10. Labour and intrapartum problems

NORMAL LABOUR

Normal labour is characterised by:

- Regular uterine contractions
- Dilatation of the cervix
- Descent of the presenting part.

It encompasses the time from the onset of regular contractions to spontaneous vaginal delivery of the infant (within 24 hours).

UTERINE CONTRACTIONS

- Contractions begin in two ‘pace-makers’ near the uterotubal junctions.
- Only one is operative in each contraction that spreads like a wave over the whole uterus.
- Relaxation begins simultaneously in all areas of the uterus.

Labour is characterised by:

- Strong and sustained action of the muscle of the uterine fundus which increases as labour progresses
- Less strong contractions of the mid-zone
- Relative inactivity of the lower segment

Normal uterine contractions are characterised by:

- A frequency of one every 2 to 3 minutes with at least 1 minute between contractions
- A duration of 40 to 70 seconds
- An intensity (measured by intrauterine catheter) of around 50 mmHg with a resting tonus of <10 mmHg.

CERVICAL DILATATION

- This occurs from above downwards accompanied by effacement (thinning).
- It is caused by co-ordinated contraction and retraction of the upper segment.
• The forewaters may act as a hydrostatic wedge, and dilatation is facilitated by close apposition of the cervix and presenting part.

**FIRST STAGE OF LABOUR**

**Latent and active phases**—see Table 10.1 and Fig. 10.1. The latent phase starts from the onset of regular uterine contractions and ends when the cervix is 2–3 cm dilated and fully effaced. It occurs because the thinning of the lower segment and cervix take a lot of uterine work before rapid dilatation can begin. In the active phase the cervix dilates at 1–3 cm per hour in primigravidae and up to 6 cm per hour in multigravidae.

**Control of uterine activity in labour**

Prostaglandins are, and oxytocin may be, important for the maintenance of progressive labour. The autonomic nervous system has little or no motor function. Progress in labour is best assessed using a *partogram* on which can be recorded:

<table>
<thead>
<tr>
<th>Table 10.1</th>
<th>Length of first stage of labour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Mean length in hours (± 1 SD)</strong></td>
</tr>
<tr>
<td>Latent phase</td>
<td></td>
</tr>
<tr>
<td>Active phase</td>
<td></td>
</tr>
</tbody>
</table>

![Fig 10.1](image-url) Cervical dilatation time curve
• Cervical dilatation—marked in centimetres at zero time (the time of admission to labour ward) and at every subsequent examination.
• Descent of the head (in fifths palpable above the pelvic brim).
• Contractions—frequency, duration and strength assessed for 10 minutes each half-hour.
• Fetal heart rate (see p. 150).
• Condition of the liquor and time and manner of membrane rupture.
• Moulding of the fetal skull.
• Dosage of oxytocin, if used.
• Maternal status (BP, pulse, temperature, urinalysis) and medication (including epidural block, if used).

MANAGEMENT OF NORMAL LABOUR
Each obstetric unit should set down (and review regularly) agreed guidelines for the management of labour to include a clear statement about the diagnosis of the onset of labour.

Routine perineal shaving and an enema on admission are outmoded practices.

Maternal informed choice is to be encouraged. (This includes recognition of responsibility for that choice.)

Posture
• Mobility should be encouraged during the latent phase.
• In the active phase (in the absence of complications) allow the mother to adopt the position she finds most comfortable.
• Maternal posture should at all times be as upright because:
  • the supine position tends to impair placental perfusion
  • the need for augmentation (see below) and analgesia is reduced

Normal progress
• In primigravidae delivery should be expected within 8 hours of the diagnosis of labour and achieved within 12 hours. Delay in primagravid labour may be due to:
  • Inefficient uterine action
  • Occipito-posterior position of the fetal head
  • True cephalo-pelvic disproportion (rarely)
• Labour is much more rapid in multiparous women, and inefficient uterine action is rare. If delay is occurring its cause should be sought and corrected if possible. Obstruction must be considered as a possible cause for prolonged labour in a multiparous woman.

Augmentation of labour in primigravidae
• This practice is widespread but remains controversial. Its aim is to achieve safe delivery within 8 hours of admission to the labour ward.
• It is usually considered if the rate of cervical dilatation is less than 1 cm per hour in the active phase of labour.
• The membranes are ruptured and oxytocin infusion is set up 1 hour later if labour does not accelerate.
• Among the contraindications are:
  • obstetric anomalies, e.g. breech presentation or multiple pregnancy.
  • fetal compromise.
• It is relatively contraindicated in multigravidae because the risk of uterine rupture is increased.
• Review of trials to date (see Enkin et al in Further reading) suggests that:
  • no beneficial effects have been demonstrated
  • women find ambulation more acceptable
  • further trials are necessary.

Oral intake in labour
• The major risk to be avoided is aspiration of gastric contents. This only occurs in the context of general anaesthesia.
• In general, therefore, low-fat, low-residue food and drink can be given to a mother during labour.
• There is no evidence that the routine use of antacids or H₂ receptor antagonists is beneficial.
• The significance of ketonuria is exaggerated:
  • intravenous infusions of dextrose solutions (particularly dextrose 10% are contra-indicated because of their deleterious effect on mother and baby (fetal hyponatraemia).
  • if dehydration needs to be corrected, normal saline should be infused but the volume should not exceed 3 litres/24 hours.

SECOND STAGE OF LABOUR
• It begins with full dilatation of the cervix and ends with delivery of the baby.
• Its average length in primigravidae is 40 minutes, and in multiparae is 20 minutes.
• It has two phases:
  • the propulsive phase from full dilatation until the presenting part has descended to the pelvic floor.
  • the expulsive phase which ends with delivery of the baby and is recognised by the mother’s irresistible desire to bear down and/or distension of the perineum.
• A woman should not usually be encouraged to bear down until she has entered the expulsive phase.
• A prolonged propulsive phase in primigravidae due to inefficient uterine action (and not cephalo-pelvic disproportion) can be treated judiciously with oxytocin.
**INDUCTION OF LABOUR**

- Induction of labour can be justified when:
  - the intrauterine risks to the fetus outweigh those from delivery
  - the risk to the mother's health from the continuation of pregnancy outweighs the risk to the fetus from delivery.
- If the added risk of labour is unacceptable, delivery must be by caesarean section.
- Otherwise, labour can be induced and the maternal and fetal state monitored throughout.
- Fetal well-being should be confirmed immediately prior to induction of labour.
- A policy of offering routine induction of labour after 41 weeks reduces perinatal mortality without increasing the caesarean section rate.
- An ultrasound scan to confirm gestation should be offered before 20 weeks gestation as this reduces the need for induction for perceived post term pregnancy.
- Women who have pregnancies complicated by diabetes should be offered induction of labour prior to their estimated date for delivery (see p. 88).
- Women with pre-labour rupture of the membranes at term should be offered a choice of immediate induction of labour or expectant management. Expectant management at term should not exceed 96 hours following membrane rupture.
- ‘Social’ indications rarely constitute an adequate reason for induction but each situation must be considered on its merits. If offered, the cervix should be favourable.

