

## Ayurlog: National Journal of Research in Ayurved Science

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### Cephalopelvic disproportion and clinical pelvimetry

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#### ABSTRACT:

Dystocia, or abnormally slow progress in labor, can result from cephalopelvic disproportion (CPD), malposition of the fetal head as it enters the birth canal, or ineffective uterine propulsive forces. Cephalopelvic disproportion occurs when there is mismatch between the size of the fetal head and size of the maternal pelvis, resulting in “failure to progress” in labor for mechanical reasons. Untreated, the consequence is obstructed labor that can endanger the lives of both mother and fetus. Despite the use of imaging technology in an attempt to predict CPD, there is poor correlation between radiologic pelvimetry and the clinical outcome of labor. Clinical pelvimetry still has a place in obstetrics for predicting or confirming CPD, but without appropriate training and repeated practice of this clinical skill, it is in danger of becoming

a lost art. For this review, a computerized search of the terms cephalopelvic disproportion, dystocia, pelvimetry, obstructed labor, and malposition was done using MEDLINE, PUBMED, SCOPUS, and CINAHL, and historical articles, texts, articles from indexed journals, and references cited in published works were also reviewed.

*Target Audience:* Obstetricians & Gynecologists, Family Physicians

*Learning Objectives:* After completion of this article, the reader will be able to interpret. How cephalopelvic disproportion is diagnosed.

Distinguish the 4 basic pelvic shapes. Evaluate pelvic measurements that best indicate adequacy or inadequacy of the pelvis.

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Bipedal locomotion and encephalization (progressive increase in brain size) have placed competing demands on the human pelvis. It is generally assumed that efficient bipedalism requires a narrow pelvis, whereas a wider pelvis is more advantageous for childbirth. The likelihood of cephalopelvic disproportion and obstructed labor has increased along with the increase in brain size, and changes in pelvic morphology that greatly restrict the midplane of the pelvis also complicate human obstetrical mechanics. Birth injuries sustained by modern women in impoverished countries who do not have access to skilled obstetric care when labor becomes obstructed attest to this painful Darwinian reality. The evolutionary consequences of these trends, if continued, are a matter for intriguing obstetrical speculation.

Dystocia, a word that literally means difficult labor, is the overall term for slow, inadequate, or dysfunctional labor. It is generally caused by uterine dysfunction (inadequate propulsive forces), or a size imbalance between the maternal pelvis and the fetal head (cephalopelvic disproportion, or CPD) that prevents the fetus from negotiating the birth canal. Cephalopelvic disproportion, a recognized obstetric problem that increases risk for both mother and infant, occurs when the fetal head is too big, the pelvis is too small, or the head is malpositioned as it enters the birth canal<sup>[1]</sup>.

Although the term CPD was coined in the 19th century when the disparity in size between the fetal head and the maternal pelvis largely resulted from pelvic contracture due to rickets, CPD is still responsible for 8% of maternal deaths worldwide [1]. Unattended, obstructed labor results in fetal death, eventual delivery of a macerated and infected baby, and atonic postpartum hemorrhage with or without puerperal infection. The survivor may be left with a vesicovaginal or rectovaginal fistula, infertility and chronic pelvic pain. Definitions of CPD vary but, barring extreme macrosomia or a severely restricted maternal pelvis, most authorities agree that it can only be diagnosed with assurance during labor. Clinical pelvimetry has traditionally been used in obstetric practice to predict CPD, and continues to be an important tool in developing countries. X-ray and computed tomography pelvimetry, and ultrasound and magnetic resonance imaging enable more precise assessment of pelvic dimensions, but cannot reliably diagnose CPD<sup>[2]</sup>. After completing this CME activity, readers will be better able to diagnose cephalopelvic disproportion, distinguish the 4 basic pelvic shapes, and evaluate pelvic measurements indicating an adequate or inadequate pelvis.

### **THE THREE “Ps” OF LABOR**

The current concept of dystocia is that it can result from CPD (a mismatch in size

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between the fetal head and the maternal pelvis), malposition of the fetal head as it enters the birth canal, or ineffective uterine propulsive forces.

These are summarized as the 3 “Ps” of labor:

1. Passageway: maternal bony pelvis and tissues.
2. Passenger: the fetus.
3. Powers: primary and secondary forces of labor.

