# UNIT 10 NORMAL LABOUR -I (Anatomy and Physiology)

**Structure**



## 10.0 OBJECTIVES

After reading this unit, you should be able to:

- demonstrate the various planes of maternal pelvis, its diameters and different types of pelvis;
- list the various diameters in the foetal skull and describe the diameters presenting during various cephalic presentations;
- palpate and record uterine contractions during labour;
- describe the physiology of normal labour; and
- demonstrate mechanism of labour with a dummy and doll.

## 10.1 INTRODUCTION

This unit deals with anatomy and physiology of normal labour. For the process of labour, one must know the passage (maternal pelvis) through which the foetus has to pass, the dimension of passenger (foetal skull) which has to pass through the passage and the power (uterine contraction) which propels the foetus through maternal passage.

Mechanism of labour deals with various movements the vertex goes through to negotiate the maternal passage culminating in delivering of baby. The unit also deals with the physiology of onset of labour, uterine contraction and placental separation following the birth of the baby.

## 10.2 ANATOMY OF MATERNAL PELVIS AND FOETAL SKULL

In this section, you will learn about the anatomy of female pelvis (maternal pelvis) and foetal skull to understand the passage and passenger concerned with normal process of labour.

## 10.2.1 Anatomy of Maternal Pelvis (Passage)

The maternal passage consists of the bony canal with soft structures lining it. Maternal passage concerned with labour is the true pelvis. The true pelvis consists of the following three parts:

1) Pelvic brim
2) Pelvic cavity
3) Pelvic outlet

1) **Pelvic Brim:** It is also known as pelvic inlet or upper pelvic straight. Brim is bounded anteriorly by the posterior margin of superior surface of pubic symphsis, laterally by iliopectineal eminences and iliopectineal lines and posteriorly by margins of alae of sacrum and sacral promontory. Shape of the brim is transversely oval. The diameters of pelvic brim are given below:

   a) ***The Anteroposterior Diameter or True Conjugate:*** From the center of sacral promontory behind to the centre of posterior margin or superior surface of the pubis. It measures 11.5 cms.

   b) ***The Right Oblique Diameter:*** From right sacroiliac joint to the illeo-pectineal eminence on opposite side. It measures 12.5 cms.

   c) ***The Left Oblique Diameter:*** From left sacroiliac joint to the illeo-pectineal eminence on opposite side (12.5 cms).

   d) ***The Transverse Diameter:*** The distance between the two furthest points in the pelvic brim. It is not a true diameter as it does not pass through the centre (13 cms).

   e) ***Obstetric Conjugate:*** From the centre of sacral promontory behind to the nearest point on the posterior surface of the pubic symphysis in front. It is 4-5 mm less than the true conjugate (11 cms). This is the antero posterior diameter available for the passage of fetus at the brim.

   f) ***The Diagonal Conjugate:*** The diagonal conjugate extends from middle of sacralt promontory to middle of lower border of symphysis pubis. It is 12.5 cms in length. This diameter can be measured on the patient if sacral promontory is reached. By subtracting 1.5 cms, appropriate length of obstetric conjugate can be obtained.

   g) ***Posterior Sagittal Diameter:*** Posterior sagittal diameter of the inlet is the segment of antero posterior diameter behind the intersection of the transverse diameter. It measures 4.5 cms.

   The plane of the pelvic brim is inclined at an acute angle to the horizontal. This angle is the angle of inclination and measures about $55^0$ (Fig. 10.1). The axis of pelvic brim is an imaginary straight line drawn perpendicular to the plane of pelvic brim at its centre. The foetus enters the brim in the direction of the axis of the brim.

2) **Pelvic Cavity:** It is the space between the brim above and plane of least pelvic dimensions below. It forms a curved canal having shallow anterior wall and a deep posterior wall. Depth of anterior wall is 4 cms and posterior wall (Curve of sacrum) is 12 cms. Diameters of the cavity are expressed at one plane-the plane of the greatest pelvic dimensions. The plane of the greatest pelvic dimension is bounded by middle of pelvic symphysis anteriorly passing through obturator foramen and greater sciatic notch laterally to the junction of 2nd and 3rd sacral vertebra posteriorly.

   It is round in shape and its diameter is 12.5 cms.

   The axis of the mid pelvic plane (plane of greatest pelvic dimensions) is the imaginary line passing perpendicular through the centre of the plane.

