



An Update on Labor induction

Haywood L. Brown, MD
Professor Obstetrics and Gynecology
Duke University

Objectives



- At the conclusion of this presentation the participants will be able to:
- Discuss indications for induction of labor
- Discuss the impact of pre-induction cervical condition on successful vaginal delivery with induction
- Describe cervical ripening methods and compare outcomes for successful induction



Disclosure

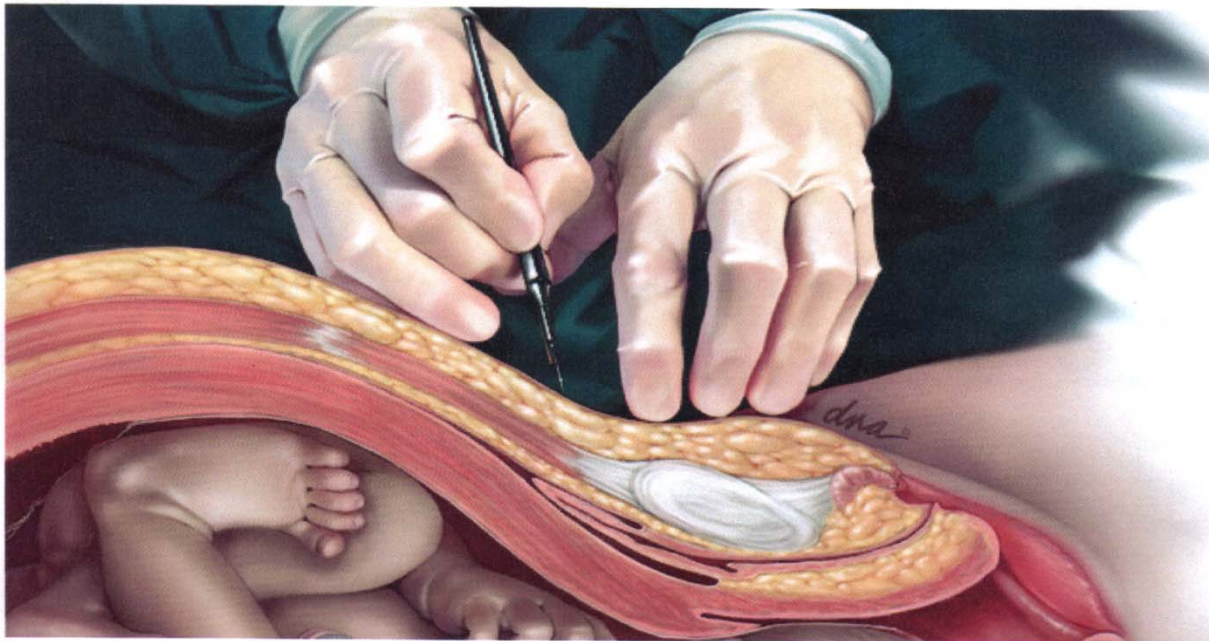
- None



Contemporary OB/GYN Obstetrics-Gynecology & Women's Health Cesarean delivery

The cesarean epidemic: Are we too quick to cut?

Cesarean delivery may be a safe alternative to vaginal delivery but its use in 1 of 3 women giving birth in the US seems to high.



April 01, 2016

By [Aaron B Caughey, MD, PhD](#)



- Maternal obesity and gestational weight gain may be contributing to rising rates of cesarean delivery.
- The most common indications for cesarean delivery are prior cesarean, failure to progress, and abnormal fetal heart tracing.



Background

- Goal = vaginal delivery by stimulating uterine contractions before the spontaneous onset of labor
- Incidence of induction
 - 1990 – 9.5% of pregnancies
 - 2009 – 23.2% of pregnancies

Martin JA, et al. Natl Vital Stat Rep 2011;60:1–104.