**CONTRAINDICATIONS**

**Absolute**
- The fetal lie is not longitudinal.
- Caesarean section has been carried out in a previous pregnancy for a recurrent reason (e.g. pelvic contraction).
- Two previous caesarean sections have been performed.
- Placenta praevia.
- A tumour occupies the pelvis that will obstruct labour.

**Relative**
- The cervix has previously been repaired. Previous cone biopsy merits caution.
- Highly multiparous woman.

**Other factors to be borne in mind**
- An unfavourable cervix
- Uncertain gestational age.
HAZARDS

- *Iatrogenic prematurity*—early pregnancy dating by ultrasound reduces this risk.
- *Infection*—there is little appreciable risk in practice but amnionitis can always be detected within 36 hours of amniotomy.
- *Neonatal jaundice*—there is a small risk if the total dose of oxytocin exceeds 20 units.
- *Failed induction*—defined as failure to deliver vaginally a patient in whom safe vaginal delivery was expected. The incidence is about 2% of all inductions.

CERVICAL RIPENESS

This is assessed by a modified Bishop’s score that gives marks of 0 to 3 for five cervical features—see Table 10.2.

- If the cervix is ‘ripe’ (score >5) induction of labour is likely to be successful.
- With a score of <5 induction is more likely to fail, the latent phase will tend to be longer, and a higher total dose of medication is likely to be necessary to reach optimal uterine activity.

METHODS OF INDUCTION

- *Membrane sweeping*—should be offered to women prior to formal induction. It is associated with discomfort during the procedure and light bleeding.
- *Prostaglandins*—should be used in preference to oxytocin in both nulliparous and multiparous women with intact membranes regardless of their cervical favourability. Intravaginal PGE₂ should be used in preference to intracervical preparations, as vaginal administration is as effective but less invasive.

Table 10.2 Modified Bishop’s score

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Cervical dilatation (cm)</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Cervical length (cm)</td>
<td>&gt;4</td>
</tr>
<tr>
<td>Station (cm above ischial spines)</td>
<td>−3</td>
</tr>
<tr>
<td>Consistency</td>
<td>Firm</td>
</tr>
<tr>
<td>Position</td>
<td>Posterior</td>
</tr>
</tbody>
</table>
Artificial rupture of membranes—following ruptured membranes, prostaglandins and oxytocin are equally effective.

Fetal well-being should be established once contractions are established or reported.

In women with intact membranes amniotomy should be performed where feasible prior to commencement of oxytocin infusion.

Oxytocin should not be started for 6 hours following the administration of prostaglandins.

Oxytocin should be delivered through a syringe driver or an infusion pump with a non-return valve. A recommended regimen is:

- Starting dose of 1–2 milliunits/min.
- Increased at intervals of 30 minutes or more.
- Minimum dose should be used, titrated against uterine contractions aiming for a maximum of 3–4 contractions every 10 minutes.
- Adequate contractions may be established at 12 milliunits/min although doses up to 32 milliunits/min are sometimes needed.
- As labour becomes established the dose of oxytocin may need to be reduced to avoid hyper-stimulation, particularly in multigravidae.

Water intoxication has occasionally followed the infusion of large volumes of fluid containing dilute oxytocin. Confusion and convulsions can proceed to coma and even death. This is totally avoidable.

For more discussion see Further reading.

Fetal heart rate monitoring is necessary if induction is being carried out for fetal reasons and during oxytocin infusion.

**PAIN IN LABOUR**

Pain is a normal part of labour and delivery although emotional, cultural and other influences alter individual responses.

**CAUSES OF PAIN IN LABOUR:**

- Dilatation of the cervix
- Accumulation of pain-producing substances due to ischaemia during uterine contractions
- Pressure on other organs (e.g. bladder and rectum) or the lumbo-sacral plexus; spasm in skeletal muscles
- Distension of vagina and perineum.

Sensory pathways are T10 to L1 for both uterine body and cervix. T11 and 12 are stimulated during the latent phase when pain is not
severe, T10–L1 are stimulated during the active phase. Referred pain is experienced in the dermatomes of the above segments.

**FACTORS AFFECTING PAIN IN CHILDBIRTH**

**Physical factors**
- Intensity and duration of contractions
- Speed of dilatation of cervix
- Vaginal and perineal distension
- Others, e.g. age, parity, size of infant, condition of patient.

**Physiological factors**
- Pain blocking, e.g. customs, culture, preparation, distractive activity
- Pain aggravating, e.g. customs, culture, fear, apprehension, anxiety, ignorance, misinformation
- Antenatal preparation of the mother and father is very important.

**ANALGESIA**

Antenatal education is a vital part of preparing women for the pain of labour.

**METHODS FOR PAIN RELIEF**

**Psychological methods**
- Counteract the ‘fear-tension’ sequence.
- Pain-relieving drugs can be used to supplement the mother’s own efforts.
- With proper preparation and support, up to 30–40% of women can go through labour without requiring analgesic drugs.

**Inhalational agents**
- Nitrous oxide (50%) and oxygen (50%)—‘Entonox’ apparatus
- Inhalational agents are often used too late and too hesitantly
- They can be highly effective and appear safe for mother and baby.

**Transcutaneous electrical nerve stimulation (TENS)**
- This aims to reduce pain by stimulating large myelinated nerve fibres to reduce input from small myelinated and non-myelinated fibres linked to peripheral pain receptors.
- Low-intensity continuous stimulation is applied to the dermatomes associated with the pain.
- It can provide good to moderate pain relief but success depends on time spent teaching and supporting the mother before and during use.

**Narcotic drugs**
- e.g. intramuscular pethidine
Note: combination with a phenothiazine (e.g. promazine or promethazine) provides no additional benefit, may produce maternal and fetal tachycardia and can rarely cause an oculogyric crisis. It should, therefore, not be used.

Advantages
• Ease of administration
• Reasonably rapid analgesia
• Low incidence of serious side-effects
• Antagonists available.

Disadvantages
• Inadequate analgesia in up to 40% of patients
• Nausea and vomiting common
• Psychic disturbances common (e.g. confusion, inability to cooperate)
• Delayed gastric emptying
• Neonatal respiratory depression.

Contraindications
• Previous idiosyncratic reactions
• Current mono-amine oxidase inhibitors.

Epidural analgesia
Despite its widespread use, little is known about the short or long term effects of epidural block on mother or baby.

Lumbar analgesia will provide total or adequate analgesia in over 90% of patients.

Indications
Epidural analgesia can be helpful for:
• prolonged labour
• maternal distress
• multiple pregnancy
• instrumental delivery
• hypertension in labour
• breech presentation.

