

Normal and Abnormal Labor

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Normal Labor

Onset of regular uterine contraction with delivery of the fetus and until expulsion of the placenta



Factors related to Birth

- Passage Birth canal
- Passenger Fetus
- Power Force of uterine contraction





Passage



Pelvic Anatomy



■ 4 bones – sacrum / coccyx / two innominate bones
 ■ Innominate bones → fusion of ilium / ischium / pubis



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Pelvic Inlet

Above:

- Promontary
- Alae of sacrum
- Linea terminalis
- Upper margin of pubic bone

Below:

- Pelvic outlet



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Sacroiliac joint

- Upward gliding at term
- Dorsal lithotomy position
- Diameter \uparrow by 1.5 ~ 2.0 cm

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Midpelvis

Ischial Spine

- Shortest diameter of the pelvic cavity (10 cm)
- landmark:
 - presenting part of the fetus in true pelvis





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Obstetrical Conjugate

- Subtract 1.5 ~ 2 from diagonal conjugate

Pelvic Shapes





Pelvimetry

- X-ray
- Computer tomography
- Ultrasound
- Magnetic Resonance Imaging





Passenger



Lie of the Fetus



Relation of fetal long axis to that of the mother (longitudinal / transverse)

Presentation

Portion of the fetus felt through the cervix (cephalic / breech / transverse)

Fetal attitude

Posture (flexed vs extended)

Position

The relation chosen of the presenting part of the fetus to the right or left side of the maternal birth canal (anterior / posterior / transverse)

Lie of the Fetus



- Relation of the fetal long axis to that of the mother
 - Longitudinal (99%)
 - Transverse
 - Multiparity, placenta previa, hydramnios, uterine anomaly
 - Oblique



Fetal Presentation



- Presenting portion of the fetal body that is foremost within the birth canal
- Longitudinal lie
 - Cephalic presentation
 - Breech presentation
- Transverse lie
 - Shoulder presentation

| Table 17-1. Fetal Prese | Table 17-1. Fetal Presentation in 68,097 Singleton Pregnancies at Parkland Hospital | | | | | |
|-------------------------|---|-----------|----|--|--|--|
| Presentation | Percent | Incidence | • | | | |
| Cephalic | 96.8 | _ | | | | |
| Breech | 2.7 | 1:36 | | | | |
| Transverse lie | 0.3 | 1:335 | | | | |
| Compound | 0.1 | 1:1000 | | | | |
| Face | 0.5 | 1:2000 | | | | |
| Brow | 0.01 | 1:10,000 | | | | |
| | | | 1. | | | |

Presentation - Cephalic





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Predominance of Cephalic



Piriform (pear) shaped uterus

Fetus turns spontaneously because the increasing bulk of the buttocks seek the more spacious uterine fundus

Incidence of Breech
 25% => 28 weeks
 17% => 30 weeks
 11% => 32 weeks
 3% => term

Presentation - Breech



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■ Factors that predispose breech presentation

- Poly / Oligo -hydramnios
- High parity with uterine relaxation / Multiple fetuses
- Hydrocephaly / Anencephaly
- Previous breech delivery
- Uterine anomalies
- Placenta previa
- Pelvic tumor

Complications of Breech

- Cord prolapse
- Placenta previa
- Congenital anomalies
- Uterine anomalies and tumor
- Difficult delivery
- Increased maternal and perinatal morbidity



- Maternal Morbidity
 - Greater frequency of operative delivery
 - Genital tract laceration
 - Delivery of after-coming head
 - → uterine, cervix, vaginal laceration
 - Extension of episiotomy and deep perineal tears





Perinatal morbidity and Mortality

■ Congenital abnormalities 6.3% (Br) vs 2.4% (Vx)

Fetal Injuries

Fracture of femur / humerus / clavicle

Upper extremity paralysis (Brachial plexus injury)

Term Breech

Head entrapment / Cerebral injury / Cord prolapse / Intracranial hemorrhage / Intrapartum asphyxia