Induction of Labor



- Oxytocin
 - One of the most commonly used drug in US
 - Uterine response depends on duration of pregnancy
 - Increase in response from 20 to 30 weeks with plateau from 24 weeks until term
- History of Oxytocin
 - First describe by Theobald in 1948
 - Synthesized by du Vigneaud in 1953

Induction of labor

Indications



- Post-term pregnancy^a
- Abruptio placentae
- Chorioamnionitis
- Fetal demise
- Gestational hypertension
- Preeclampsia, eclampsia
- Premature rupture of membranes
- Maternal medical conditions (eg, diabetes mellitus, renal disease, chronic pulmonary disease, chronic hypertension, antiphospholipid syndrome)
- Fetal compromise (eg, severe fetal growth restriction, isoimmunization, oligohydramnios)
- Logistic reasons (eg, risk of rapid labor, distance from hospital, psychosocial indications)

1. ACOG Practice Bulletin No. 107: Induction of labor. August 2009.
2. Declercq ER, et al. *J Perinat Educ.* 2014;23(1):9-16.

Induction of Labor Contraindications



- Vasa previa or complete placenta previa
- Transverse fetal lie
- Umbilical cord prolapse
- Previous classic cesarean delivery
- Active genital herpes infection
- Previous myomectomy entering the endometrial cavity

Induction of Labor

Cervical ripening



- To facilitate softening, thinning, & dilation of an unfavorable cervix
 - Reduce failed induction rate
 - Reduce time to delivery

Induction of Labor



Goal: to stimulate uterine contractions to achieve vaginal delivery before spontaneous onset of labor¹

- Cervical ripening enhances and augments labor induction and is part of a continuum²
- Cervical ripening is an integral component of labor induction, helping to reduce the rate of failed induction and time to delivery³

1. Wing DA, Farinelli CK. Abnormal labor and induction of labor. In: Gabbe SG, Niebyl JR, Simpson JL, et al, eds. *Obstetrics: Normal and Problem Pregnancies*. 6th ed. Philadelphia, PA: Elsevier Saunders; 2012.

2. Mackenzie IZ. *Reproduction*. 2006;131(6):989-998.

3. ACOG Practice Bulletin No. 107: Induction of labor. August 2009.

Methods of Cervical Ripening



- Mechanical dilators
 - Hygroscopic – Dilapan
 - Osmotic – Laminaria
- Foley catheter
 - 30 – 80 mL
 - Single vs. double balloon device
 - +/- saline infusion
 - +/- pitocin
- Prostaglandins
 - PGE₁ – misoprostol tablet or vaginal insert
 - PGE₂ – dinoprostone gel or vaginal insert



Cervical Ripening During Labor



Cervical ripening involves several events:

- Dissolution of collagen bonds
- Increased water content and permeability

Chemical reactions including:

- Hormones (relaxin, estrogen, progesterone)
- Cytokines
- Prostaglandins

Bishop's Score



Factor	Score			
	0	1	2	3
Cervical dilation	Closed	1–2	3–4	≥5
Cervical position	Posterior	Midposition	Anterior	---
Cervical effacement (%)	0–30	40–50	60–70	80
Cervical consistency	Firm	Medium	Soft	---
Fetal station	-3	-2	-1, 0	+1, +2

Factors to Consider



- Maternal and fetal conditions
- Gestational age
- Pre- induction cervical status
(Bishop Score)



Benefits Should Outweigh the Potential Maternal and Fetal Risks

Maternal Risks of Labor Induction



- Increased rate of cesarean delivery (more in nulliparous women)
- Intra-amniotic infection
- Postpartum hemorrhage
- Hysterectomy

Tachysystole



- A persistent pattern of more than 5 contractions in 10 minutes (30-min period)
- Contractions lasting 2 minutes or more
- Contractions of normal duration occurring within 1 minute of each other
- Inadequate resting tone between contractions
- Increasing resting tone >20 mm Hg with an intrauterine pressure catheter

