# LABOUR by Dr. Noor Hazim



#### Labour or human parturition

- Is the physiological process that results in birth of a baby, delivery of the placenta and the signal for lactation to begin.
- Normal labour requires observation and support and falls within the expertise of midwifery care.
- Health professionals who manage labour must have an understanding of the anatomy and physiology of the mother and fetus, what distinguishes a normal from an abnormal labour, when it is appropriate to intervene, how to intervene safely and how to support the woman and her partner through unexpected labour events.



Labour is divided into:

fourth stages:

- The first stage begins with diagnosis of the onset of labour and is complete when
- full cervical dilatation has been reached.
- > The second stage begins with full cervical dilatation and
- ends with birth of the baby.
- The third stage begins with birth of the baby and ends with complete delivery of the placenta and membranes.
- >The fourth stage of labour the hour immediately following delivery
- Complications can occur during any of the 4th stages and can be divided into maternal and fetal neonatal complication

# Labour is best summarized using the '3 Ps',

# Which are:

- 1- the powers
- 2- the passages
- 3- the passenger.
- 1- The 'powers' refers to forces, firstly the contractions of the uterine muscle that result in passage of the fetus through the birth canal, and secondly the maternaleffort of pushing in the second stage of labour.
- 2-The'passages' refers to the birth canal itself, which is made up of the bony pelvis, the muscles of the pelvic floor and the soft tissues of the perineum.
- 3- The 'passenger' refers to the fetus in terms of its size (small,average, large), presentation (that part of the fetusentering the pelvis first, e.g. vertex of head, face,
- brow or breech) and position (orientation of the presenting part in relation to the maternal public symphysis, e.g. occipito-anterior, occipito-posterior).
- When the 3Ps are favourable, normal labour is likely to ensue, resulting in an unassisted or spontaneous vaginal birth.

Labour and childbirth has physical, psychological, social, cultural and political dimensions, which makes it a very interesting area to work in.

# Maternal and fetal anatomy

- The maternal pelvis
- 1-The pelvic inlet

The pelvic inlet or brim is bounded anteriorly by the upper border of the symphysis pubis (the joint separating the two pubic bones), laterally by the upper margin of the pubic bone, the ileopectineal line and the ala of the sacrum, and posteriorly by the promontory of the sacrum . The normal transverse diameter in this plane is 13.5 cm diameter, and is wider than the anterior–posterior (A–P) diameter, which is normally 11.0 cm . The fetal head typically enters the pelvis orientated in a transverse position in keeping with the

wider transverse diameter.

□ The angle of the inlet is normally 60° to the horizontal in the erect position, but in Afro-Caribbean women this angle may be as much as 90°. This increased angle may delay the head entering and descending through the pelvis during labour compared to labour inCaucasian women .

diameter, which is normally 11.0 cm (Figure 12.2).

Iliac crest Sacroiliac llium joint Anterior  $\mathcal{N}$ Sacrum superior iliac spine  $\sim$ 0 Coccyx Superior and inferior rami Os pubisof the pubic bone Obturator foramen Ischial tuberosity Ischium Pubic symphysis





Figure 12.2 The pelvic brim.

spines and +1 is 1 cm below the spines).

describes an imaginary curved line, a path that the





Figure 12.3 Sagittal section of the pelvis demonstrating the anterior–posterior (A–P) diameters of the inlet and outlet. Figure 12.4 The pelvic outlet.



#### 2-The midpelvis

The midpelvis, also known as the midcavity, can be described as an area bounded anteriorly by the middle of the symphysis pubis, laterally by the pubic

bones, the obturator fascia and the inner aspect of the ischial bone and spines, and posteriorly by the junction of the second and third sections of the sacrum.

The midpelvis is almost round, as the transverse and anterior diameters are similar at 12 cm.

The ischial spines are palpable vaginally and are used as important landmarks for two purposes:

1- To assess the descent of the presenting part on vaginal examination (e.g. station zero is at the level of the ischial spines, -1 is 1 cm above the spines and +1 is 1 cm below the spines).

2- To provide a local anaesthetic pudendal nerve block. The pudendal nerve passes behind and below the ischial spine on each side.

> A pudendal nerve block may be used for a vacuum or forceps assisted delivery.

