Chapter 5 Contracted Pelvis, Cephalopelvic Disproportion and Trial of Labor

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OVERVIEW

1. Four parent pelvic shapes are gynecoid (50%), anthropoid (25%), android (20%) and platypelloid (5%).
2. Gross contracted pelvis is a rarity nowadays. Minor variations in size and shape are commonly found.
3. Diagnosis of contracted is mainly by pelvic examination supplemented by other findings in history, general and abdominal examination.
4. Fetal head is the best pelvimeter.
5. Muller-Munro Kerr's method is an important cephalopelvic disproportion test.
6. Trial of labor is carried out in vertex presentation in minor degree CPD.
7. Well-effaced, thinned-out, well-applied cervix to the head with good uterine contraction are good signs for successful trial.
8. Continuous cardiotocograph and plotting the progress of labor in partogram is a must in trial of labor.
9. Aim of good obstetrics is to deliver undamaged baby by a healthy mother.

CLASSIFICATION OF PELVIS

Variations in the female pelvis and in the planes of any pelvis are so great that a rigid classification is not possible. Many pelves are mixed in that the various planes do not confirm to a single parent type. In mixed or intermediate type, the posterior segment determines the type of pelvis. For the purpose of classification, the pelvis is named on the basis of the inlet, and a mention is made of nonconforming parameters. Four parent types of pelvic shapes were recognized by Caldwell and Moloy (Figs 5.1A to C).

1. Gynecoid pelvis (50%): It is normal female pelvis. The inlet is round or transverse oval as the transverse diameter of inlet is greater than the anteroposterior diameter. Sides of the posterior segment are round, wide and roomy. The anterior sagittal diameter is slightly more than the posterior sagittal diameter.

   At the midcavity the spines are not prominent and sidewalls are straight. Interischial spine distance is 10 cm or more. The sacrum is well-curved and the sacrosciatic notch is well-rounded.

   The subpubic angle at the outlet is wide (right angle).

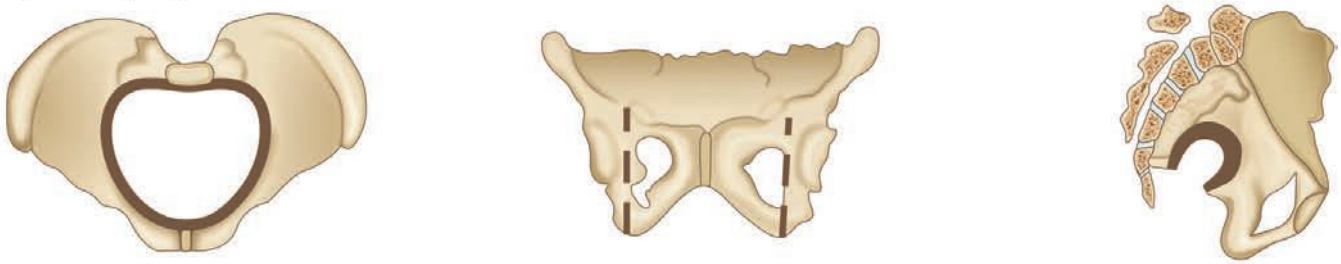
   In a small gynecoid pelvis, all the diameters are proportionally reduced but the shape is normal.
2. Anthropoid pelvis (25%): Ape-like pelvis. At the inlet, the pelvis is long anteroposterior oval. The anteroposterior diameter is more than the transverse diameter. The anterior segment is narrow and pointed.

   The side walls are often convergent at the midpelvis and the spines are likely to be prominent. The sacrosciatic notch is wide and the sacrum usually has six segments.

   The subpubic angle is normal or relatively narrowed but well-shaped at the outlet.

   In this type of pelvis, labor and delivery are usually easy, face to pubis deliveries are common.
3. Android pelvis (20%): Male pelvis. The inlet is heart- or wedge-shaped. The use of posterior space is much limited in this as the posterior sagittal diameter is much less than anterior sagittal diameter. The anterior segment is narrow and sharply angulated and the posterior pelvis is shallow. Sacral promontory indents the inlet and reduces its capacity.

