Aims

• Principles, purpose and *pitfalls* of monitoring of early pregnancy

  – Importance of *Clinical* assessment

  – Laboratory testing

  – Ultrasound
Who is this.....?
Rudyard Kipling
I keep six honest serving-men
( they taught me all I knew)
Their names are What and Why and When
And How and Where and Who.

Rudyard Kipling
“The Elephant’s Child”
What.....?

• Early pregnancy
  – Presence
  – Location
  – Viability and progress
  – “Type”
  – Gestational age
  – Number
Early pregnancy physiology

1. ZYGOTE
   fertilized ovum
   zona pellucida
   polar body

2. TWO-CELLED ZYGOTE
   blastomere

3. SOLID 16-CELL MORULA

4. EARLY BLASTOCYST
   thin wall of blastocyst
   (trophoblast, inner cell mass)

5. TROPHOBLASTIC MASS
   inner cell mass
   extra-embryonic mesoderm
   mesenchyme
   yolk sac
   embryonic disk
   trophoblasts
   synchrony trophectoderm

6. CYTOPLASMA OF TROPHOBLASTS

7. AMNION
   amnion
   syncytiotrophoblast

8. EMBRYO
   embryo
   chorion
   chorionic vessels
   chorionic basal plate
   villi
   body stalk
   umbilical cord
   decidua basalis plate
   intervillous space
   cytotrophoblast
   mesenchyme (connective tissue)
   chorionic vessels
   chorionic basal plate

9. PLACENTA

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Why.....?
Possible outcomes of early pregnancy

- Viable intra-uterine pregnancy
  - Including multiple pregnancy/chorionicity

- Non-viable pregnancy
  - Miscarriage
  - Tubal abortion
  - Gestational trophoblastic disease

- Ectopic pregnancy

- Pregnancy of unknown location (PUL)
Why.....?

- Potentially life-threatening complications
- Guide management
- Reassurance
When……..?

• As early as possible ????

• When abnormal symptoms occur

• Caution with *early* and/or *single* results
How......?

• Clinical features

• Laboratory tests

• Ultrasound
How.....?

Clinical features

Laboratory testing

Ultrasound
Where......?

- GP/Outpatient
- EPAU
  - Follow-up
- Admission
Who.....?

• Clinical assessment

• Symptomatic vs asymptomatic
Assessment - clinical

• History
  – Medical, surgical and pregnancy history
  – Amenorrhoea – menstrual pattern
  – Symptoms of pregnancy
  – Pain
  – Bleeding *
  – Other symptoms of ectopic pregnancy may mimic other conditions
Assessment - clinical

- Examination
  - Vital signs
  - Bimanual
  - Speculum
Assessment - clinical

“all women are pregnant till proven otherwise

AND

all pregnancies are ectopic till proven otherwise”
Laboratory assessment

• bHCG
  – Produced by cytотrophoblast cells in early pregnancy
  – Detectable in serum and urine after implantation and vascular communication
    – 5% at day 8
    – 98% at day 11
Laboratory assessment

bHCG – *rate of rise* in levels

– Viable pregnancy roughly doubles each 48 hours

• Peaks at 8 – 10 weeks at 60,000 – 90,000
Laboratory assessment

bHCG

– Slower rise may indicate ectopic pregnancy

– Falling levels indicate non-viable pregnancy
Laboratory assessment

bHCG

– Rapid rise and/or very high levels associated with *molar* pregnancy

– “discriminatory zone” correlates with U/S findings
b-hCG in cases with suspected ectopic

- Viable in utero (doubling time 48 hours)
- Ectopic (plateau)
- Miscarriage (half life 1.4 days)
Laboratory assessment

• However......

• A single pattern of HCG does not exist for abnormal early pregnancy
Laboratory assessment

- So.....

  - *Caution* needed in interpreting serial bHCG levels in early pregnancy

  - Importance of *clinical* signs, especially if they *change*  (NICE guidelines 2012)
Laboratory assessment

• Check **blood group**

• Anti-D for Rh negative except TMC< 12/40
  • RANZCOG Guidelines
Laboratory assessment

- Histopathology
  - Molar pregnancy
  - Pregnancy tissue in uterine curettings
  - Pregnancy tissue in removed fallopian tube
Histopathology

Complete hydatidiform mole: Microscopically Enlarged, edematous villi and abnormal trophoblastic proliferation that diffusely involve the entire placenta
Ultrasound in early pregnancy

- Establish the presence and position of a pregnancy
- Establishing gestational age
- Assess adnexal pathology
- Viability (Criteria for Early Pregnancy Failure)
- Fetal number / type of multiple pregnancy
Ultrasound in early pregnancy

“Inform women that diagnosis of miscarriage using one U/S cannot be guaranteed to be 100% accurate and there is a small chance that the diagnosis may be incorrect, particularly at very early gestational ages”

NICE guidelines 2012
Early pregnancy failure: managing expectations

- Sensitive home pregnancy tests inform women they are pregnant before their missed period.

