Early (14-16 week) scan vs late (18 - 22 week) scan

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Introduction

• **11-13 week scan**
  – most effective method of early screening for aneuploidy
  – identify women at risk for wide range of pregnancy complications
  – Assess prognosis of such pregnancies at early gestation

• **Other benefits**
  – accurate dating of the pregnancy
  – early diagnosis of many major structural fetal defects
  – diagnosis of multiple pregnancies / confirming chorionicity
  – early screening for severe preeclampsia
Introduction

- **Early screening:**
  - potential to reduce healthcare costs
  - offer early counseling, karyotyping,
  - termination of pregnancy, if needed.

- **Pitfall of 11-13 weeks scan**
  - cannot rule out certain significant structural anomalies that appear or develop later in pregnancy
  - mid-trimester fetal anatomy scan crucial to compliment the late first-trimester scan

- **Delay screening to 14 weeks** – high proportion of fetuses destined to miscarry would have already done so

To avoid diagnostic pitfalls – must know USG features of normal fetal development during pregnancy
Early vs late scan

Three groups of major fetal abnormalities

- **Always be detected**
  - Anencephaly

- **Never detected**
  - Microcephaly

- **Potentially detectable depending on**
  - objectives set for such scan
    - the time allocated for the fetal examination
    - the expertise of the sonographer
    - the quality of the equipment used
  - presence of easily detectable marker for underlying abnormality
  - evolution in phenotypic expression of abnormality with gestation

**Syngelaki et al.,** Prenat Diagn 2011; 31: 90–102
14-16 weeks scan

**Limited role**
- If no first trimester scan done
- Follow up scan for uncertainty in earlier scan
- **Dating**
  - Less accurate compared to first trimester scan
  - More accurate compared to midtrimester scan
- **Screening for aneuploidy**
  - late for NT and other 1st trimester markers risk assessment
  - ? early for midtrimester risk assessment
- **Fetal sex determination**
- **Diagnostic tests**
  - Late CVS
  - Early amniocentesis - controversial?
### What can be done at 14-16 weeks?

<table>
<thead>
<tr>
<th>Routine</th>
<th></th>
<th>Selective</th>
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<tr>
<td><strong>Missed 1st trimester scan</strong></td>
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<td><strong>Interventions / Procedures</strong></td>
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<tr>
<td>• Pregnancy dating</td>
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<td>– Cervical cerclage</td>
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<td>• Higher order gestation</td>
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<td>• Markers of aneuploidy</td>
<td></td>
<td>twins discordant for severe</td>
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<tr>
<td>• <strong>Major structural defects</strong></td>
<td></td>
<td>fetal anomaly</td>
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<tr>
<td>‒ CNS</td>
<td></td>
<td>– Adnexal masses</td>
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<tr>
<td>‒ Heart</td>
<td></td>
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<tr>
<td>‒ Anterior abdominal wall</td>
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<tr>
<td>‒ Urinary tract</td>
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<tr>
<td>‒ Bladder length &gt;16mm</td>
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<td></td>
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<tr>
<td>‒ Skeleton / Limbs</td>
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**Other**
Arnold-Chiari malformation at 14 weeks
Banana sign and Meningomyelocele

**Head:** banana-shaped cerebellum (arrows)

**Spine:** lumbosacral region shows a meningomyelocele (arrow).

Fong K W et al. Radiographics 2004;24:157-174
Holoprosencephaly at 14 weeks

Head:
• fused thalami \((T)\)
• monoventricle \((M)\) with virtually no cerebral tissue
• absence of the interhemispheric fissure and falx
• small echogenic choroid plexuses (arrow) on either side of the fused thalami

Fong K W et al. Radiographics 2004;24:157-174
Multicystic dysplastic kidney
14 weeks gestation

Sagittal view of fetus
- several cysts (arrow)
- slightly enlarged kidney (cursors).