**Fig. 10.1: A bisected pelvis, as in the erect position, showing the inclination of the pelvic brim**

3) **Pelvic Outlet:** This is bounded above by the plane of least pelvic dimensions (narrow pelvic plane) above and by the anatomical outlet of the pelvis below. This segment has posterior and two lateral walls but has deficient anterior wall below the pubic arch.

The outlet diameters are expressed at two levels:

i) Obstetric outlet

ii) Anatomic outlet

i) ***The obstetric outlet or plane of narrow pelvic dimension:*** The plane of least pelvic dimension is bounded anteriorly by lower margin of pubic symphysis, laterally by ischeal spines and posteriorly by the tip of the sacrum. The diameters of this plane are as follows:

*The antero posterior diemeter* is the distance from the middle of lower border of pubic symphysis to the tip of the sacrum. It measures 12 cm.

*The transverse diameter* (interspinous diameter) is the distance between the two ischial spines. It measures 10.5 cms and is the shortest pelvic diameter.

*The posterior sagital diameter* at narrow pelvic plane is from the centre of the interspinous diameter to the tip of the sacrum. It measures 4.5 to 5 cms.

*Axis of obstetric outlet* is the imaginary perpendicular line passing through centre of plane of least pelvic dimension.

ii) ***Anatomic outlet*** is bounded anteriorly by pelvic arch, laterally by ischeal tuberosity, sacrosciatic ligaments and posterrioly by the tip of sacrum (tip of coccyx if it is fused). Hence, it is lozenge shaped.

*Antero posterior diameter* is same as that of AP diameter of least pelvic dimension.

*The transverse diameter* of the anatomical outlet (The distance between the inner borders of the two ischial tuberosities (11 cms).

*The posterior sagital diameter* of anatomical outlet extends from middle of transverse diameter to tip of sacrum. It measures 4.5 to 5 cms.

Curve of carus or the anatomical axis of the pelvis (Fig 10.2) is a line uniting centers of the plane of the brim, plane of the cavity and outlet. It is a curved line with concavity forward . it represents the true path of the foetal head through maternal pelvis. Decrease in 1 cm or more in any of the diameters of pelvis is considered as contracted pelvis.

**Fig. 10.2: The obstetrical pelvis oxis**

**Shape of the Pelvis**

Classically pelvis have been described into four categories on the basis of pelvic inlet and non-confounding characteristics. A woman's pelvis is unlikely to be classified during life time unless she has problems during childbirth. The foetal head is the best pelvimeter. Four types of pelvis are described:

- Gynaecoid
- Anthropoid
- Android
- Platypelloid

In many cases pelvis is of mixed type. The different types of pelvis is shown in Table 10.1.

**Table 10.1: Features of the Types of Pelvis**

| **Features** | **Gynaecoid** | **Android** | **Anthropoid** | **Platypelloid** |
|---|---|---|---|---|
| Brim | Rounded or | Heart shaped | Long oval | Kidney shaped |
| | Transverse oval | | | |
| Sacrum | Well curved | Flat | Well curved | Flat |
| Fore pelvis | Generous | Narrow | Narrow | Wide |
| Side wall | Straight | Convergent | Straight/ divergent | Divergent |
| Ischeal spines | blunt | Prominent | Blunt | blunt |
| Sacrosciatic Notch | Rounded, wide | Narrow | Wide | Wide |
| Sub pubic angle | $90^0$ | $\leq 90^0$ | $\geq 90^0$ | $>90^0$ |
| Incidence | 50% | 20% | 25% | 5% |

The delivery of foetal head through gynaecoid and anthropoid pelvis has equal mechanical problems. If it is easy at brim, it is easy in cavity and outlet.

The delivery of foetal head through android pelvis gives increasing problems when it descends further.

The delivery of foetal head through platypelloid pelvis meets problems at the brim but thereafter, the difficulties decrease with descent.

**Other Pelvic Variations**

High assimilation pelvis (where 5th lumbar vertebra is fused to sacrum), deformed pelvis due to developmental anomalies, dietary deficiency like rickets, osteomalacia, diseases like poliomyelitis, TB of hip joints and lower spine and injury may cause deformed pelvis.

