



Reviewed By
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Induction of Labour (IOL)

Objectives:

- Differentiate between IOL and augmentation of labor.
- List the indications and contraindications for IOL.
- List the methods used for IOL and their complications:
 - Mechanical
 - Artificial rupture of Membranes(ARM)
 - Pharmacologic
 - Prostaglandin
 - Oxytocin



- Slides
- **Important**
- **Golden notes**
- Extra
- **Doctor's notes**
- **Previous Doctor's notes**
- **Reference**

Editing File

Induction of Labour

Introduction:

- **Induction of labour (IOL):** an intervention designed to artificially initiate uterine contractions leading to progressive dilatation and effacement/thinning of the cervix and birth of the baby.
- **Includes:** women with intact membranes & women with spontaneous rupture of membranes but who are **not in labour**.
 - **Intact membranes:** membranes around the fetus are present.
 - **Spontaneous rupture of membranes:** rupture of the amniotic sac.
- **Induction of labor:** the process whereby labor is initiated by artificial means.
- **Augmentation:** the artificial stimulation of labor that has begun spontaneously.
- Normally we don't induce labor because at 40 weeks, the cervix dilate itself by ↑ prostaglandins or mechanical pressure.
- Induction of labor depends on the GA and should be at least 34 weeks of gestation to complete the maturity of the fetus.

Indications¹:

- **Intrauterine growth restriction (IUGR - FGR - SGA)⁴:** all terms almost mean the same.
 - ↑ fetal demise risk.
- Intrauterine fetal death (IUFD).
- **Non-reassuring fetal surveillance² / abnormal fetal testing:** cardiotocography (CTG) & ↓ fetal movement.
- Multiple gestation.
- Abruptio³.
- Premature rupture of membranes (**PROM**).
 - Even if < 40 weeks, due to infection risk (chorioamnionitis).
 - Can happen due to membrane weakness due to infection.
 - 12 - 24 hours chance before induction, not more than that!
- **ER!** **chorioamnionitis:**
 - **Symptoms:** fever - abdominal pain - foul smelling vaginal discharge.
 - **Lead to:** septic shock & systemic infection.
 - **Management:** antibiotics + induce labor regardless of GA.
- Rh incompatibility.
- Fetal abnormality.

Fetoplacental Indications

Maternal Indications

- **Post-term pregnancy / prolonged pregnancy:** most common.
 - **Abortion:** < 20 weeks.
 - **Pre term:** 20 - 36.6 weeks.
 - **Term:** 37 - 42 / 40 weeks.
 - **Post date:** 40 - 42 weeks.
 - **Post term:** ≥ 42 weeks.
 - Completed → one week chance (41 to 42 weeks) then start induction.
 - No IOL → calcified placenta → can't do its job → ↑ fetal demise risk.
- **Maternal medical conditions:**
 - DM& GDM.
 - Controlled → don't exceed 40 weeks.
 - Uncontrolled / on insulin → induce at 38 weeks.
 - **Risk of:** macrosomia + stillbirth.
 - Renal disease.
 - HPT.
 - Gestational HPT.
 - Significant pulmonary disease.
 - Antiphospholipid syndrome.
 - Heart disease.
 - Autoimmune disease.
 - Infection.
- **ER!** severe preeclampsia.
 - Uncontrolled HTN → mother might end up with stroke.
- **Elective** risk of rapid labor.
- **Elective** long distance from hospital.
- **Elective** psychological reasons.

1. Induction of labor before term is indicated only when the continuation of pregnancy represents a significant risk to the fetus or mother. In some situations, induction may be indicated at term, as in the case of premature rupture of the membranes.

2. One of the induction drugs is oxytocin, which has a potent antidiuretic effects (it's related structurally and functionally to vasopressin or antidiuretic hormone) can cause water intoxication, which can lead to convulsion, coma and death.

3. A term that may be used to describe a baby's health late in the pregnancy or during labor. It is used when test results suggest that the baby may not be getting enough oxygen. 3. When the placenta separates early from the uterus.

4. IUGR at 28 weeks (early) → wait with close monitoring until you feel the placenta not anymore working (advanced, just know that IUGR is an indication).