Contraindications
• Lack of experienced personnel
• Infection at the injection site
• Shock & hypovolaemia
• Bony abnormalities of the spinal column
• Idiosyncratic reactions to local anaesthetic agents.

Pre-existing neurological disease is not necessarily a contraindication as long as it is understood that coincidental relapses can occur unrelated to the epidural block.
Immediate maternal problems

- **Dural tap**—dural puncture by needle or catheter; it may lead to ‘spinal’ headache (see below).
- **Total spinal block**—loss of all sensory and motor function; can include unconsciousness, severe hypotension and apnoea; it results from subarachnoid injection of epidural dose of local anaesthetic agent.
- **Hypotension**—can be avoided by nursing the patient on her side and by the intravenous infusion of Hartmann’s solution before the block is established (also used for treatment of hypotension).
- **Motor paralysis**—reduces maternal expulsive effort, tends to prevent rotation of the fetal head and makes instrumental delivery more likely. Motor block may be reduced by modification of anaesthetic agents used (see below).
- **Prolongation of second stage of labour.**
- **Toxic reactions** to local anaesthetic agents.

Delayed maternal hazards

- **Severe spinal headache** due to spinal tap.
  - Ensure adequate hydration and analgesia.
  - Infuse 1 litre of normal saline through the epidural catheter over 24 hours.
  - If no improvement within 48 hours consider a ‘blood patch’ (i.e. injection of up to 20 ml autologous blood into epidural space).
- **Urinary retention**?—more usually due to method and circumstances of delivery.
- **Sepsis**—extremely unlikely if bacterial filter is used.
- **Temporary diminished sensation of dermatomes affected.**
- **Local backache** is an occasional temporary problem. Chronic long-term backache is not.

Fetal effects

There are no direct adverse effects on the fetus. Temporary changes in the fetal heart rate, sometimes related to hypotension, are not uncommon.

Guidelines for use

- The regional block may be continuous during labour or as a single injection for operative delivery.
- Bupivacaine (0.5, 0.375 or 0.25%) is the preferred anaesthetic—a test dose should be injected initially. Lower concentrations of Bupivicaine (0.1–0.25%) combined with an opiate (e.g. fentanyl) reduce the motor block and may allow a ‘walking epidural’.
- Anaesthetic agents are often given by continuous infusion.
- Constant monitoring of maternal and fetal condition is mandatory.
- Top-up dose must be individually chosen when the patient begins to experience discomfort.

Epidural analgesia and previous caesarean section

Epidural block is permissible in any woman who is being allowed to labour having previously been delivered by caesarean section. FHR
should be monitored throughout. Significant FHR abnormalities may be a sign of scar dehiscence (and see p. 171).

**PRE-TERM LABOUR AND DELIVERY**

**Definition**
Regular, painful uterine contractions accompanied by effacement and dilatation of the cervix after 20 and before 37 completed weeks of pregnancy. It accounts for 5–10% of all deliveries but 85% of neonatal deaths.

**FACTORS ASSOCIATED WITH PRE-TERM DELIVERY**
- Spontaneous labour—cause unknown: 40%
- Spontaneous labour due to maternal or fetal conditions other than multiple pregnancy: 25%
- Multiple pregnancy: 10%
- Elective delivery: 25%

**CAUSES OF SPONTANEOUS PRE-TERM LABOUR**
These are given in the information box (roughly in order of importance).

<table>
<thead>
<tr>
<th>Spontaneous pre-term labour: causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple pregnancy</td>
</tr>
<tr>
<td>Antepartum haemorrhage</td>
</tr>
<tr>
<td>Intrauterine growth restriction</td>
</tr>
<tr>
<td>Cervical incompetence</td>
</tr>
<tr>
<td>Amnionitis</td>
</tr>
<tr>
<td>Congenital uterine anomaly</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Polyhydramnios</td>
</tr>
<tr>
<td>Pyelonephritis</td>
</tr>
<tr>
<td>Other infections</td>
</tr>
</tbody>
</table>

**PREDICTION OF RISK**
- No scoring system yet devised has proven itself superior to clinical judgement.
- The strongest association is with previous pre-term delivery. Among the measures suggested for prediction of high risk and possible prevention and for which no evidence of benefit exists are:
  - routine cervical examination
  - home monitoring of uterine activity
  - prophylactic beta-sympathomimetics
  - routine screening for bacterial vaginosis
  - prophylactic antibiotics
- It has, however, been suggested that the risk tends to increase the shorter the cervix measured by vaginal ultrasound from 20–28 weeks. See information box over:
Management varies according to five main factors:

- **The state of the membranes**—it is generally inadvisable to inhibit pre-term labour when the membranes are ruptured.
- **Dilatation of the cervix**—labour is likely to progress if the cervix is >4 cm dilated.
- **Gestational age**—the earlier the gestation, the more strenuous attempts to inhibit labour must be. Labour should be allowed to progress if the estimated fetal weight is >2000 g or gestation is >34 weeks.
- **The cause of pre-term labour**—delivery is indicated if fetal welfare is prejudiced.
  - Carry out an infection screen on the mother and consider amniocentesis for bacteriological culture if suspicion of chorioamnionitis.
  - Assess fetal well-being (see p. 54).
- **The availability of neonatal intensive care facilities**—if all cots are full or facilities are inadequate consider transfer of the patient (in good time) to a unit with better facilities.

**Glucocorticoid therapy and the prevention of respiratory distress syndrome**

- Corticosteroids given to the mother between 24 and 34 weeks can induce pulmonary surfactant in the lungs of the immature fetus and reduce the severity of respiratory depression syndrome.
- One regimen is dexamethasone or betamethasone 12 mg i.m. on 2 successive days. Where the risk of pre-term labour is very high (e.g. triplet pregnancy) this may be repeated two-weekly to 34 weeks.

**INHIBITION OF PRE-TERM LABOUR**

In up to 50% of patients contractions will stop spontaneously and the pregnancy will continue to term without any treatment whatsoever.

The clinical problem is to discern correctly those in whom drug therapy is indicated.

<table>
<thead>
<tr>
<th>Length of cervix (at or below centile)</th>
<th>Length of cervix (mm)</th>
<th>Relative risk of preterm delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>75th</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>10th</td>
<td>26</td>
<td>6</td>
</tr>
<tr>
<td>5th</td>
<td>22</td>
<td>9.5</td>
</tr>
<tr>
<td>1st</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>
β-sympathomimetic drugs
• These drugs (e.g. salbutamol or ritodrine hydrochloride) suppress uterine activity.
• Prolongation of pregnancy is, however, not necessarily beneficial to the fetus.
• The only true indication for their use is to delay delivery for long enough to allow:
  • glucocorticoids to stimulate fetal lung surfactant (see above)
  • transfer of the mother to a centre with adequate facilities for preterm delivery.