Preterm Breech

< 1500 gm no significant difference in vaginal vs C/S</p>



Term Breech Trial Collaborative Group (2000)

- 1041 women C/S
- 1042 women Vaginal
- Vaginal group only 57% actually delivered vaginally
- Planned C/S
 - Lower risk of perinatal mortality (0.003% vs 0.013%)
 - Lower risk of serious neonatal morbidity (1.4% vs 3.8%)

Presentation





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Brow



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Face

Transverse Lie







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Fetal Attitude or Posture



- As a rule, the fetus forms an ovoid mass that corresponds roughly to the shape of the uterine cavity
 - Back convex
 - Head flexed so chin in contact with the chest
 - Thigh flexed over abdomen
 - Legs are bent at the knees

ATTITUDE



Flexion is normal



flexed

extension

Fetal attitude is the relationship of fetal body parts to itself.

Fetal Position

Relationship of fetal presenting part to the right or left of the birth canal





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Factors in Malpresentation



Maternal

Great parityPelvic contractures

Pelvic tumors Uterine malformations

Fetal

Prematurity
Multiple gestation
Hydramnios
Macrosomia
Hydrocephaly

Trisomies Anencephaly Myotonic dystrophy Placenta previa





Abdominal palpation

 Leopold Maneuvers

 Vaginal Examination

 After commencement of labor

 Auscultation
 Imaging Studies

 Ultrasound / Plain KUB / CT scan / MRI







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The Force



Forces Concerned in Labor



Positive Forces

- Uterine contractions
- Abdominal pressure by rectus muscles
- Fundal pressure
- Forceps delivery and vacuum extraction

Resistance

Uterine cervix

Muscles of the pelvic floor



- Phases of Parturition
- Stages of Labor
- Uterine Structure
- Regulation of Parturition



Phases of Parturition

Multiple transformation in uterine and cervical function

| _ | | | | |
|-----------|--------------------|---------------|--------------------|-------------------|
| 1 te | Phase 1 | Phase 2 | Phase 3 | Phase 4 |
| gnar | // Quiescence | Activation | Stimulation | Involution |
| | Prelude to | Preparation | Processes | Parturient |
| la // | parturition | for labor | of labor | recovery |
| | Contractile | Uterine | Uterine | Uterine |
| Ч | corvical softening | for labor | contraction, | cervical repair |
| | cervical softening | cervical | fetal and placenta | breast feeding |
| | | ripening | expulsion (three | breast recurry |
| Conceptio | n | npening | stages of labor) | |
| | Initiat | Initiation of | | |
| | partu | irition Ons | et of Deliv | ery of |
| | | | conc | eptus Fer rest |

Phase I

- Uterine quiescence
 - Uterine muscle tranquility with maintenance of cervical integrity until near end of pregnancy
- Cervical softening
 - Increased tissue compliance
 - Increased vascularity
 - Stromal hypertrophy
 - Glandular hypertrophy and hyperplasia
 - Changes of extracellular matrix

Phase II

- Preparation for Labor
 - Uterine awakening or activation
 - Uterine changes in last 6 ~ 8 wks of pregnancy
 - Myometrial changes
 - Contraction associated proteins
 - (oxytocin receptor, prostaglandin receptor)
 - Increased uterine responsiveness to uterotonics
 - Formation of lower uterine segment
 - Cervical ripening
 - Cervical remodeling and dilatation upon initiation of uterine contractions


Phase III



■ Labor

- Uterine contractions bring progressive cervical dilatation and delivery
- Divided into the 3 stages of labor



Stages of Labor

■ First Stage

Labor onset to full dilation of cervix
(Comming ofference on the dilatestic of the community of the cervice of the

(Cervix effacement and dilatation)

Second Stage

Full dilatation of cervix to delivery of the fetus
 (Expulsion of the fetus)

Third Stage

After birth and ends with delivery of the placenta (Separation and expulsion of the placenta)



First Stage of Labor



Upper segment (Active)

■ Contract, retract and expels the fetus.