Fong K W et al. Radiographics 2004;24:157-174
Clubfoot and polydactyly at 14 weeks

Foot:
- varus deformity (arrow)
- six toes

Fong K W et al. Radiographics 2004;24:157-174
18-22 weeks

ISUOG Practise Guidelines:

- Recommend routine midtrimester fetal scan performed between 18-22 weeks
- Compromise period between:
  - dating (more accurate if done earlier)
  - detection of fetal structural anomalies

- **Main objective**
  - provide accurate diagnostic information to optimise antenatal care for best maternal and perinatal outcome

ISUOG Clinical Standards Committee:
Ultrasound Obstet Gynecol 2011; 37: 116–126
18-22 weeks

ISUOG Practise Guidelines –

• **Midtrimester estimated fetal weight:**
  – baseline parameter for detection of subsequent growth problems

• **Not recommended as routine in low risk pregnancies**
  – **Doppler ultrasonography**
    • insufficient evidence to support universal use of uterine or umbilical artery Doppler
  – **Biophysical profile**
  – **Cervical length measurements**
    • insufficient evidence to recommend as routine in an unselected population

ISUOG Clinical Standards Committee: *Ultrasound Obstet Gynecol 2011; 37: 116–12*
18-22 weeks
ISUOG Practise Guidelines

• Incidental findings:
  – Uterine fibroids and maternal adnexal masses should be documented

• Woman /couple – counselled on the potential benefits and limitations of this routine scan:
  • Some malformation are progressive in nature
  • May not be detected at first and midtrimester scans

ISUOG Clinical Standards Committee:
Ultrasound Obstet Gynecol 2011; 37: 116–12
Beyond 24 weeks (usually 3rd T)

- Microcephaly
- Ventriculomegaly - 2° haemorrhage or infection
- Fetal ovarian cysts
- Bowel obstruction
- Cerebral atrophy
- Upper urinary tract obstruction

Never seen

- Autism
Early vs Late 2\textsuperscript{nd} Trimester scan Studies

- Two staged USG screening
  
  \textit{What can be seen and what cannot?}

- Fetal abdominal cysts

- Bladder length

- Cervical length
Two staged USG screening

*What can be seen and what cannot?*

- **4789 consecutive low risk pregnancies**
  - 4073 had both scans
  - Scans performed by specially trained midwives

- **Findings:**
  - **13-14 weeks** - good for detection of chromosomal abnormalities
  - **18-22 weeks** - detection of structural defects

*Taipale et al., 2004; 83(12):1141-1146*
Fetal abdominal cysts

- Assess clinical significance of fetal abdominal cysts
- **Study**: two staged screening
- **14–16 weeks** abdominal cyst was confirmed - 5 cases
  - No associated anomalies
- **18–22 weeks**
  - 3 cases showed complete resolution
    - Uneventful antenatal course / Normal neonates
  - 2 cases
    - Prenatal aspiration at 19 weeks - subsequently resolved
    - Remained stable in size and was managed conservatively
      - Infant required surgery at the age of 7 weeks for a choledochal cyst obstruction

- **Abdominal cysts detected in early second trimester scan**
  - Usually have good outcome but must be followed up by midtrimester scan
  - Has prognostic implications

*Sepulveda et al., UOG.2008; 32: 860–864*
Bladder Length

• Study: 145 fetuses 10-14 weeks

• **Bladder length and risk of aneuploidy**
  • 7–15 mm - 25%
  • >15mm - 10%

• **Normal karyotype**
  – <16mm – 90% spontaneous resolution
  – >16mm – progressive obstructive uropathy

• **Findings:**
  – Bladder length in euploid fetuses at 14 weeks can be used to prognosticate outcome

Liao et al., UOG. 2003; 21: 338–341
Cervical length study

- Prospective study 529 unselected pregnant population
- **11-14 weeks** [mean 42.4mm]
  - Delivered preterm (40.6mm)
  - Delivered at term (42.1mm)  \( p=NS \)
- **20-22 weeks** [mean 38.6mm]
  - Delivered preterm (26.7mm)
  - Delivered term (39.3mm)  \( p=0.0001 \)

Cervical assessment in unselected - useful tool for prediction of PTL at 20-22 weeks than 11-14 weeks

Carvalho et al., UOG 2003, 21:135-139

- Similar results: Ozdemir et al., EJOGRB, 2007;130(2):176-179
Invasive Diagnostic Tests