## 10.2.2 Anatomy of Foetal Skull (Passenger)

Normally the foetus is in an attitude of universal flexion. With flexion attitude, foetus forms an ovoid mass. Dimensions of this ovoid foetal mass (Fig. 10.3) are described in terms of:

- Vertico-podalic diameter (V-P)
- Bis-acromial diameter (A-A)
- Bi-trochanteric diameter (T-T)

**Fig. 10.3: The normal attitude flexion (diagramatic) and diameters of foetal ovoid**

In normal pregnancy, long axis of the foetus corresponds with long axis of the uterus, i.e. longitudinal lie, and the presentation is cephalic. In majority of cephalic presentations, presenting part is vertex. This suggests that head is well flexed. The vertex is an area of the vault of the foetal skull, bounded in front by the anterior fontanelle and coronal suture, behind by the posterior fontanelle and lambdoidal suture and laterally by lines passing through the parietal eminences.

In the head, other than the vertex, it can be face or brow presentation. The face presentation extends from root of the orbital ridges and root of the nose to the junction of the chin and neck. Chin (mentum) is the landmark.

Brow extends from the anterior fontanelle and coronal suture to the orbital ridges.

The foetal skull at term is not completely ossified. The bones of the vault are thin, pliable, and are separated by sutures and fontanelle (unossified membranes). The base of the skull is firm. Fig. 10.4 show anterior fontanelle, sagittal suture and coronal sutures, both parietal and both frontal bones. Fig. 10.4 shows posterior fontanelle and lambdoidal suture, both parietal and occipital bones. Look at both these figures carefully as all these can be recognized by touch during per vaginal examination of a woman in labour.

The girdle of contact is that circumference of the foetal head, which comes in contact with the pelvic brim. It varies with the degree of flexion or extension, i.e. diameter of engagement. From full flexion to full extension, diameters of engagement are:

**Fig. 10.4: Head moulding, showing overlapping of bones at the lampdoidal and sagittal sutures**

| | |
|---|---|
| • Sub-occipito-bregmatic diameter (9.4 cm)<br>(It extends from below the occiput to centre of bregma) | Occipito anterior position of vertex |
| • Sub-occipito-frontal diameter (10.0 cm)<br>From below the occiput to ant angle of bregma | Occipito posterior position of vertex depending on deflexion of head |
| • Occipito-frontal diameter (11.5 cm)<br>Occipital protruberance to the root of nose | |
| • Mento-vertical diameter (13.5 cm)<br>From point of chin to the highest point on vertex in the sagittal suture | Brow presentation |
| • Sub-mento-vertical diameter (11.3)<br>point between neck and chin to the centre of sagittal suture | Glabella Presentation From the (Between face and brow) |
| • Sub-mento-bregmatic diameter (9.4 cm)<br>From the point between neck and chin to the centre of the bregma | Face Presentation |

The foetal head has three transverse diameters:

- Bi-parietal diameter (9.4 cm) between two parietal eminences.
- Bi-temporal diameter (8.1 cm) between antero-inferior ends of the coronal sutures.
- Bi-mastoid diameter (7.5 cm) between the tip of two mastoid processes.

As the foetus is surrounded by liquor amnii, during labour , till membranes have ruptured, foetus is protected from the direct pressure of uterine contractions. The lower pole of the foetal head covered by membranes containing liquor amnii (Fore-water) gets detached from the lower segment early in the labour and forms bag of waters. This bag aids in the dilatation of the cervix. Once the cervix is fully dilated, the bag gets unsupported and usually ruptures.

During labour, head undergoes changes in the shape as a result of the pressure to which it is subjected during labour. Lower most part of the head may get oedematus due to pressure of the rigid perineum on the venous circulation. This swelling on the parietal bone is known as caput succedaneum, it disappears after birth within 24 hours.

Another change in the shape of the head is due to movement of skull bones at sutures. Usually, the margins of the occipital bones are pushed under the parietal bones. Rarely, frontal bone may move under parietal bones. In many cases, one parietal bone may overlap another. This is known as moulding. It is physiological to certain extent i.e. “0” and “+”. It is harmful, if it is severe, i.e. “++” or “+++”. Moulding decreases the bi-parietal diameter and sub-occipito-bregmatic diameter.

## 10.3 PHYSIOLOGY OF LABOUR

This section deals with physiology of uterine contraction (power), theories of onset of labour and physiology of placental separation.