Potential side-effects
• Maternal tachycardia
• Hypotension
• Palpitations, headache, visual disturbances, skin flushing, nausea and vomiting
• Fetal tachycardia
• Hyperkalaemia
• Hyperglycaemia
• Rarely right heart failure may develop (usually when glucocorticoids have also been given).

Contra-indications:
• Antepartum haemorrhage
• Severe pre-eclampsia
• Maternal anti-hypertensive therapy (risk of myocardial infarction)
• Maternal cardiac disease or thyrotoxicosis
• Any other situation in which the prolongation of pregnancy could be hazardous
• Extreme caution must be exercised if the woman has diabetes, or is being treated with corticosteroids.

Other tocolytics
• Atosiban—oxytocin receptor antagonist. Licensed for the inhibition of uncomplicated pre-term labour between 24 and 33 weeks of gestation. Reported to have fewer side effects than β-sympathomimetics but more expensive.
• Indomethacin and nifedipine have also been used, but their use is unlicensed.

METHOD OF DELIVERY IN PRE-TERM LABOUR
• If the fetus is viable it must be delivered by the route least likely to cause trauma or hypoxia.
• Aim to have an experienced neonatal paediatrician present for delivery.
• In general, aim for vaginal delivery if the presentation is cephalic.
• Caesarean sections at very early gestation <26 weeks, and with infants under 1000 g, can be hazardous for the mother, and are not necessarily safer for the baby.
• The indications for caesarean section are stronger but not absolute in multiple pregnancy and breech presentation.
• Ventouse delivery should be avoided below 34 weeks.
• Pre-term labour is unpredictable and the woman may become fully dilated quickly and silently.

PRE-LABOUR RUPTURE OF THE MEMBRANES (PROM)

This is defined as rupture of the membranes before the onset of labour without reference to gestational age.

• It can be managed conservatively before 34 to 36 weeks’ gestation unless intrauterine infection is present or likely to develop. In the absence of infection prophylactic erythromycin should be given for 10 days.
• A high vaginal swab should be taken on admission. If it grows any significant organisms (particularly beta-haemolytic streptococci), delivery should be expedited and the neonatal paediatricians alerted.
• Any intrauterine infection must be treated vigorously and expeditiously (see ‘Further reading’).
• In term pregnancies 86% of women with PROM go into labour within 24 hours and deliver satisfactorily. The rate of spontaneous labour after this is about 5% per day. In the absence of any evidence of infection or cord presentation/prolapse, the onset of labour can be awaited for 24 hours. Expectant management of women with pre-labour rupture of the membranes at term should not exceed 96 hours following membrane rupture.

INTRAPARTUM FETAL MONITORING

Prior to any form of fetal monitoring, the maternal pulse should be palpated simultaneously with fetal heart rate auscultation in order to differentiate between maternal and fetal heart rates.

The aim of monitoring is to detect fetal hypoxia. The effects of hypoxia depend on the fetal glycogen reserves. A growth-restricted fetus will, therefore, be affected earlier and more severely than a well-nourished fetus.

• Anaerobic glycolysis results in an accumulation of lactate. This causes a fetal metabolic acidosis.
• The fetal pCO₂ rises, causing a respiratory acidosis.
• The blood pH falls.
• Fetal heart rate (FHR) patterns change (see below) the most serious being late decelerations associated with a fetal tachycardia.

Fetal distress
The traditional diagnosis of ‘fetal distress’ depended predominantly on the crude observation of heart changes.

‘Fetal distress’ is an imprecise and rather unhelpful term. Half of all babies delivered by forceps or caesarean section because of ‘fetal
distress’ are not hypoxic; and half of the most hypoxic babies do not exhibit classical signs of ‘fetal distress’.

METHODS OF INTRAPARTUM MONITORING

Intermittent auscultation of FHR using a fetal stethoscope
• In the active stage of labour this should occur after a contraction for a minimum of 60 seconds, and at least:
  • Every 15 minutes in the first stage.
  • Every 5 minutes in the second stage.
• It is applicable to low-risk patients with no significant obstetric abnormalities.
• More intensive monitoring should be used if any risk factors are present (see below).

Continuous monitoring of FHR and uterine activity (cardiotocography; CTG)
• The FHR is obtained by an external Doppler ultrasound monitor or an electrode attached to fetal scalp.
• The monitor measures the interval between paired beats, converts it into ‘beats per minute’ (bpm) and registers it.
• Uterine activity can be assessed by an external strain gauge transducer or measured by intrauterine catheter.
• This is a screening technique that facilitates the detection of fetal hypoxic stress. It is not diagnostic.
• Even when the most ominous pattern is present (see below) only 50% of the babies have a low Apgar score (see p. 188) at birth.
• The use of continuous FHR recordings must therefore be backed up by measurement of fetal scalp pH (see below).

Guide to indications for continuous FHR monitoring in labour

Antepartum risk factors
• Previous caesarean section
• High multiparity
• Suspected FGR
• Hypertension/pre-eclampsia
• History of APH in this pregnancy
• Poor obstetric history
• Diabetes
• Multiple pregnancy
• Rhesus iso-immunisation
• Oligohydramnios
• Reduced fetal movements
• Abnormal antenatal FHR tracing.

Intrapartum risk factors
• FHR >160 or <110 bpm
• Meconium-stained liquor
• Prolonged labour
• Epidural anaesthesia
• Augmented or induced labour
• Pre-term labour
• Breech presentation
• Prolonged rupture of membranes.

Interpretation
The whole clinical situation must be considered particularly gestational age, stage and progress of labour.
**Normal pattern**
- Rate between 110 and 160 bpm observed over a 5 or 10-minute period to determine the baseline.
- Baseline irregularity/variability of ≥5 bpm.
- No significant reduction in rate during contractions.

**Loss of baseline irregularity (<5 bpm)**
- This is the feature most commonly associated with fetal hypoxia
- Maternal drug administration can also reduce it
- Regard as:
  - *suspicious* if it lasts for up to 40 minutes
  - *pathological* if it lasts for >90 minutes

Management: check fetal pH.

**Baseline bradycardia (FHR <110 bpm)**
Regard as significant if it is:
- accompanied by loss of baseline irregularity and/or decelerations (i.e. complicated bradycardia)
- and/or is <100 bpm.

Management: turn the patient on her side, give oxygen and check fetal pH.

**Baseline tachycardia (FHR >160 bpm)**
Management: measure fetal pH if tachycardia persists or it is accompanied by decelerations and/or loss of baseline irregularity.

**Accelerations**
Transient increases in FHR of 15 bpm or more and lasting 15 seconds or more. This is normal and reassuring.

**Decelerations**
Transient episodes of slowing of FHR below the baseline level of more than 15 bpm and lasting 15 seconds or more.

*Early decelerations:*
- Uniform, repetitive, periodic slowing of FHR with onset early in the contraction and return to baseline at the end of the contraction.
- It may be due to head compression, cord compression or early hypoxia.

