorders [6].

**Differential Diagnosis List:** Giant parietal foramina, Cleidocranial dysostosis, Potocki-Shaffer syndrome, Frontonasal dysplasia

**Final Diagnosis:** Giant parietal foramina

**References:**


Description: Inclined AP X-ray of the skull. A large midline defect is seen at the posterior aspect of the parietal bones. A single parasagittal focus of ossification (arrow) is present within the centre of the defect. Origin: Department of Medical Imaging, The Royal Children’s hospital, Parkville, Australia
Description: Lateral X-ray of the skull demonstrating the parietal osseous defect. Origin: Department of Medical Imaging, The Royal Children's hospital, Parkville, Australia
Figure 2

Description: Coronal T1 MRI image.
Bilateral parietal osseous defects are seen (between arrows). No herniation of brain parenchyma or meninges through the defect. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: Sagittal T2 MRI image.
Hypoplasia of the straight sinus and anomalous venous drainage through a persistent falcine sinus are seen. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: Sagittal T1 post Gd contrast MRI image. Hypoplasia of the straight sinus and anomalous venous drainage through a persistent falcine sinus are seen. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Figure 3

Description: AP skull X-ray at age 3 years. The large midline defect has now closed but the parietal foramina still remain present. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: AP X-ray at age 4 years. Persistence of the bilateral parietal foramina. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: Lateral X-ray at age 4 years. Persistence of the bilateral parietal foramina. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Figure 4

Description: Coronal CT skull - bone window. No further closure of the foramina is seen compared to the previous studies. Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: Lateral CT skull - bone window Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia
Description: CT skull - 3D reformat - view from posterior
Origin: Arys B, Medical Imaging Department, The Royal Children's Hospital, Parkville, Australia