### 10.3.1 Physiology of Uterine Contractions (Power)

The uterus plays many diverse roles in human reproduction. It receives the delicate blastocyst, nurtures the ovum and growing foetus, remains quiescent till term and finally functions as a powerfully co-ordinated organ of expulsion.

The uterus consists of the body and the cervix. Though part of a single organ, they are expected to act very differently from each other. During most of the pregnancy, it is essential that the myometrium be dilatable but quiescent. On the other hand, the cervix must remain rigid and unyielding. After an average of 9 months suddenly, the same uterus starts contracting and the cervix dilating to effect delivery. But this is not so sudden, as has been seen by studies of changes at the cellular level.

**Prelabour Changes**

Multiple changes take place both in the uterus and the cervix as a preparation towards the physiological event of labor.

1) In the myometrium, there is formation of gap junctions which are cell to cell contacts composed of portions of plasma membrane of two adjacent cells.

2) The number of oxytocin receptors in the myometrium increases.

3) Cervical softening and ripening: Cervical softening and ripening is caused by rearrangement or breakdown of collagen fibres and alterations in the relative amount of glycosaminoglycans in the ground substance. Hyaluronic acid content in the cervix increases with retention of water. There is a decrease in the dermatin sulfate and chondroitin sulfate in the cervix.

4) There is increase in contractile responsiveness of the myometrium to uterotronins. Uterotronins are substances that act to causes myometrial contractions such as those characteristic of active labour.

With all these changes, the stimulus which triggers off actual contractions in human beings is not known and is under intensive study.

**Uterine Contractions During Pregnancy**

The gravid uterus undergoes rhythmic contractions from as early as 4-8 weeks - the well known Palmer’s sign. These contractions have intensities of 2-4 mm of Hg., and occur at a frequency of one per minute. The contractions are later known as Braxton-Hicks contractions which have intensities of 10-15 mm Hg and a frequency of 1 per 10 minutes. These contractions are intermittent and involuntary but painless and the patient is quite unconscious of them.

**Uterine Contractions During Labour**

Physiological muscular contractions are painless but contractions of labour are painful—thus unique. The first and second stage contractions are painful though the third stage

contractions are almost painless. Uterine contractions are involuntary and for the most part independent of extra-uterine control. Evidence is that in paraplegic women, they are normal though painless contractions, as in women after bilateral lumbar sympathectomy. The exact cause of pain during contractions is not known but it is suggested that the following factors may be responsible : (a) hypoxia of contracted myometrium (as in angina) (b) Compression of nerve ganglia in the cervix and lower uterus by the tightly interlocking muscule bundles. (c) Stretching of cervix during dilatation (d) Stretching of the overlying peritoneum.

No anatomical pacemakers like the nodes of the heart or conduction network has been demonstrated in the uterus. The pacemaker sites seems to be near the utero tubal junctions. The propogation of impulse through the myometrium occur via myometrial gap junctions in a downward direction at a rate of 1-3 cm. per second. Thus within half a minute, the whole myometrium becomes active and peak contraction is reached simultaneously. The wave pattern is regular and there is good synchronization and good relaxation in between uterine contractions. The contractions occur mainly in the upper segment and muscle fibres do not retract to their original positions. The lower segment becomes stretched and remains stretched. So with each contraction, uterine cavity becomes smaller and presenting part is pushed lower downwards into the cervix. This tends to dilate the cervix . This is normal uterine polarity.

Fundal dominance — (a) Propogation of wave downwards from a fundal source (b) Prolonged fundal systolic phase (c) Maximal fundal intensity.

All these results in a gradient of force directed from fundus to the least active and weakest area of the uterus (cervix). This is called fundal dominance.

Mechanical stretching of cervix causes enhanced uterine contractions, possibly this is due to release of postaglandins by manipulation of cervix.

The boundary between the thick upper segment and thinner lower segment is marked by a ridge on the inner uterine surface. It is known as physiological retraction ring (see Fig.10.5)

**Fig. 10.5: Physiological Retraction Ring**

**Patterns of Normal Uternine Contractions**

In early labor, the contractions occur irregularly. But as labor advances, they start coming at regular intervals.

a) ***Frequency***

The frequency of uterine contractions increases and interval between the contractions decreases, from about 1 in 10 minutes at the onset of first stage of labour to one minute or less interval in the second stage.

b) ***Duration***

Duration of contraction increases. In the active phase of labor duration of each contraction ranges from 30 to 90 seconds averaging approximately one minute.

c) ***Intenstiy***

As labor advances, intensity of contractions also increases. Intensity is gauged from the degree of firmness the uterus achieves. At the height of contraction, the uterus cannot be indented with a finger.

