Pregnancy Dating & Growth Monitoring

- Pregnancy dating is important for:
  - Appropriate scheduling of anomaly scans and any screening tests which rely on gestational age
  - Estimating viability in extreme prematurity
  - Identifying postmaturity

- Dates to remember:
  - Missed period = >4 weeks
  - Visible on scan = >6 weeks
  - Heartbeat seen = >8 weeks
  - Gender visible = >16 weeks
  - Viability = >24 weeks
  - Preterm = <37 weeks
  - Post-term = >42 weeks

- Last menstrual period (LMP):
  - This is the first day of the woman’s last period
  - The estimated date of delivery (EDD) is 40 weeks from the LMP
  - LMP is not especially reliable because it assumes that:
    - the woman can remember her LMP (most aren’t very sure or get it wrong)
    - the woman’s cycle is 28 days long
    - conception occurred mid-cycle
  - In IVF pregnancies, pregnancy can be dated using the date of embryo transfer

- USG: crown-rump length (CRL)
  - Best used between 7-13 weeks’ gestation
  - ~10mm at 7 weeks → ~55mm at 12 weeks (the machines can work out gestational age for you)
  - Useful in roughly determining the age of a fetus in early pregnancy assessment units

- USG: biparietal diameter (BPD) + femur length (FL) + abdominal circumference (AC)
  - Best used after 13 weeks’ gestation (can be used at 12 week dating scan too)
  - These parameters can be plotted on fetal growth charts to monitor the baby’s progress
  - Abdominal circumference is particularly important in differentiating types of growth restriction

- Fundal height:
  - Grows at a rate of 1cm per week +/-2cm
    - 14w → pubic symphysis
    - 20w → umbilicus
    - 36-38w → xiphisternum
    - 38-40w → ↓↓ as head engages
  - Provides a rough idea of fetal growth
  - Useful for picking up major growth abnormalities but very prone to observer bias

Large for Gestational Age & Macrosomia

- Differential diagnosis
  - A large-for-dates fundal height may also be the result of other problems, such as:
    - Wrong dates
    - Multiple pregnancy
    - Polyhydramnios
    - Postmaturity
    - Fibroids

- Fetal macrosomia is defined as >90th centile for weight for gestational age (≥4000-4500g at term)

- Epidemiology: occurs in up to 10% of pregnancies; incidence is increasing due to obesity epidemic

- Causes
  - Constitutionally large baby
  - Maternal diabetes (pre-existing/gestational)
  - Hyperinsulinaemia resulting from maternal obesity or excessive maternal weight gain
  - Beckwith-Wiedemann syndrome (rare)

- Investigations
  - Macrosomia itself can be diagnosed using fundal height and ultrasound measurements
  - Features of Beckwith-Wiedemann syndrome (e.g. macroglossia) may be seen on scan
  - Maternal blood glucose should always be investigated

- Management
  - There is controversy over the best way to manage the delivery of a constitutionally large baby:
    - A recent Cochrane review found no evidence of improved outcomes with induction of labour before 40 weeks’ gestation
    - Elective Caesarean section also carries its own risks to both mother and baby, and can complicate future pregnancies
    - Currently the best option seems to be to allow labour to start naturally + aim for SVD
  - Diabetes necessitates regular monitoring of maternal glycaemic control and fetal wellbeing
  - Diabetic mums should be offered induction at 38 weeks + to reduce risk of intrauterine death

- Complications
  - ↑↑ risk of traumatic delivery
    - Shoulder dystocia → acute fetal compromise, arm fractures, brachial plexus injuries
    - Perineal/vaginal/cervical tears → maternal haemorrhage
  - ↑↑ risk of emergency Caesarean section
  - Postpartum hypoglycaemia (50%)
  - Polycythaemia → neonatal jaundice
  - Hypocalcaemia (up to 50%) and other electrolyte disturbances
  - Poor feeding
  - Left colon syndrome (similar to Hirschsprung’s syndrome)
  - Macrosomic babies may be at increased risk of diabetes and obesity later in life

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Small for Gestational Age & IUGR

- **Small for gestational age babies (SGA or LBW)** is defined as <10th centile for weight for gestational age (<2500g at term). They may be constitutionally small, or may suffer from pathological IUGR.
  - **Very low birth weight babies (VLBW)** are babies born weighing <1500g at term.
- **Intrauterine growth restriction (IUGR)** occurs when the baby's growth slows or ceases in utero as a consequence of a pathological insult. There are two diagnostic categories:
  - **Symmetrical IUGR**: all fetal growth parameters are proportionately small (stopped growing)
  - **Asymmetrical IUGR**: abdominal circumference is disproportionately reduced (starving)

**NB**: babies with IUGR may not be small for gestational age

- **Differential diagnosis**: symmetrical IUGR
  - The fetus is starved of nutrients and directs the small amounts it does receive towards the growth of vital organs like the brain and heart. This occurs at the expense of the liver, fat and muscle tissues → “head-sparing” pattern on scan with ↓↓ abdominal circumference and thin limbs
  - If placental insufficiency continues, head and femur growth may also be affected
  - Generally a result of placental insufficiency and can have onset at any point during pregnancy