Induction of Labour

Risks:

- ↑ rate of operative vaginal deliveries (**example:** forceps).
- ↑ rate of cesarean section (CS), specifically early in pregnancy.
- **Excessive uterine activity:** hyperstimulation as an ADR of the medication we give for induction.
- Abnormal fetal heart rate patterns.
 - **Normally:** amniotic fluid will protect the cord when there's contractions.
 - **Oligohydramnios:** contractions → compressed cord → fetal bradycardia - hypoxia - distress.
- Respiratory distress syndrome.
- Uterine rupture.
- Maternal water intoxication (**example:** oxytocin infusion affects water balance).
- Delivery of preterm infant due to incorrect estimation of gestational age (GA).
- **Cord prolapse with artificial rupture of membranes (ARM):** can lead to fetal asphyxiation.
- **Meconium fetal aspiration:** significant complication of post maturity.

Contraindications:

- Contraindications to labor or vaginal delivery.
- **Induction of labor = induce vaginal delivery** → by default anything that is contraindicated for vaginal delivery, will be contraindication for induction of labor.



Figure 1



Figure 2

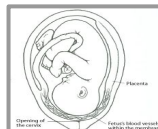


Figure 3

- **Fetal transverse lie (figure 1):** never induce it.
 - Vaginal delivery ↑ hand prolapse risk, unless you do ECV.
- **Placenta previa (figure 2):** placenta in lower 1/3 of uterus.
- **Vasa previa³ (figure 3).**
- Preterm fetus without lung maturity.
- Acute fetal distress.
- Abnormal presentation.

Fetoplacental Contraindications

Maternal Contraindications

- **Absolute:** contracted pelvis.
- **Relative:**
 - **Previous myomectomy entering the cavity / complete transection of uterus (myomectomy reconstruction¹):** during that operation you opened the cavity.
 - **Myomectomy:** risk of scar rupture.
 - Previous uterine surgery.
 - Previous uterine rupture.
 - Invasive cervical cancer.
 - Active genital herpes.
 - Previous classical (longitudinal) or inverted T uterine incision²/scar.
 - 2 or more cesarean sections (CS).
 - Over-distended uterus.

1. Surgical removal of uterine leiomyomas, also known as fibroids.
 2. Muscles arranged longitudinally so once you have previous longitudinal scar any uterine contractions may lead to rupture.
 3. A condition in which fetal blood vessels cross or run near the internal opening.

Induction of Labour



Prerequisites:

- **Assess the following:**
 - Indication / any contraindications.
 - Gestational age (GA).
 - **Cervix favorability (Bishop score):** ↑ score → ↑ success of induction.
 - **Pelvis, fetal size & presentation:** should be cephalic.
 - **Membranes status:**
 - Intact → one of the methods will be AROM.
 - **Fetal heart rate monitoring prior to IOL:**
 - If I plan induction, 1st thing to do is to put CTG or NST:
 - Deceleration → no time for induction.
 - Reactive → start IOL.
 - Elective induction (social induction, without Indication 'wish') should be avoided due to the potential complication.
 - It's very important to add another modality of dating such as, early US with LMP to make sure that the gestational age is accurate.



Bishop Score:

- Please understand how to calculate bishop score and the interpretation of the score.

Modified Bishop Score:

- Used to assess the cervix and the likelihood of a successful induction.
- **Interpretation:**
 - Bishop score ≥ 8 → favorable cervix for vaginal delivery.
 - Bishop score ≤ 6 → unripe or unfavorable cervix; not ready for vaginal delivery.
 - High Bishop score (9 - 13) → high likelihood of a vaginal delivery.
 - Low Bishop score (<5) → ↓ likelihood of successful vaginal delivery.

Simplified Bishop Score:

- **Considers only:** fetal station - cervical dilation - cervical effacement.
- **Interpretation:**
 - Bishop score ≥ 5 → favorable cervix for vaginal delivery.

	0 Points	1 Points	2 Points	3 Points
Cervical Dilation <i>Figure 1</i>	0 cm (closed)	1 - 2 cm	3 - 4 cm	> 5 - 6 cm
Cervical Position <i>Figure 2</i>	Posterior	Mid Posterior Midline	Anterior	
Cervical Effacement <i>Figure 3</i>	0 - 30%	40 - 50% 31 - 50%	60 - 70% 51 - 80%	> 80%
Fetal Station	-3 cm	-2 cm	-1 / 0 cm	+1 / +2 cm
Cervical Consistency	Firm	Medium Moderately firm	Soft (ripe)	

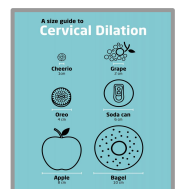


Figure 1

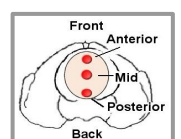


Figure 2

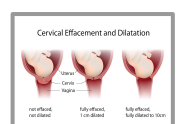


Figure 3

Methods of Induction of Labour

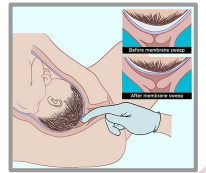
Approach to/Methods of Induction of Labour:

- **Before IOL:** we can do **membrane sweeping** → shortens time to onset of labor.
- Still unfavorable cervix → **cervical ripening** with prostaglandin E₁ or E₂ (**Example:** misoprostol).
- Maternal oxytocin infusion.
- **Amniotomy:** only if partially dilated cervix + completely effaced cervix + fetal head is well applied.
 - Administer under fetal heart rate monitoring.
- **Decide the methods based on:** gestational age - gravity.