Good uterine contractions means adequate cervical dilatation and descent of presenting part.

d) ***Character of pain***

Pain starts at the lower back and radiates to the lower abdomen along the groin.

**Monitoring Uterine Contractions By Manual Palpation**

On placing the palm of the hand on the uterus, the beginning of contractions are easily appreciated. The frequency of contractions are monitored every half an hour. For 10 minutes the contractions are monitored. Duration of contraction is determined by palpation, then by patients statements as she cannot feel the contraction till several seconds after it has begun and discomfort disappears before the uterus is relaxed. Intensity of contraction is determined by the firmness with which the muscle contracts, i.e., indentation of uterus with fingers at height of contraction. The pain starts at the back and radiates along the groin to the front of the lower abdomen. There is good relaxation of uterus in between contractions. In hypotonic uterine contractions, pressure never reaches to a height when indentation of uterus is not possible. In hypertonic contractions (a) pain is felt at the back constantly, (b) abdominal discomfort all over, (c) uterus does not relax well, (d) pain is felt before or with the contraction and persists even after the contractions has passed off.

*Intrauterine Pressures During Labour (in mm of Hg)*

1) Resting pressure—4-12 (avg. 6-8) mm Hg
2) Contractions felt (Palpated)—20 mm
3) Patient feels discomfort—25 mm
4) Pressure required to dilate cervix—15 mm
5) Uterine fundus indented— Less than 50 mm
6) Active labour — 30-40 mm>50 mm
7) Second stage—100-150 mm
8) Valsalva —100-150 mm
9) Third stage —100-150 mm

Intensity, frequency, duration of uterine contractions vary considerabley during normal labor. The position of patients affects the frequency and intensity of uterine contractions.

| | |
|---|---|
| Supine position | Contractions more trequent, less intense than when lying on her side. |
| Sitting or standing | Frequency of contraction increases. Duration and intensity also increase. Increased pressure of about 30 mm Hg on uterine cervix in standing position. |
| Ambulatory | Amplitute of contractions goes up by 8.8 mm Hg than when patient is resting in bed. |

**Other Forces Concerned in Labour**

Contraction of abdominal muscles and forced respiratory efforts with the glottis closed, increases intraabdominal pressure, which also helps in expulsion of the foetus through the dilated cervix and vagina. It also plays a role in third stage of labour with spontaneous expulsion of the placenta by mother's bearing down.

**Check Your Progress 1**

1) Describe the girdle of contact.

.....

.....

2) What is physiologic retraction ring?

.....

.....

3) Fill in the blanks:

a) Angle of inclination of the pelvic brim is……

b) Transverse diameter of the narrow pelvic plane is the distance between……

c) Anatomical outlet is……. Shaped.

d) When original length of muscle fibre is not achieved after contraction, it is known as …….

## 10.3.2 Physiology of Onset of Labour

There are several theories to explain the onset of labour. Prostaglandin, progesterone, oestrogen, calcium and foetal signals trigger onset of labour.

**Prostaglandin (PG):** Uterotropine is an agent which prepares the uterus for labour. Uterotonins are substances which cause uterine contractions. Prostaglandin is an uterotropin produced within the uterus. Foetal membranes provide arachidonic acid which is precursor for PG synthesis during labour. The decidual activation with release of PG could be an important event in initiation of labour. Prostaglandin are responsible for making the following changes in the cervix and uterus at term:

- Cervical softening and ripening
- Development of gap junctions between myometrial cells
- Increase in number of oxytocin receptors in myometrium

Gap junctions of myometrium are cell to cell contacts composed of symmetrical portions of the plasma membranes of two adjacent cells. Communication between myometrial cells is accompanied by way of gap junctions which facilitates the passage of current between the cells. Gap junctions are absent during pregnancy. At term the number of gap junctions increase. Number of gap junctions increase further during labour.