Station zero is an important landmark clinically because instrumental delivery can only be performed if the fetal head has reached the level of the ischial spines or below.

# 3-The pelvic outlet

- The pelvic outlet is bounded anteriorly by the lower margin of the symphysis pubis, laterally by the descending ramus of the pubic bone, the ischial tuberosity and the sacrotuberous ligament, and posteriorly by the last piece of the sacrum.
- The AP diameter of the pelvic outlet is 13.5 cm and the transverse
- diameter is 11 cm .
- The transverse is the widest diameter at the inlet, but at the outlet it is the AP diameter, and the fetal head must rotate from a transverse to an AP position as it passes through the pelvis.
- Typically, this happens in the midpelvis where the transverse and
- AP diameters are similar. In addition, the pelvic axis describes an imaginary curved line, a path that the centre of the fetal head must take during its passage through the pelvis, from entry at the inlet, descentand rotation in the midpelvis and exit at the outlet.



The important features of the maternal pelvis is central to understanding the mechanism of labour.

# Pelvic shape

- The pelvic measurements described above are average values and relate to bony points. Maternal stature, ethnicity, previous pelvic fractures and
- metabolic bone disease, such as rickets, may all be associated with measurements less than the population average.
- Furthermore, as the pelvic ligaments at the pubic ramus and the sacroiliac joints loosen towards the end of the third trimester, the pelvis becomes more flexible and these diameters may increase during labour. It is also possible to enhance the pelvic dimensions with more favourable maternal positions in labour (e.g. squatting or kneeling).
- It is now uncommon to perform X-rays or computed tomography (CT) or magneticthe pelvic dimensions because they have, on the whole, proven to be of little clinical use in predicting the outcome of labour.

A variety of pelvic shapes are described, and these may contribute to difficulties encountered in labour.

1- The gynaecoid pelvis is the most favourable for labour, and a the classical female pelvis with the inlet transversely oval and a roomier pelvic cavity.

2- An android-type pelvis is said to predispose to failure of rotation and deep transverse arrest . the inlet is heart-shaped and the cavity is funnel-shaped with a contracted outlet.

3-the anthropoid shape encourages an occipito-posterior (OP) position. A long, narrow and oval-shaped pelvis due to the assimilation of the sacral body to the fifth lumbar vertebra.

4- A platypelloid pelvis is also associated with an increased risk of obstructed labour due to failure of the head to engage, rotate or descend. a wide pelvis flattened at the brim with the sacral promontory pushed forward.





#### The ideal female pelvis has the following features:

- Oval brim.
- Shallow cavity.
- Non-prominent ischial spines.
- Curved sacrum with large sciatic notches >90
- Sacrospinous ligament >3.5cm long.
- Rounded subpubic arch >90
- Intertuberous distance of at least 10cm.
- Diagonal conjugate diameter of at least 12cm.



#### The pelvic floor

This is formed by the two levator ani muscles which, with their fascia, form a musculofascial gutter during the second stage of labour .The configuration of the bony pelvis together with the gutter-shaped pelvic floor muscles encourage the fetal head to flex and rotate as it descends through the midpelvis towards the pelvic outlet.



#### The perineum

- The final obstacle to be overcome by the fetus during labour is the perineum. The perineal body is a condensation of fibrous and muscular tissue lying between the vagina and the anus .
- It receives attachments of the posterior ends of the bulbo-cavernous muscles, the medial ends of the superficial and deep transverse perineal muscles and the anterior fibres of the external anal sphincter.
- The perineum is taut and relatively resistant in the nulliparous woman, and pushing can be prolonged.
- Vaginal birth may result in tearing of the perineum and pelvic floor muscles or an episiotomy (surgical cut) may be required.
- The perineum is stretchy and less resistant in multiparous women, resulting in faster labour and a higher probability of delivering with an intact perineum.