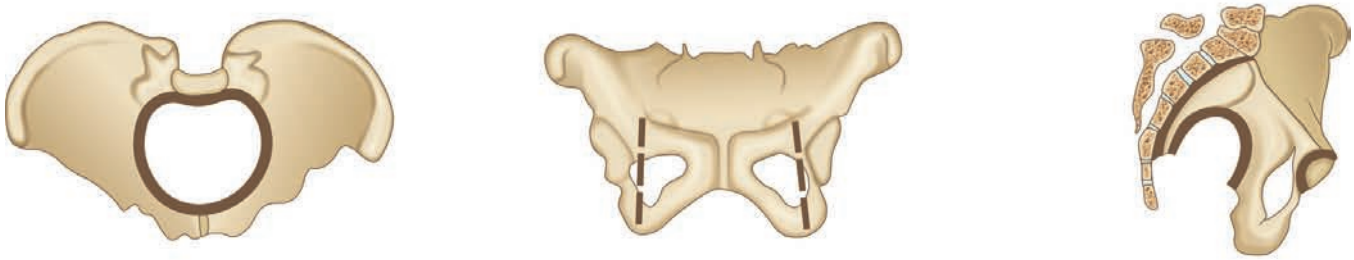
Gynecoid (50%)—round or transverse oval



Anthropoid (25%)—long anteroposterior oval

Android (20%)—heart or wedge-shaped

Platypelloid (5%)—transverse oval (Flat)



A Inlet **B** Cavity **C** Outlet

Figs 5.1A to C: Parent pelvic types (Caldwell-Moloy classification)

The side walls are convergent (funnel-shaped) at the midpelvis, and the ischial spines are prominent. The sacrum is usually straight and set forward into the pelvis. The sacrosciatic notch is narrow and highly arched.

The subpubic angle at the outlet is narrow (acute angle).

Occipitoposterior positions are more common in this type of pelvis. Because of the funnel shape of the pelvis, rotation fails to occur and deep transverse arrest is common.

4. Platypelloid pelvis (5%): Flat female pelvis. It is a flattened gynecoid pelvis with a wide transverse and short anteroposterior diameter. The sacrosciatic notch is very wide and the sacrum is usually well-curved and rotated backwards.

   Difficulty in engagement of fetal head is usually noted in flat pelvis.

CONTRACTED PELVIS

Anatomical definition: It is a pelvis in which one or more of its diameters are reduced below the normal by one or more centimeters.
Obstetric definition: It is a pelvis in which one or more of its diameters are reduced so that it interferes with the normal mechanism of labor in an average size baby.

Etiology

Conditions like rickets, osteomalacia, bone tuberculosis and malnutrition which cause gross degree of contracted pelvis are nowadays a rarity. A minor variation in size and shape of the pelvis is commonly found which is often overlooked until complications arise.

Causes in the Pelvis

- Developmental (congenital):
  - Small gynecoid pelvis (generally contracted pelvis)
  - Small android pelvis
  - Small anthropoid pelvis
  - Small platypelloid pelvis (simple flat pelvis)
  - Naegele's pelvis: Absence of one sacral ala
  - Robert's pelvis: Absence of both sacral alae
  - High assimilation pelvis: The sacrum is composed of 6 vertebrae
  - Split pelvis: Split symphysis pubis
- Metabolic:
  - Rickets
  - Osteomalacia (triradiate pelvic brim)
- Traumatic: As fractures
- Neoplastic: As osteoma.

Causes in the Spine

- Lumbar kyphosis
- Lumbar scoliosis
- Spondylolisthesis: The 5th lumbar vertebra with the above vertebral column is pushed forward while the promontory is pushed backwards and the tip of the sacrum is pushed forwards leading to outlet contraction.

Causes in the Lower Limbs

- Dislocation of one or both femurs
- Atrophy of one or both lower limbs

Note: Oblique or asymmetric pelvis: One oblique diameter is obviously shorter than the other. This can be found in:

- Naegele's pelvis
- Scoliotic pelvis
- Diseases, fracture or tumors affecting one side.

DIAGNOSIS OF CONTRACTED PELVIS

The diagnosis is made based on the history, general, abdominal and pelvic examinations.