Myometrial fibers become shorter and thicker

Lower segment (Passive)

- Relaxed, dilated and greatly expanded, thinned-out for the passage of the fetus.
- Myometrial fibers become stretched and longer



First Stage of Labor





Dilatation

Primigravida



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Effacement



Second Stage of Labor



- Fetal descent (Station)
 - Descent of the fetal biparietal diameter in relation to maternal ischial spine
 - Active descent takes place after dilatation progression



Third Stage of Labor

- After delivery of fetus
- Uterine contraction
 - → separation and expulsion of placenta
- Compression of fundus and traction of cord



Phase IV



■ The puerperium

- Myometrium remains rigid and persistent contraction and retraction noted.
- Allows compression of large uterine vessels and allow thrombosis of lumens preventing PPH
- Uterine involution and cervical repair occurs within 4 ~ 6 weeks after birth

Regulation of Parturition

Neural Mechanism

No influence on myometrial function during parturition

Hormonal Factors

- No direct effect on contractility
- Exert a regulatory influence, by way of synthesis of proteins, receptors, phospholipids, and prostaglandin precursors

Prostaglandin



- PGE2 / PGF2α / PGI2 / Thromboxane
- PGE: 10 times as potent as PGF₂ α
- \blacksquare PGF₂ α : main prostaglandin release during labor
- Action on myometrium
 Increase intracellular free Ca ion

 Opening calcium channel
 Release Ca from intracellular vesicles

 Receptors

 Significant lower during pregnancy
 PGE2 has higher affinity

PG and Human Parturition



- PG increases strikingly during labor in amniotic fluid, maternal blood, urine, and in intrauterine tissues.
- PG (E2, F2) evokes myometrial contraction at any stage of pregnancy
- Administration routes:

oral / intra-amniotic / intra-venous / vaginal
 Inhibition of PG synthesis:

prolongation of pregnancy / stop labor

Oxytocin

- Great potency for uterine contraction
- Pulsatile secretory pattern
- Action on uterine myometrium
 Stimulate PLC (phospholipase C)
 Hydrolysis of phosphotidyl-inositol in decidua
 - ➔ Mobile free arachidonic acid
 - ➔ Prostaglandin synthesis

➔Increase intracellular Ca concentration



Oxytocin Receptors



- Present in both myometrium and endometrium
- Estrogen and uterine distension

Increase oxytocin receptors

- Receptor increases throughout pregnancy
 - At term: 80 ~ 100 fold higher
 - Highest in early labor
 - In preterm labor: 2 ~ 3 times higher
- Progesterone inhibits the formation of receptors (use as tocolytic)



Parturition



Lightening



- Occurs a few weeks before the onset of labor
 Reduced fundosymphysis distance (FSD)
- Change in abdominal shape
- Fetal head descent
- Reduced amniotic volume





Signs of Labor
Cardinal Movements
Episiotomy and Delivery
Vaginal Laceration + Repair



Signs of Labor



- Passage of mucus plug
- Bloody show
- Rupture of membrane
- Intermittent lower back / abdominal pain



True Labor

Definition of labor

Uterine contractions that bring about effacement and dilatation of the cervix

■ Cervical dilatation of 3 ~ 4 cm or greater

Dublin

Painful uterine contractions accompanied by one of the following

- Rupture of membrane
- Bloody show
- Complete cervical effacement

True vs False Labor



| Characteristic | True Labor | False Labor |
|----------------------------|--------------------|------------------|
| Contractions | | |
| Rhythm | Regular | Irregular |
| Intervals | Gradually shorten | Unchanged |
| Intensity | Gradually increase | Unchanged |
| Discomfort | | |
| Location | Back / Abdomen | Lower abdomen |
| Sedation | No effect | Usually relieved |
| Cervical Dilatation | Yes | No |

Cardinal Movements





1. Head floating, before engagement

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2. Engagement, descent, flexion

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3. Further descent, internal rotation

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4. Complete rotation, beginning extension

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5. Complete extension

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6. Restitution (external rotation)

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7. Delivery of anterior shoulder

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8. Delivery of posterior shoulder