- The likelihood of a scan showing an intrauterine pregnancy of uncertain viability is:
  - 86% at 28-34 days gestation
  - 60% at 35-41 days gestation
  - 29% at 42-48 days gestation

From: The optimal timing of an ultrasound scan to assess the location and viability of an early pregnancy
Hum Reprod | © The Author 2009. Published by Oxford University Press on behalf of the European Society of Human Reproduction and Embryology. All rights reserved. For Permissions, please email: journals.permissions@oxfordjournals.org
Ultrasound in early pregnancy

• Importance of:
  
  – Appropriate and sensitive counselling
  
  – Awareness of, and accessibility of, appropriate medical services
  
  – *Serial* measurements and U/S
  
  – *Correlation* bHCG, ultrasound and clinical conditions
### Chronological landmarks as seen on TV scan

<table>
<thead>
<tr>
<th>Week (5 + 0)</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 + 0</td>
<td>Empty GS; MSD 10mm</td>
<td><img src="527x341" alt="Image" /></td>
</tr>
<tr>
<td>5 + 4</td>
<td>GS with YS</td>
<td><img src="527x237" alt="Image" /></td>
</tr>
<tr>
<td>6 + 0</td>
<td>GS(MSD 16mm) and YS with adjacent FH but small embryo (3-4mm)</td>
<td><img src="527x119" alt="Image" /></td>
</tr>
<tr>
<td>8 + 0</td>
<td>Embryo with CRL 16mm; AS; YS; FH; FM</td>
<td><img src="528x119" alt="Image" /></td>
</tr>
</tbody>
</table>
5.5 weeks
Gestation sac and contents

6.5 weeks
Yolk sac (left)
Fetus is 3mm long
A fetal heartbeat
Establishing (non) viability

- NICE guidelines
1. Mean gestational sac diameter (MGSD) ≥ 25mm and no yolk sac or fetal pole
2. Crown-rump length (CRL) ≥ 7mm and no fetal heart beat present
3. ≥ 70 days gestation and the MGSD ≥ 18 mm with no embryo or an embryo with CRL ≥ 3 mm with no heart activity

Miscarriage

1. Fetal pole < 7 mm with no fetal heart beat
2. MGSD ≥ 12 mm and < 25 mm with no embryo/ no yolk sac

Repeat ultrasound scan ≥ 7 days

1. Embryo present with no heart beat
2. No embryo is seen

Miscarriage

MGSD < 12 mm

Repeat ultrasound scan ≥ 14 days

MGSD has not doubled in size

Miscarriage
Establishing gestational age

• For approximate due date
  – Mean Sac Diameter under 6 weeks (± 4 days)
    • Visible from 4.4 – 5 w on TV scan
    • The subsequent loss rate once a GS has been identified is 11%
  – Crown - rump length (CRL) from 5½ weeks (2 mm)
    • little biological variability
    • rapid increase in measurement

• EDB determined by CRL measured between 8 and 14 weeks

ISUOG Practice Guidelines: performance of first-trimester fetal ultrasound scan
Ultrasound Obstet Gyneco 2013; 41: 102–113
Determining location of pregnancy

• Ectopic pregnancy
  • .25-2% of pregnancies

• Incidence increasing (ART) but mortality falling

• Symptoms may mimic other conditions

• 30% no known risk factors
Ectopic pregnancy

• TV ultrasound
  • At best 85 - 90% detection on US

• Biochemistry
  • $\beta$-hCG – “discriminatory zone” 1500
Reporting ectopic pregnancy

- **Possible ectopic pregnancy**
  - Clinical Signs & Symptoms
  - BHCG >1500 mIU/ml
  - Absence of IU pregnancy on TV scan
• Probable ectopic pregnancy
  – BHCG > 1500 mIU/ml
  – Absence of IU pregnancy
  – Adnexal mass
  – Free fluid
• **Ectopic pregnancy**

  – GS, YS, +/- embryo & FHM in Fallopian tube on TV ultrasound

  – Free fluid
Pregnancy of unknown location
Pregnancy of unknown location - A diagnosis of exclusion

The Clinical Problem:

- positive pregnancy test
- PV bleeding
- inconclusive scan - no evidence of intrauterine or extrauterine pregnancy seen
- 8% of scans will be inconclusive
- 20% of women cannot recall their LMP
PUL

- Commoner if U/S done *early* in gestation
PUL – natural history

- 8 -31% of EPAU presentations
  - Normal ongoing pregnancy 71%
  - Miscarriage 18%
  - Inconclusive 8%
  - Ectopic 3%
PUL - management

• Serial TVS or serum B-HCG
  • Allows a non-surgical “wait & see”

• At least two visits to EPAU
  • Especially with *abnormally rising* B-HCG levels
Conclusion

• NOT TO MISS
  
  • Rhesus negative
  
  • Ectopic pregnancy

  • Molar pregnancy
Conclusion

Importance of *clinical* features, especially if they *change*

– Limitations and variations of tests – especially if *too early*

– Sensitive, realistic counselling
"Words are, of course, the most powerful drug used by mankind."
—Rudyard Kipling