Management: check fetal pH if the pattern deteriorates or persists.

*Late decelerations:*
- Uniform, repetitive, slowing of FHR with onset mid to end of the contraction and nadir more than 20 seconds after the peak of the contraction and ending after the contraction.
- The greater the lag time the more serious the significance.
- The worst picture is of shallow late decelerations, loss of baseline irregularity and tachycardia.
Management: a fetal pH measurement is mandatory.

Variable decelerations:
- Variable, repetitive, periodic slowing of FHR with rapid onset and recovery. Time relationships with contraction cycles are variable and they may occur in isolation.
- Sometimes they resemble other types of deceleration patterns in timing and shape.
- If they appear consistently, fetal hypoxia is likely.

Management: check fetal pH if the pattern persists after turning the patient on her side (or if other adverse features are present).

FHR in the second stage of labour
- The fetal heart patterns are complex and may be difficult to interpret in the second stage of labour.
- The CTG trace should be interpreted in conjunction with the pattern in the first stage of labour.
- Brief profound early decelerations are not uncommon but persistent late decelerations or prolonged bradycardia must not be ignored.

Fetal ECG
- Uses the same scalp clip as for the FHR
- It depends on analysis of the ST waveform
- The following adverse features have been suggested:
  - T/QRS ratio >0.25
  - a negative T wave
  - ST depression with T elevation
- Its main benefit is to provide reassurance in the presence of an abnormal CTG and, perhaps, reduce the rate of unnecessary caesarean sections.

Fetal blood sampling (FBS)
- FHR and scalp pH measurement are complementary.
- The former without the latter increases the caesarean section rate unnecessarily because of false positive diagnoses.
- The indications for FBS are outlined above.
  - A fetal scalp pH of 7.0 or less is strongly associated with a poor outcome (particularly if the Apgar score is 3 or under at 5 minutes)
  - A pH of 7.20 or less suggests the need to deliver
  - A base deficit of >12 mmol/l is also abnormal

Significance of meconium staining of the liquor
- Meconium is present in the liquor of about 15% of all deliveries at term and up to 40% post-term.
- It’s significance as a diagnostic sign of ‘fetal distress’ has been over-emphasised although gross staining is more likely to be significant.
Aspiration by the baby of the liquor heavily stained with meconium causes a severe and sometimes fatal pneumonitis.

**Conclusion**
The sensitivity and specificity of all methods for intrapartum monitoring of the fetus are still poor. New initiatives are still badly needed. For further discussion see NICE guidelines and Enkin et al in Further reading.

**THE NORMAL PELVIS**

**AVERAGE DIAMETERS**

**PELVIC SHAPE—IN THE NORMAL PELVIS**
- The brim is round, and the sacral promontory is not prominent.
- The angle of inclination is about 55° to the horizontal.
- The cavity is shallow with straight, non-converging walls.
- The sacrum is smoothly curved.
- In the outlet the sacro-sciatic notches are wide and shallow.
- The sacrum does not project forwards.
- The ischial spines are not prominent.
- The pubic arch is wide and domed.
- The sub-pubic angle is about 90°.
- The inter-tuberous diameter is wide.

**PELVIMETRY**
- Clinical assessment of pelvic size and shape is only likely to be of benefit if the pelvis is severely contracted.

![Figure 10.2](Normal_Pelvis.png)

**Fig 10.2**  Normal Pelvis
• X-ray pelvimetry has been superseded in many places by CT scanning. This reduces the radiation dosage and is likely to be more accurate.
• However, the criteria for normality have not yet been set.
• Pelvimetry is of no clinical value if the presentation is cephalic.
• There is also no reliable evidence of benefit for the traditional indications of primigravid breech presentation or after caesarean section for suspected disproportion. Pelvimetry after previous caesarean section has been shown to increase caesarean section rates in subsequent pregnancies.

CEPHALO-PELVIC DISPROPORTION (CPD)

Definition: The failure of the head to pass through the pelvis safely because the pelvis is too small and/or the head too large
• CPD is more likely if maternal height is 1.5 metres or under.
• The diagnosis is made in labour if the fetal head fails to descend and the cervix to dilate. With increasing oedema of the scalp, caput forms and excessive moulding of the skull bones occurs.

MANAGEMENT
• Elective section is rarely necessary in primigravidae unless there are other indications e.g. a malpresentation or the true conjugate is <7.5 cm.
• Otherwise an attempt at vaginal delivery is justifiable. This is then regarded as a trial of labour.
• A trial of labour should be allowed to continue for as long as progress is occurring in labour with regular forceful contractions.
• If the woman has not delivered within 12 hours of the onset of regular contractions the situation must be reviewed critically.
• Such a trial of labour has no place in multigravid women or in the presence of a breech presentation.

ABNORMALITIES OF LIE, PRESENTATION AND POSITION

BREECH PRESENTATION

Incidence
3–4% of all labours. Up to one-third are undiagnosed.

Definitions
• Frank breech (65%)—both legs extended at the knee.
• Complete breech (10%)—both legs flexed at hip and knee.
• Footling breech (25%)—one or both feet tucked underneath the buttocks; more common in multiparous women due to laxity of abdomen.
Causes
• Extended legs preventing spontaneous version
• Those conditions preventing the presenting part entering the pelvic cavity
• Uterine anomaly
• Chance.

Associations
• Fetal anomaly
• Pre-term delivery
• Multiple pregnancy.

Antenatal management
• Spontaneous version is likely up to 34 weeks but may occur later.
• External cephalic version (ECV) is safe for mother and baby in carefully selected patients and reduces the need for elective caesarean section. It should be actively offered and discussed.
• ECV is not advised before 36 weeks’. Tocolytic agents may increase success rates. Do not use in women with heart disease, diabetes or thyroid disease.
• ECV at term will reduce non-cephalic births by up to 60%. Over 95% remain cephalic.

Hazards of ECV. See the information box.

<table>
<thead>
<tr>
<th>Hazards of ECV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-term labour</td>
<td>Cord accident</td>
</tr>
<tr>
<td>Placental abruption</td>
<td>Uterine rupture (if previous section)</td>
</tr>
</tbody>
</table>

Contraindications to ECV. See the information box.

<table>
<thead>
<tr>
<th>Contraindications to ECV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute</td>
<td>Relative</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>Previous caesarean section</td>
</tr>
<tr>
<td>APH</td>
<td>FGR</td>
</tr>
<tr>
<td>Ruptured membranes</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Oligohydramnios</td>
<td>Rhesus iso-immunisation</td>
</tr>
<tr>
<td>Significant fetal anomaly</td>
<td>High multiparity</td>
</tr>
<tr>
<td>Caesarean section indicated for other reasons</td>
<td>Anterior placenta</td>
</tr>
<tr>
<td>Placenta praevia</td>
<td>Obesity</td>
</tr>
</tbody>
</table>

Prerequisites for ECV
• Gestation at least 36 weeks’
Recent ultrasound to confirm presentation, normal fetus and adequate liquor volume
• Reactive FHR
• Informed consent of mother
• Facilities for rapid progression to caesarean section, if necessary
• Rh-D-negative women must be given anti-D immunoglobulin (50 µg or more as Kleihauer test dictates).