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Caput Succedaneum

- Edematous fetal scalp
- Head in birth canal



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Episiotomy and Delivery









| Characteristic | Midline | Mediolateral |
|-------------------|-----------|---------------------|
| Surgical Repair | Easy | More difficult |
| Faulty Healing | Rare | More common |
| Postop Pain | Minimal | Common |
| Anatomical result | Excellent | Occasionally faulty |
| Blood loss | Less | More |
| Dyspareunia | Rare | Occasional |
| Extensions | Common | Uncommon |





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Vaginal Delivery for Breech



- Careful assessment before attempt of vaginal breech delivery
- Spontaneous breech delivery
 - Fetus is expelled spontaneously without any traction or manipulation
- Partial breech extraction
 - Fetus is delivered spontaneously as far as umbilicus, remainder extracted by operator traction / maneuvers
- Total breech extraction
 - Entire body of fetus extracted by operator















Mauriceau Maneuver





Prague Maneuver





Piper forceps

External Cephalic Version





Increase Success
 Increase parity
 Ample AFV
 Unengaged fetus
 Tocolysis

Decrease Success
 Engaged fetus
 Tense uterus
 Obesity
 Anterior placenta



Risk of External Version

- Placenta abruption
- Uterine rupture
- Fetomaternal hemorrhage
- Preterm labor
- Fetal compromise
- Maternal death (amniotic fluid embolism)



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Vaginal Laceration + Repair



■ 1st degree

Involves the fourchette / perineal skin / vaginal and vaginal mucous membrane

2nd degree

■ 1st + fascia and muscle of perineal body

■ 3rd degree

2nd + anal sphincter laceration

4th degree

■ 3rd + through rectal mucosa





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Abnormal Labor







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Abnormal labor



Abnormal labor refers to difficult labor.

■ Another name is dystocia.

Clinical presentation is slow labor process.



Causes of Ineffective Labor



- Inadequate Cervical Dilation or Fetal Descent
 - Protracted labor slow progress
 - Arrested labor no progress
 - Inadequate expulsive effort ineffective pushing
- Fetopelvic disproportion
 - Excessive fetal size
 - Inadequate pelvic capacity
 - Malpresentation or position of fetus

Rupture membrane without labor

Factors for Abnormal Labor

Abnormal maternal bony pelvis
Abnormal fetal presentation
Abnormal expulsive force
Obstructive labor



Abnormal Bony Pelvis



Contracted Pelvic Inlet

- Platypelloid → AP diameter < 10 cm
- Anthropoid → Transverse diameter < 12 cm
- Small women = small pelvis
- Higher incidence
 Face presentation
 Shoulder presentation
 Cord prolapse



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Contracted inlet plane



- Criteria: sacral-pubic diameter < 18 cm
- Clinical findings:
 - Fetal head palpable above the inlet plane.
 - Prolonged latent phase





Contracted Midpelvis

- Prominent ischial spine. Converged pelvic sidewall, or narrow sacrosciatic notch
- Normal measurement
 - AP: 11.5 cm
 - Ischial: 10.5 cm
 - Post saggital: 5 cm
- Contracted
 - Ischial + Saggital < 13.5 cm
 - Ischial < 8 cm



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Contracted Pelvic Outlet

Interischial tuberous diameter < 8 cm

Associated with contracted midplane



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Mechanism



- For Contracted pelvis , the fetus has difficulty in passing through birth canal.
- The labor is protracted or arrested.



Abnormalities of fetus



Abnormalities of fetal position

Macrosomia

Fetal malformation



Abnormal Presentation

Breech Presentation

3~4% of singleton deliveri
Presenting part: buttock ...

Etiology Hydramnios Multiple gestation Hydrocephaly Uterine anomalies Previous breech presentatio



FIGURE 22–2. Double-footling breech presentation in labor with membranes intact. Note possibility of umbilical cord accident at any instant, especially after rupture of membranes.