Tachysystole

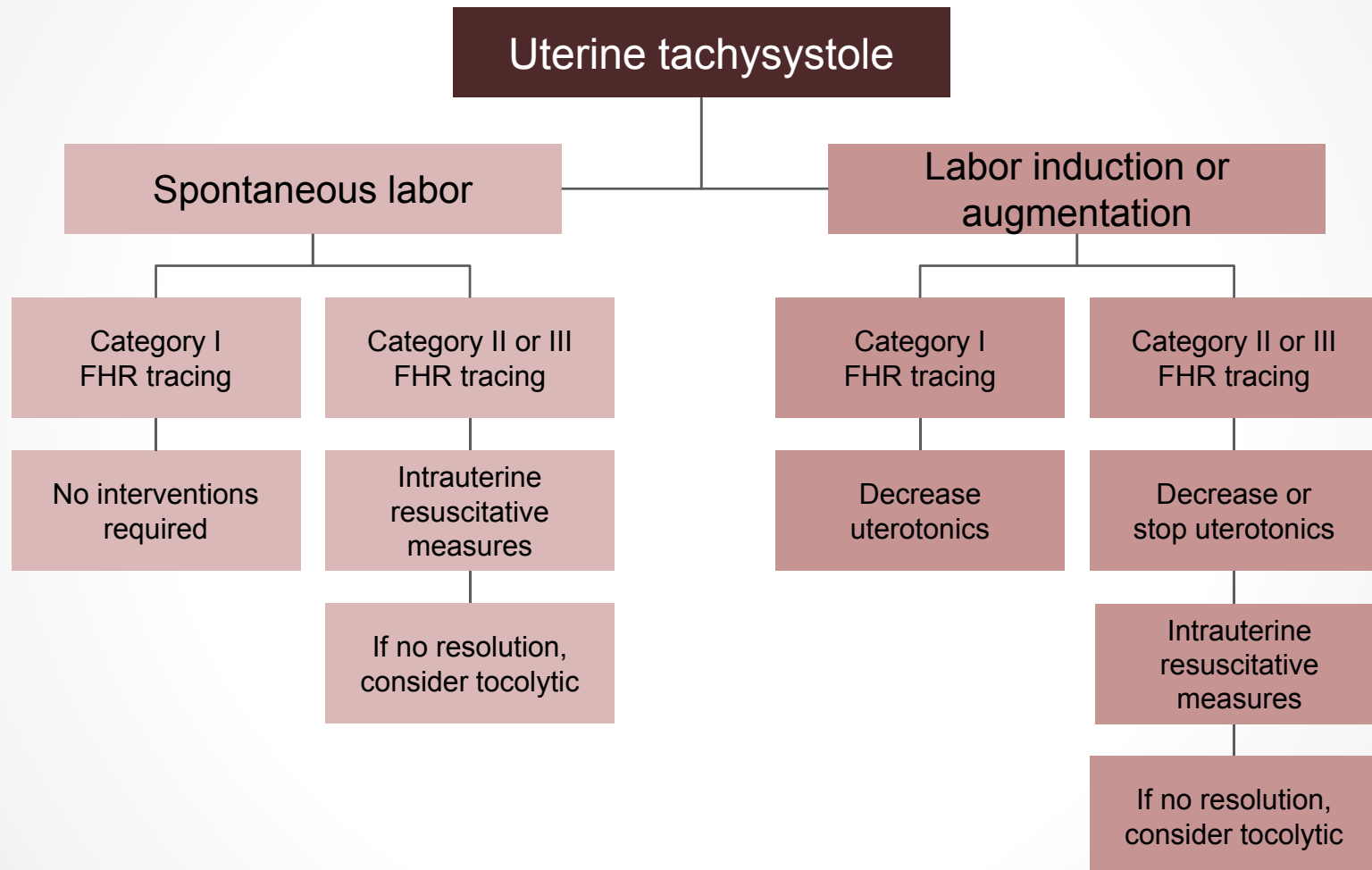


In one study, approximately 11% of term laboring patients experienced tachysystole¹

With oxytocin use:

- rate of tachysystole with fetal heart rate (FHR) changes 2X
 - rate of tachysystole requiring intervention 3X
 - Dose-dependent
-
- 25% of tachysystole events had FHR changes
 - Tachysystole increased the risk of neonatal morbidity

Management



Management



Oxytocin

- The infusion rate should be reduced or discontinued in women who experience uterine tachysystole with Category III FHR
- Use of tocolytics may also be considered

Prostaglandins

- Removing the prostaglandin, if possible
- Intrauterine rescue may be required, usually with tocolytics
(terbutaline 0.25 mg^{1,2})

1. ACOG Practice Bulletin No. 107: Induction of labor. August 2009.

2. ACOG District II Patient Safety and Quality Improvement Committee. *Oxytocin for Induction*. Optimizing Protocols in Obstetrics. Series 1; December 2011.