**NB**

- **Epitheliology**
  - The incidence of IUGR is ~5% → ~1000 babies die in the UK every year as a result of IUGR
  - Incidence of live-born VLBW infants is 0.6%, but they make up 25% of neonatal mortalities

**Causes**

- **Physiological**
  - Constitutionally small babies make up 40% of the small for gestational age group
  - Maternal size (small mums tend to make small babies) and ethnicity
  - Increasing maternal age
  - Increasing maternal parity
- **Maternal pathology**
  - Poor nutrition causes up to 30% of cases of SGA (low SEP is a risk factor)
  - Maternal alcohol use, smoking or other recreational drug use e.g. cannabis
    - Maternal smoking is believed to contribute to up to 40% of cases
  - Maternal disease
    - Anaemia/oesophageal cell disease
    - Diabetes (pre-existing/gestational)
    - Hypertension/cardiac disease
    - Renal disease
    - Autoimmune diseases e.g. SLE, antiphospholipid syndrome
    - Thrombophilia
    - Undiagnosed coeliac disease
- **Maternal genetic disorder** e.g. phenylketonuria
- **Maternal medications** e.g. warfarin, steroids, phenytoin

**Fetal pathology**

- Multiple pregnancy → IUGR may affect both babies or only one (twin-to-twin transfusion)
- Genetic abnormalities
  - Trisomy 13, 18 or 21
  - Turner’s syndrome (XO)
  - Triploidy
- Congenital abnormalities
  - Cardiac malformations e.g. tetralogy of Fallot, transposition of great arteries
  - Gastrochisis
- Congenital infection
  - CMV, rubella, toxoplasma, syphilis (any intrauterine infection can cause IUGR)

**Placental pathology → placental insufficiency**

- **Primary placental insufficiency** (rubbish placenta)
- **Pre-eclampsia**
- **Abnormal placentation**
  - Placenta praevia
  - Placenta accreta/increta/percreta
- **Placental abruption**
- **Placental infarction**
- **Placental haemangiommas**
- Umbilical cord abnormalities e.g. two-vessel cord, velamentous cord insertion

**Differential diagnosis: asymmetrical IUGR**

- The fetus is starved of nutrients and directs the small amounts it does receive towards the growth of vital organs like the brain and heart. This occurs at the expense of the liver, fat and muscle tissues → “head-sparing” pattern on scan with ↓↓ abdominal circumference and thin limbs
- If placental insufficiency continues, head and femur growth may also be affected
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**Investigations**

- IUGR can be diagnosed using fundal height and ultrasound scan measurements
  - Remember that abdominal examination alone misses up to 30% of cases
  - Growth parameters and weight estimates are plotted on centile charts – this allows for the monitoring of trends in fetal growth and prompt detection of any abnormally
  - If baby is small but still growing, this is a very reassuring sign
  - Ultrasound can also be used to monitor fetal wellbeing and detect potential causes:
    - Detailed inspection of fetus for signs of congenital abnormalities
    - Biophysical profile: fetal breathing and body movements, flexor tone, HR accelerations
    - Assessment of amniotic fluid index (IUGR is strongly associated with oligohydramnios)
    - Umbilical artery and placental Dopplers to assess placental structure, function and flow
    - Investigate any potential maternal causes e.g. anaemia, diabetes, hypertension, coeliac disease
    - Investigate potential fetal causes: karyotype if strong suspicion of chromosomal defect

**Management**

- Constitutionally small babies require no further interventions
- **Treat underlying cause if possible** e.g. iron supplements, antihypertensives, glycaemic control
- **Regular monitoring of IUGR babies**
  - USS with measurement of growth parameters and assessment of trends
  - Umbilical artery Dopplers to assess for absent or reversed end-diastolic flow, which is a strong indicator of terminal placental insufficiency and risk to the fetus (i.e. <48hrs left)
  - CTG monitoring
- **NB**: if <24 weeks gestation or baby weighs <500g monitoring is pointless as baby will not survive delivery
  - Deliver in a specialist unit as a high-risk pregnancy → continuous intrapartum CTG/EFM
  - Delivery should be carefully timed based on gestation, placental function and maternal health
  - Continue pregnancy as long as it is safe to do so to avoid fetal prematurity
  - If end-diastolic flow remains positive: aim for delivery at ≥37 weeks
- If end-diastolic flow deteriorates: deliver as soon as possible, give steroids if <36 weeks
- There is no evidence to support elective Caesarean section as routine management
- **Appropriate postpartum management** of the premature or VLBW infant

![Image of a baby](image from MedicineWorld)

**Low birth weight (LBW):**

- **Very low birth weight (VLBW):**
- **Rumaisha Rahman:** the world’s smallest surviving baby, born weighing 244g

**Complications**

- **Intrapartum fetal distress and asphyxia**: ↑↑ risk of emergency CS and intraparturine death
- **Meconium aspiration**
- **Prematurity**: respiratory distress, necrotising enterocolitis, jaundice, retinopathy, IVH
- **Hypoglycaemia and hypocalcaemia**
- **Perinatal mortality** is up to 10x higher; incidence of cerebral palsy is 4x higher
- **Increased risk of hypertension, type 2 diabetes and thyroid problems later in life**

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