Diagnosis

- Abdomen: Fetal heart beat above umbilicus
- PV: buttock / sacrum / anus / external genitalia / feet
- DDx: face presentation
- Ultrasound

Delivery

80% delivered by C-section
 Vagina: Previous vaginal delivery

 Fetal weight (2000 ~ 3500 gm)
 Frank breech
 Gynecoid (round) / anthropoid (elliptical)



Complications

- Prolapsed cord
- Placenta previa
- Congenital anomalies
- Uterine anomalies and tumors
- Difficult delivery
- Increased operative delivery (C-section)

Maternal

- Genital tract laceration
- Uterine rupture
- Infection

Perinatal

- Congenital anomalies
- Fractures
- Low APGAR score
- Brachial plexus injury
- Perinatal loss



- The main cause of death in term breech fetus are head entrapment, cord prolapse, severe asphyxia, and cerebral injury and hemorrhage.
- The main cause of death in preterm breech fetus are hypoxia and physical trauma





Face Presentation

■ Incidence: 1/600 ~ 2000

Presenting part: chin (mentum)



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Etiology

Preterm infants
Contracted pelvis
Nuchal cord

Enlarged fetal neck Large fetus Anencephaly



Diagnosis ■ PV: facial features ■ DDx: breech

Delivery ■ Vaginal: favorable pelvis ■ C-section preferred





FIGURE 19-4. Edema in face presentation.







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Transverse Lie

0.3% of all singletonsPresenting part: shoulder





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■ Etiology

MultiparityPlacenta previaUterine anomalies

Preterm fetus Hydramnios Contracted pelvis



Diagnosis

Abdomen: wide abdomen, short FSD fetal heart beat in higher/lower abdomen PV: shoulder palpated

Delivery
 C-section

 (low vertical)



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Compound Presentation 1/700~1000 singleton deliveries Presenting part: extremity

Delivery

■ C-section

Await spontaneous delivery

Perinatal loss

Preterm delivery

- Prolapsed cord
- Traumatic obstetrical procedure





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Persistent OP position

- Most undergo spontanenous anterior rotation
- Factor: Midpelvis narrowing
- 15% early labor → 5% delivery

Delivery

 Await spontaneous delivery (Severe perineal laceration)
 C-section (prolonged labor) (1 hr in parous / 2 hrs in nulliparous)





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Abnormal Contractions



- The uterine contraction is the most important expulsive force.
- Bring about dilation of cervix and expulsion of fetus and placenta.
- Common causes of dystocia

Hypotonic



- No basal hypertonus , synchronous contractions , low pressure insufficient to dilate the cervix
- May be related to use of analgesia
- Effect: prolong or protraction of labor course
- Management: Rupture of membrane / oxytocin iv drip

Hypertonic

- High basal tonus, asynchronous contractions
- May be related to use of high dose oxytocin
- Effect: acute fetal distress
- Management: analgesics / DC oxytocin / C section

Dysfunctional Labor



| Diagnostic Criteria | | | | |
|---------------------------------------|---|---------------------|--|---|
| Labor Pattern | Nulliparas | Multiparas | Preferred Treatment | Exceptional Treatment |
| Prolongation Disorder | | | | |
| Prolonged latent phase | > 20 hr | > 14 hr | Bed rest | Oxytocin or cesarean delivery for urgent problems |
| Protraction Disorders | | | | |
| Protracted active-phase dilatation | < 1.2 cm/hr | < 1.5 cm/hr | Expectant and support | Cesarean delivery for |
| Protracted descent | < 1 cm/hr | < 2 cm/hr | j ' '' | CPD |
| Arrest Disorders | | | | |
| Prolonged deceleration phase | > 3 hr | > 1 hr | Evaluate for CPD: | Doct if aubourted |
| Secondary arrest of dilatation | > 2 hr | > 2 hr | CPD: cesarean delivery No CPD: oxytocin | |
| Arrest of descent | > 1 hr | > 1 hr |) | |
| Failure of descent | No descent in deceleration phase or second stage | | | |

Interaction





Management



- Vaginal examination: rule out cephalopelvic disproportion
- Supportive management
- Augmentation



Augmentation



Increase the frequency and force of the existing uterine contractions.