#### The fetal skull

- The skull bones, sutures and fontanelles
- The fetal skull is made up of the vault, the face and the base.
- The sutures are the lines formed where the individual bony plates of the skull meet
- one another. At the time of labour, the suturesjoining the bones of the vault are soft, unossified membranes, whereas the sutures of the fetal
- face and the skull base are firmly united . The vault of the skull is composed of the
- parietal bones and parts of the occipital, frontal
- and temporal bones. Between these bones there are four membranous sutures: the sagittal, frontal,
- coronal and lambdoidal sutures.
- The fontanelles are the junctions of the various sutures.
- The anterior fontanelle, also known as bregma, is at the junction of the sagittal, frontal and coronal sutures, and is diamond shaped.
- On vaginal examination four suture lines can be



Fig. 1.6 Fontanelles, sagittal suture, and biparietal diameter. Reproduced from Collier J, Longmore M, et al. (2008). Oxford Handbook of Clinical Specialties, 8th edn. Oxford: OUP. By permission of Oxford University Press.





The posterior fontanelle lies at the junction of the sagittal suture and the lambdoidal sutures between the two parietal bones and the occipital bone, and is smaller and triangular shaped.

On vaginal examination three suture lines can be felt.

The fact that the sutures are not fixed is important for labour. It allows the bones to move together and even to overlap.

The parietal bones usually slide over the frontal and occipital bones. Furthermore,

the bones themselves are compressible. Together, these characteristics of the fetal skull allow a process called 'moulding' to occur, which reduces the diameters of the fetal head and encourages progress through the bony pelvis, while still protecting the underlying .



- However, severe moulding, or moulding early in labour, can be a sign of obstructed labour due to a fetal malposition (failure of the head to rotate) or cephalopelvic disproportion (a mismatch between the size of the fetal head and maternal pelvis)
- The vertex is area of the fetal skull bounded by the two parietal eminences
- and the anterior and posterior fontanelles .
- In normal labour the vertex of the fetal head is the presenting part and the posterior fontanelle (indicating the occiput) is used to define the position of the fetal head in relation to the pubic symphysis.
- The anatomical differences between the anterior and posterior fontanelles on vaginal
- examination facilitate correct diagnosis of the fetal head position in labour.
- The occipito-anterior (OA) position is the most favourable for a spontaneous vaginal birth.
- The occipito-transverse (OT) position or OP position is a malposition and may result
- in prolonged labour, instrumental delivery or caesarean section.

The degree of moulding can be assessed vaginally:

- No moulding: when the suture lines are separate.
- 1+ moulding: when the suture lines meet.
- 2+ moulding: when the bones overlap but can be reduced with gentle digital pressure.
- 3+ moulding: when the bones overlap and are irreducible with gentle digital pressure.
- The presence of caput and moulding can play an important part in diagnosing obstructed labour.



# The diameters of the skull

- The fetal head is ovoid in shape.
- The attitude of the fetal head refers to the degree of flexion and extension at the upper cervical spine.
- Different longitudinal diameters are presented to the pelvis in labour depending on the attitude of the fetal head.
- The longitudinal diameter that presents with a flexed attitude of the fetal head(chin on the chest) is the suboccipito-bregmaticdiameter. This is usually 9.5 cm and is measured.
- From beneath the occiput (suboccipital) to the centre of the anterior fontanelle (bregma).
- The longitudinal diameter that presents in a less well-flexed head, such as is found in an OP position, is the suboccipito-frontal diameter. It is measured from the suboccipital region to the prominence of the forehead and measures 10 cm.

With further extension of the head, the occipitofrontal diameter presents (deflexed OP). This is measured from the root of the nose to the posterior fontanelle and is 11.5 cm. The greatest longitudinal diameter that may present is the mento-vertical, which is taken from the chin to the furthest point of the vertex and measures 13 cm. This is known as a brow presentation and it is usually too large to pass through the normal pelvis.

- Extension of the fetal head beyond this point results in a smaller diameter. The submento-bregmatic diameter is measured from below the chin to the anterior fontanelle and is 9.5 cm.
- This is termed a face presentation. A face presentation can deliver vaginally when the chin is anterior (mento-anterior position)



# Regions of the fetal head

- The fetal head has different regions assigned to help in the description of the presenting part felt during vaginal examination in labour.
- The occiput is the bony prominence that lies behind the posterior fontanelle.
- The vertex is the diamond-shaped area between the anterior and posterior fontanelles, and between the parietal eminences.
- The bregma is the area around the anterior fontanelle.
- The sinciput is the area in front of the anterior fontanelle, which is divided into the brow (between the bregma and the root of the nose) and the face (lying below the root of the nose and the supraorbital ridges)



