

NORMAL LABOUR: MECHANISMS

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Contents

- Definition
- Stages of labour
- Physiology of labour-uterus
- Physiology of labour-fetus
- Physiology of labour-pelvis

Definition

- spontaneous onset of regular, painful uterine contractions (3 in 10 minutes) that are associated with:
 - effacement and progressive dilatation of the cervix (3-4cm or more)
 - descent of the presenting part of the fetus.
 - with or without bloody show or ruptured membranes.
- results: birth of neonate followed by expulsion of placenta and membranes

Stages of labour

First stage

-begins with onset of labour (cervical dilatation of 3-4cm) and finishes at full dilatation (cervical dilatation of 10cm).

i) Latent phase:

-dilatation: 3-4cm, effacement: 0.5-3cm (<100%)

-slow, variable in duration phase: 8 hours (nulliparous), 6 hours (multiparous)

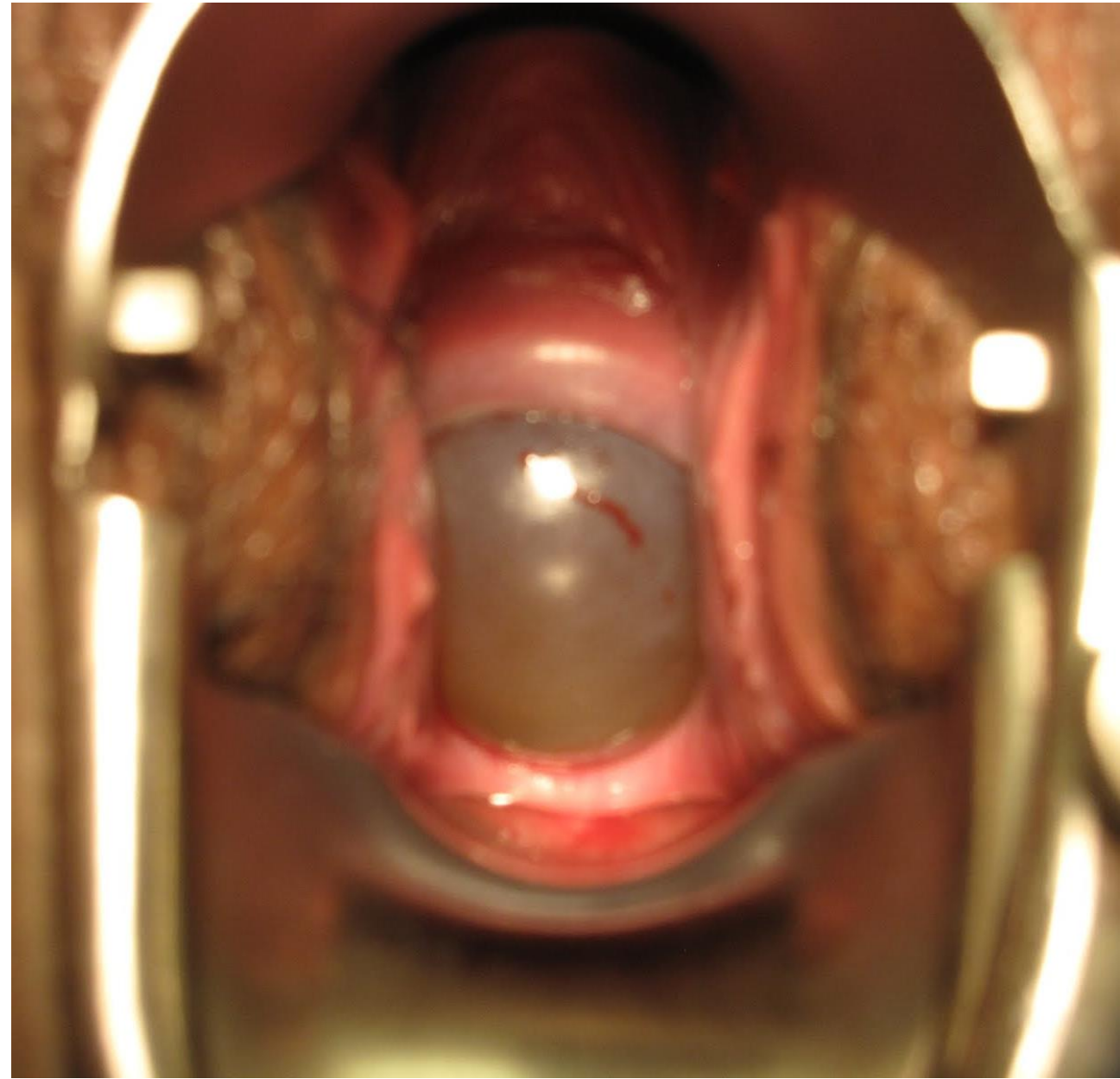
Stages of labour

ii) Active phase:

- dilatation: 4-10cm, effacement: 0cm (100cm)
- fast (acceleration, maximum slope, deceleration phase)
- 1cm/ hour dilatation (nulliparous, multiparous)

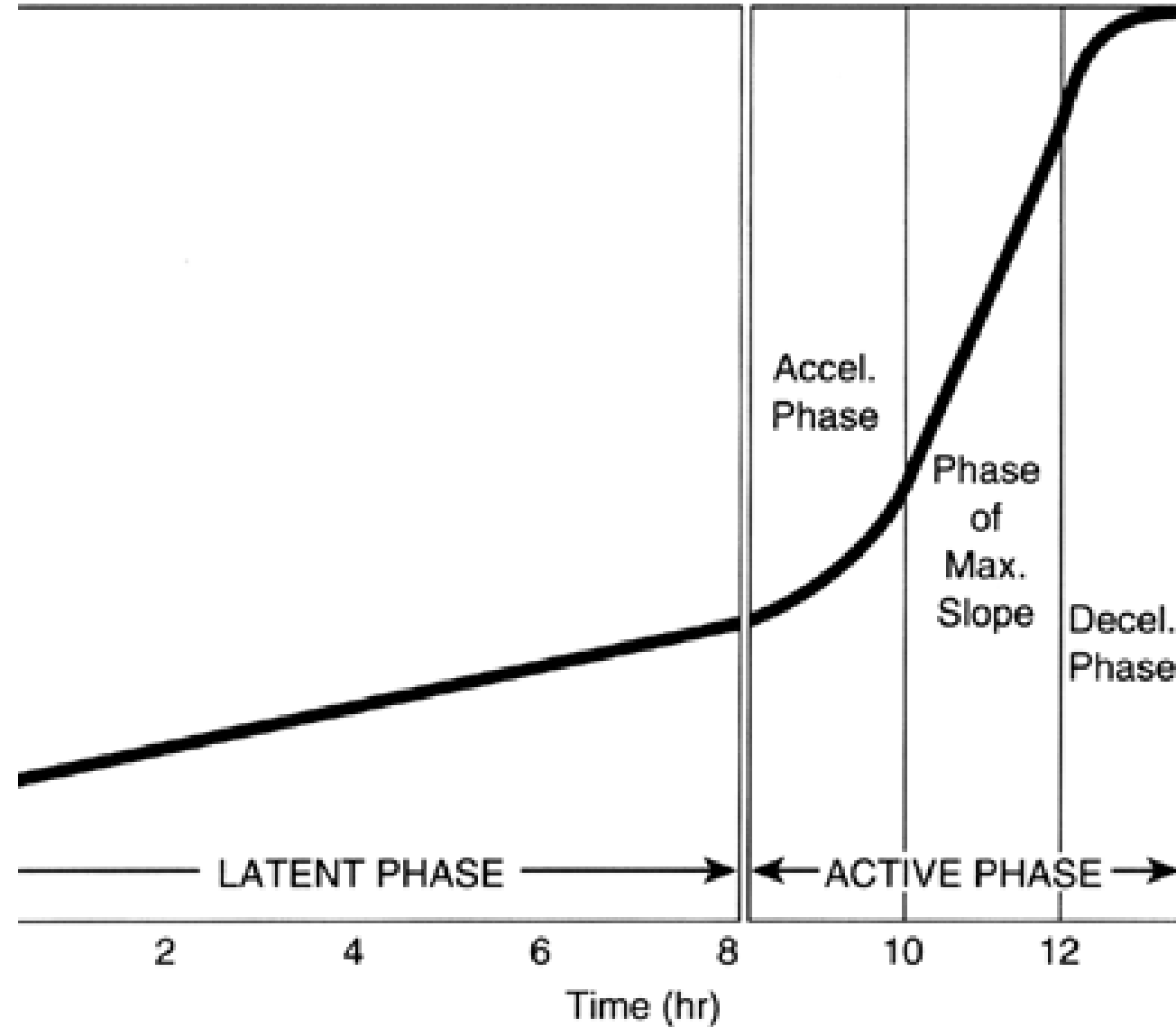
Stages of labour

-speculum examination:
cervical dilatation of 4-5cm with
visible fetal membranes.