Tachysystole



Goal of Treatment	FHR Abnormality	Intrauterine Resuscitation
Promote fetal oxygenation and improve uteroplacental blood flow	<ul style="list-style-type: none"> • Recurrent late decelerations • Prolonged deceleration or bradycardia • Minimal or absent FHR variability 	<ul style="list-style-type: none"> • Initiate maternal repositioning (left or right) • Administer maternal oxygen supplementation • Administer intravenous fluid bolus • Reduce uterine contraction frequency
Reduce uterine activity	<ul style="list-style-type: none"> • Tachysystole with Category II or III tracing 	<ul style="list-style-type: none"> • In cases where pharmaceutical agents have been used to induce or augment labor, either decrease or stop administration of those agents • Administer tocolytic medication (ie, terbutaline)
Alleviate umbilical cord compression	<ul style="list-style-type: none"> • Recurrent variable decelerations • Prolonged decelerations or bradycardia 	<ul style="list-style-type: none"> • Initiate maternal repositioning • Initiate amnioinfusion • If umbilical cord is prolapsed, elevate the presenting fetal part while preparing for operative delivery

“Natural” Methods



- Sweeping membranes
- Acupuncture
- Castor Oil
- Primrose oil
- Nipple stimulation
- Sexual intercourse
- Spicy foods
- Pineapple
- Walking

Induction of Labor



- Membrane stripping
 - Increases Phospholipase A₂ and PGF₂a activity
 - Increases likelihood of spontaneous labor within 48 hours
 - Reduces incidence of induction
- Amniotomy
 - Insufficient data on efficacy of amniotomy alone for labor induction
 - Shorter time to delivery with study showing amniotomy + oxytocin vs. amniotomy alone

Amniotomy



- Viable method of induction if favorable cervix
- RCT of amniotomy alone vs. amniotomy + oxytocin
 - 196 participants, Bishop score ≥ 6
 - Amniotomy group given oxytocin if no labor after 24 h
- Time to delivery significantly shorter with oxytocin
- Insufficient data to guide practice in GBS+ women

	Amniotomy	Amniotomy + oxytocin
Latent phase (h)*	4.3	2.3
Time to delivery (h)*	9.0	6.0

Membrane Stripping



- Commonly practiced in outpatient setting
- Induces phospholipase A₂ and prostaglandin F_{2α}
- Increases likelihood of spontaneous labor within 48 h and reduces incidence of induction
- Disadvantages
 - Discomfort
 - Vaginal bleeding
 - Irregular contractions for 24 – 48 hours
- Insufficient data to guide practice in GBS+ women

Pharmacologic Induction

- Most common pharmacologic agents used for cervical ripening and labor induction include¹⁻⁵:
 - Oxytocin – for inducing labor
 - Pitocin^{®1}
 - Syntocinon^{®2}
 - Prostaglandins – for cervical ripening and induction
 - Prostaglandin E₁ (PGE₁)
 - Misoprostol (Cytotec[®])
 - Prostaglandin E₂ (PGE₂)
 - Dinoprostone (Cervidil⁵, Prepidil^{®6})
- ** Others: Osmotic dilators, Foley Catheters

1. Pitocin (oxytocin injection, USP) [package insert]. Rochester, MI: JHP Pharmaceuticals, LLC; February 2011.

2. Syntocinon (synthetic oxytocin) [package insert]. North Ryde, NSW, Australia: Novartis Pharmaceuticals Australia Pty. Ltd.; March 2009

3. ACOG Practice Bulletin No. 107: Induction of labor. August 2009.

4. Cytotec (misoprostol tablets) [package insert]. New York, NY: Pfizer Inc; December 2012.

5. Cervidil (dinoprostone vaginal insert) [package insert]. Parsippany, NJ: Ferring Pharmaceuticals, Inc; April 2015.

6. Prepidil (dinoprostone cervical gel) [package insert]. New York, NY: Pfizer Inc. December 2014.

Oxytocin



Oxytocin alone is still the most common method of induction¹

- labor induction and augmentation²
- prostaglandins are used primarily for cervical ripening²

1. Laughon SK, et al. *Am J Obstet Gynecol*. 2012;206(6):486.e1-9.

2. Wing DA, Farinelli CK. Abnormal labor and induction of labor. In: Gabbe SG, Niebyl JR, Simpson JL, et al, eds. *Obstetrics: Normal and Problem Pregnancies*. 6th ed. Philadelphia, PA: Elsevier Saunders; 2012.



