Central nervous system

- Malformations – some of the most common of all congenital abnormalities
- Neural tube defects – the most frequent at 1-2 cases per 1000 births
- Long term studies suggest intracranial abnormalities may be as high as 1 in 100 births

Central nervous system

- Sonography is THE tool to visualize anatomy, pathology and developmental changes
- Most common approach is transabdominal – usually can obtain axial planes or views
- Highly skilled sonographers use transvaginal scanning to obtain coronal and sagittal views
- 3D sonography allows one to view all 3 orthogonal planes

International Society of Ultrasound in Obstetrics and Gynecology guidelines 2007

- “basic examination”
- “targeted exam or neurosonogram”
“basic examination”

- Intracranial
- 3 views and 2 components
- Views: transventricular, transthalamic and transcerebellar
- Components: biometry and evaluation of brain anatomy

“basic examination”

- Transventricular plane
- Components: anterior and posterior portions of the lateral ventricle, cavum septum pellucidum, atrium and choroid plexus
- CSP seen from 18-37 weeks
- Atrium of the lateral ventricle “filled” with choroid plexus
- Choroid plexus is very echogenic and produces the spinocerebral fluid

“basic examination”

- Medial and lateral walls of the lateral ventricle parallel to midline and easily measured
- At any gestational age, should measure 10 mm or less
“butterfly” sign

“basic examination”
- Transthalamic plane
- Inferior and parallel to transventricular plane
- Contains: frontal horns, CSP, thalami and hippocampal gyri
- Plane used to perform all measurements: BPD, HC, and OFD

“basic examination”
- Transcerebellar plane
- Inferior to the transthalamic plane and tilted posteriorly to image the posterior fossa
- Structures: frontal horns, CSP, thalami, cerebellum and cisterna magna
- Cerebellum – composed of 2 rounded cerebellar hemispheres and joined by vermis; measured from the outer-to-outer edge; 18th and 24th the TCD equals # of weeks
“basic examination”

- Cisterna magna: fluid filled space; measured from posterior aspect of cerebellum and inner edge of occipital bone; > 10 mm considered abnormal
- Thin septa commonly seen within the CM
- Caution: inferior vermis is not completely formed until 20 weeks

“basic examination”

- Cavum septum pellucidum
  - Fluid filled cavity in between the frontal horns
  - Visible between 18 and 37 weeks
  - If not seen, abnormalities such as agenesis of the corpus callosum and septo-optic dysplasia could be present

Fetal spine

- Visualized starting at 14 weeks
- 3 planes should be obtained: sagittal, coronal and axial or transverse planes
- Very dependent on fetal position – usually can obtain at least two views
Fetal spine

- Axial or transverse plane
- Sweep up and down evaluating the cervical, thoracic, lumbar and sacral segments of the spine
- 3 ossification centers - body and 2 posterior arches - seen in a triangular shape

Fetal spine

- Sagittal plane
- Usually see 2 parallel lines: the ossification center of the vertebral body (one line) and one of the posterior arches (second line)
- Lines flare in upper cervical region and converge towards the sacrum
- Intact skin should be seen above 2 lines
Fetal spine

- Coronal plane
- Can see one, two or three parallel lines depending on fetal position

Choroid plexus cyst

- Cysts within the CP
- > 2 mm
- Resolve in third trimester
- Seen in 1% of second trimester scans
- 50% of T18 fetuses have CP cysts
- Refer
Spina bifida – spinal findings

- Splayed posterior arch ossification centers
- Myelomeningocele sac – 80%
- 73% lumbar
- Transverse view best to see bony defect
- Almost 100% are detectable

Spina bifida – cranial and intracranial findings

- Easier to see than spinal defect
- Frontal bone scalloping or “lemon” sign
- 99% have Chiari II malformation
- Cerebellum curved around midbrain or “banana” sign
- Obliteration of cisterna magna
- Ventriculomegaly - > 10 mm
Ventriculomegaly

- Measured at atrium of lateral ventricle
- 10 -15 mm: mild ventriculomegaly
- > 15 mm: moderate to severe
- Normal posterior fossa (CB and CM)
- “Dangling” choroid
- Head size may be large
- Thinning of cortical mantle
Anencephaly

- No calvarium
- Varying amounts of neural tissue
- CRL less than expected
- Protuberant eyes
- Polyhydramnios common
- Can be diagnosed between 10 and 14 weeks
- 100% detected in the second trimester
Encephalocele

- Herniation of intracranial structures through a skull defect
- Paracranial mass with boney defect
- Occipital, parietal, vertex and frontal locations
  - 80% occipital
- Diverse appearance of herniated tissue – mixed cystic/solid mass
  - 70% ventriculomegaly; 25% microcephaly
Arachnoid cyst

- Cerebrospinal fluid collection enclosed within layers of arachnoid
- Extra-axial cyst
- Most common over cerebral convexities
- One third of cases occur in the posterior fossa
- Remaining brain usually appears normal
Holoprosencephaly

- Single ventricle
- Absent midline structures
- Fused thalami
- Facial anomalies
- Alobar, semilobar and lobar

Dandy Walker
FIGURE 1. Axial scan at the transthalamic plane. A demonstrates the biometric measurements of the biparietal diameter (BPD), head circumference (HC), and occipitofrontal diameter (OFD), which are routinely performed during the screening or basic scan. B shows the anatomic landmarks of the transthalamic plane (AH indicates anterior horns; CP, choroid plexus; CSP, cavum septi pellucidi; Th, thalamus).