■ Methods:

Amniotomy

- Oxytocin administration
- Medical
- Mechanical

Amniotomy



- If the fetal head is engaged, amniotomy is a choice to facilitate the uterine activity.
- After amnitomy the fetal head descends , pressing directly on cervix to enforce uterine contraction and accelerating labor.







- Capable of inducing uterine contracion in the third trimester.
- Contraindiction: cephalopelvic disproportion and severe fetal malposition.



Obstructive Labor

Fetal Congenital Anomalies

- Hydrocephalus
- Abdominal / Bladder distension
- Conjoined twins



FIGURE 19–15. Severe dystocia from hydrocephalus, breech presentation. Note the distention of the lower uterine segment.





■ Shoulder Dystocia ■ 0.6% to 1.4%

- Larger baby with greater shoulder-to-head or chest-to-head disproportion
- Head to body delivery time > 60 seconds





Risk factors

- Maternal: Obesity / DM / Postterm pregnancy
- Intrapartum: Midforceps or vacuum dlivery
- Prolonged 1st or 2nd stage of labor Fetal : Greater birth weight
 - (BW > 5000 nondiabetic / > 4500 diabetic)

Maternal Complication

Postpartum hemorrhage (Uterine atony)Infection following C-section



| Birthweight Group | Births No. | Shoulder Dystocia No. (%) | |
|-------------------|------------|---------------------------|--|
| ≤ 3000 g | 2953 | 0 | |
| 3001-3500 g | 4309 | 14 (0.3) | |
| 3501-4000 g | 2839 | 28 (1.0) | |
| 4001-4500 g | 704 | 38 (5.4) | |
| > 4500 g | 91 | 17 (19.0) | |
| All weights | 10,896 | 97 (0.9) | |




Newborn Complication

- Transient brachial plexus palsy (2/3)
- Clavicular fracture (38%)
- Humeral fracture (17%)
- Neonatal death

Management

Prediction and prevention is impossible
Large episiotomy
Adequate analgesia



ource: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY Illiams Obstetrics, 23rd Edition: http://www.accessmedicine.com opyright @ The McGraw-Hill Companies, Inc. All rights reserved.



- Suprapubic pre
- Mc Roberts ma
- Woods corkscr maneuver
- Delivery of posishoulder
 - Rubin maneuve
- Zavanelli mane
- Fracture of clay
- Symphysiotom



FIGURE 19–13. Rubin (second) maneuver. A. The shoulderto-shoulder diameter is shown as the distance between the two small arrows. B. The more easily accessible fetal shoulder (the anterior is shown here) is pushed toward the anterior chest wall of the fetus. Most often, this results in abduction of both shoulders, reducing the shoulder-to-shoulder diameter and freeing the impacted anterior shoulder.



Uterine Myoma

Location: Cervix / Lower segment

- Confused with fetal head
- Ultrasound to determine delivery method.
- Avoid myomectomy during pregnancy or at time of delivery as not to induce profuse bleeding.







Adnexal Mass

- Resection of ovarian mass
 6 cm or larger that persist after 16 weeks.
- Emergent resection for ruptured, twisted, or infarcted cyst.
- Ultrasound to determine delivery method.



FIGURE 35–15. Ovarian cyst filling most of true pelvis and causing dystocia. (c = ovarian cyst; u = pregnant uterus.)

Clinical outcome (2nd stage of labor)



| | < 2 hours | 2~4 hours | > 4 hours |
|--------------------------|-----------|-----------|-----------|
| | n = 6259 | n = 384 | n = 148 |
| Cesarean Delivery | 1.2 % | 9.2 % | 34.5 % |
| Instrumental Delivery | 3.4 % | 16.0 % | 35.1 % |
| Perineal Trauma | 3.6 % | 13.4 % | 26.7 % |
| PPH | 2.3 % | 5.0 % | 9.1 % |
| Chorioamnionitis | 2.3 % | 8.9 % | 14.2 % |