Oxytocin

- Oxytocin has a short half-life (about 1–6 minutes)¹
 - administered as a continuous intravenous infusion²
 - steady state within 40 minutes²
- stimulates uterine contractions, but it also indirectly increases the release of prostaglandins³
- There is no consensus on initial dose, time between doses, and maximum dose²

1. Pitocin (oxytocin injection, USP) [package insert]. Rochester, MI: JHP Pharmaceuticals, LLC; February 2011.

2. Hawkins JS, Wing DA. *Expert Opin Pharmacother*. 2012;13(14):2005-2014.

3. Kilpatrick S, Garrison E. Normal labor and delivery. In: Gabbe SG, Niebyl JR, Simpson JL, et al, eds. *Obstetrics: Normal and Problem Pregnancies*. 6th ed. Philadelphia, PA: Elsevier Saunders; 2012.

4. ACOG Practice Bulletin No. 107: Induction of labor. August 2009.

Oxytocin



- Examples of low and high dose oxytocin regimens for labor induction:

Regimen	Starting Dose (mU/min)	Incremental Increase (mU/min)	Dosage Interval for Incremental Increase (min)
Low-dose	0.5–2	1–2	15–40
High-dose	6	3–6 ^a	15–40

^aIncremental increase is reduced to 3 mU/min in cases of hyperstimulation and to 1 mU/min with recurrent hyperstimulation.

Prostaglandins



- Prostaglandins cause changes in the connective tissue of the cervix, including¹:
 - Dissolution of collagen bundles
 - Increase of submucosal water content
- Effects of prostaglandins in the cervix are similar to the physiologic changes that occur with cervical ripening in normal labor²

1. Wing DA, Farinelli CK. Abnormal labor and induction of labor. In: Gabbe SG, Niebyl JR, Simpson JL, et al, eds. *Obstetrics: Normal and Problem*

Pregnancies. 6th ed. Philadelphia, PA: Elsevier Saunders; 2012.

Prostaglandins



- Compared with placebo or oxytocin alone, vaginal prostaglandins use for cervical ripening:
- increase the likelihood of delivery within 24 hrs
- do not reduce the rate of cesarean delivery
- Increase the risk of uterine tachysystole with associated FHR changes



Prostaglandins are contraindicated in patients with previous uterine scar because of risk of uterine rupture**

Prostaglandins



Misoprostol

- PGE₁ synthetic analog
- FDA-approved for peptic ulcer disease

Recommended dose 25 mcg

Majority of adverse maternal and neonatal outcomes resulted from doses greater than 25 mcg

Dinoprostone



- is the synthetic form of the naturally occurring PGE_2
- PGE_2 is secreted continuously by the fetal membranes and placenta;
it plays an important role in the events leading to labor¹
- PGE_2 stimulates the production of prostaglandin $\text{F}_{2\alpha}$ ($\text{PGF}_{2\alpha}$), which in turn sensitizes the myometrium to endogenous or exogenously administered oxytocin¹

Misoprostol vs. Dinoprostone

- RCT of intravaginal misoprostol vs. intracervical dinoprostone
- February 7 – June 15, 1994
- 25 mcg misoprostol in posterior vaginal fornix every 3 hours or Dinoprostone gel 0.5 mg placed in endocervix every 6 hours for a maximum of 24 hours
- 275 participants randomized

Misoprostol vs. Dinoprostone



	Miso	Dinoprost
Insertion to delivery (hr) *	23.4	28.5
Insertion to vaginal delivery (hr) *	22.1	25.5
Vaginal delivery in 12 h (%) *	30	14.1
Vaginal delivery in 24 h (%) *	65.5	41.4
Cesarean delivery	20.3	27.7