# Diameters and presenting parts of the fetal head

- Suboccipitobregmatic diameter (9.5cm): presentation of a well-flexed vertex. Diameter extends from the middle of the bregma to the undersurface of the occipital bone where it joins the neck. Fetal head circumference is smallest at this plane and measures 32cm.
- Suboccipitofrontal diameter (10.5cm): partially flexed vertex, with diameter extending from the prominent point of the mid-frontal bone to the undersurface of occipital bone where it joins the neck.
- Occipitofrontal diameter (11.5cm): presentation of a deflexed head. Diameter extends from the prominent point of the mid-frontal bone to the most prominent point on the occipital bone. Fetal head circumference at this plane measures 34.5cm.



- Mentovertical diameter (13cm): brow presentation, with the diameter extending from the chin to the most prominent point of the midvertex. Presents with the largest anteroposterior diameter.
- Submentobregmatic diameter (9.5cm): face presentation, with diameter extending from just behind chin to the middle of the bregma.
- Other noteworthy diameters of the fetal head include:
- Biparietal diameter (BPD, 9.5cm): greatest transverse diameter of the head, extending from one parietal eminence to the other.
- Bitemporal diameter (8cm): greatest distance between two temporal eminences.
- Bimastoid diameter (7.5cm): distance between the tips of the two mastoid processes.



	Flexed			Extended
Attitude	Well flexed	Less well flexed (partially extended) or deflexed	Extended 'brow presentation'	Hyperextended 'face presentation'
Diameter	Suboccipito- bregmatic	Occipito-frontal	Occipito-mental	Submento- bregmatic
Measurement	9.5 cm	11.5 cm	13.0 cm	9.5 cm



#### Useful definitions when discussing the presenting part

- Presentation is the lowermost part of the fetus presenting to the pelvis. In more than 95% of cases the vertex is the presenting part and is called normal presentation. Any other presentation (e.g. face,
- brow, breech, and shoulder) is called malpresentation.
- Denominator is the most definable peripheral landmark of the
- presenting part, i.e. occiput for the vertex, mentum for the face, and sacrum for the breech presentation.
- Position of the presenting part is the relationship of the denominator
- to the fixed points of the maternal pelvis, i.e. sacrum posteriorly, pubic symphysis anteriorly, sacro-iliac joints posterolaterally, and ileo-pectineal eminences anterolaterally.
- Station is the relationship of the most prominent leading part of the presenting part to the ischial spines expressed as ± 1,2,3cm.
- In the vertex presentation more than 90% present in the occipitoanterior position, i.e. the occiput is in the anterior half of the pelvis and is called the normal position. If the occiput is pointing laterally or is in the posterior half of the pelvis, it is called malposition and is associated with deflexed head presenting a larger anteroposterior diameter of the vertex (11.5cm) and, hence, difficulties with progress of labour

# Physiology of labour

- The mechanisms underlying human parturition are not
- fully understood and differ from other animal .
- There are a number of important elements.
- ➢ The cervix, which is initially long, firm, and closed, with a protective mucus plug, must soften, shorten, thin out (effacement) and dilate for labour to progress.
- ➤The uterus must change from a state of relaxation to an active state of regular, strong, frequent contractions to facilitate transit of the fetus through the birth canal.
- Each contraction must be followed by a resting phase in order to maintain placental blood flow and adequate perfusion of the fetus.
- The pressure of the presenting part on the pelvic floor muscles as the fetus descends from the midpelvis to the pelvic outlet produces a maternal urge to push, enhanced further by stretching of the perineum.

The onset of labour occurs when the factors that inhibit contractions and maintain a closed cervix diminish and are overtaken by the actions of factors that do the opposite.

# The uterus

- Myometrial cells of the uterus contain filaments of actin and myosin, which interact and bring about contractions in response to an increase in intracellular calcium. Prostaglandins and oxytocin increase intracellular free calcium ions, whereas beta-adrenergic compounds and calcium-channel
- blockers do the opposite. Separation of the actin and myosin filaments brings about relaxation of the myocyte; however, unlike any other muscle cell of the
- body, this actin-myosin interaction occurs along the full length of the filaments so that a degree of shortening occurs with each successive interaction.