Stages of labour

- Friedman described labour progress in 100 nulliparous women in spontaneous labour at term.
- progress was presented graphically by plotting cervical dilatation over time.
- this is the base of the modern partograph used in labour as a pictorial representation of events



Stages of labour

Second stage

- dilatation: 10cm (full dilatation) until delivery of neonate

- i) Passive phase:

- no urge to push, head is high in pelvis

- ii) Active phase:

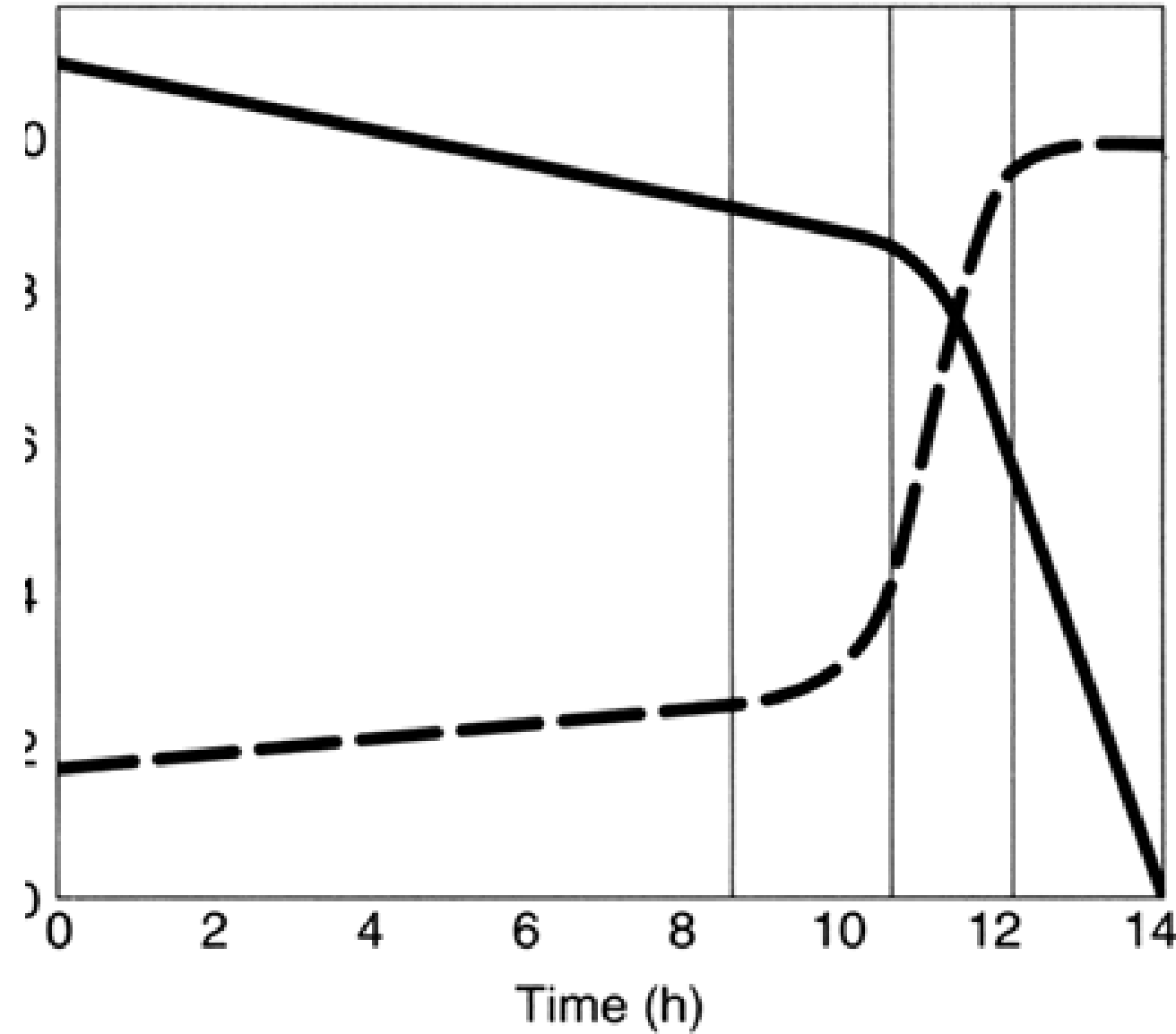
- urge to push, head is low in pelvis

- 2 hours (nulliparous), 1 hour (multiparous): no epidural

- 3 hours (nulliparous), 2 hours (multiparous): epidural

Stages of labour

-relationship between descent and cervical dilatation



Stages of labour

Third stage

- delivery of the neonate until expulsion of placenta

- i) Active management:

- use of oxytocin and maneuvers to extract placenta

- 30 minutes

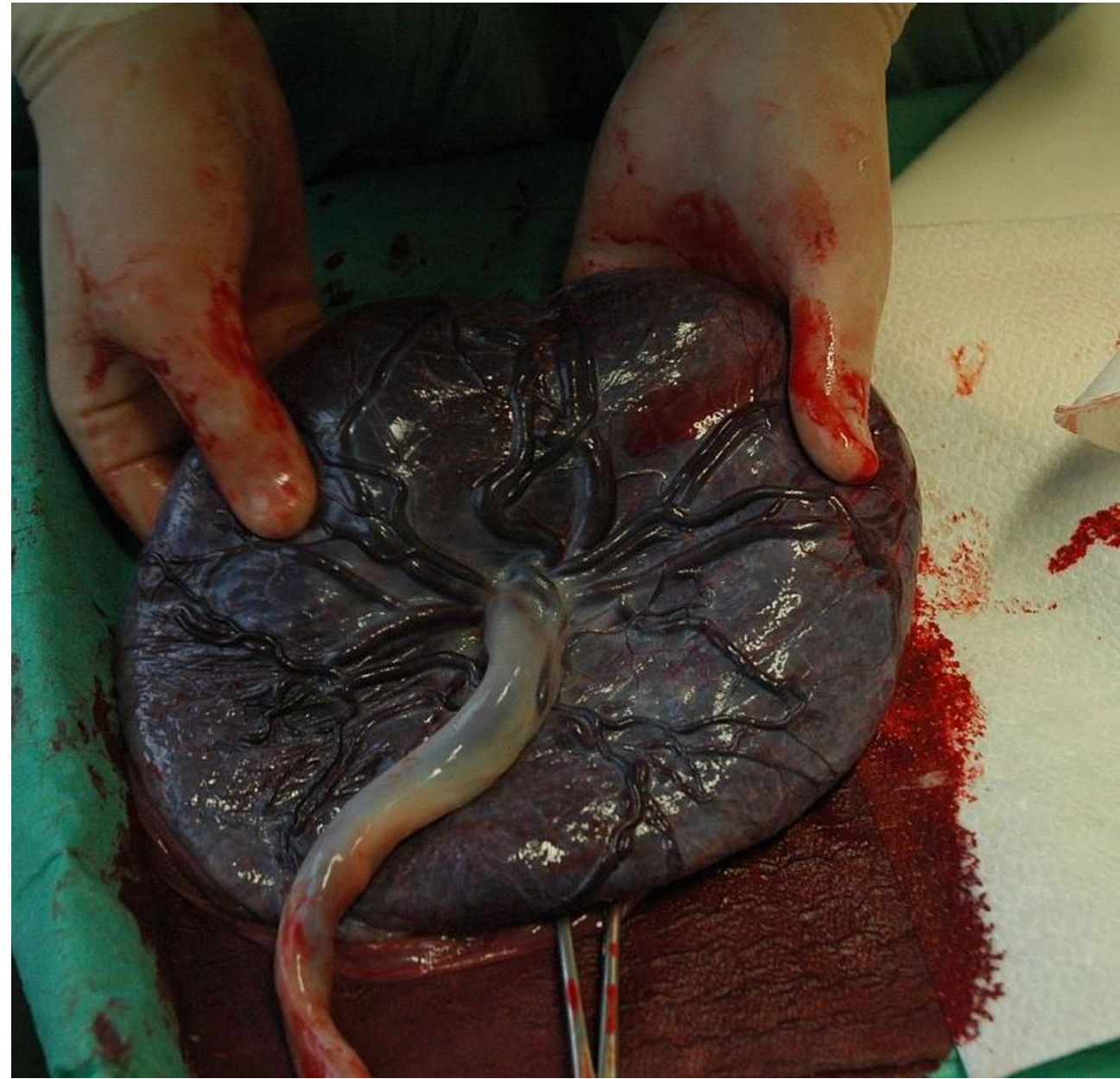
- ii) Physiological management:

- no use of oxytocin or maneuvers to extract placenta

- 60 minutes

Stages of labour

-placental cord traction:
placenta and fetal membranes are
expelled from uterus.



Physiology of labour

Uterus

- myometrial contractility
- membrane status

Fetus

- lie, presentation, position, station, attitude
- anomalies
- size

Pelvis

- pelvic type

Physiology of labour-uterus

Myometrial activity (parturition cascade)

i) Phase 0:

-active inhibitors: progesterone, relaxin, nitric oxide, prostacyclin

-functional quiescence

Physiology of labour-uterus

ii) Phase I:

- myometrial activation: oxytocin, prostaglandins
- myometrial receptors, gap junctions increase
- decreased threshold for myometrial contractility

Physiology of labour-uterus

iii) Phase II:

- stimulatory phase: oxytocin, prostaglandins

- contractions

- Braxton-Hicks contractions:

 - irregular intensity and frequency, weeks prior to delivery, various origins

- labour contractions:

 - regular intensity and frequency, hours prior to labour, onset at fundus and extension towards cervix

Physiology of labour-uterus

iv) Phase III:

- involution: oxytocin

- contractions after delivery of neonate

Physiology of labour-uterus

Myometrial changes

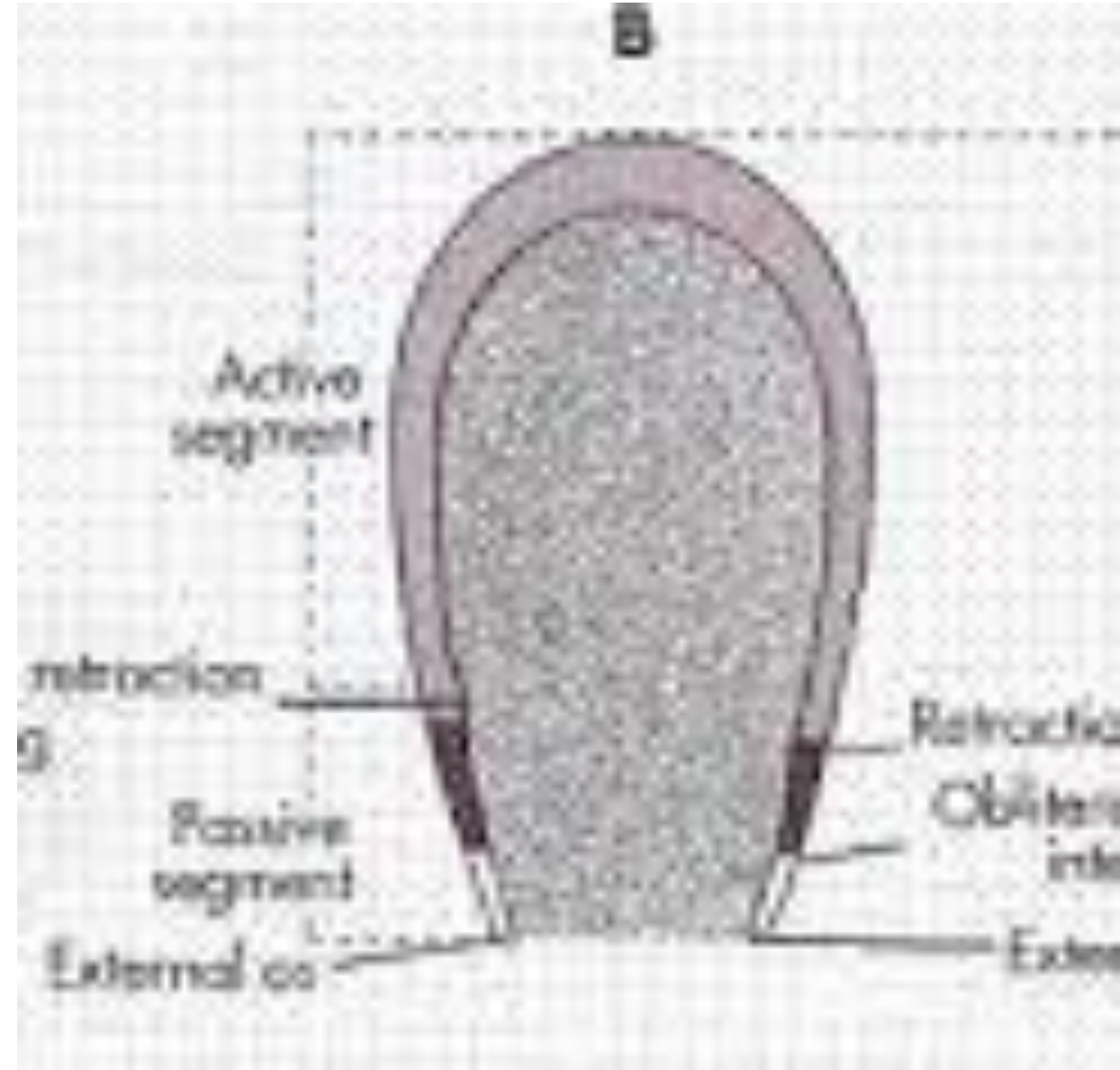
- lower uterine segment: expansion during last weeks of pregnancy
retraction ring
- fetal presenting part: descent “lightening”

Cervical changes

- mucous plug: ruptured capillary vessels “bloody show”
- effacement: shortening, incorporation into lower uterine segment
- dilatation:

Physiology of labour-uterus

- physiological retraction ring during last stages of pregnancy
- formed due to contractions
- allows fetal presenting part to descent



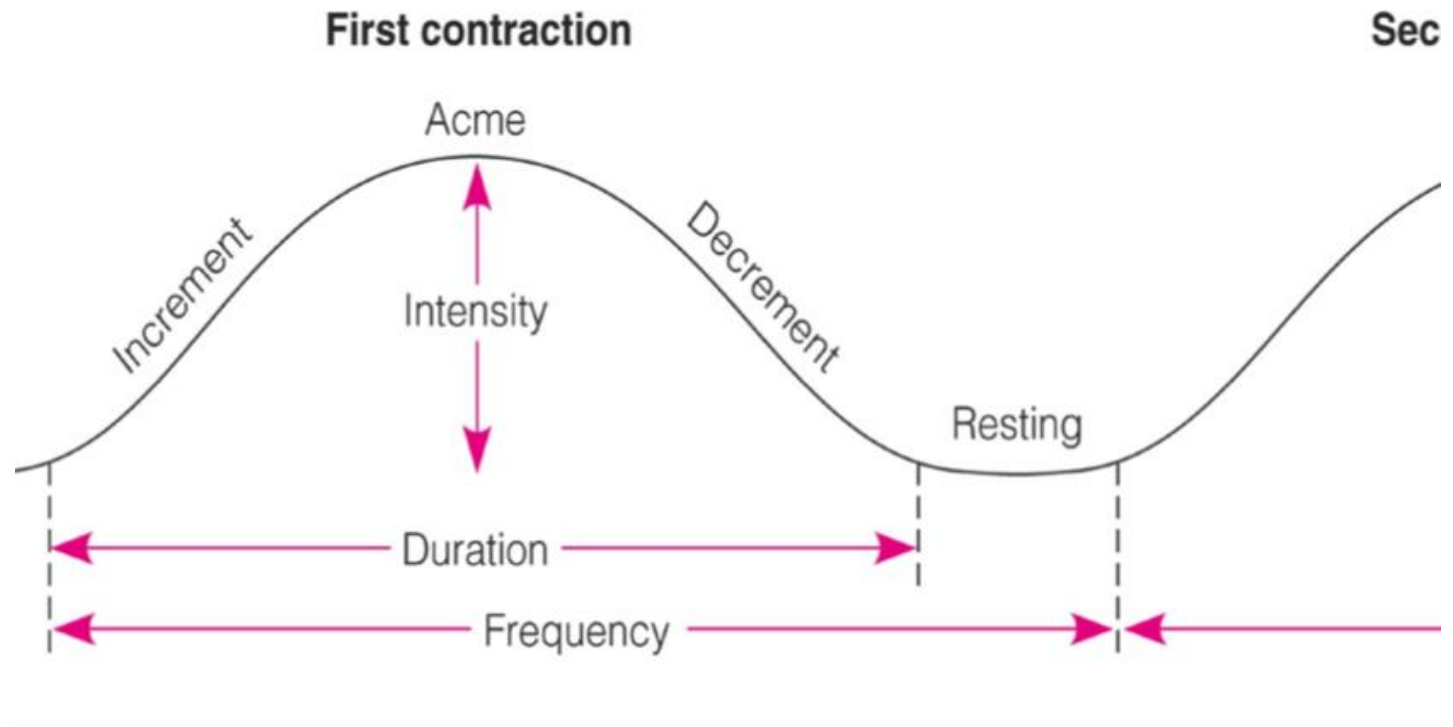
Physiology of labour-uterus

Myometrial contraction features

- frequency: number in 10 minutes
- duration: seconds to minutes
- intensity
- phases: increment, acme, decrement
- resting pressure

Physiology of labour-uterus

Contraction features



Physiology of labour-uterus

Myometrial contractions

i) early labour

- frequency: every 3-5 minutes
- pressure: 20-30 mmHg above resting pressure
- duration: 30-60 seconds
- resting pressure: 5-10 mmHg

Physiology of labour-uterus

ii) Late labour

- frequency: every 2-4 minutes
- pressure: 30-50 mmHg above resting pressure, 100-150 mmHg-during pushing
- duration: 60-90 seconds
- resting pressure: 12-14 mmHg

Physiology of labour-uterus

Minimal effective myometrial contractility

- frequency < 5 minutes
- pressure >25mmHg

Physiology of labour-uterus

Membrane status

- i. Ruptured membranes prior to onset of contractions:
 - increased release of prostaglandins into amniotic cavity
 - 90% of cases at term, will have spontaneous onset of contractions in 24 hours.
 - complications: chorioamnionitis, umbilical cord compression

Physiology of labour-fetus

Fetal head sutures and fontanelles

-sagittal suture:

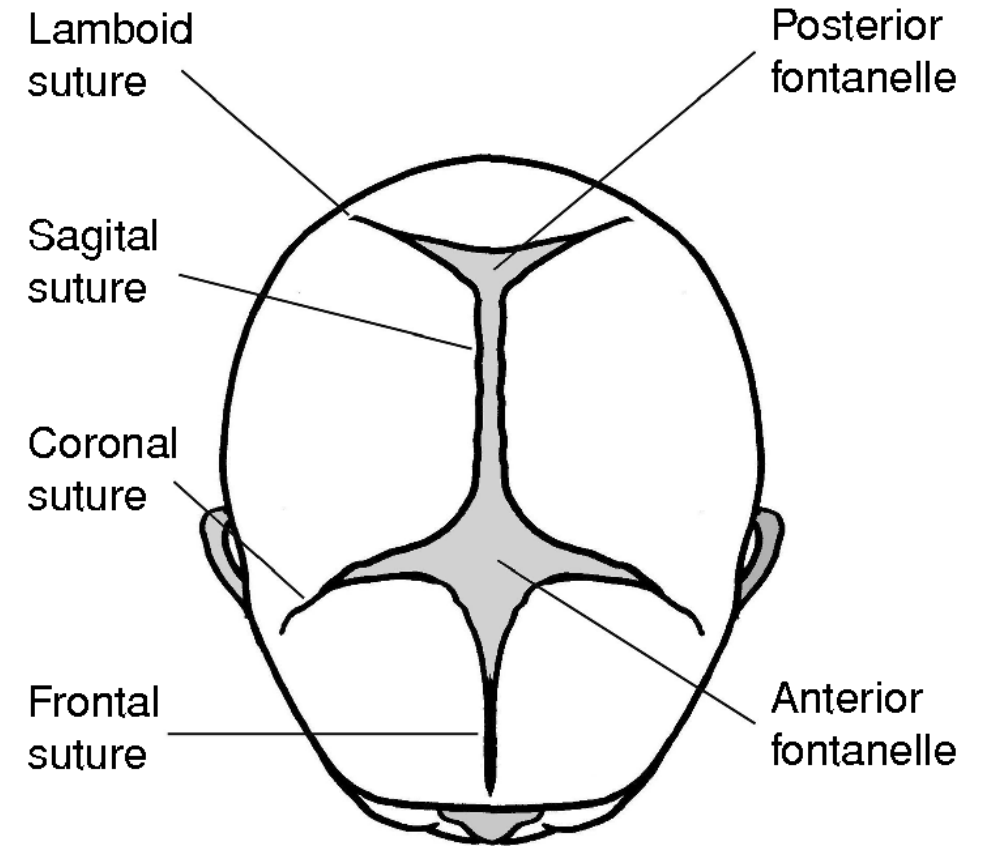
connects fontanelles

-anterior fontanelle:

greater than posterior

-posterior fontanelle:

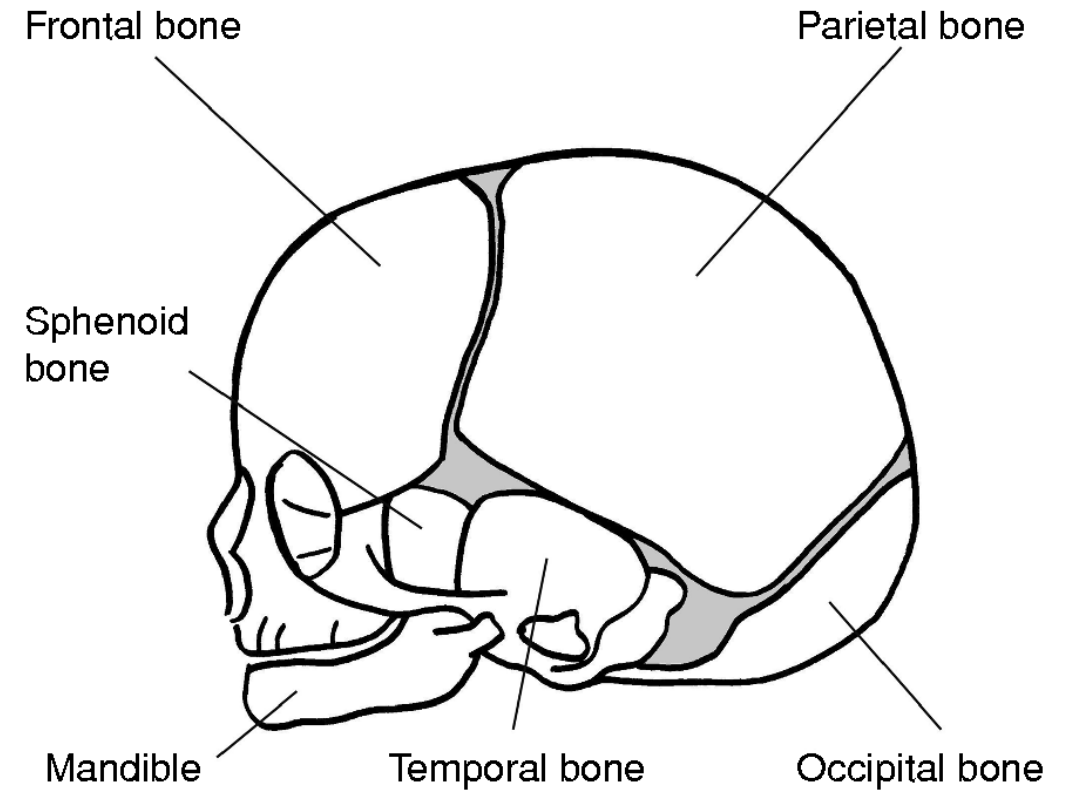
smaller than anterior-triangle



Physiology of labour-fetus

Fetal skull bones

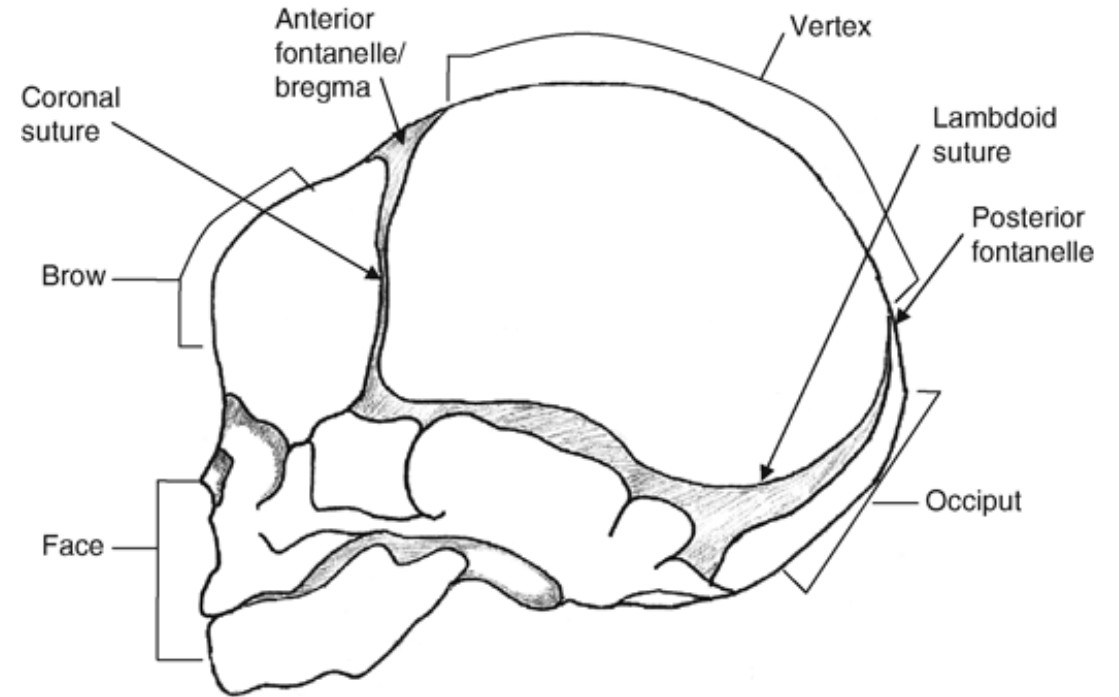
- parietal bones: lateral
- frontal bone: anterior
- occipital bone: posterior



Physiology of labour-fetus

Presenting parts for vertex

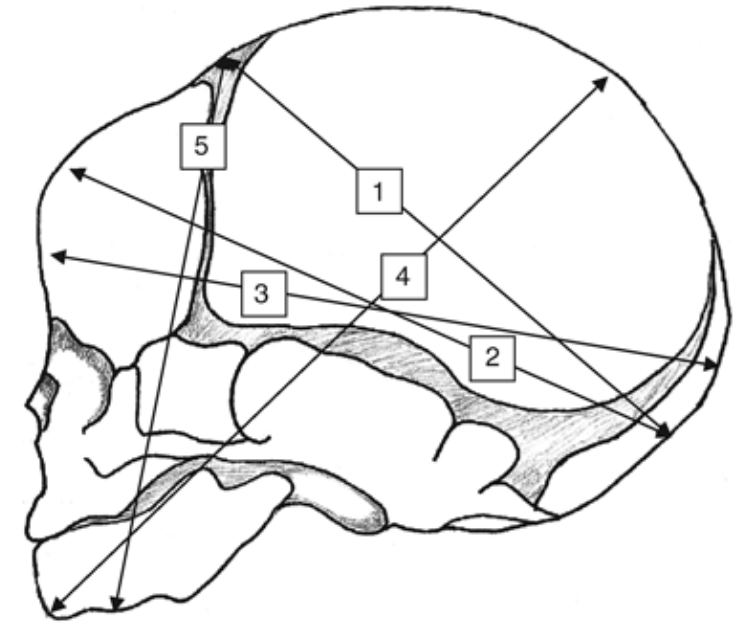
- occiput: occipital position
- brow: brow presentation
- face: face presentation



Physiology of labour-fetus

Fetal head diameters

- suboccipitobregmatic: 9.5cm-occiput
(shortest antero-posterior diameter-optimal)
- occipitomenal: 13.5cm-brow



1. Suboccipito-bregmatic, 9.5 cm
2. Suboccipito-frontal, 10.5 cm
3. Occipito-frontal, 11.5 cm
4. Mento-vertical, 13.5 cm
5. Submento-bregmatic, 9.5 cm