Management of delivery
Current evidence suggests that:
• Vaginal breech delivery is safe for 97% of babies in whom there are no other risk markers (see below).
• However, the overall risk of perinatal death for the term singleton breech delivered by planned caesarean section is reduced by 75% [Relative risk (RR) 0.23; Confidence interval (CI) 0.07–0.8].

Thus, women should be offered an elective caesarean section if ECV is declined or unsuccessful.

Although there is insufficient evidence to support routine caesarean section for the delivery of the pre-term breech and the first or second breech twin, most obstetricians would now recommend caesarean section for the pre-term breech or if twin one is breech.

Some mothers will still opt for an attempt at a vaginal breech delivery and should be further assessed (see below).

Pre-delivery assessment
• There is no evidence that routine pelvimetry is beneficial. It has not been shown to improve outcome. If thought to be necessary use CT pelvimetry (see p. 154).
• Carry out ultrasound assessment of BPD, fetal mass, fetal attitude and flexion/extension of fetal head.
• Major fetal anomalies should have been excluded.

Vaginal delivery
• An attempt at vaginal delivery can be considered with:
  • Term pregnancy and fetal weight estimated at 2500–3800 g
  • Frank or complete breech
  • Presumed or demonstrated normal pelvic dimensions
  • No other complications of pregnancy (e.g. pre-eclampsia)
  • Normal fetal assessment
  • Epidural anaesthesia can be useful during a breech labour but is not essential.
  • Augmentation of labour with oxytocin should only be used with extreme caution and close monitoring. It is contraindicated if there is any evidence of disproportion.
  • The baby should be born by the patient’s own efforts with little assistance from the obstetrician (assisted breech delivery).
• Any more active intervention involving breech extraction is contraindicated because the perinatal consequences are so severe.

**Caesarean section**
Among the definite indications are any medical or obstetric complications that are likely to be associated with mechanical difficulties at delivery or a compromised fetus:

- Any abnormality of bony pelvis
- Fetal weight estimated at >3.8 kg
- Hyperextension of fetal head
- Previous difficult labour
- FGR
- Bad obstetric history
- Diabetes
- Severe pre-eclampsia
- Failure to progress in first stage
- Failure of descent of breech in second stage
- Any condition which would apply whatever the presentation, e.g. fetal hypoxia.

**OCCIPITO-POSTERIOR POSITION**
Incidence: approximately 20% in early labour.

If the baby's head is partially extended it does not fit into the lower uterine pole well, with the following consequences in labour:

- The membranes rupture early and the cervix is not well apposed to the cervix.
- The sinciput reaches the pelvic floor first and, therefore, rotates to the front, i.e. the occiput is posterior.
- The larger occipito-frontal diameter (10 cm) of the head presents, making its passage through the pelvis more difficult.
- The first stage of labour is prolonged.
- The moment of the forces pushes the head posteriorly causing backache and inducing bearing-down efforts before full dilatation.
- The second stage of labour may be prolonged.

The occiput may:

- Rotate anteriorly and deliver relatively easily (75%)
- Persist posteriorly (POP) and delivery spontaneously if the pelvis is capacious (i.e. face to pubes) or require assisted delivery (5%)
- Begin to rotate anteriorly but undergo deep transverse arrest at the level of the ischial spines. Instrumental delivery will be required (20%).

**Predisposing factors**
- Slight reduction in pelvic inlet
- Large baby

**Diagnosis**
Antenatally—this is inaccurate:
the maternal abdomen may be flattened or fetal parts palpable easily on both sides of the midline.
the head is unengaged and feels larger than usual.

Intrapartum—by vaginal examination:
both fontanelles can be felt more easily.
moulding and caput may make recognition difficult and palpation of an ear may be necessary for correct positioning.

Management
Provide adequate analgesia: an epidural anaesthetic is ideal.
Prevent ‘maternal distress’, ketosis and dehydration.
Observe progress in labour carefully.
Monitor fetal welfare.
Syntocinon may be used with care only in primigravidae to encourage spontaneous rotation to occipito-anterior.

Relative cephalo-pelvic disproportion may occur and there is an increased risk of instrumental delivery and caesarean section.
The criteria for assisted delivery are discussed on p. 164.

BROW PRESENTATION
Incidence: approximately 1/1000
A brow presentation discovered antenatally may be due to:
• chance—and may correct itself spontaneously
• a swelling in the neck causing extension of the head, e.g. goitre, cystic hygroma
• spasm of the sterno-mastoid muscles.

Suspect a brow presentation in a multiparous woman with delay in the first stage of labour despite good contractions when she has delivered vaginally easily before.

Diagnosis
• Supra-orbital ridges and anterior fontanelle palpable p.v.
• Confirm by ultrasound.

Management
• In early labour a brow presentation may flex to become a vertex or extend further to a face presentation. Both are potentially deliverable vaginally.
• If the brow presentation persists into, or is discovered in, established labour delivery should be by caesarean section.

FACE PRESENTATION
Incidence: approximately 1/500. (75% mento-anterior).
A face presentation has the same causes as a brow presentation but causing full extension of the head on the neck.

In labour, anterior rotation of the chin is essential: a mento-posterior position cannot deliver vaginally.

**Diagnosis**
Palpation of supra-orbital ridges and the alveolar margins (confusion may arise between a face and the breech).

**Management**
An attempt at vaginal delivery should be allowed unless:
- Something is obstructing the entry into the pelvis.
- The pelvis is too small.
- The chin is posterior.

**TRANSVERSE AND OBLIQUE LIE**
Incidence: approximately 1/300
Among the causes are:
- High multiparity
- Pre-term labour
- Multiple pregnancy
- Uterine anomaly
- Hydramnios
- Obstructing tumour or placenta praevia
- Severe pelvic contraction.

**Antenatal management**
See p. 132.

**Intrapartum management (singleton pregnancy)**
In a neglected shoulder presentation an arm may well be prolapsed and the baby already dead. In these circumstances vaginal decapitation may be possible but only by an experienced operator. This is very seldom performed in the UK.
Otherwise caesarean section with decapitation *in utero* is less hazardous for the mother.

**SHOULDER DYSTOCIA**
*Incidence*: about 0.2–1%.
This is one of the most frightening obstetric emergencies
It occurs when the fetal shoulders fail to negotiate the pelvic inlet
Prompt (but not forcible) action is required to prevent fetal morbidity or mortality (see Stirrat and Taylor in ‘Further reading’)

**Antenatal risk factors**
- Mother’s birthweight >90th centile
- Maternal obesity or massive weight gain
• Diabetes mellitus—can be despite seemingly good blood sugar control
• Prolonged pregnancy (beyond 42 completed weeks)
• Previous shoulder dystocia (10% risk of recurrence) or large baby
• Recognised macrosomia this pregnancy.