- This progressive shortening of the uterine smooth muscle
- cells is called retraction and occurs in the cells of the
- upper part of the uterus. The result of this retraction
- process is the development of the thicker, actively
- contracting 'upper segment'.
- At the same time, the lower segment of the uterus becomes thinner and
- more stretched. Eventually, this results in the cervix being 'taken up' (effacement) into the lower segment of the uterus so forming a continuum with the lower
- uterine segment . The cervix effaces and then dilates, and the fetus descends in response to this directional force.



- ≻Individual myometrial cells are laid down in a mesh of collagen.
- There is cell-to-cell communication by means of gap junctions, which facilitate the passage of various products of metabolism and electrical current between cells. These gap junctions are absent for most of the pregnancy but appear in significant numbers at term. Gap junctions increase in size and number with the progress of labour and allow greater coordination of myocyte activity.
- Prostaglandins stimulate their formation, while beta-adrenergic compounds are thought to do the opposite.
- Uterine contractions are involuntary in nature and there is relatively little extrauterine neuronal control. The frequency of contractions may vary during labour and with parity.
- Throughout the majority of labour, they occur at intervals of 2–4 minutes and are described in terms of the frequency within a 10-minute period (i.e. 2 in 10 increasing to 4–5 in 10in advanced labour).





Figure 12.15 The thick upper segment and the thin lower segment of the uterus at the end of the first stage of labour. The dotted lines indicate the position assumed by the uterus during contraction.



Their duration also varies during labour, from 30 to 60 seconds or occasionally longer.

The frequency of contractions can be recorded on a cardiotocograph (CTG) using a pressure transducer(tocodynamometer) positioned on the abdomen at the fundus of the uterus. The intensity or amplitude of the intrauterine pressure generated with each contraction averages between 30 and 60 mmHg.

#### The cervix

The cervix contains myocytes and fibroblasts separated by a 'ground substance' made up of extracellular matrix molecules. Interactions between collagen, fibronectin and dermatan sulphate (a proteoglycan) during the earlier stages of pregnancy keep the cervix firm and closed.

Contractions at this point do not bring about effacement or dilatation. Under the influence of prostaglandins, and other humoral mediators, there is an increase in

proteolytic activity and a reduction in collagen and elastin. Interleukins bring about a proinflammatory change with a significant invasion by neutrophils. Dermatan sulphate is replaced by the more hydrophilic hyaluronic acid, which results in an increase in water content of the cervix.

This causes cervical softening or 'ripening', so that contractions, when they begin can bring about the processes of effacement and dilatation

# Hormonal factors

- Progesterone maintains uterine relaxation by suppressing prostaglandin production, inhibiting communication between myometrial cells and preventing oxytocin release.
- Oestrogen opposes the action of progesterone. Prior to labour, there is a reduction in progesterone receptors and an increase in the concentration of oestrogen relative to progesterone.
- Prostaglandin synthesis by the chorion and the decidua is enhanced, leading to an increase in calcium influx into the myometrial cells.
- This change in the hormonal milieu also increases gap junction formation between individual myometrial cells, creating a functional syncytium, which is necessary for coordinated uterine activity.
- The production of corticotrophin-releasing hormone (CRH) by the placenta increases in concentration towards term and potentiates the action of prostaglandins and oxytocin on myometrial contractility.

- The fetal pituitary secretes oxytocin and the fetal adrenal gland produces cortisol, which stimulates the conversion of progesterone to oestrogen.
- It is unclear which of these hormonal changes actually initiates labour
- As labour becomes established, the output of oxytocin increases through the
- 'Fergusson reflex'. Pressure from the fetal presenting part against the cervix is relayed via a reflex are involving the spinal cord and results in increased oxytocin release from the maternal posterior pituitary.



#### Normal labour

#### **Diagnosis of labour**

The onset of labour can be defined as the presence of strong regular painful contractions resulting in progressive cervical change.

**Braxton Hicks contractions** are mild, often irregular, non-progressive contractions that may occur from 30wks gestation (more common after 36wks) and may often be confused with labour. However, contractions in labour are painful, with a gradual increase in frequency, amplitude, and duration.

Loss of a 'show' (a blood-stained plug of mucus passed from the cervix) or spontaneous rupture of the membranes (SROM) does not define the onset of labour, although these events may occur

around the same time. Labour can be well established before either of these events occurs, and both may precede labour by many days.