Prior to Induction of Labour:

Sweeping of the Membranes

- Vaginally, examining finger is placed through cervical os & swept around to separate the membranes from the lower uterine segment → ↑ local PGF_{2α} production & release from decidua & membranes → onset of labor.
- ↑ rate of delivery in 2 - 7 days.
- ↓ rate of post-term.
- ↓ use of formal induction methods.
- **Urgent** indication for IOL → sweeping is **not** the method of choice.



Cervix Ripening

- **Indication:** Bishop score is ≤ 8 or ≤ 6.
- The state of cervix is an important predictor of successful IOL.
- **Methods:** lesser dose, more frequent.
 - **Dinoprostone:** PGE₂ (2 mg), most commonly used, usually for multipara.
 1. **Intracervical PGE₂ gel:** 0.5 mg / 6 hours, 3 doses.
 2. **Intravaginal PGE₂ gel:** 1 - 2 mg / 6 hours, 3 doses.
 - ↓ rate of not being delivered in 24 hours.
 - ↓ use of oxytocin for augmentation of labor.
 - ↑ rate of uterine hyperstimulation.
 - **Misoprostol:** PGE₁, should **not** be used for term fetuses, we use it in **miscarriage**.
 - **Mechanical methods:**
 - For those who can't tolerate chemical methods:
 - **History of surgery:** chemicals ↑ risk of rupture.
 - Multiparous.
 - Lesser side effects.
 - 1. **Foley catheter:**
 - Introduced into the cervical canal past the internal os, the bulb is inflated with 30 - 60 cc of water.
 - Left for up to 24 hours or until it falls out.
 - **Contraindications:**
 - Low lying placenta.
 - Antepartum Hg.
 - ROM.
 - Cervicitis.
 - No difference in operative delivery rate, or maternal or neonatal morbidity compared to PG gel.
 - For any patient, but usually we use it to induce labor for a patient with 1 previous C/S because there's no risk of hyperstimulation.
 - **Risks:** no significant risk + more safer than pharmacological.
 - 2. **Osmotic/hygroscopic dilators (Example: laminaria tents):** higher rate of infections.

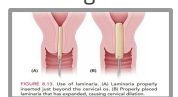
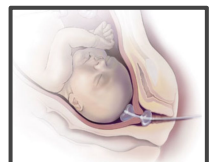
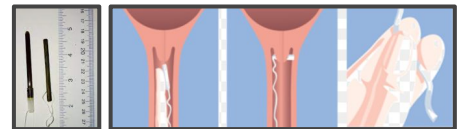


FIGURE 9-13 Use of laminaria. (A) Laminaria tents inserted past beyond the cervical os. (B) Foley's placed beyond the os (vaginally) against internal os.

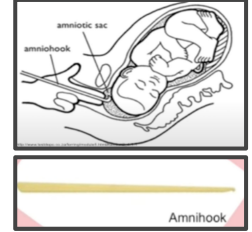
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Methods of Induction of Labour

Induction of Labour:

Oxytocin with Amniotomy



- IV → **only to allow it to be discontinued quickly if complications develop.**
- Slowly increase the dose till you achieve proper contractions.
- **Half life:** 5 - 12 minutes → **beneficial when we want to stop it.**
- **Uterine response:** steady state, occurs in ≥ 30 minutes.
- Fetal heart rate & uterine contractions must be monitored.
- **Hyperstimulation** or **nonreassuring fetal heart rate pattern** → D/C infusion.
- Women who receive oxytocin were more likely to be delivered in 12 - 24 hours than those who had amniotomy alone, & less likely to have operative delivery.
- Cervix needs to be dilated at least $\pm 1.5 - 2$ cm + **presenting part:** cephalic + no umbilical cord.
- **Third stage of labor management** → IM oxytocin.
- **42 week pregnant woman labor induction** → IV oxytocin (**best way**).
- Less invasive.