**Intrapartum risk factors**

*First stage:*
• ‘dysfunctional labour’
• secondary arrest after 8 cms.

*Second stage:*
• midcavity arrest
• need for midcavity instrumental delivery in multiparous woman.

**Prediction**
• Consideration of above risk factors predicts fewer than 20% of cases!
  • Where practiced it has not reduced fetal asphyxia or trauma.
  • When interpreted too rigidly many women will have unnecessary interventions.
• Clinical prediction of excessive birthweight is unreliable.
• Ultrasound estimates are inaccurate at upper centiles.

**Risks to the baby**
• Neurological injury—occurs in 1–2/1000 births. It can involve:
  • cervical cord
  • brachial plexus—Erb’s palsy (C5,6,7): Klumpke’s palsy (C7,8,T1)
  • phrenic nerve.
• Hypoxic ischaemic encephalopathy (HIE)—0.5–1/1000 births
• Fractures: clavicle (2–3/1000); humerus (0.2–0.3/1000).

**Management**
• Recognition and recording of possible risk factors (keep good records!)
• Clear plan of action in guidelines
• Rapid reaction—the midwife has a vital role
• Immediate response:
  • call for help—summon experienced obstetrician, anaesthetist and paediatrician
  • place woman in ‘McRoberts position’, i.e. hip joints fully abducted, rotated outwards and flexed with thighs touching maternal abdomen. This encourages release of the anterior shoulder.
  • make good-sized episiotomy.
• Next steps:
  • Apply suprapubic pressure to try to encourage the anterior shoulder to flex and rotate transversely.
• Attempt to deliver posterior shoulder if unable to deliver anterior (adequate analgesia needed for this and manoeuvres below).
• Try to dislodge and rotate fetal shoulders vaginally (Wood's screw manoeuvre).
• Cephalic replacement following tocolysis and delivery by caesarean section (Zavanelli manoeuvre) has been described but only as a 'desperate solution'.
• Symphysiotomy may allow delivery as a last resort, but is seldom used in the UK.

MULTIPLE PREGNANCY AND LABOUR

TWINS
• Pre-term labour is common.
• Placenta praevia may be present.
• Prolapse of the cord must be watched for.
• Malpresentations are more likely—the presentations in order of frequency being:
  - Vertex: vertex
  - Vertex: breech
  - Breech: vertex
  - Breech: breech
  - Vertex: transverse
  - Breech: transverse.

POSSIBLE INDICATIONS FOR ELECTIVE CAESAREAN SECTION
• First twin presenting as a breech
• Triplets and higher multiples
• Proteinuric pre-eclampsia
• Any indication which would also apply in singleton pregnancies, e.g. FGR, APH.

MANAGEMENT OF LABOUR AND DELIVERY
• An intravenous line should be set up; a paediatrician and an anaesthetist should be present for delivery lest rapid general anaesthesia becomes necessary.
• An epidural is often useful, particularly to assist in delivery of the second twin.
• After vaginal delivery of the first twin, check the lie is longitudinal. External cephalic version is usually possible. If necessary, presentation can be checked by portable ultrasound in the delivery room. The second sac should be ruptured once uterine activity begins.
• If contractions do not begin within 15 minutes, commence an oxytocin infusion.
• If the cord of the second twin prolapses, proceed to ventouse extraction (if the presentation is cephalic) or breech extraction (if the presentation is breech).
• Anaesthesia for the latter should be epidural if already established, or general.
• *The interval between delivery of the first and second twins should be no more than 20 minutes.*
• *Beware of postpartum haemorrhage.* The third stage should be actively managed and a syntocinon infusion given if the uterus is poorly contracted.
• After delivery check placentae and membranes for zygosity. Histological confirmation is necessary.

## OPERATIVE OBSTETRICS

### EPISIOTOMY

The need for an episiotomy is a matter for experienced clinical judgement. ‘Routine’ episiotomy is no longer practiced.

#### Indications

Among these will be:

- When a major perineal tear appears inevitable
- In cases of fetal distress late in the second stage
- Most forceps deliveries (except low cavity forceps)
- Pre-term delivery
- Breech delivery
- Failure to advance because of perineal rigidity.

#### Technique

An episiotomy must be:

- Performed at the correct time—incise too early and unnecessary blood loss will result.
- Carried out with adequate local or regional anaesthesia. Failure to use anaesthesia is to be deprecated.
- Made with sharp scissors in the correct place. The medio-lateral episiotomy is more common in the UK. Midline incisions increase the risk of third degree tears. The episiotomy must always start in the midline.
- Repaired properly within as short a time of delivery as possible.

#### Side-effects

- *Pain.* This can be severe and is the main reason for avoiding episiotomy. It can be reduced by prompt, careful and expert repair.
- *Bleeding.* The average blood loss is about 100 ml and much larger losses are all too common.
- *Breakdown.* Inversely related to the expertise of the person repairing the episiotomy.
- potential causes are delay in suturing, inappropriate suture materials and bad technique.
• primary repair with antibiotic cover should be carried out where possible.
• Dyspareunia. This can be so severe that it becomes a factor in marital breakdown.

THIRD- AND FOURTH-DEGREE PERINEAL TEARS

All women having a vaginal delivery should have a systematic examination of the perineum, vagina and rectum to assess the severity of damage prior to suturing.

Third-degree tears involve the external anal sphincter muscle. Fourth-degree tears also involve the rectal mucosa.

• They must be repaired in theatre under epidural or general anaesthesia by an experienced obstetrician.
• Give broad spectrum intra-operative and post-operative antibiotics to reduce infection risk and wound dehiscence.
• Use of stool softeners such as lactulose and a bulking agent such as Fybrogel for 10 days is recommended.
• If the repair breaks down eradicate local sepsis before attempting another repair.
• The prevalence of anal symptoms is reported to be 25–57%.
• Women should be followed up at 6 weeks and 6 months.

Subsequent delivery
Discuss the possibility of recurrence and deterioration of faecal symptoms. If symptomatic, offer elective caesarean section, as there is risk of deterioration in symptoms.

There is no evidence regarding the role of prophylactic episiotomy.

INSTRUMENTAL DELIVERY

Potential indications
• Failure to advance in the second stage, frequently due to failure of maternal effort, epidural analgesia and/or malposition of the fetal head.
• Maternal conditions in which (prolonged) expulsive efforts may be detrimental e.g. cardiac and respiratory disease, severe pre-eclampsia or eclampsia.
• ‘Fetal distress’ in the second stage.
• Prolapse of the cord in the second stage.

Delivery can be by the vacuum extractor (ventouse) or obstetric forceps.

