**MR Imaging of the Fetal Cerebellar Vermis in Utero: Description of some Useful Anatomical Criteria for Normal Development**

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**Purpose**
To define easily identifiable and reproducible measurements and markers of normal anatomic development of the fetal cerebellar vermis in vivo.

**Embryology (what is already known)**

- Developmental
- V vermicle (not yet visible)
- V vermicle notch not visible
- V vermicle notch thicker
- V vermicle complete

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**Materials & Methods**

Retrograde analysis of midline sagittal view of 189 consecutive fetal MRI examinations were performed for CNS and non-CNS indications.

Analysis included identification of the following:

- **fastigium**
- **vermian**
- **cranio-caudal diameter**
- measurement of ratio of vermis tissue above and below the fastigium-declive line
- line drawn from the **fastigium** to the dorsal most point of the vermis the 
- **tegmento-vermian angle**
- Foculys imaged for assessment of abnormalities affecting the posterior fossa structures (n=42) were evaluated separately.

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**Anatomy and measurements**

- Image adapted from Duvernoy 1995
- Normals: Pre-culmenate fossure: appears from 21-23 weeks
- Normals: pre-pyramidal fissure: appears from 24-26 weeks
- Normals: primary fissure: appears from 27-28 weeks
- Normals: secondary or post-pyramidal fissure: appears from 29-31 weeks
- Normals: uvula/nodule: appears from 31-33 weeks

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**Results**

Gestational age ranged from 14.0 to 38.6 weeks with a mean of 26.7 weeks. Useful midline sagittal views were obtained in 152 studies for a total of 230 measurements. Cranio-caudal diameter of the cerebellar vermis follows a first order polynomial equation with an R² value of 0.89. **cranio-caudal diameter (mm): 0.74 x gestational age (weeks) – 6.11**

Average height above and below the fastigial point also increased linearly, with percentages above and below between 39.8% and 59.3% (average 47.9% & 52.1% respectively), and no significant change in this ratio with gestational age. The tegmento-vermian angle was almost always 0° in normal fetuses, only one normal fetus had an angle of between 6-9°.

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**Conclusions**

1. The **fastigium** should be clearly visualized at any gestational age in the normal fetuses.
2. The vermis should cover the 4th ventricle by 17-18 weeks gestation, but initially may be slightly smaller inferorly.
3. There should be linear and symmetrical growth of the vermis throughout gestation.
4. The ratio of vermis tissue above and below the **fastigium-declive line** should be slightly below unity and not change significantly.
5. A slightly increased tegmento-vermian angle may be a normal variant and does not necessarily predict an adverse outcome.
6. The **declive** and primary fissure should always visible in normal fetuses from 17.5 weeks. The other lobules (besides declive) become visible from 24 weeks and most were visible by 27 weeks.
7. The other fissures should be visible as follows: the **secondary and post-pyramidal fissure** from 20 weeks, the **pre-pyramidal** from 21 weeks, and the **pre-culmenate** from 22 weeks. There is therefore a delay of between 10 weeks between identification of these features in live fetuses versus fetal specimens (Chong 1997, Nakayama 1999).

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**References**