History

The following history will help us in identifying the women who are at risk to have contracted pelvis. Prolonged labor ending in difficult forceps, cesarean delivery, fetal birth injury and fresh stillbirth; history of trauma or diseases of the pelvis, spines or lower limbs; a history of delayed walking and dentition which is suggestive of rickets needs to be asked in suspected cases.

Examination

General Examination

Abnormal gait suggesting abnormalities in the pelvis, spines or lower limbs and height less than 145 cm usually have contracted pelvis. Spine, lower limbs, manifestations of rickets need to be examined. In dystocia dystrophia syndrome the woman is short, stocky, subfertile, has android pelvis, masculine hair distribution and history of delayed menarche. These women are more exposed to occipitoposterior position and dystocia.

Abdominal Examination

In a primigravida nonengagement of the head (free floating head) in the last 3–4 weeks, head in one of the iliac fossae,

pendulous abdomen and malpresentations are common in cases of contracted pelvis.

Pelvimetry

It is assessment of the pelvic diameters and capacity done at 38–39 weeks by internal, external and imaging methods of which the internal pelvimetry is important.

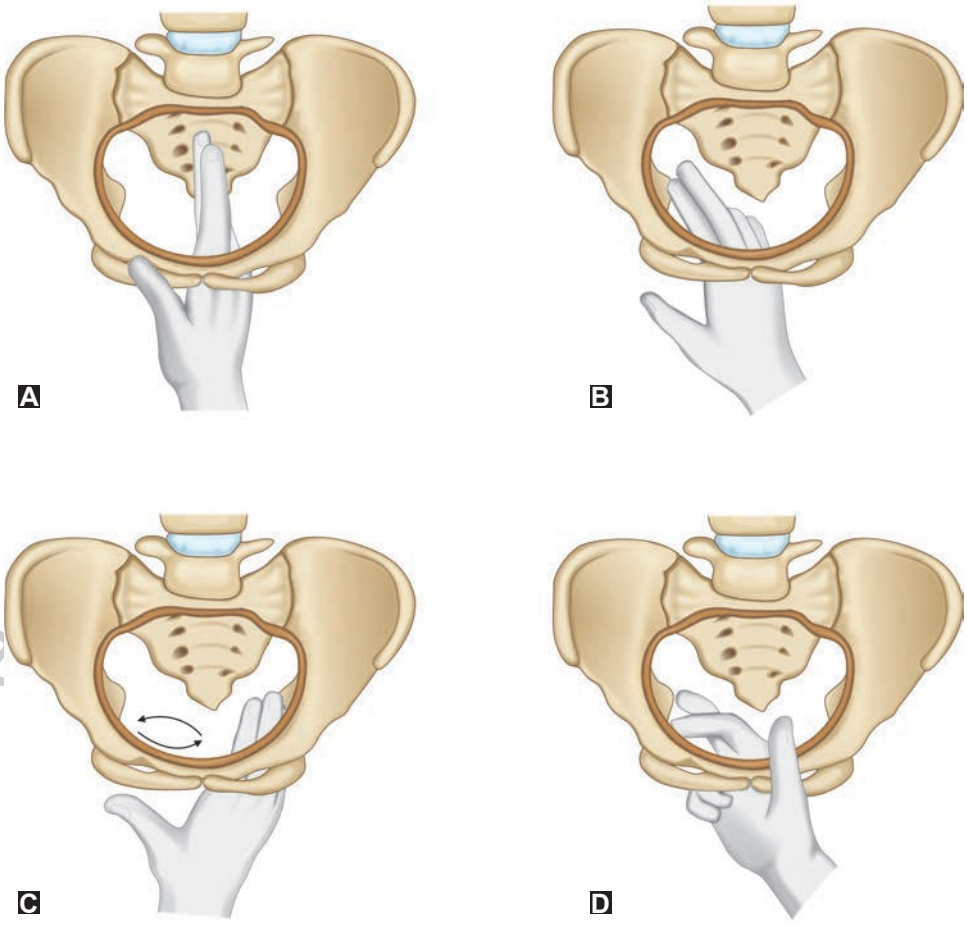
Internal Pelvimetry (Done through Vaginal Examination) (Figs 5.2A to D)

The patient has to empty the bladder and is placed in dorsal position. Rule out placenta previa before doing a vaginal examination. This examination needs to be done with a sterile glove under all aseptic precautions.