A clinical classification divides CPD due to “passageway” or “passenger” into absolute and relative entities (6):

### **Absolute CPD—True Mechanical Obstruction**

#### *Permanent (Maternal)*

- Contracted pelvis
- Pelvic exostoses
- Spondylolisthesis
- Anterior sacrococcygeal tumors

#### *Temporary (Fetal)*

- Hydrocephalus
- Large infant

#### *Relative CPD*

- Brow presentation
- Face presentation—mentoposterior
- Occipitoposterior positions
- Deflexed head

Some clinicians consider the maternal pelvis to be “proven” if the woman has had a previous vaginal delivery. However,

subsequent fetuses can be larger, and maternal anatomy can change between pregnancies. Occasionally, lumbosacral spondylolisthesis may develop between pregnancies and reduce the effective anteroposterior diameter of the pelvic brim, rendering a previously adequate pelvis inadequate. Although descent of the fetal head through the pelvis may be obstructed by the relative sizes of the fetal head and the maternal pelvis, uterine “power” (contraction frequency and strength) must also be assessed. In most cases of slow or seemingly obstructed labor, augmentation with oxytocin is indicated. Indeed, O’Driscoll stated that, “cephalopelvic disproportion cannot be excluded unless oxytocin is used”, and others diagnose CPD only if there is a prolonged first (≥12 hours) or second (≥2 hours) stage of labor in women receiving oxytocin. The American College of Obstetricians and Gynecologists has stated that dystocia cannot be diagnosed before there has been an adequate trial of labor; to achieve this, women who are in the active phase of labor (cervix, 3–4 cm dilated) and are contracting less frequently than 3 times in 10 minutes, and whose contractions do not measure at least 25 mm Hg, and in whom fetal well being has been established, should have their labor augmented with oxytocin. Once an adequate contraction pattern is achieved, they should have at least 2 hours and possibly up to 4 hours of adequate labor without further

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cervical change before dystocia can be

### PELVIC SHAPES, DIMENSIONS, AND MEASUREMENTS

#### Pelvic Shapes

Although pelvis can be categorized by the measurements of their diameters, it is usual in obstetrics to classify pelvis according to the shape of the pelvic inlet. Four main types are recognized:

(1) **gynecoid**, a rounded inlet; (2) **android**, a heart-shaped inlet; (3) **anthropoid**, a long, narrow, oval inlet; and (4) **platypelloid**, an ovoid inlet with its long axis transverse

1. **Gynecoid**—this is the classical female pelvis, with the inlet transversely oval and a shallow pelvic cavity, with a broad well-curved sacrum. The gynecoid pelvis has a sub-pubic angle of 90 degrees and blunt ischial spines.

2. **Android**—this type of pelvis is more masculine in its shape and diameters. It is characterized by a heart-shaped inlet and a funnel-shaped, deep cavity; the sacrum is straight rather than curved. The sub-pubic arch has an angle  $\approx 90$  degrees, and the ischial spines are prominent, which may hinder internal rotation of the fetal head, and may ultimately lead to a deep transverse arrest. This type of pelvis is the least favorable for achieving a vaginal birth.

3. **Anthropoid**—this type of pelvis results from high assimilation, i.e. the sacral body is

diagnosed.

assimilated to the fifth lumbar vertebra. The pelvic brim is long, narrow, and oval in shape, and the anterior-posterior diameter is greater than the transverse diameter. The side walls of the cavity diverge, and the sacrum is long and concave. The sub-pubic angle is very wide and the ischial spines are not prominent.

4. **Platypelloid**—this is a wide pelvis that is flattened at the brim, with the sacral promontory pushed forward. This forms a kidney-shaped pelvic brim. The side walls of the pelvis diverge; the sacrum is flat, and the pelvic cavity shallow. As a result, the transverse diameter is greater than the anterior-posterior diameter. The subpubic angle is  $\approx 90$  degrees and the ischial spines are blunt.

### PELVIC DIMENSIONS AND CLINICAL PELVIMETRY

The pelvic dimensions can be determined clinically during a detailed bimanual exam in which various measurements of the pelvis are estimated and recorded. Some internal pelvic diameters are not accessible to direct measurement, so must be inferred. Findings are usually recorded as adequate, borderline, or inadequate, although some practitioners prefer to record the various pelvic dimensions in centimeters.

#### The Pelvic Inlet

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The pelvic brim or inlet separates the “false” pelvis from the “true” pelvis that is below. The inlet is round in shape, with the sacral promontory protruding into it posteriorly. The pubic bones form the anterior border of the pelvic brim; the iliac bones form the lateral borders, and the posterior border is formed by the sacral promontory and its alae. The pelvic inlet has 3 principal diameters: anteroposterior, transverse, and oblique. The anteroposterior diameter or obstetrical conjugate extends from the sacrovertebral angle (sacral promontory) to the symphysis pubis. The obstetrical conjugate is the most important diameter of the pelvic inlet since it is the shortest distance between the sacrum and the symphysis pubis. The average length of the obstetrical conjugate is 11 cm; the pelvic inlet is considered to be contracted if it is  $\leq 10$  cm<sup>[4]</sup>. However, the obstetrical conjugate cannot be measured directly with the hand since the upper margin of the symphysis cannot be reached. Instead, the diagonal conjugate is measured; this is the distance from the inferior border of the symphysis pubis to the sacral promontory, and is typically 1.5 cm longer than the obstetrical conjugate or 12.5 cm. The length of the diagonal conjugate is determined during a vaginal examination by placing the lateral edge of the middle finger of the examining hand flush with the lower border of the symphysis and trying to reach the sacral promontory. Failure to reach the