Physiology of labour-fetus

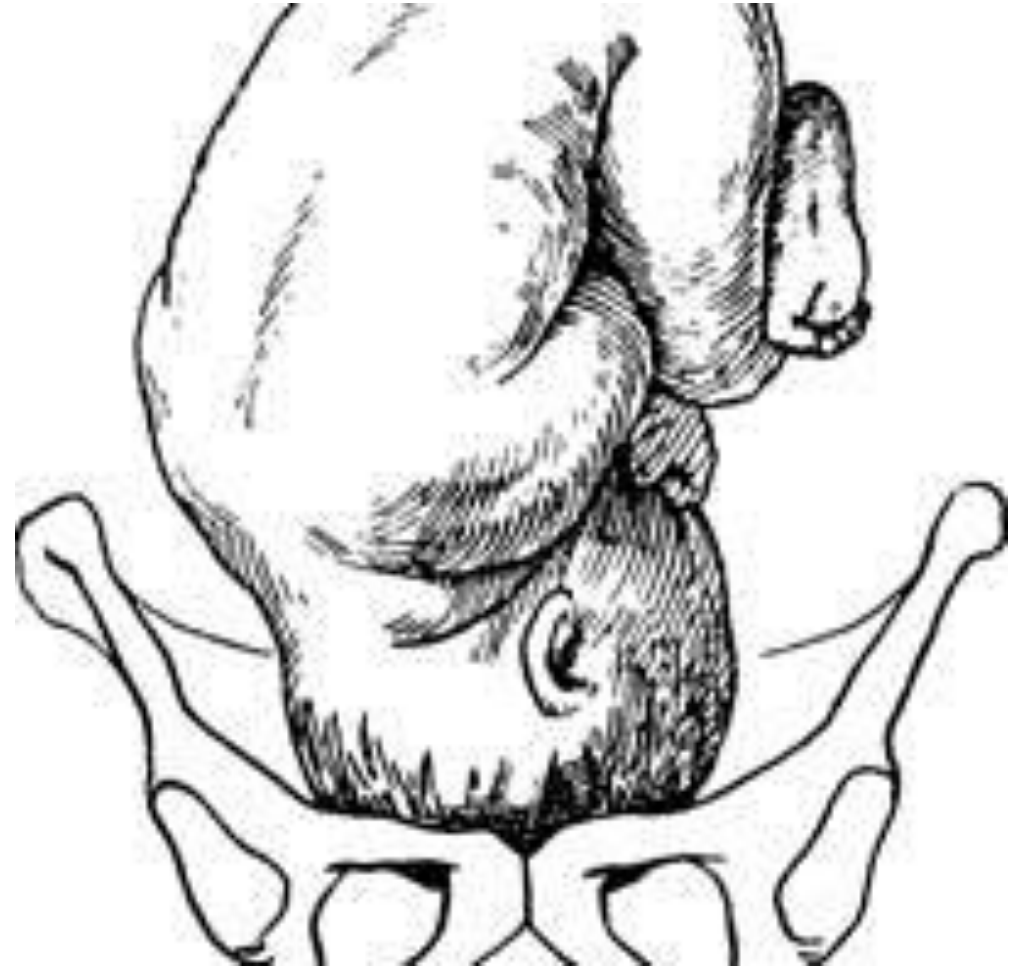
Fetal lie

-relationship between fetal and maternal dorsal columns (longitudinal axis)

- i) Longitudinal lie: fetal and maternal axis are parallel, commonest
- ii) Transverse lie: fetal and maternal axis are positioned at 90 degrees
- iii) Oblique lie: variants between longitudinal and transverse lie.

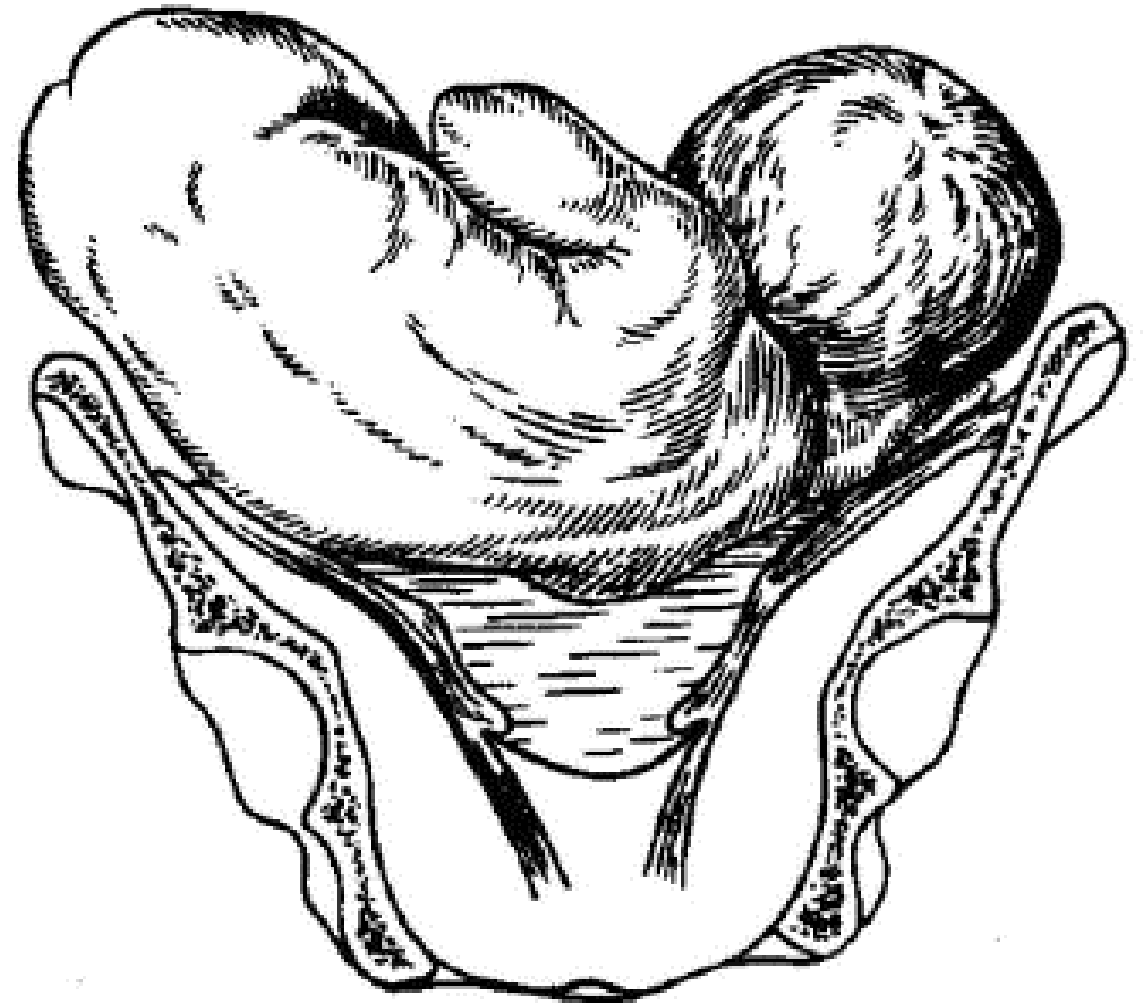
Physiology of labour-fetus

- longitudinal lie
- parallel axis of fetus and uterus



Physiology of labour-fetus

-transverse lie:
fetal axis 90 degrees relationship to
maternal axis



Physiology of labour-fetus

Fetal presentation

-presenting part of fetus in the maternal pelvis

i) cephalic: longitudinal lie

-degree of flexion or extension of fetal head

a) vertex: complete flexion

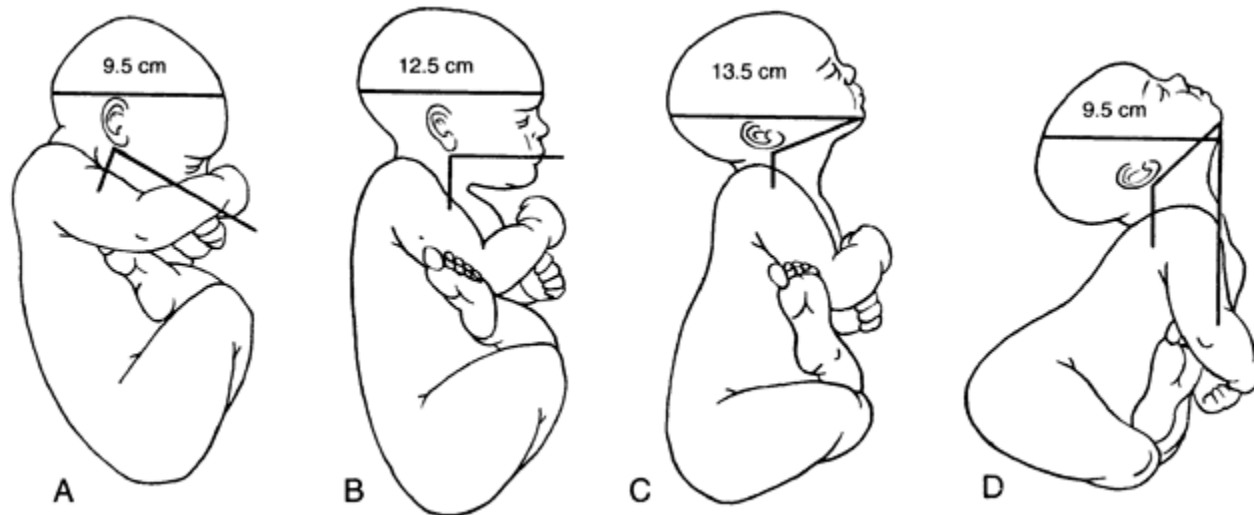
b) sinciput: incomplete flexion

c) Brow: incomplete extension of fetal head (transient, persistent)

d) Face: complete extension of fetal head (anterior, posterior)