The Inlet

Palpation of the forepelvis (pelvic brim): The index and middle fingers are moved along the pelvic brim. Note whether it is round or angulated, causing the fingers to dip into a V-shaped depression behind the symphysis.

Diagonal conjugate: Try to palpate the sacral promontory to measure the diagonal conjugate. Normally, it is 12.5 cm and cannot be reached. If it is felt, the pelvis is considered contracted and the true conjugate can be calculated by subtracting 1.5 cm from the diagonal conjugate. This



Figs 5.2A to D: Clinical assessment of pelvis

assessment is not done if the head is engaged. Inlet contraction is usually defined as a diagonal conjugate less than 11.5 cm.

The Cavity

Shape and inclination of the sacrum is to be noted.

Side walls: To determine whether it is straight, convergent or divergent starting from the pelvic brim down to the base of ischial spines in the direction of the base of the ischial tuberosity.

Ischial spines: Whether it is blunt (difficult to identify at all), prominent (easily felt but not large) or very prominent (large and encroaching on the midplane). The ischial spines can be located by following the sacrospinous ligament to its lateral end.

Interspinous diameter: By using the two examining fingers, if both spines can be touched simultaneously it suggests inadequacy for an average-sized baby.

Sacrosciatic notch: If the sacrospinous ligament is two fingers, the sacrosciatic notch is considered adequate.

Contracted midpelvis is common than inlet contraction. Midpelvis is likely to be contracted when the sum of the interspinous and posterior sagittal diameter of midpelvis is 13.5 cm or less (normal is 10.5 cm plus 5 cm or 15.5 cm) or suspect CPD whenever interspinous distance is less than 10 cm. Some authors have noted that the relationship between the intertuberous and the interspinous diameters is sufficiently constant that narrowing of the interspinous diameter can be anticipated when the intertuberous diameter is narrow. However, a normal intertuberous diameter does not always exclude a narrow interspinous diameter.

The Outlet

At this level, the subpubic angle (90–100°) normally admits two fingers and bituberous diameter normally admits the closed fist of the hand (4 knuckles). Mobility of the coccyx can be checked by pressing firmly on it while an external hand on it can determine its mobility (Fig. 5.3).

Radiological Pelvimetry

Ultrasonographic estimation of biparietal diameter (BPD), occipitofrontal diameter and circumference of the head is a safe, accurate and easy method to suspect inadequacy of the pelvis.

External pelvimetry and other modalities of imaging pelvimetry do not have much role in modern obstetrics.

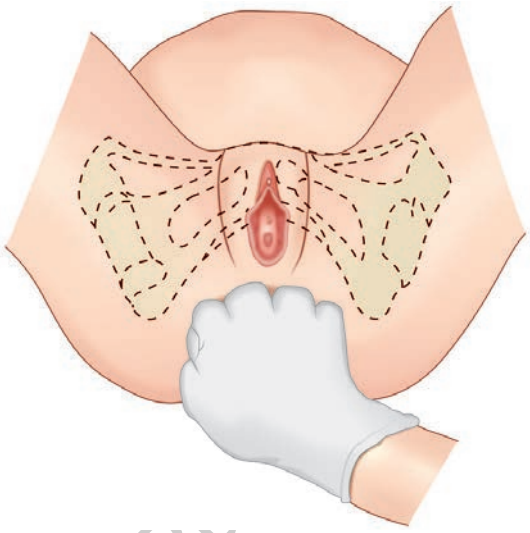


Fig. 5.3: Assessing transverse diameter of the outlet

CEPHALOPELVIC DISPROPORTION

Cephalopelvic disproportion (CPD) refers to the inability of the fetus to pass through the pelvis which may be absolute or relative. It is absolute when under no circumstances baby (passenger) can safely pass through the pelvis (passage). When other factors are involved, it results in relative disproportion. Minor degrees of disproportion can be overcome by effective uterine contractions (power), dilatability of soft tissues, favorable attitude, presentation and position of fetus, and moldability of fetal head.