PGE₂

- **For women with favorable cervix, PGE₂:**
 - ↓ rate of operative delivery.
 - ↓ failed IOL when compared to Oxytocin.
- ↑ GIT side-effects.
- ↑ pyrexia.
- ↑ uterine hyperactivity.
- May lead to hypoxia and causes atony and PPH.
- **PGE₂ vaginal pessaries (10 mg)** is the best method for induction of labour in case of:
 - **Gestation age:** 41+ weeks.
 - **Bishop's score:** < 5.

Induction of Labour:

01

Prelabor SROM at term

- This is normal & patient can still deliver naturally without IOL.
- 6 - 19%.
- IOL with oxytocin ↓ risk of maternal (chorioamnionitis & endometritis) & neonatal infections.
- Do NOT leave the fetus in the uterus for too long after amniotic fluid is lost, as this ↑ infection risk.
- PG ↓ maternal infections & neonatal NICU admissions.

02

IOS after CS

- PG can result in ruptured uterus → should **not** be used.
 - Due to the complication of uterine hyperstimulation.
- Oxytocin or foley catheter may be used.
- This is only applicable if the patient has had ONLY ONE previous C-section.
 - Patient had $2 \geq$ C-sections → any subsequent deliveries MUST be C-section.

439 Doctor's Notes



Doctor's Notes:

Indications for IOL:

- **Emergent conditions:**
 - **ROM with chorioamnionitis:** induce labor regardless of the gestational age.
 - Severe **pre-eclampsia**.
- **PROM:**
 - Induction of labor depends on the GA and should be at least 34 weeks of gestation to complete the maturity of the fetus, but if the mother has symptoms of chorioamnionitis → immediately induce labor to prevent the systemic infection and septic shock.
 - **Symptoms of chorioamnionitis:** fever - abdominal pain - foul smelling vaginal discharge.
 - **Source of chorioamnionitis:** uterine cavity with the fetus and ruptured membrane.
- Maternal medical condition (GHTN).
- Non-reassuring fetal status (IUGR - **reduced fetal movement**).
- **Post-term:** ≥ 42 weeks.
 - **Term:** 37 - 42 weeks.
 - **Post date:** 40 - 42 weeks.
 - **Post term:** ≥ 42 weeks.
- **Elective induction:**
 - Risk of rapid labor.
 - Mom long distance from hospital.
 - Psychological reasons.

Contraindications for IOL:

- Induction of labor = induce vaginal delivery.
- So by default anything that is contraindicated for vaginal delivery, will be contraindication for induction of labor:
 - History of c-section (**vertical Cs**) or myomectomy (risk of scar rupture).
 - Placenta previa (risk of bleeding).
 - Malpresentation (transverse lying).
 - Non-reassuring fetal status,
 - **Example:** fetal bradycardia you should deliver the fetus with c-section.
 - Active genital herpes (risk of transmission to the fetus during vaginal delivery).

- It's very important to add another modality of dating such as, early US with LMP to make sure that the gestational age is accurate.
- Fetal well-being is assured by antenatal testing.
- Some studies shows that Induction of labor in low risk pregnancy after 41 weeks gestation is associated with reduction of perinatal mortality and NO increase of the instrumental delivery or c-section, for this reason now we induce all the patients on 41+3 weeks because most of the complications and mortality happen after 41 weeks of gestation.

Bishop Score:

- **Bishop score:** the way I asses favorability of the cervix. Has 5 criteria:
 - **Dilatation of the cervix (0 - 3 scores):** closed → 0 | 1 - 2 cm → 1 | 3 - 4 cm → 2 | ≥ 5 cm → 3.
 - Effacement of the cervix.
 - Station of the fetus.
 - Consistency of the cervix.
 - Position of the cervix.

439 Doctor's Notes



Doctor's Notes:

Methods of Induction:

→ Mechanical methods:

- We don't use medications, methods induce endogenous PG release → contraction.
- **Cervical ripening:** at term.
- **Sweeping the membrane / membrane stripping:** at term.
 - **Risks:** patient can go in labor.
- Foley's balloon catheter of the cervix.
 - **Risks:** no significant risk + more safer than pharmacological.
- **Extra amniotic saline infusion:** not used nowadays.

