Fetal Neck Mass

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Radiology Core Clerkship
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Fetal Ultrasound

• Standard imaging modality for prenatal screening, diagnosis, perinatal planning, amniocentesis guidance
• No radiation involved
• Heats tissues, but minimal time on single area since transducer moving
• Inexpensive
Limitations of fetal ultrasound

- Poor differentiation of soft tissues
- Limited penetration of fatty tissue
- Poor visualization with oligohydramnios
- Dependent on fetal position
- Ossification of calvaria by 33 weeks limits visualization of intracranial structures

Standard Second Trimester Fetal US

- Number of live intrauterine pregnancies
- Fetal position
- Placental position
- Amount of amniotic fluid
- Views of head, face, heart, LV/RV out-flow tracts, stomach, kidneys, bladder, spine, extremities, cord insertion site
- Biometric data: BPD, HC, AC, FL
- Age by US and LMP, estimated fetal weight

Courtesy of BIDMC OB/GYN US Dept
Normal fetal profile by US

http://womenshealth.jhmi.edu/ob-ultrasound/images/ultrasound/18%20weeks_profile.jpg
Our patient:
Sagittal US at 24 weeks 6 days
shows an anterior neck mass
Homogeneous, echogenic, solid
Sagittal US shows mass extending posteriorly
Concerning for tracheal obstruction
Sagittal US shows patent esophagus: Fluid (anechoic) passing from oropharynx
Sagittal US shows fluid passing distally
Coronal US:
Bilateral, symmetric mass
Fluid passing in midline
Doppler US at 28 weeks 5 days demonstrates mass hypervascularity
Fetal MRI - Indications

- Further characterization of abnormal ultrasound findings, assessment of structures poorly visualized by ultrasound, and surgical planning
- Evaluation of CNS (ventriculomegaly, cortical malformations, posterior fossa)
- Scalp and neck
- Trachea (fluid filled) – evaluate for obstruction
- Growth (based on liver volume)
- Maternal obesity

Limitations of Fetal MRI

- Prohibited by fetal movement: fast single-shot T2 images (slice acquisition time < 1 second)
- Not FDA approved, but not proven to be teratogenic or to cause acoustic damage
- Gadolinium not approved for use in pregnancy
- Incomplete data on indications and expected findings

Our patient:
Sagittal T2-weighted MRI at 24 weeks 6 days
Neck mass is hypointense on T2
Sagittal T2 weighted MRI: fluid passing distally
Sagittal T1-weighted MRI at 24 weeks 6 days

Neck mass is intermediate intensity on T1
Sagittal T2-weighted MRI:
Fluid trapped in oropharynx
But distal fluid visualized
No other anomalies

- Female fetus
- 3 vessel cord
- Normal interval growth
- Trisomy screen: 21 - 1/7,001
  13/18 – 1/<10,000
- Nuchal translucency – 1.2 mm (11-13 wks)
- AFI – 21 (Normal 8-18), mild polyhydramnios
Normal Nuchal Translucency
Our patient:
Neck mass characteristics

• Anterior
• Midline
• Bilateral
• Symmetric
• Homogeneous
• Echogenic
• Hypervascular
• Hypointense on T2
• Intermediate intensity on T1
Differential diagnosis for a fetal neck mass

- **Goiter** – most likely in this case
- Cervical teratoma
- Cystic hygroma
- Thyroglossal duct cyst
- Hemangioma
- Branchial cleft cyst
- Neuroblastoma
- Rhabdomyoma
- Laryngocele
- Cervical meningocele
Maternal Data

- 33 years old (AMA >35)
- G2P1
- Graves disease, treated with Synthroid post radioiodine ablation 9 years ago
Our patient:
3D Ultrasound
Bilobed butterfly-shaped anterior neck mass
3D Ultrasound:
Hyperextended neck
Neck mass diagnosis:

Goiter
Causes of fetal goiter

- Maternal Graves disease
- Maternal Hashimoto thyroiditis
- Maternal iodine ingestion
- Maternal use of PTU, methimazole
- Primary fetal hypothyroidism

Ultrasound findings for fetal goiter

- Midline anterior neck mass, usually extending bilaterally
- Usually symmetric
- Bilobed
- Homogeneous
- Echogenic, solid
- Hypervascular
- +/- Neck hyperextension
- +/- Tracheal obstruction (echogenic lungs, flat diaphragms, distally dilated airways)
- +/- Esophageal obstruction (polyhydramnios)

MR findings for fetal goiter

- Similar location/shape as seen on US
- Homogeneous
- Hypointense on T2 (normal thyroid is isointense to muscle on T2)
- Intermediate to hyperintense on T1
- +/- Fluid trapping in oropharynx


Fetal thyroid disease

- Fetal thyroid begins functioning at 12 weeks
- Fetal TSH increases at 18-22 weeks (hypothalamic-pituitary axis matures)
- Maternal TSH does not cross placenta
- Maternal T3 and T4 are deiodinated by placenta
- Maternal TRH and antibodies cross the placenta
- Synthroid does not readily cross the placenta
- Typical findings: tachycardia (>160), hydrops, IUGR, oligohydramnios


Our patient:
Diagnosis – hypothyroidism

- Maternal thyroid stimulating/blocking antibodies negative
- Fetal heart rate 140-180 bpm (normal 120-160)
- Thyroid width (24w5d): 3.1 cm (US), 3.4 cm (MR)
  Normal (95\textsuperscript{th} \%-ile at 24 weeks): 2.5 cm
- Maximum width (30 weeks): 4.3 cm (MR)
- Cordocentesis: TSH 16 (2-11 mU/L), T4 1.7 (10-20 pmol/L)

Cordocentesis

- Ultrasound guided umbilical cord blood sampling
- Administer antibiotics to reduce risk of chorioamnionitis
- Administer steroids to promote fetal lung maturity in case emergency C-section is needed
- Draw maternal blood sample for quality control
- Fetal sample usually drawn from cord insertion site in placenta (Doppler shows branching of cord vessels)
- Umbilical vein puncture is safer than arterial (less post-procedure bradycardia and bleeding)
- Amniocentesis may be necessary prior to sampling to reduce fluid volume
- Risk of fetal loss not documented

Ghidini A. Fetal blood sampling: Technique and complications. Up-To-Date, March 2006.
Treatment

• Intraamniotic T4 injections
• Started at 31 weeks
• Data on neurologic/IQ outcomes are conflicting
• Goal to reduce size of goiter and prevent tracheal obstruction/need for EXIT procedure
Response to treatment

- Thyroid width decreased to 3.0 cm at 32 weeks (2.9 cm = 95\textsuperscript{th} %-ile)
- AFI decreased to 15-18
- Hyperextension resolved

Our patient:
Sagittal US post-intraamniotic T4 injections
Mass size reduced
Mass size reduced (calipers)
Delivery

- 37 weeks
- 5 lbs, 12 ounces
- C-section
- No EXIT procedure
- APGARs 8 and 9 at 1 and 5 minutes
Other Fetal Neck Masses

Cystic hygroma
Cervical teratoma
Companion Patient 1:
Cystic hygroma on US (calipers)

Well circumscribed
Anechoic
Postero-lateral
Companion Patient 2: Cystic hygroma on coronal US
Companion Patient 2:
Cystic hygroma on coronal T2 weighted MRI
Companion Patient 3: Cervical teratoma on sagittal US (calipers) and 3D ultrasound

- Heterogeneous cystic and solid mass
- Hypovascular
- Caused tracheal deviation
- Lateral flexion and hyperextension of neck
Companion Patient 3: Cervical teratoma on axial US
Companion Patient 3: Cervical teratoma on T2 weighted MRI
Companion Patient 3: Cervical teratoma on T2 weighted MRI

Coronal

Sagittal
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