sacrum indicates that the conjugate is  $\leq 12.5$  cm. If the sacrum is reached, the point where the lowest border of the pubic symphysis impinges on the middle finger is noted, and the length of the middle finger to that point is equal to the length of the diagonal conjugate. Subtracting 1.5 cm from that distance gives the approximate length of the obstetrical conjugate. Instead of estimating the length of the diagonal conjugate in this manner, some practitioners simply note whether the sacral promontory was reached easily, with difficulty, or not at all.

The transverse diameter extends across the greatest width of the superior aperture, from the middle of the brim at the level of the linea terminalis on one side to the same point on the opposite. The average length of the transverse diameter is 13.5 cm; it is considered inadequate if it is  $\leq 12$  cm. There are 2 oblique diameters; each extends from the iliopectineal eminence of one side to the sacroiliac articulation of the opposite side. Their average measurement is 12.5 cm.

### **The Midpelvis and Pelvic Cavity**

The mid pelvis is at the level of the ischial spines. The ischial spines can be located by following the sacrospinous ligaments to their lateral ends. The spines should be palpated to determine if they are prominent or unduly pronounced, and the interspinous diameter should be estimated. The intraspinous diameter is the smallest dimension of the pelvis. It is assessed by

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touching both spines simultaneously with 2 examining fingers, and noting the distance between the fingers; it should be at least 10 cm. Assessment of the pelvic cavity is also done to determine if the walls of the cavity are straight, convergent, or divergent. While touching an ischial spine with the index and middle fingers of the examining hand, the thumb of the other hand is placed on the ischial tuberosity on the same side. If the thumb is medial to the examining fingers, the side wall is convergent, and if lateral it is divergent. The sacrum is also palpated for its curve, shape, and length. Finally, the sacrosciatic notch is evaluated; if the notch accommodates 2 and half fingers, it is considered adequate<sup>[3]</sup>.

### The Pelvic Outlet

The perimeter of the pelvic outlet is partially comprised of ligaments, and is either ovoid or diamondshaped. Landmarks of the pelvic outlet include the lower border of the symphysis pubis, the pubic arch, the ischial tuberosities, the sacrotuberous and sacrospinous ligaments, and the lower aspect of the sacrum and the coccyx. The posterior surface of the pubic symphysis should be palpated; in the normal female pelvis, this is a smooth rounded curve. The subpubic angle should be more than 90 degrees, and normally admits 2 fingers. The distance between the ischial tuberosities (the bituberous diameter) is normally at least 8 cm; this is equivalent to the width of the

closed fist or 4 knuckles for most examiners. The mobility of the coccyx is determined by pressing firmly on it. During the pelvic examination, the muscular structure of the pelvis is also noted. Prominent obturator internus muscles may occupy space in the cavity, and rigid, inelastic levatores may obstruct descent of the head. Finally, the perineal muscles are assessed for their density and elasticity. In performing clinical pelvimetry, a formula to follow is described as the rule of 3s, indicating that there are 3 parts of the pelvis to examine, and each part has 3 components (Table 1). The findings expected in an adequate pelvis are shown in Table 2.

**TABLE 2**  
**Findings expected in an adequate pelvis**

Assessment	Finding
Pelvic brim	Round
Diagonal conjugate _	-12.5 cm
Symphysis sacrum	Average thickness, parallel to
Sacrum	Hollow, average inclination
Side walls	Straight
Ischial spines	Blunt
Interspinous diameter	_10.0 cm
Sacrosciatic	2.5–3 finger

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<b>notch</b>	<b>breadths</b>
<b>Subpubic angle</b>	<b>_90 degrees (2 finger breadths)</b>

<b>Bi-tuberous diameter</b>	<b>_8.0 cm (4 knuckles)</b>
<b>Coccyx</b>	<b>Mobile</b>

**Table :2**

<b>rule of three</b>
<b>Brim</b>
<b>Diagonal conjugate</b>
<b>Posterior surface of pubic symphysis Ilio- pectineal line</b>
<b>Cavity</b>
<b>Sacrum-shape, curve and length</b>
<b>Ischial spines</b>
<b>Sacrospinous ligament</b>
<b>Outlet</b>
<b>Subpubic arch and angle</b>
<b>Intertuberous diameter</b>
<b>Sacrococcygeal joint</b>

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