**Foetus:** There are some foetal signals which awaken the uterus. The mature foetal adrenal send the signal. Placental enzymes convert precursors produced by the foetal adrenal glands into oestrogen. Relative proportion of progesterone and oestrogen changes and oestrogen in turn play a role in initiation of labour. Also it is believed that foetal anterior pituitary, foetal kidneys could be sending a signal.

**Oestrogen and progesterone:** During pregnancy the uterine myometrium is refractory to oxytocic. Progestrone is responsible for uterine unresponsiveness during pregnancy. It also reduced the intercellular calcium concentration, prevents formation of gap junctions and causes degradation of oxytocin receptors. Placental enzymes dependent on progesterone bring about degradation of uterotonin.

Oestrogen increases the gap junction proteins. Also it increases the oxytocin receptors of the myometrium.

**Calcium:** Intensity of uterine muscle contraction is directly proportional to intracellular calcium concentration. Uterine muscle is a smooth muscle which contains inactive myosin light chain. It gets activated by activated myosin light chain kinase in presence of calcium ions. Decrease in calcium ion concentration bring relaxation of uterine musculature.

### 10.3.3 Physiology of Placental Separation

During the third stage, separation and expulsion of placenta and membranes occur. This is due to haemostatic and mechanical factors. The third stage usually lasts between 5-15 minutes. Placental separation occur by two methods.

**Schultz mechanism:** Due to sudden emptying of the uterus at the end of second stage, the placental site diminish in size. Due to retraction of uterine musculature (oblique fibres), the maternal blood vessels are compressed. The blood in the intervillous space is forced back into the spongy layer of the placenta. There is haemorrhage in the centre with formation of central haematoma. The haematoma helps in the separation of the placenta. Due to the weight of the haematoma, adjacent membranes are peeled off. The placenta descends, foetal surface first, like an inverted umbrella. This type of separation is associated with less blood loss.

**Mathews Duncan mechanism:** Placenta starts separating from the lateral borders. The blood escapes and the separation is not aided by retroplacental clot. Placenta separates shipping sideways maternal surface first with anterior wall attachment and foetal surface first with posterior wall attachment. This process takes longer with a higher blood loss and incomplete expulsion of membranes.

Once separation is complete, with strong uterine contractions, placenta and membranes descend into the lower uterine segment and finally into the vagina.

## 10.4 MECHANISM OF NORMAL LABOUR

The positional changes in the presenting part as it descends in the birth canal constitute the mechanism of labour. As seen in the anatomy of the passage, shape of the pelvic canal is irregular. Different diameters of the foetal head, as learnt before, vary in length and hence cannot pass through all the diameters of the pelvis. To overcome this, a process of adaptation and accommodation is required to complete childbirth. For this process, presenting part undergoes positional changes. Same constitue the mechanism of labour.

The cardinal movements of labour are:

i) Engagement

ii) Descent

iii) Flexion

iv) Internal rotation

v) Extension

vi) Restitution and external rotation

vii) Expulsion

**Engagement**

Entry of the greatest transverse diameter of the presenting part in the pelvic inlet is designated as “engagement”. In vertex presentation, greatest transverse diameter is biparietal diameter. It enters the pelvic inlet in the transverse or one of the oblique diameter. At the beginning of labour, the fetus is in the attitude of flexion, but the neck is not fully flexed. So the sub-occipito frontal is the presenting diameter. As flexion

increases, Sub-occipito bregmatic diameter gets engaged. This phenomenon of engagement may take palce in the last few weeks of pregnancy. Sometimes it takes place after the commencement of labour. In left occipito-anterior position, sub-occipito-bregmatic diameter gets engaged in right oblique diameter of the pelvic inlet. In right occipito-anterior position, sub-occipito-bregmatic diameter gets engaged in left oblique diameter of the pelvic inlet.

Usually during engagement, in the transverse diameter at the pelvic brim, the sagittal suture remains exactly midway between the pubic symphysis and sacral promontory. Occasionally, sagittal suture is deflected posteriorly towards sacral promontory or towards pubic symphysis. Such lateral deflection of the head to a more anterior or posterior position in the pelvis is known as “asynclitism”.

**Descent**

Descent usually begins with the engagement. Descent occurs in the direction of the least resistance. It is brought about by one or more of the following four forces:

i) Pressure of the amniotic fluid.

ii) Direct pressure of the uterine fundus upon the breech,

iii) Contractions of the abdominal muscles,

iv) Extension and straightening of the foetal body.