Normally, cervical dilatation is aided by the hydrostatic action of unruptured membranes or after their rupture, by the direct application of the presenting part against the cervix. In case of inlet contraction since the head is arrested at the inlet, the entire force exerted by the uterus acts directly on the membranes that contact the dilating cervix and results in early spontaneous rupture of membranes. In women with contracted pelvis, face and shoulder presentations are encountered three times more frequently and cord prolapse four to six times more often.

Midpelvic contraction is more common than inlet contraction and an isolated outlet contraction without concomitant midplane contraction is rare. Perineal tears are more common with increasing narrowing of the pubic arch because, as the occiput cannot emerge directly beneath the symphysis pubis, it is forced farther down upon the ischiopubic rami. As a result, perineum becomes increasingly distended, and thus exposed to greater degree of laceration.

Cephalopelvic Disproportion Tests

It depends upon the fact that "the head is the best pelvimeter for the pelvis".

These are done to detect contracted inlet if the head is not engaged in the last 3–4 weeks in a primigravida.

1. *Pinard's method:* The patient evacuates her bladder and rectum, and she is placed in semi-sitting position to bring the fetal axis perpendicular to the brim. The left hand of the examiner pushes the head downwards and backwards into the pelvis while the fingers of the right hand are put on the symphysis to detect disproportion.
2. *Muller-Munro Kerr's method:* It is more valuable in detection of the degree of disproportion. The patient evacuates her bladder and rectum, and she is placed in the dorsal position. The left hand of the examiner pushes the head into the pelvis and vaginal examination is done by the right hand while its thumb is placed over the symphysis to detect disproportion (Fig. 5.4).
3. *Mueller-Hillis maneuver:* The fetal brow and suboccipital region are grasped through the abdominal wall with fingers, and firm pressure is directed downward in the axis of the inlet. If no disproportion, head readily enters the pelvis and vaginal delivery can be predicted.

Interpretation of the Results of CPD Tests

- *No disproportion:* If the head can be pushed into the pelvis.
- *Minor disproportion:* The anterior surface of the head is in line with the posterior surface of the symphysis. During labor, the head is engaged due to molding and vaginal delivery can be achieved.
- *Moderate disproportion (1st degree disproportion):* The head does not enter the pelvis and is nearly at the same level of the anterior surface of the symphysis pubis. Vaginal delivery may or may not occur depending upon the undetermined factors of labor like molding of the head and yielding of the pelvis.
- *Marked disproportion (2nd degree disproportion):* The head overrides the anterior surface of the symphysis. Usually found in cases with marked degree of contracted pelvis. In these cases, vaginal delivery cannot occur.

This estimation may not be correct in case of long uneffaced cervix.

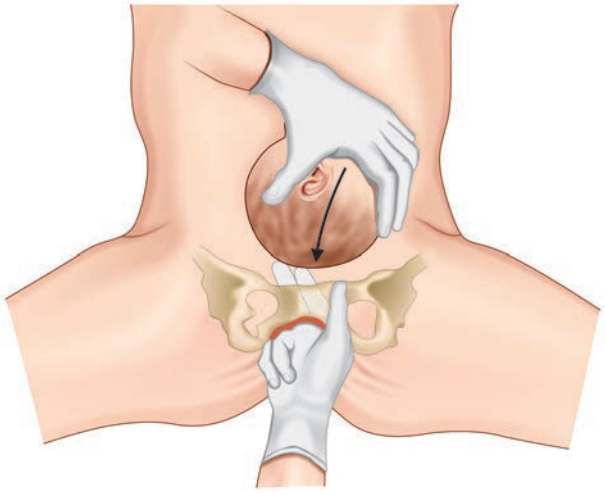


Fig. 5.4: Muller-Munro Kerr's method of testing CPD

Management of Labor in Contracted Pelvis

Before allowing labor to continue, early exclusion of indications for cesarean is mandatory, e.g. malpresentations, uterine scar of previous cesarean or myomectomy, etc.

In cases of mild to moderate degree of cephalopelvic disproportion, trial of labor (TOL) can be carried out in selected cases. Cesarean delivery is done if trial of labor fails or is contraindicated.

In marked to extreme degree of cephalopelvic disproportion, there is no role for TOL, delivery is achieved by cesarean in these cases.