Physiology of labour-fetus

Degree of flexion



Physiology of labour-fetus

ii) breech: longitudinal lie

-flexion of hips and knees

a) Frank: hips flexion, knees extension

b) Full-complete: hips flexion, knees flexion

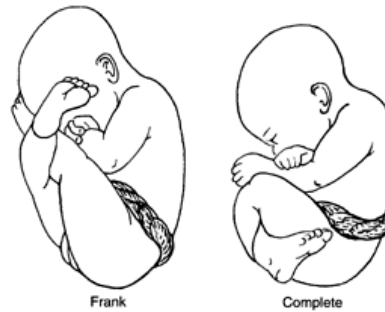
c) Footling-incomplete: one or both hips and knees in partial extension

iii) Back or shoulder: transverse, oblique lie

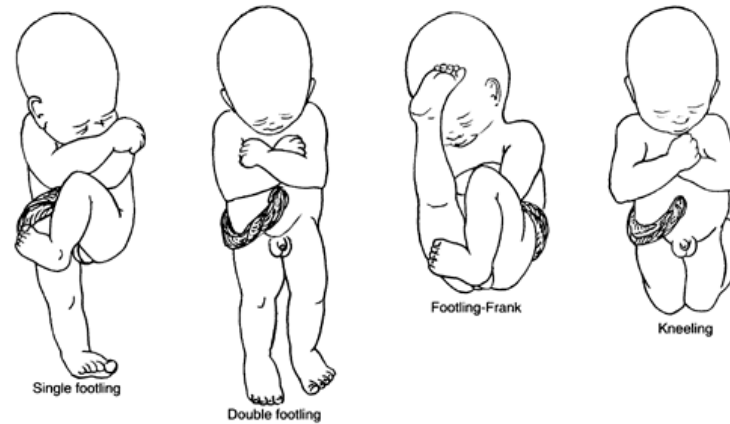
Physiology of labour-fetus

Breech presentation

"Full" Varieties



Incomplete Varieties



Physiology of labour-fetus

Fetal position

- relation of fetal presenting part to pelvis

- i) Occiput anterior:

- vertex-cephalic presentation

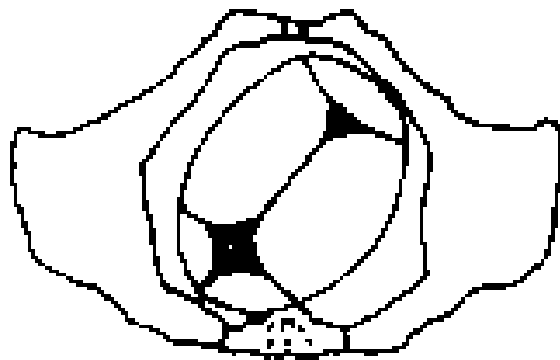
- occiput: towards maternal symphysis pubis

- la) occiput anterior left: between ischial spines and symphysis pubis

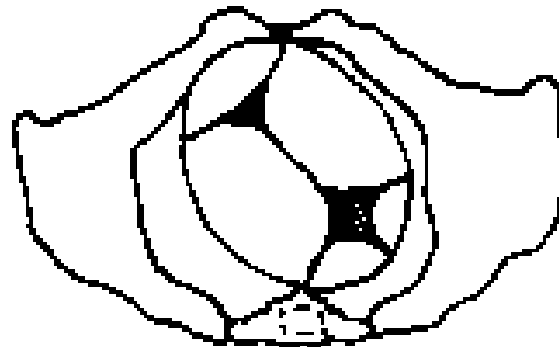
- lb) occiput anterior right: between ischial spines and symphysis pubis

Physiology of labour-fetus

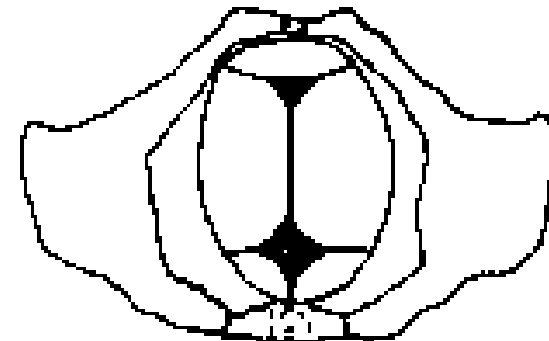
Occiput-anterior positions



Left occiput anterior



Right occiput anterior



Occiput anterior

Physiology of labour-fetus

ii) Occiput posterior: 10-15% of vertex

-occiput: towards maternal sacrum

iiia) occiput posterior left: between ischial spines and sacrum

iiib) occiput posterior right: between ischial spines and sacrum

iii) Occiput transverse:

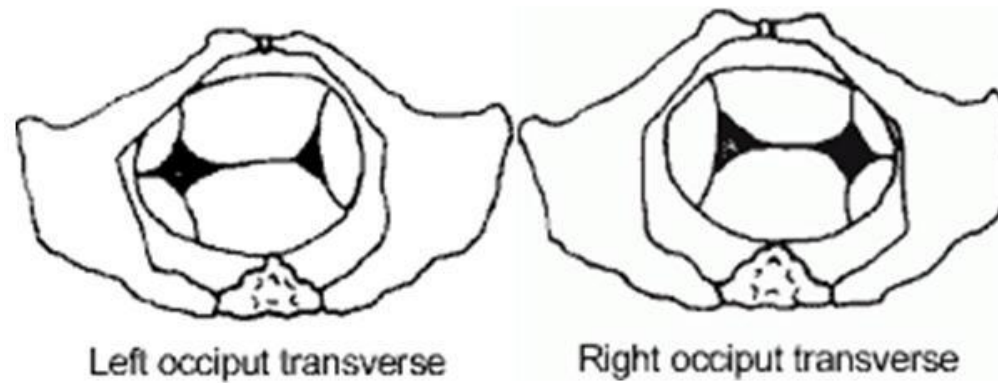
-occiput: halfway between maternal symphysis pubis and sacrum

iiia) occiput transverse left:

iiib) occiput transverse right:

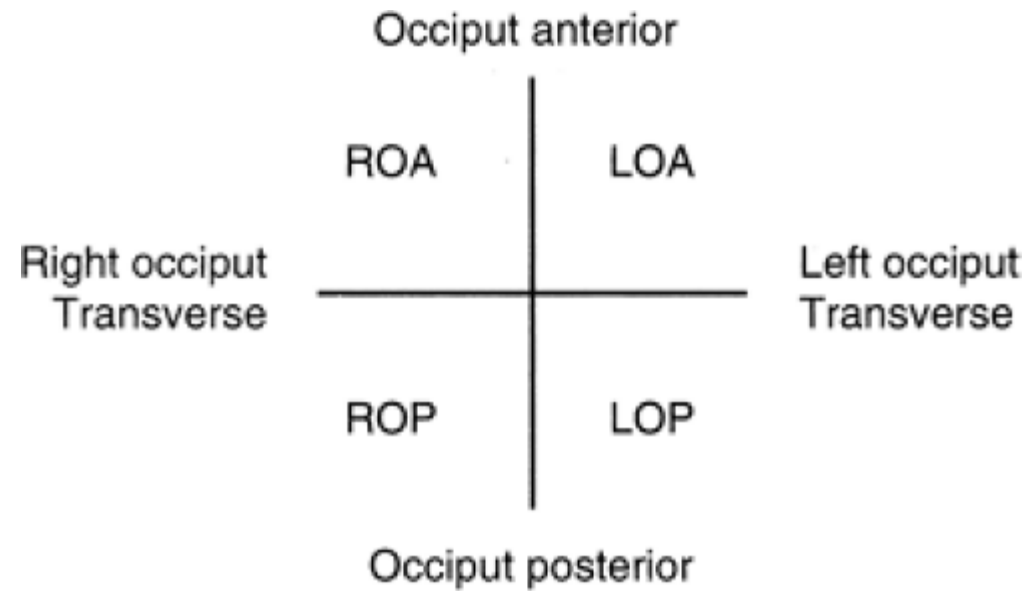
Physiology of labour-fetus

Occiput transverse positions



Physiology of labour-fetus

Occiput positions



Physiology of labour-fetus

iv) Brow:

-bregma: towards maternal symphysis pubis

v) Face:

-mentum: towards maternal symphysis pubis

vi) breech:

-sacrum: towards maternal symphysis pubis

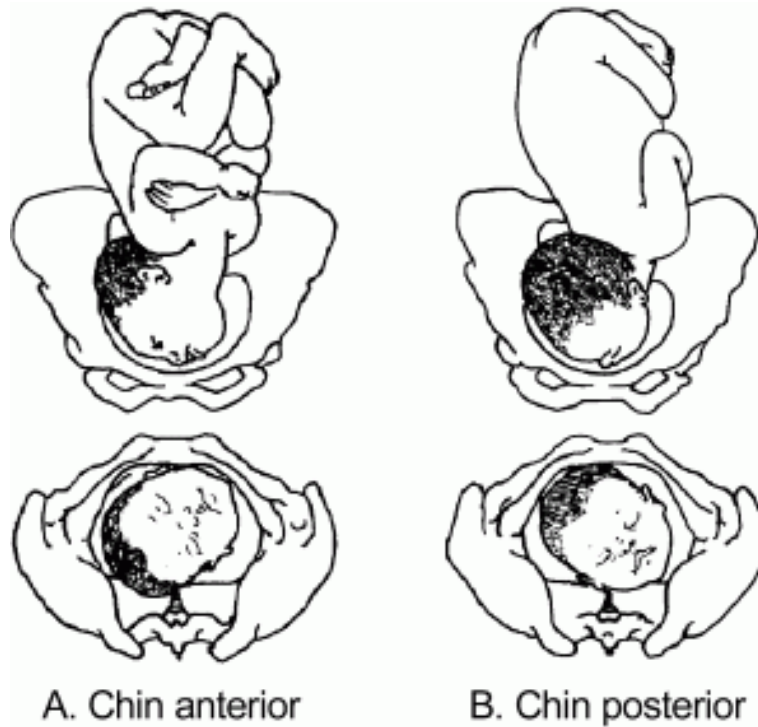
vii) transverse:

-shoulder: towards maternal symphysis pubis

viii) compound:

Physiology of labour-fetus

Face presentation



Physiology of labour-fetus

Fetal station

- level of presenting part in maternal pelvis (ischial tuberosities)
- above: negative-floating
- at: zero
- below: positive-engaged

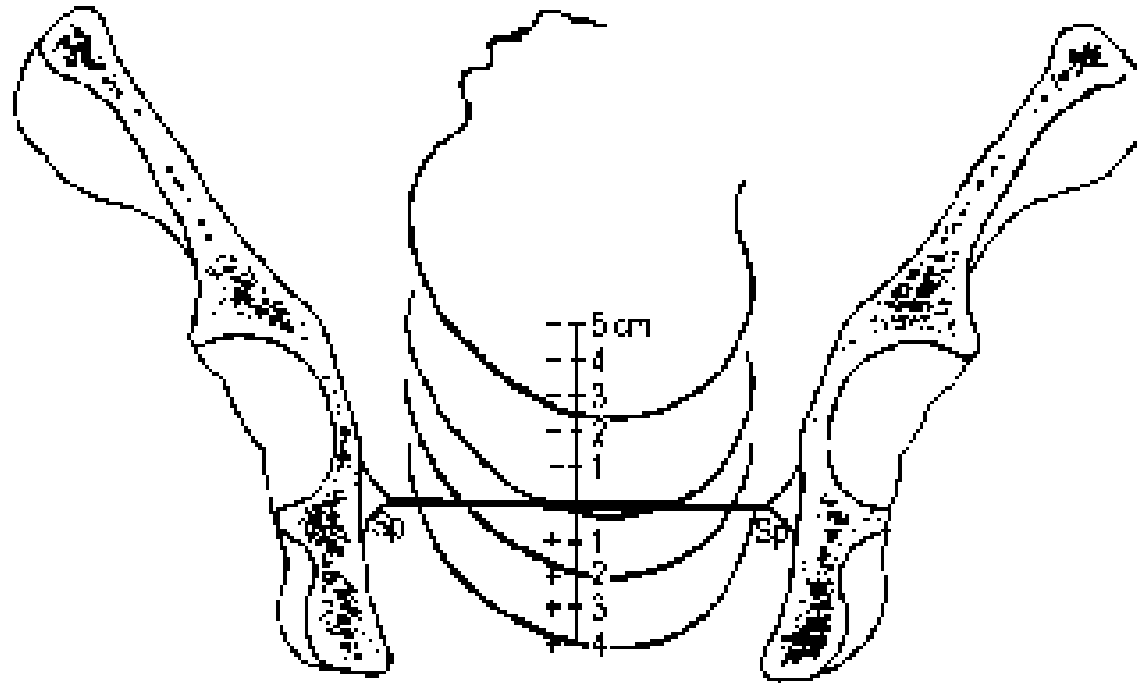
Physiology of labour-fetus

Fetal station:

0: ischial spines

-1: above (unengaged)

+1: below (engaged)



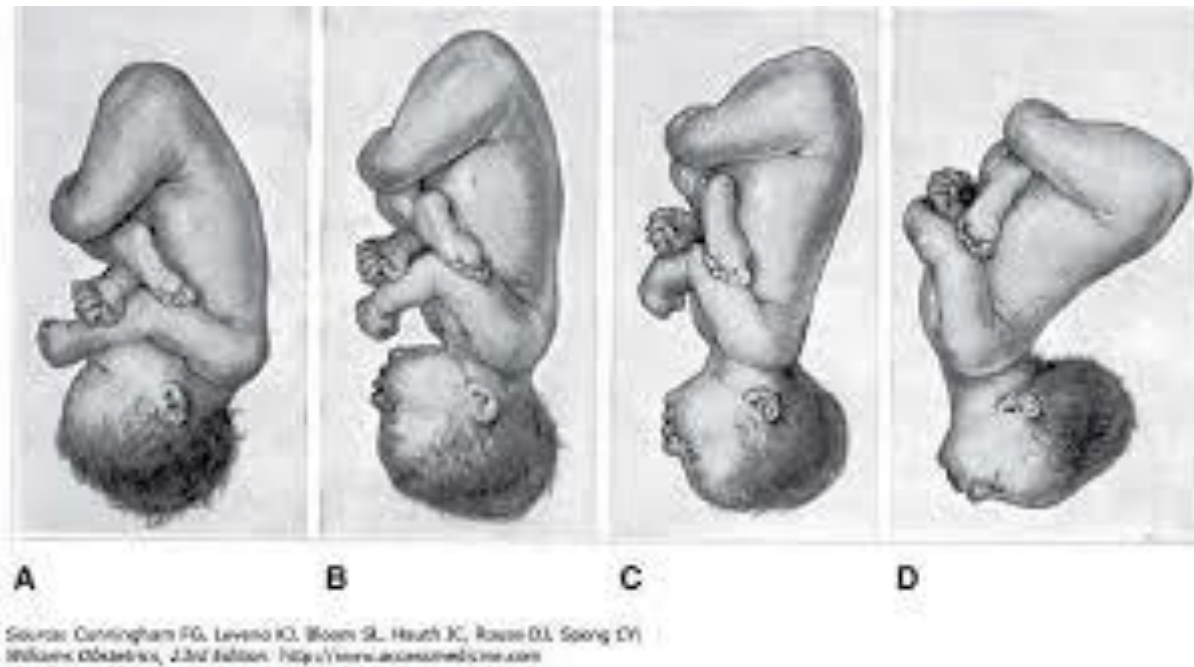
Physiology of labour-fetus

Fetal attitude

- relation of various parts of fetus to each other
- normal attitude: universal flexion, enables to occupy the least amount of space
- abnormal attitude: degree of extension
- sonographic diagnosis

Physiology of labour-fetus

Fetal attitudes



Physiology of labour-fetus

Cardinal movements

-engagement:

passage from widest diameter to level below ischial spines

biparietal diameter is at level or lower of ischial spines

-descent:

downwards passage concomitant with engagement

-flexion:

fetal head onto thorax due to maternal pelvic floor muscle resistance

smallest diameter (sub-occipitobregmatic diameter)

Physiology of labour-fetus

- internal rotation:

 - rotation from transverse to antero-posterior diameter

 - widest diameter (pubococcygeus, iliococcygeus muscles configuration)

- extension:

 - level of introitus

 - due to contractions and pelvic floor muscle configuration

- head delivery

Physiology of labour-fetus

- external rotation:

 - alignment of fetal head with spine

 - restitution to previous position, rotation 90 degrees

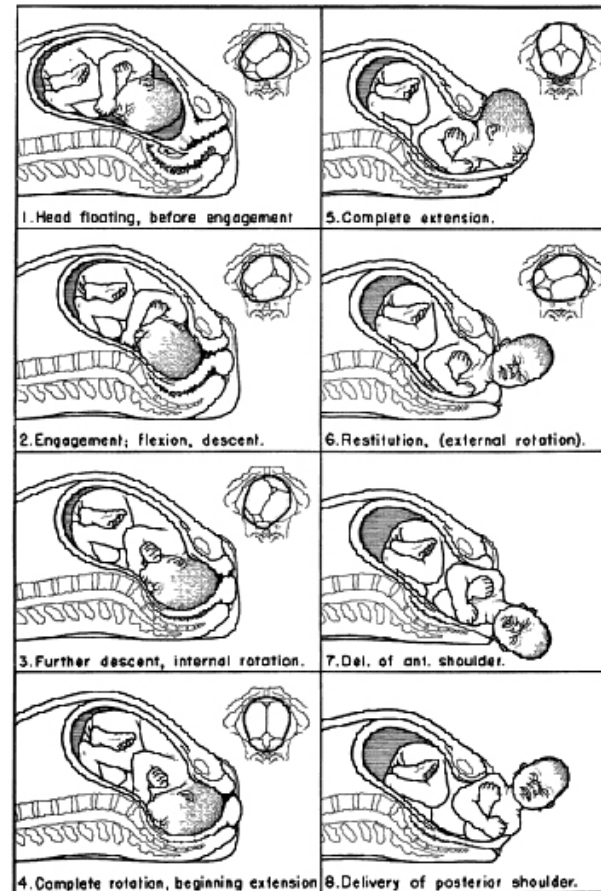
 - pressure from pelvis and muscles on head is alleviated

- expulsion:

 - anterior shoulder descends under pubic bone

Physiology of labour-fetus

Cardinal movements



Physiology of labour-fetus

Fetal head molding

- skull bones overlap at major suture lines
- decrease biparietal diameter by 0.5cm
- overcomes minor degree of pelvic contractility

Physiology of labour-fetus

Fetal anomalies that affect labour

- hydrocephalus, encephalocele
- fetal hydrops
- omphalocele, gastroschisis
- sacroccygeal teratoma