# Stages of labour

Labour can be divided into 4th stages. The important events when labour is normal are the diagnosis of labour and the maternal urge to push, which usually corresponds with full dilatation of the cervix and the baby's head resting on the perineum.

- Defining the fourth stages of labour becomes more relevant if labour is not progressing normally. The average duration of a first labour is 8 hours, and that of a subsequent labour 5 hours.
- First labour rarely lasts more than 18 hours, and second and subsequent
- labours not usually more than 12 hours.

#### First stage

This describes the time from the diagnosis of labour to full dilatation of the cervix (10 cm).

The first stage of labour can be divided into two phases.

The 'latent phase' is the time between the onset of regular painful contractions and 3–4 cm cervical dilatation. During this time, the cervix becomes 'fully effaced'.

Effacement is a process by which the cervix shortens in length as it becomes incorporated into the lower segment of the uterus. The process of effacement

may begin during the weeks preceding the onset of labour, but will be complete by the end of the latent phase. Effacement and dilatation should be thought

of as consecutive events in the nulliparous woman, but they may occur simultaneously in the multiparous woman. Dilatation is expressed in centimetres

from 0 to 10 cm. The duration of the latent phase is variable, and time limits are arbitrary. However, it usually lasts between 3 and 8 hours, being shorter in multiparous women.

- The second phase of the first stage of labour is
- called the 'active phase' and describes the time between the end of the latent phase (3–4 cm dilatation) and full cervical dilatation (10 cm). It is also
- variable in length, usually lasting between 2 and 6 hours, shorter in multiparous women. Cervical dilatation during the active phase occurs typically
- at 1 cm/hour or more in a normal labour (again, anarbitrary value), but is only considered abnormal if it occurs at less than 1 cm in 2 hours

#### Second stage

This describes the time from full dilatation of the cervix to delivery of the fetus or fetuses. The second stage of labour may also be subdivided into two phases.

The 'passive phase' describes the time between full dilatation and the onset of involuntary expulsive contractions. There is no maternal urge to push and the fetal head is still relatively high in the pelvis.

The second phase is called the 'active second stage'. There is a maternal urge to

push because the fetal head is low (often visible), causing a reflex need to 'bear down'.

In a normal labour, the second stage is often diagnosed at this late point because the maternal urge to push prompts the midwife to perform a vaginal examination.

If a woman never reaches a point of involuntary pushing, the active second stage is said to begin when she starts making voluntary pushing efforts directed by her midwife. Conventionally, a normal active second stage should last no longer than 2 hours in a nulliparous woman and 1 hour in women who delivered vaginally before.

- There is evidence that a second stage of labour lasting more than 3 hours is associated with increased maternal and fetal morbidity. Use of epidural anaesthesia will influence the length and management of the second stage of labour.
- A passive second stage of 1 or 2 hours is usually recommended to allow the

head to rotate and descend prior to active pushing.

# Third stage

- This is the time from delivery of the fetus or fetuses until complete delivery of the placenta(e) and membranes. The placenta is usually delivered within a few minutes of the birth of the baby. A third stage lasting more than 30 minutes is defined as abnormal, unless the woman has opted for 'physiological management'
- in which case it is reasonable to extend this definition to 60 minutes

#### Fourth stage of labour

- The hour immediately following delivery is critical and it has been designated by some as fourth stage of labour.
- The placenta, membranes ,and umbilical cord should be examined for completeness and for anomalies.
- Consequently the uterus and perimeum should be frequently evaluated

# The duration of labour

- There is no ideal length of labour for all women but morbidity increases when labour is too fast (precipitous) or two slow (prolonged).
- From a psychological perspective, the morale of most women starts to
- deteriorate after 6 hours in labour, and after 12 hours the rate of deterioration accelerates.
- There is a greater incidence of fetal hypoxia and need for operative
- delivery associated with longer labours.
- It is difficult to define prolonged labour, but it would be reasonable to suggest that labour lasting longer than 12 hours in nulliparous women and 8 hours in multiparous women should be regarded as prolonged.
- Precipitous labour is defined as expulsion of the fetus within less
- than 3 hours of the onset of regular contractions

# The mechanism of labour

- This refers to the series of changes in position and attitude that the fetus undergoes during its passage through the birth canal.
- It is described here for the vertex presentation and the gynaecoid pelvis.
- The relation of the fetal head and body to the maternal pelvis changes as the fetus descends through the pelvis.
- This is essential so that the optimal diameters of the fetal skull are present at each stage of the descent.