Maternal Risks during Labor in Contracted Pelvis

- Prolonged labor and slow dilatation of the cervix (abnormal progress of labor)
- Premature rupture of membranes and prolapse of cord
- Obstructed labor, may end in rupture of the uterus
- Higher incidence of instrumental and operative delivery
- Postpartum hemorrhage (due to atony and lacerations)
- Maternal infection (due to prolonged labor and instrumental delivery)
- Genitourinary fistula.

Fetal Risks during Labor in Contracted Pelvis

- Fetal birth injuries
  - Intracranial hemorrhage
  - Fractures of the skull
  - Nerve injuries
- Intrapartum and neonatal asphyxia

- Prolapse of the cord, due to the high non-engaged presenting part resulting in fetal death
- Intra-amniotic infection, due to the prolonged early spontaneous rupture of membranes.

TRIAL OF LABOR

This is a clinical attempt to evaluate the extent of cephalopelvic disproportion. The woman is allowed to labor under close supervision to see if the natural forces of labor can overcome the suspected disproportion.

Hence, trial of labor (TOL) is a clinical test for the factors that cannot be determined before the start of labor such as efficiency of uterine contractions (power), molding of the fetal head (passenger), yielding of the pelvis and soft tissues (passage).

Trial of labor is carried out in a hospital where facilities for cesarean delivery are available. For a trial of labor, the presentation must be vertex. Patient has to be kept nil per oral. Number of vaginal examinations has to be minimized to avoid premature rupture of membrane. Proper assessment of the progress of labor is done by the use of partogram. Proper and adequate analgesia has to be given to avoid maternal exhaustion. If a careful selection of case is made, the incidence of failures in trial labor would not be more than 10–15%, provided no complications arise during the trial.

It is preferable that the patient go into labor spontaneously. Induction can be carried out in special cases, but augmentation of labor by artificial rupture of membranes or oxytocin infusion is done once the labor is well-established.

The following factors are closely monitored during the process of labor:

- Mental and physical condition of the mother
- Fetal heart rate (continuous cardiotocographic monitoring) as well as other signs of fetal distress, such as passage of meconium
- Force and coordination of the uterine contraction
- Dilatation and effacement of the cervix
- Descent of the presenting part
- Degree of molding, formation and size of caput succedaneum.

Favorable progress of cervical dilatation and effacement, descent of head into the pelvis are the criteria for continuing the trial, whereas irregular and ineffective uterine contractions, the lack of effacement and progressive dilatation of the cervix, failure of the head to enter the inlet serve as evidence that the trial of labor has failed and other means of delivery should be sought.

Augmentation during the trial of labor is justified because many patients do not make good progress in labor because of unrecognized inefficient uterine action. On this basis, before a diagnosis of disproportion is made and operative delivery is employed, a trial of augmentation of labor with oxytocin infusion may be carried out, provided there are no signs of fetal distress. Hence, during the trial of labor, partogram has to be plotted and fetal heart rate should be monitored continuously with a cardiotocograph.

The signs of good prognosis to a successful vaginal delivery are:

1. Good uterine contraction.
2. Early engagement of the head.
3. Rupture of membranes nearing full cervical dilatation.
4. Well thinned-out and effaced cervix closely applied to the vertex.
5. Vertex anterior position.
6. Flat pelvis without any cavity contraction is the most favorable one.

When these are present, trial of labor is almost always successful in that vaginal delivery can be effected with safety to the mother and the child.

On the other hand, the signs of bad prognosis are:

1. Weak uterine action.
2. Slow descent of the head.
3. Premature rupture of membranes.
4. Uneffaced partially dilated cervix hanging loose like a cuff; occasionally, edema of the anterior lip of the cervix due to it being nipped between the head and symphysis pubis.
5. Occipitoposterior position of the head.
6. Android pelvis or a contracted pelvis. When the above findings are noted, cesarean delivery has to be considered.

A trial of labor is called as successful if vaginal delivery of a live, undamaged child is obtained with the mother also in good condition. The vaginal delivery may be spontaneous or helped by forceps. It is a failure if it results in the delivery of a dead baby or a child dying in the neonatal period. It is also a failure if delivery is by cesarean. In our opinion, defining the adequacy of trial of labor is a priority in moderating the primary cesarean delivery rate for dystocia. The aim of obstetrics is to deliver undamaged babies by a healthy mother.

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