Physiology of labour-fetus

Fetal size

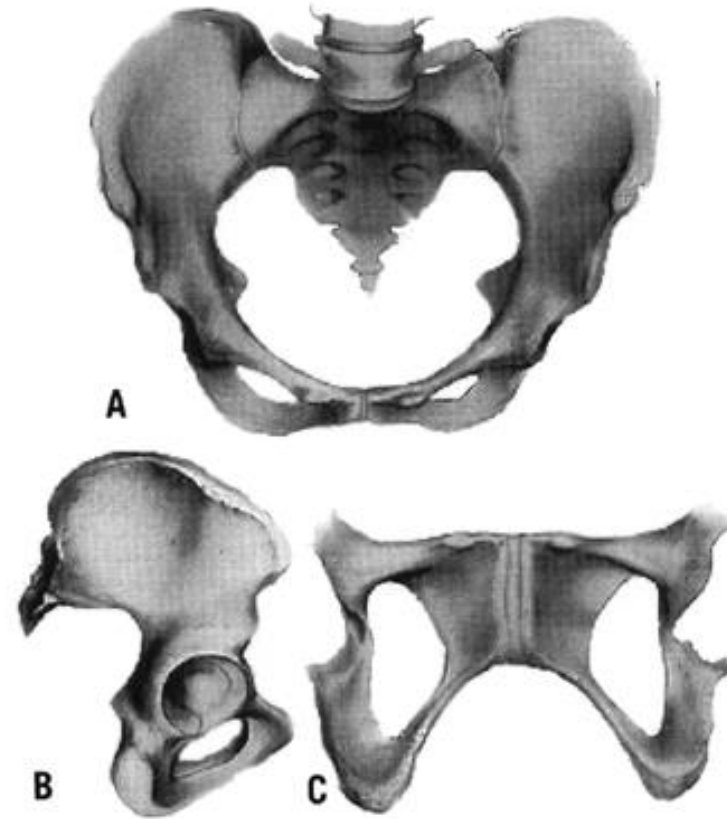
- macrosomia (estimated birth weight >4000-4500gr)
- 10%: >4000gr, 1%: >4500gr

Physiology of labour-pelvis

Pelvic types

Gynecoid pelvis

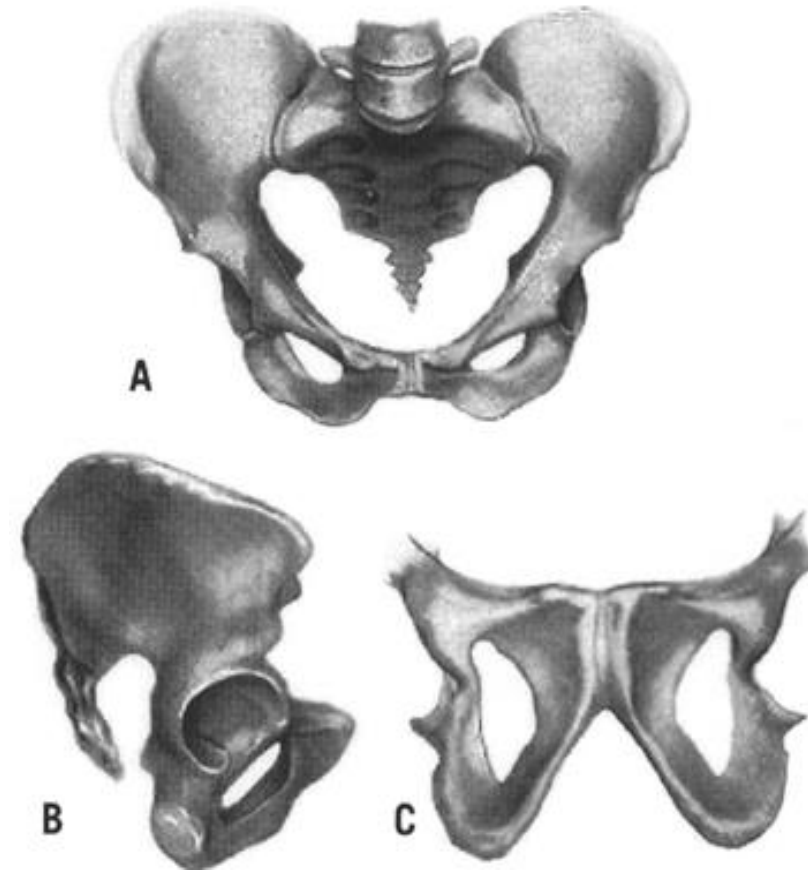
- inlet: ovoid, round
- posterior segment: spacious
- anterior segment: wide
- interspinous diameter: wide
- sacral inclination: average
- subpubic arch: wide



Physiology of labour-pelvis

Android pelvis

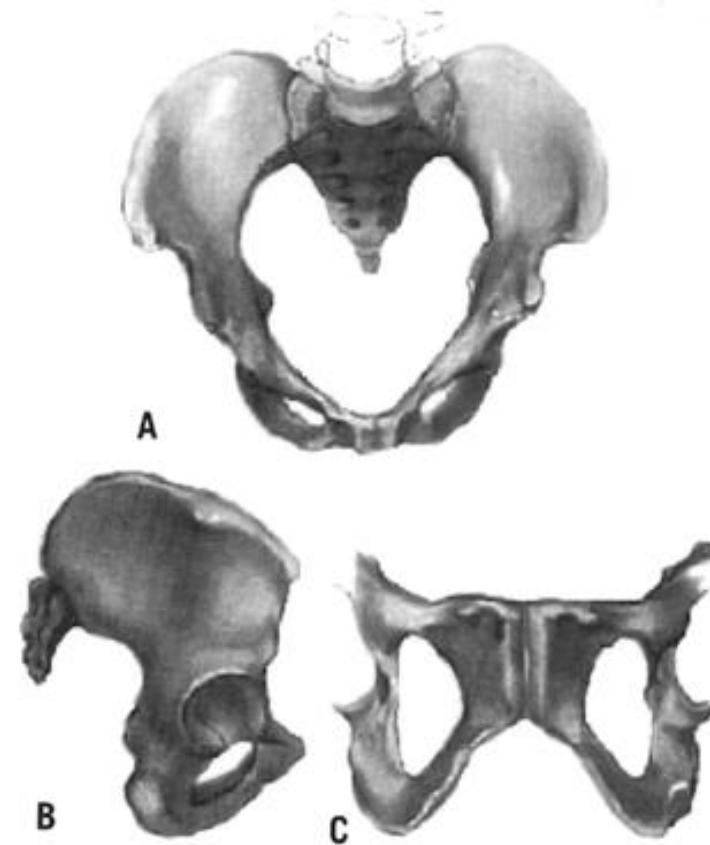
- inlet: wedge
- posterior segment: flat
- anterior segment: narrow
- interspinous diameter: narrow
- sacral inclination: forward
- subpubic arch: narrow, wedge



Physiology of labour-pelvis

Anthropoid pelvis

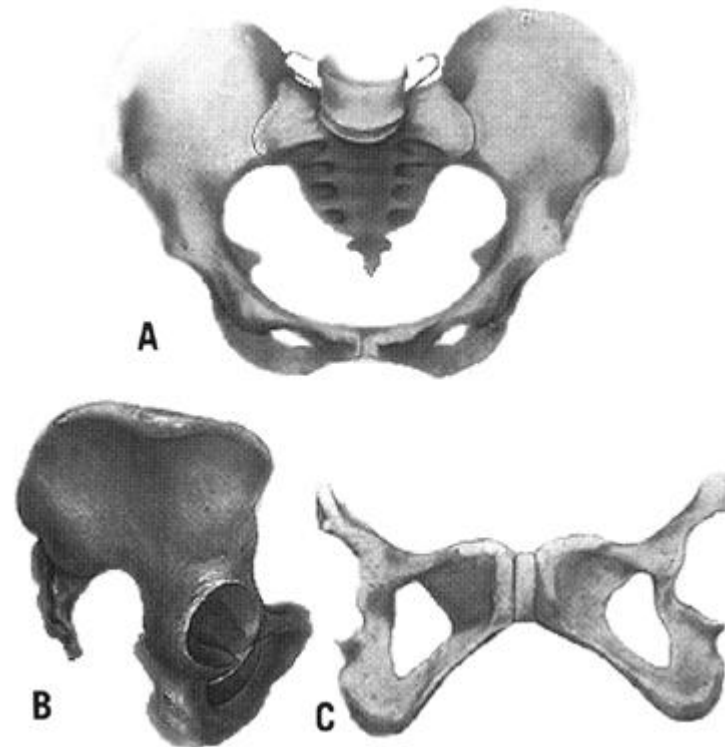
- inlet: narrow, long
- posterior segment: narrow, long
- anterior segment: narrow, long
- interspinous diameter: below average
- sacrum: narrow, long
- subpubic arch: narrow



Physiology of labour-pelvis

Platypelloid pelvis

- inlet: oval shape
- posterior segment: wide
- anterior segment: wide
- interspinous diameter: wide
- sacral inclination: average
- subpubic arch: wide



Physiology of labour-pelvis

Frequency of pelvic types

- gynecoid: most common
- android
- anthropoid
- platypelloid: most rare

Favorability for vaginal delivery

- gynecoid, anthropoid

Physiology of labour-pelvis

Pelvic inlet

- anterior: pubic crest
- posterior: sacrum
- lateral: iliopectineal lines
- anteroposterior diameter (obstetric conjugate):
symphysis pubis to sacral promontory

Physiology of labour-pelvis

Midpelvis

- anterior: symphysis pubis
- posterior: sacrum
- lateral: pelvic sidewalls, ischial spines
- antero-posterior diameter (interspinous diameter): 10cm

Physiology of labour-pelvis

Pelvic outlet

- anterior triangle: pubic arch
- posterior triangle: sacrum, ischial tuberosities
- anteroposterior diameter: 11.5cm
- transverse diameter: 10cm

Physiology of labour-pelvis

Pelvic diameters

- diagonal conjugate (anteroposterior diameter)

 - symphysis pubis: inferior border to sacral promontory

 - greater than 11.5cm

- bi-ischial diameter

 - ischial tuberosities

 - greater than 8cm

References

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