• **Early Amniocentesis** (< 15 weeks)
  - is known to be riskier to the pregnancy
    - higher fetal loss
    - talipes equinovarus
  - less reliable in terms of obtaining a fetal chromosome result

• **Midtrimester amniocentesis** [16-22 weeks]
  - Relatively safe (numerous studies)

• **Ideal Timing**
  - CVS at 11-13 weeks
  - Amniocentesis at 16-18 weeks
  - 14-15 weeks “grey area”
## For Earlier Diagnosis

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<tr>
<th>14-16 weeks scan</th>
<th>18-22 weeks scan</th>
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<td><strong>Higher order gestation</strong></td>
<td><strong>MCA Doppler for fetal anaemia</strong></td>
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<td><strong>Markers of aneuploidy</strong></td>
<td><strong>TTTS</strong></td>
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<tr>
<td><strong>Structural Abnormalities</strong></td>
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<tr>
<td>- Anencephaly / Acrania</td>
<td>- Hydrocephalus</td>
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<tr>
<td>- Alobar holoprosencephaly</td>
<td>- Skeletal dysplasia</td>
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<td>- Body stalk anomaly</td>
<td>- CCAM</td>
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<tr>
<td>- Spina bifida</td>
<td>- Agenesis corpus callosum</td>
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<tr>
<td>- Abdominal wall defects</td>
<td>- Complex cardiac anomalies eg:</td>
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<tr>
<td>- Acardiac twin</td>
<td>- TGA / HLHS/ Pulm. atresia</td>
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<tr>
<td>- Multicystic dysplastic kidneys</td>
<td>- Cerebellar / Vermian</td>
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<tr>
<td>- Clubfeet / polydactyly</td>
<td>- hypoplasia</td>
</tr>
<tr>
<td>- Megacystis/ Fetal Hydrops / Sex</td>
<td>- Ambiguous genitalia</td>
</tr>
</tbody>
</table>
# For Earlier Prognosis

## 14-16 weeks scan
- Pregnancy dating
- Chorionicity in twins
- Doppler Uterine Artery / DV – Preeclampsia
- Bladder length >16mm

### Interventions / Procedures
- Cervical cerclage
- MFPR
- Cord occlusion in MC twins
- Maternal surgical procedures eg: for large adnexal masses

## 18-22 weeks scan
- Subsequent growth problems
- Fetal anaemia - MCA Doppler
- Fetal cardiac failure - venous and cardiac Doppler [eg: DV & TR]
- PTL – cervical length
- Abdominal cysts
- Urinary tract obstruction
- Poly /Oligo-hydramnios

### Interventions / Procedures
- Genetic amniocentesis
- Fetal shunts
- IUT
Summary

• **11-13 weeks** scan cannot rule out certain significant structural anomalies that appear later in pregnancy

• There may be a place for the **14-16 week scan**
  – did not have the benefit of the 11-13 week scan
  – as a follow up to uncertainties in the earlier scan
  – Interventions in management

• The mid-trimester fetal anatomy scan in our practice remains crucial to complement the late first-trimester scan

• Pregnancies at risk of maternal or fetal disease may be better identified during the **18-22 week scan** thus providing more individualized patient- and disease-specific approach to the further management of the pregnancy

• Some anomalies manifest beyond 24 weeks – missed at 18-22 weeks
Thank You
Beyond 22 weeks

**Diagnosis** - not made by direct visualization of defect

- **Duodenal atresia**
  - polyhydramnios
  - double-bubble appearance of stomach & proximal duodenum

- **Bowel obstruction**
  - Distended loops of bowel proximal to the obstruction

**These anomalies usually occur after 22 weeks**

**Diagnosis may be missed at 20 week scan**
Beyond 22 weeks

**Severe hydronephrosis** due to ureteric stenosis / VUR
- are not apparent until the second or third trimesters
  - *megacystis from urethral obstruction present in 1st trimester*
  - most likely explanation for this delayed diagnosis
  - early pregnancy the rate of fetal urine production is too low to result in retention within the upper urinary tract

**Diagnosis may be missed at 20 week scan**