→ Pharmacological methods:

- **PGE₁:** tablet either oral or vaginal.
- **PGE₂:** vaginal gel, vaginal insert and intracervical.
 - Contractions happen within 1 hour & peak after 4 hours.
 - 1/3 risk of uterine tachysystole.
 - PGE₂ vaginal pessaries is the best method for induction of labour if:
 - **Gestation age:** 41+ weeks.
 - **Bishop's score:** < 5.
- **Oxytocin:**
 - Third stage of labor → IM oxytocin.
 - 42 week pregnant woman labor induction → IV oxytocin (best way).
- **Risks of pharmacological methods:**
 - Once you give it you can't control it:
 - **Example:** if you gave tablet in high dose and she started hyperstimulation and uterine contractions → fetal asphyxia and uterine rupture.
 - Except oxytocin since it's in a drip you can control it.
 - **Bishop score can help in the dose:** ↓ score → ↑ dose.
 - **vaginal birth after c-section (VBAC):**
 - Hyperstimulation risk → prostaglandins usually not recommended (not contraindicated).
 - Mechanical methods is more preferred.
 - History of upper segment c-section → contraindicated prostaglandin IOL.

→ Procedure: *Artificial Rupture of Membranes (AROM) / Amniotomy*

- Rupture of membrane → released endogenous PG → contractions.
- Make sure that the mother advance in the labor & the fetal head is well applied nothing comes out before the head, due to the risk of **cord prolapse** that requires **c-section**.

Intrapartum Management:

- Asses the fetus and do CTG.
- Start induction of labour.

439 Summary

Induction of Labor

Overview:

- **Induction:** labor is initiated by artificial means after appropriate assessment of mother and fetus
- **Augmentation:** artificial stimulation of labor that **has begun spontaneously**
- IOL should not be done before 38 weeks gestation because of the possibility of neonatal morbidity (unless it's urgently indicated)


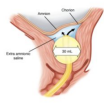
Bishop's Score: Used to assess the likelihood of a successful induction

Physical finding	Score			
	0	1	2	3
Cervical position	Posterior	Mid	Anterior	-
Cervical consistency	Firm	Medium	Soft	-
Cervical effacement	0-30%	40-50%	60-70%	≥ 80 %
Cervical dilation	0 cm	1-2 cm	3-4 cm	≥ 5 cm
Fetal head station	-3	-2	-1	+1

- **Score ≥ 8:** favorable cervix for vaginal delivery
- **Score ≤ 6:** unripe or unfavorable cervix; not ready for vaginal delivery

Methods of IOL:

- Prior to induction of labor:
 - Sweeping of the membranes
 - Cervical ripening
- Induction of labor:
 - Oxytocin with Amniotomy
 - PGE2

Unfavorable cervix	1. Membrane Sweeping	
	Mechanical method	<ul style="list-style-type: none"> ● Membrane sweeping/stripping: manual separation of the chorioamnion from the lower uterine segment 
	(Separation of the membranes from the cervix leads to the local release of prostaglandins)	
	2. Cervical ripening	
Mechanical method	<ul style="list-style-type: none"> ● Intrauterine foley catheter: placed into the cervix and inflation of the balloon with 10 cc of saline  <ul style="list-style-type: none"> ● Hydroscopic dilators: ex. Laminaria tents. Has higher infection rate 	
Pharmacological methods	<p>Prostaglandins:</p> <ul style="list-style-type: none"> ● Intravaginal PGE2 (dinoprostone, known as cervidil) or PGE1 (misoprostol, known as cytotec). <ul style="list-style-type: none"> ○ Tablets forms are easier to remove if hyperstimulation occurs ○ Misoprostol should only be used for term fetuses ○ Cytotec can be used in medical abortion, cervical ripening ● Intracervical PGE2 ● Side effects: GIT, pyrexia, uterine hyperactivity, uterine atony, PPH ● Absolute Contraindication: Previous C-section (2 or more) as IOL can result in ruptured uterus 	

3. Initiation of uterine contractions

Favorable cervix	Oxytocin	<ul style="list-style-type: none"> ● Pitocin is the synthetic form of oxy ● The only drug approved for induction and augmentation of labor
	Amniotomy	<ul style="list-style-type: none"> ● Also known as "artificial" rupture of membranes (AROM) ● Releases local PG causing cervical ripening and myometrial contractions ● AROM alone is not recommended ● Starting oxytocin at the time of amniotomy has been shown to decrease the induction delivery interval, thereby decreasing both fetal and maternal risks of sepsis ● Consider amniotomy (only if the cervix is partially dilated and completely effaced, and the fetal head is well applied)

Indication & contraindications of IOL:

	Indications	Contraindications
Maternal	<ul style="list-style-type: none"> ● Preeclampsia ● Gestational HTN <ul style="list-style-type: none"> ○ Gestational HTN with superimposed preeclampsia ● Gestational DM ● Heart disease ● Renal disease ● Antiphospholipid syndrome ● Multiple gestation 	<ul style="list-style-type: none"> ● Contracted pelvis ● Prior uterine surgery ● Classic CS = vertical incision being made in the midline of the abdomen (upper segment) ● Previous classical (longitudinal scar) or inverted T uterine incision ● 2 or more C-sections ● Complete transection of uterus (myomectomy, reconstruction) ● Overdistended uterus ● Previous uterine rupture ● Active genital herpes ● Invasive cervical cancer
Fetoplacental	<ul style="list-style-type: none"> ● Postterm pregnancy (term= 40w) ● IUGR ● IUFD ● Abnormal fetal testing (such as: reduced fetal movements) ● Rhesus type incompatibility ● Fetal abnormality ● PROM ● Chorioamnionitis 	<ul style="list-style-type: none"> ● Preterm fetus without lung maturity ● Acute fetal distress ● Abnormal presentation (breech) ● Fetal lie: transverse ● Placenta previa ● Vasa previa ● Placental abruption

Indication of augmentation:

- Abnormal labor (in the absence of inadequate uterine activity)
- Prolonged latent phase
- Prolonged active phase

Prerequisites of IOL:

Assess each of the following:

1. Indications/contraindications
2. Confirm gestational age
3. Bishop score (cervix favorability) - high score suggests higher success rate of induction
4. Pelvis, fetal size, fetal presentation
5. Membrane status
6. FHR monitoring prior to IOL
7. Elective induction should be avoided (as in social/wishful reason of induction due to potential complication)

Risks and possible complications of IOL:

- Increased rate of operative vaginal deliveries
- Increased rate of CS (cesarean section)
- Excessive uterine activity
- Abnormal fetal heart rate patterns
- Respiratory distress syndrome
- Uterine rupture
- Maternal water intoxication
- Delivery of preterm infants due to incorrect estimation of GA
- Cord prolapse with artificial rupture of membranes
- Meconium fetal aspiration

Quiz

Question 1:

- A 36 week primigravida Presented to the labour room with signs and symptoms of severe pre-eclampsia. What is your management?
- A. Perform immediate cesarean labour.
 - B. Stabilize her and schedule her for induction of labour at 38 weeks.
 - C. Stabilize her and induce labour.
 - D. Stabilize her and wait for spontaneous labour.

Question 2:

- A 40-year-old G4 P3+0, 38 weeks pregnant with gestational diabetes. You are planning for induction of labor. What is the expected risk factor for this baby?
- A. Respiratory distress syndrome.
 - B. Congenital anomaly.
 - C. Hyperglycemia after delivery.
 - D. Intrauterine growth restriction.

Question 3:

- A 38-weeks gestational diabetic patient controlled with diet came in for check up until recently she developed postprandial hyperglycemia. What is your management?
- A. Cesarean section.
 - B. Induction of labor.
 - C. Wait for spontaneous labour.
 - D. Nothing.

Question 4:

- IUFD at 34 weeks bishop score is <5 what management will you do?
- A. Cesarean section.
 - B. D&C.
 - C. Induction of labor.
 - D. Hysterectomy.

Question 5:

- Primigravida at 38 weeks of gestation is in active labor. The cervix is rimmed at 5 cm for 2 hours with clear amniotic fluid. Fetal heart is normal. She was having irregular and infrequent uterine contractions. What is the best management option for her?
- A. Cesarean section.
 - B. Ergometrine.
 - C. Oxytocin.
 - D. Prostaglandin.

0	0	8	4	0
5	4	3	2	1

Quiz



Question 1:

- According to the Bishop Scoring System, labor induction is likely to be successful in a woman whose cervix is soft, 60% effaced, anterior position, and 3 cm dilated with the fetus in vertex presentation at +1 station.
- A. True
 - B. False



Question 2:

- Which of the following should be ruled out,, before oxytocin is given for labor augmentation?
- A. Severe preeclampsia.
 - B. Maternal diabetes mellitus.
 - C. Chorioamnionitis.
 - D. Category III fetal heart rate tracing.



Question 3:

- Induction of labor is usually appropriate in all of the following situations, except when
- A. The fetus died 6 weeks earlier.
 - B. Chorioamnionitis is present.
 - C. The fetus is post-term.
 - D. There is a face presentation.

D	D	A
E	Z	1

Reference

dilation or effacement. They may serve a physiologic role in preparing the uterus and cervix for true labor.