#### Engagement

- The fetal head normally enters the pelvis in the transverse position or some minor variant of this, taking advantage of the widest pelvic diameter.
- Engagement is said to have occurred when the widest part of the presenting part has passed successfully through the inlet.
- Engagement has occurred in the vast majority of nulliparous women prior to labour, usuallyby 37 weeks' gestation, but not so for the majority of multiparous women.
- The number of fifths of the fetal head palpable abdominally is used to describe
- whether engagement has taken place. If more than two-fifths of the fetal head is palpable abdominally, the head is not yet engaged



Fig. 1.2 Clinical estimation of descent of the fetal head and engagement. Reproduced from Arulkumaran S, Symonds IM, Fowlie A. (2004). Oxford Handbook of Obstetrics and Gynaecology. Oxford: OUP. By permission of Oxford University Press.

#### Descent

- Descent of the fetal head is needed before flexion, internal rotation and extension can occur. During the first stage and passive phase of the second stage of labour, descent of the fetus occurs as a result of uterine contractions.
- In the active phase of the second stage of labour, descent of the fetus is assisted by voluntary efforts of the mother using her abdominal muscles and the Valsalva manoeuvre ('pushing').

#### Flexion

The fetal head is not always completely flexed when it enters the pelvis. As the head descends into the narrower mid pelvis, flexion occurs. This passive

movement occurs, in part, due to the surrounding structures and is important in reducing the presenting diameter of the fetal head.

# Internal rotation

If the head is well flexed, the occiput will be the leading point, and on reaching the sloping gutter of the levatorani muscles it will be encouraged to rotate anteriorly so that the sagittal suture now lies in the AP diameter of the pelvic outlet (i.e. the widest diameter). If the fetus has engaged in the OP position, internal rotation can occur from an OP position to an OA position.

- This long internal rotation may explain the increased duration of labour associated with OP position. Alternatively, an OP position may persist, resulting in a 'face to pubes' delivery. Furthermore, the persistent OP position may be associated with extension of the fetal head and a resulting increase in the diameter presented to the pelvic outlet.
- This may lead to obstructed labour and the need for instrumental delivery or even caesarean section.

# Extension

- Following completion of internal rotation, the occiput is beneath the symphysis pubis and the bregma is near the lower border of the sacrum. The well-flexed head now extends and the occiput escapes from underneath the symphysis pubis and distends the vulva.
- This is known as 'crowning' of the head. The head extends further and the occiput
- underneath the symphysis pubis acts as a fulcrum point as the bregma, face and chin appear in succession over the posterior vaginal opening and perineal body.
- This extension process, if controlled, reduces the risk of perineal trauma. However, the soft tissues of the perineum offer resistance, and some degree of tearing occurs in the majority of first births.

#### Restitution

When the head is delivering, the occiput is directly anterior. As soon as it crosses the perineum, the head aligns itself with the shoulders, which have entered

the pelvis in the oblique position. This slight rotation of the occiput through oneeighth of the circle is called 'restitution'.

# External rotation

In order to be delivered, the shoulders have to rotate into the direct AP plane (remember, the widest diameter at the outlet). When this occurs, the occiput

rotates through a further one-eighth of a circle to the transverse position. This is called external rotation

# Delivery of the shoulders and fetal body

- When restitution and external rotation have occurred, the shoulders will be in the AP position. The anterior shoulder is under the symphysis pubis and delivers first, and the posterior shoulder delivers subsequently.
- Although this process may occur without assistance, traction is often exerted by gently pulling the fetal head in a downward direction along the axis of the pelvis to help release the anterior shoulder from beneath the pubic symphysis.
- Normally the rest of the fetal body is delivered easily, with the posterior shoulder guided over the perineum by gentle upward traction in the opposite
- direction, so delivering the baby on to the maternal abdomen.



Figure 12.16 Descent and flexion of the head followed by internal rotation and ending of the head by extension.



Figure 12.17 External rotation of the head after delivery as the anterior shoulder rotates forward to pass under the suprapubic arch.