The ventouse must not be considered as an easy way out when adverse features are present or the position of the fetal head is unknown.
Prior conditions for instrumental delivery

- A legitimate indication must be present.
- The presentation must be suitable, i.e. vertex, face (mento-anterior—not ventouse!) or after-coming head in a breech delivery.
- There must be no cephalo-pelvic disproportion. Moulding of the fetal skull must not be excessive.
- The head must be engaged. Ideally, no part of the fetal head should be palpable per abdomen, and if more than 1/5 can be palpated vaginal delivery must not be contemplated.
- The position of the head must be known.
- For forceps, the cervix must be fully dilated.
- The ventouse can, in some circumstances, be used before the cervix has reached full dilatation (see below).
- Analgesia must be adequate.
- The bladder must be empty.
- The uterus must be contracting.

Forceps to the after-coming head (ACH) in a breech delivery

This is the method of choice for delivery of the ACH because of the degree of control the operator can exercise.

Forceps in the delivery of low birthweight infants (<2500 g)

Lift-out forceps neither protects against nor induces birth trauma in LBW infants. Rotational forceps are best avoided for LBW infants. Ventouse should be avoided <34 weeks.

‘Trial of forceps’

- This is justifiable when it is likely, but not entirely certain, that vaginal delivery by forceps will be successful. Otherwise the patient should be delivered by caesarean section.
- It should be carried out in a theatre by an experienced obstetrician, with the mother fully prepared for caesarean section to reduce delay in delivery if unable to deliver vaginally.

The use of the ventouse

Vaginal delivery is technically possible before full dilatation but should not be attempted if there is any suspicion of cephalo-pelvic disproportion.

The following points are a guide to its proper use:

- The patient’s expulsive efforts are used to assist delivery.
- The fetal head must be at least at the level of the spines.
- The largest possible of the four cups should be used.
- If delivery is not imminent after pulling on the ventouse during three contractions the attempt must cease and the patient must be delivered by caesarean section.

Analgesia for instrumental delivery

- Perineal infiltration alone is suitable for episiotomy, and low outlet deliveries using the ventouse or ‘outlet’ forceps.
Pudendal nerve block is useful for mid-cavity forceps and some ventouse deliveries. It does not provide adequate analgesia for rotational forceps. The transvaginal route is recommended for insertion of the block.

Epidural anaesthesia is ideal particularly for rotational forceps; it is also suitable for emergency caesarean sections in which an existing epidural block is providing good analgesia.

CAESAREAN SECTION
Definition of classes of caesarean section adopted by the RCOG:

- **Emergency**—immediate threat to life of woman or fetus.
- **Urgent**—maternal or fetal compromise that is not immediately life threatening.
- **Scheduled**—needing early delivery but no maternal or fetal compromise.
- **Elective**—at a time to suit the patient and the maternity team.
- **Perimortem**—carried out in *extremis* while the mother is undergoing active resuscitation to save the fetus or the mother.
- **Postmortem**—carried out after the mother has died in order to try to save the fetus.

The overall caesarean rate in the UK is about 20%, but there are wide variations between regions and individual hospitals.

- It must not be carried out without good reasons.
- It is indicated when delivery must be effected rapidly for fetal and/or maternal reasons and when it is not thought to be safe vaginally.
- The transperitoneal lower segment caesarean section accounts for virtually all of the operations in modern obstetrics.
- Classical caesarean section is very occasionally indicated, e.g. for transverse lie with PROM, or for caesarean section at 26 to 28 weeks. In this latter situation, the vertical incision starts in the lower segment but extends into the upper segment.

Epidural or spinal anaesthesia and caesarean section

**Advantages**
- It is safer for the mother.
- She is awake and sees the child at delivery.
- The father can usually be present.
- Consciousness is not impaired immediately post-operatively.
- Post-operative problems and pain are less than after general anaesthesia.
- Breast-feeding and mobilisation can start early.

**Disadvantages**
- The procedure takes longer.
- Occasionally anaesthesia is not complete. Therefore the patient should be fully prepared for general anaesthesia (GA).
• Contraindications to epidural/spinal anaesthesia are discussed on p. 144.

SOME IMPORTANT TECHNICAL POINTS ABOUT LOWER SEGMENT CAESAREAN SECTION (LSCS)

• H²-receptor antagonists should be given pre-operatively to reduce the risk from aspiration of acid gastric contents.
• This also applies to procedures using epidural/spinal block lest conversion to GA becomes necessary.
• Induction of GA should take place at the last possible moment to reduce fetal exposure to the anaesthetic agents.
• The operation is carried out with a 10–15° left lateral tilt to prevent supine hypotension.
• A cuffed endotracheal tube must be used.
• Special care must be taken in Rh-negative women to remove residual blood from the peritoneal cavity because some of it may be Rh-D-positive fetal blood.
• Thrombo-prophylaxis must be considered (see also p. 75):
  - Low risk—early mobilisation and hydration.
  - Moderate risk—subcutaneous heparin and/or mechanical methods.
  - High risk—heparin prophylaxis and leg stockings.

DELIVERY IN SUBSEQUENT PREGNANCIES

• Elective caesarean section is advised if the cause is recurrent (e.g. CPD)
• If vaginal delivery is attempted, oxytocin must be used with extreme care and only with the strongest of indications. (It may be helpful to monitor intrauterine pressure).
• Epidural anaesthesia can be used; the pain of ruptured uterus will break through the epidural block.
• Significant increased risk of placenta accreta if placenta praevia.

MATERNAL MORTALITY AND CAESAREAN SECTION

See Further reading and Chapter 12.

• There were 40 direct and 51 indirect deaths in women who had a caesarean section in the UK in 1997–1999.
• The main associated causes of direct deaths (in order of frequency) were:
  - Hypertensive disease 12
  - Thrombosis 11
  - Sepsis 6
  - Haemorrhage 4
  - Amniotic fluid embolism 2
  - Trauma/other 1
Surgical case fatality rates are a combination of the risk associated with the disorder for which the surgery is performed and that of the procedure itself (including anaesthesia and peri-operative care).

The direct death case fatality rate for following caesarean section was:
- About $\times 5$ greater than for vaginal delivery.
- $\times 12$ greater for emergency caesarean section
- $\times 2$ greater for elective caesarean section.

Substandard care was deemed to be a factor in a significant number of cases, the main criticisms being:
- lack of facilities and staff for ‘high risk’ cases
- failure to understand the severity of the woman’s condition
- misjudgement of fluid balance and transfusion requirements
- inappropriate delegation or assumption of responsibility

Clear guidelines should be set for perimortem and postmortem caesarean sections and be made known in all Obstetric and Accident & Emergency Units.

**FURTHER READING**


Creasy RK, Resnik R 1998 Maternal Fetal Medicine, 4th edn. Saunders, Philadelphia


RCOG Clinical Guideline No. 1 (B) 2002. Tocolytic drugs for women in preterm labour. RCOG, London