Cervical Effacement

Before the onset of parturition, the cervix is frequently noted to soften as a result of increased water content and collagen lysis. Simultaneous effacement, or thinning of the cervix, occurs as the internal os of the cervix is taken up into the lower uterine segment (Figure 8-8, B). Consequently, patients often present in early labor with a cervix that is already partially effaced. As a result of cervical effacement, the mucous plug within the cervical canal may be released. The onset of labor may thus be heralded by the passage of a small amount of blood-tinged mucus from the vagina ("bloody show").

Induction and Augmentation of Labor

Induction of labor is the process whereby labor is initiated by artificial means after appropriate assessment of the mother and fetus and an explanation to the patient of the indications for induction. In the case of high-risk pregnancies, induction is necessary to reduce the risk of morbidity to the mother and her fetus. In general, induction of labor is not used for the convenience of the mother or her family, and it should not be done before 38 weeks' gestation because of the possibility of neonatal morbidity. Augmentation is the artificial stimulation of labor that has begun spontaneously (see Chapter 11).

Cervical effacement and softening (ripening) occur before the onset of spontaneous labor. Cervical ripening frequently has not occurred before a decision to induce labor, yet the success of induction is dependent on these changes in the cervix.

Several mechanical and pharmacologic approaches may be used to promote cervical ripening before the actual induction of uterine contractions. Currently approved pharmacologic treatments include intravaginal application of prostaglandin E₂ using a vaginal insert (on a string) called **Cervidil**, which can be removed quickly if the medication causes hyperstimulation. **Cytotec**, a synthetic prostaglandin E₁ analogue, has also been approved for cervical ripening. One 25- μ g tablet placed intravaginally effectively initiates cervical ripening. Although prostaglandin administration has been demonstrated to shorten the duration of labor induction, the impact on cesarean delivery rates due to failed induction has been minimal.

Other methods of cervical ripening may include intrauterine placement of a **Foley catheter** into the cervix and inflation of the balloon with 10 cc of saline.

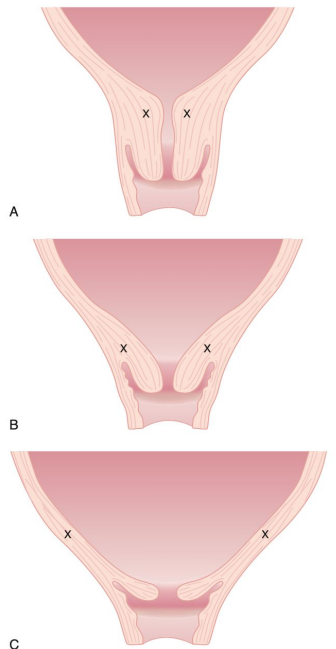


FIGURE 8-8 A, The absence of cervical effacement before labor (X shows the location of the internal os in a normal cervix). B, Cervical os (X) being progressively taken up into the lower segment of the uterus (about 50% effaced). C, Cervical os (X) fully taken up (cervix is completely effaced).

Manual separation of the chorioamnion from the lower uterine segment—referred to as "stripping the membranes"—does not necessarily speed up the onset of labor. **Artificial rupture of the membranes is not recommended** as a method to induce labor.

In addition to cervical ripening, induction of labor requires the initiation of effective uterine contractions. **Oxytocin** is identical to the natural pituitary peptide, and it is the **only drug approved for induction and augmentation of labor**. Pitocin is the synthetic preparation.

The physician must be fully aware of the indications and contraindications for the use of induction and augmentation of labor (Table 8-2). The most common contraindication has been prior uterine surgery in which there has been complete transection of the uterine wall. However, a **previous lower transverse incision is no longer considered a contraindication to a trial of labor**. This is referred to as **vaginal birth after cesarean**, or VBAC.

TABLE 8-2
INDICATIONS AND CONTRAINDICATIONS FOR INDUCTION AND AUGMENTATION OF LABOR

Indication	Augmentation
Indications	
<i>Maternal</i>	
Preeclampsia	Abnormal labor (in the presence of inadequate uterine activity)
Diabetes mellitus	Prolonged latent phase
Heart disease	Prolonged active phase
<i>Fetoplacental</i>	
Prolonged pregnancy	
Intrauterine growth restriction	
Abnormal fetal testing	
Rhesus type incompatibility	
Fetal abnormality	
Premature rupture of membranes	
Chorioamnionitis	
Contraindications	
<i>Maternal</i>	
Absolute	Same contraindications as for maternal and fetoplacental
Contracted pelvis	
<i>Relative</i>	
Prior uterine surgery	
Classic cesarean delivery	
Complete transection of uterus (myomectomy, reconstruction)	
Overdistended uterus	
<i>Fetoplacental</i>	
Preterm fetus without lung maturity	
Acute fetal distress	
Abnormal presentation	