The descent continues throughout labour.

**Flexion**

Flexion is primary attitude of foetus. With descent, head gets further flexed and the sub-occipito-bregmatic becomes the presenting diameter. Chin of the foetus comes more closer to the foetal thorax. This facilitates further descent. Mechanism of this flexion can be explained by lever theory. Here vertical limb of the lever in the vertebral coloumn and the transverse limb of the lever is base of the foetal skull. This transverse limb of lever is divided into two arms of unequal length, longer anterior and shorter posterior, because of fulcrum at the occipito-allantoid joint. When resistance is encountered at the pelvic floor, the long arm will ascend slight, but shorter arm will descend more resulting into more flexion.

**Internal Rotation**

Rotation of the foetal head inside the pelvic cavity is known as “Internal rotation”. Usually occiput of foetal head rotates in anterior direction bringing suboccipito-bregmatic diameter in the anteroposterior diameter of the obstetric outlet. Length of this route is described as 1/8th of a circle. Rarely head rotates posteriroly. Posterior rotation is present with occipito-posterior position of foetus. Reason for anterior internal rotation is anterior and inward slope of the pelvic floor. Different degree of flexibility of different parts of foetus is one of the etiological factor for internal rotation.

As foetal head rotates, shoulders do not rotate simultaneously and this results in partial twisting of the neck. Soon it gets corrected, when head gets delivered out of pelvis (see Restitution and External Rotation).

**Extension**

Foetal head at the end of internal rotation is at vulva. It undergoes another movement that is “Extension”. It is essential for its birth. Uterine force acts on foetal head in the posterior direction, while force due to resistant pelvic floor and symphysis acts more anteriorly. The resultant force is in the direction of the vulvar opening. The vulvar outlet is directed upward and forward. Hence extension must occur before the head passes through it.

**Restitution and External Rotation**

i) Descent and delivery of the head bring the shoulders into the pelvic cavity. The head after delivery is oblique to the line of shoulders causing a twist to the neck. The head

now rotates to the natural position relative to the shoulders. This movement is known as restitution.

ii) Internal movements of shoulder (internal rotation of shoulder). With further descent, the anterior shoulder rotates to bring bi-acromical diameter in the anteroposterior diameter of the pelvic outlet. This causes the head to rotate towards maternal thigh. This is external rotation.

**Expulsion**

Immediately after external rotation, the anterior shoulder appears under the symphysis pubis. The perineum soon becomes distended by the posterior shoulder. Further force from abve deliver posterior shoulder followed by anterior shoulder. Rest of foetal body is quickly pushed out. Due to curved pelvic canal, vertebral column gets into lateral flexion while delivering.

**Check Your Progress 2**

1) The cardinal movements of labour are:

   a) .....

   b) .....

   c) .....

   d) .....

   e) .....

   f) .....

   g) .....

2) Fill in the blanks:

   a) The entry of the greatest transverse diameter of presenting part in the pelvic inlet is designated as …….

   b) Mechanism of flexion is explained by ……

   c) External rotation of the foetal head represents …… of the …….

   d) Foctal head gets delivered by the movement of……..

## 10.5 LET US SUM UP

In this unit, you read about the maternal pelvis (passage), the foetus (passenger) and uterine action (power) and other expulsive forces. The signs of onset of labour, physiology of uterine contractions, mechanism of labour and how placenta separates are described. This knowledge will help you to understand management of normal labour which is dealt in the next unit (Unit 11).

## 10.6 ANSWERS TO CHECK YOUR PROGRESS

**Check Your Progress 1**

1) Girdle of contact is the circumference of the foetal head which comes in contact with the pelvic brim.

2) Physiologic retraction ring is the boundary between the thinned lower and thickened upper segment, marked by a ridge on the inner uterine surface.

3) a) 55 degree

b) two ischial spines

c) lozenge

d) retraction

e) mento-vertical

**Check Your Progress 2**

1) a) Engagement

b) Descent

c) Flexion

d) Internal rotation

e) Extension

f) Restitution and external rotation

g) Expulsion

2) a) engagement

b) lever theory

c) internal rotation, shoulders

d) extension

## 10.7 FURTHER READINGS

Holland & Brews, *Manual of Obsterics* (1991), 15th Edition, B.I. Churchil Livingstone Pvt. Ltd., New Delhi.

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