TECHNIQUE FOR INDUCTION AND AUGMENTATION OF LABOR

A hospital obstetric service must establish guidelines for the proper use of oxytocin for induction and augmentation of labor. In general, an assessment and plan of management should be outlined in the patient's medical record. It is helpful to assess the likelihood of success by a careful pelvic examination to determine the **Bishop score**, which is used to evaluate the status of the cervix and the station of the fetal head (Table 8-3). A high score (9 to 13) is associated with a high likelihood of a vaginal delivery, whereas a low score (<5) is associated with a decreased likelihood of success (65–80%). Before induction is begun, the patient's blood must be typed and screened for antibodies. A blood specimen should be held in the laboratory in case crossmatching becomes necessary. **Continuous electronic monitoring of the fetal heart rate and uterine activity is required during induction**. An internal uterine catheter for monitoring uterine pressure is suggested if intensity cannot be adequately assessed.

Oxytocin Infusion

Several principles should be followed when oxytocin is used to induce or augment labor:

- Oxytocin must be given intravenously** to allow it to be discontinued quickly if a complication such as uterine hypertonus or fetal distress develops. Because oxytocin has a half-life of 3 to 5 minutes, its physiologic effect will diminish quickly (within 15 to 30 minutes) after discontinuation.
- A dilute infusion must be used and "piggybacked" into the main intravenous (IV) line** so that it can be stopped quickly if necessary, without interrupting the main IV route.
- The drug is best infused with a calibrated infusion pump** that can be easily adjusted to deliver the required infusion rate accurately.

TABLE 8-3
BISHOP SCORE TO ASSESS LIKELIHOOD OF SUCCESSFUL INDUCTION OF LABOR

Physical Findings	Rating			
	0	1	2	3
Cervix				
Position	Posterior	Mid	Anterior	—
Consistency	Firm	Medium	Soft	—
Effacement (%)	0-30	40-50	60-70	≥80
Dilation (cm)	0	1-2	3-4	≥5
Fetal Head				
Station	-3	-2	-1	+1

- The induction of labor for a specific indication generally should not exceed 72 hours**. In patients with a low Bishop score, it is not unusual for an induction to progress slowly. If the cervix effaces and dilates, it is recommended that the membranes be ruptured on the third day. If adequate progress is not made within 12 hours of rupturing the membranes, a cesarean delivery may be performed.

- If adequate labor is established, the infusion rate and the concentration may be reduced**, especially during the second stage of labor. Adherence to this principle avoids the risks of hyperstimulation and fetal distress, which frequently occur once labor has been established.

Substantial variation exists regarding the initial dose, incremental dose, and time interval between dose increments when oxytocin is used for labor induction and augmentation. Well-performed clinical studies have supported both low-dose (1 to 30 mU/min) and high-dose (4 to 40 mU/min) protocols, as shown in Table 8-4. It is not surprising that many protocols use moderate doses of oxytocin. Generally, intervals between dose increments should be no less than 20 minutes to permit time for steady-state plasma levels of oxytocin to be achieved and to prevent an increased risk of uterine hyperstimulation.

COMPLICATIONS. The use of oxytocin for the induction and augmentation of labor can cause three major complications. First, an excessive infusion rate can cause **hyperstimulation** and thereby cause fetal distress from ischemia. In rare situations, a tetanic contraction can occur, which can lead to **rupture of the uterus**. Second, because oxytocin has a structure similar to that of antidiuretic hormone, it has an intrinsic **antidiuretic effect** and will increase water reabsorption from the glomerular filtrate. **Severe water intoxication with convulsions and coma can occur rarely** when oxytocin is infused continuously for more than 24 hours. Third,

prolonged infusion of oxytocin can result in **uterine muscle fatigue** (nonresponsiveness) and **postdelivery uterine atony** (hypotonus), which can increase the risk of postpartum hemorrhage.

TABLE 8-4
METHOD OF OXYTOCIN INFUSION FOR INDUCTION AND/OR AUGMENTATION OF LABOR

	Low-Dose Protocol	High-Dose Protocol
Starting dose	1 mU/min	4 mU/min
Increment	1 mU/min	4 mU/min
Interval	20 min	20 min
Limited by	5 contractions in 10 min	7 contractions in 15 min
Maximal dose	20-30 mU/min	40 mU/min

Solution: 10 U of oxytocin in 1000 mL of 5% dextrose or balanced salt solution (10 mU/mL). Administration: Piggyback into main intravenous line; administer solution by infusion pump.



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Good Luck!



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