- Average interval from start of induction to vaginal delivery was shorter in the misoprostol group
- Oxytocin augmentation required for 73% in dinoprostone group vs. 46% in misoprostol group ($p < 0.0001$)
- No difference in route of delivery or uterine tachysystole

Wing et al. AJOG 1995;172:1811-6

Misoprostol vs. Foley + Oxytocin



- RCT of 25 mcg miso vs. Foley + oxytocin
- Singleton, cephalic, term, intact membranes, Bishop < 6
- 25 mcg intravaginal misoprostol every 6 hours with maximum 4 doses
- 14-F Foley catheter + intravenous oxytocin with expulsion or removal after 24 hours
- 240 participants randomized

Misoprostol vs. Foley + Oxytocin



	Miso	Foley + Oxytocin
Vaginal delivery in 12 h (%)*	23.5	7.4
Vaginal delivery in 24 h (%)	42.0	25.6
Mean duration of induction (h)*	17.0	20.2
Cesarean delivery (%)	26.9	36.4

- Misoprostol was more effective in inducing labor than Foley catheter and oxytocin
- No differences in tachysystole, puerperal infection or neonatal outcomes



PROBAAT Trial

- Meta-analysis of 3 trials of foley vs. prostaglandin E2
 - Total N = 1431
 - N = 223, Pennell CE et al, BJOG 2009; 119:1443-52
 - N = 389, Prager M et al, BJOG 2008; 115:1443-50
 - N = 819, PROBAAT
- No difference in cesarean delivery
- Hyperstimulation and postpartum hemorrhage statistically favor foley catheter

Misoprostol vaginal insert (MVI)



- 24 hour controlled release vaginal insert
- RCT comparing MVI 100, 150, and 200 mcg
- April – December 2009
- Singleton, cephalic, Bishop ≤ 4
- 374 women randomized, stratified by parity
- MVI removed for active labor, adverse event, or at 24 hours

Misoprostol vaginal insert (MVI)



	100 mcg	150 mcg	200 mcg
Median time drug exposure (h)	14.4	11.3	8.6
Vaginal delivery in 24 h (%)	63.8	66.7	76.0
Time to vaginal delivery (h)	29.1	25.6	19.7*
Time to any delivery (h)	23.4	22.3	17.4*
Cesarean delivery (%)	31.4	30.4	22.9
Pre-delivery oxytocin (%)	70.9	60.0	48.9*
Tachysystole (%)	19.5	25.6	41.2*
Hyperstimulation syndrome (%)	6.8	9.6	12.2
Category II or III fetal tracing	63.6	56.8	54.2

Compared to MVI 100, MVI 200 significantly reduced time to vaginal delivery, but no improvement in vaginal delivery by 24 hrs

EXPEDITE Study



- **EX**ogenous **P**rostaglandin comparing the **E**fficacy and safety of the Misoprostol Vaginal Insert (MVI) 200 mcg to the **D**inoprostone vaginal **I**nsert (DVI) for reducing **T**ime to vaginal delivery in pregnant women at **tE**rm
- Double-blind, randomized, multicenter study to assess the efficacy and safety of up to 24 hours treatment with
 - MVI 200 mcg
 - DVI 10 mg
- Stratification by site and parity (~60% nulliparous)

MVI



- Advantages

- Delivers precise dose in a controlled, sustained manner, → low plasma levels and reduces major side effects
- One administration, decreasing need for frequent exams
- Removal stops exogenous prostaglandin release

- Disadvantages

- Unstable at room temperature
- Cost – ongoing drug development
- Uterine tachysystole/hyperstimulation syndrome

Transcervical Foley Balloon



- > 100 Pubmed citations for RCTs + meta-analyses and systematic reviews
- Mechanism of action
 - Mechanical dilation of the cervix
 - Release of endogenous prostaglandins from the fetal membranes
- Decreased risk of cesarean delivery compared with oxytocin alone
- No difference in the time to delivery or risk of cesarean compared to prostaglandins

Cochrane Database 2001, Issue 4, Article #CD001233
ACOG Practice Bulletin #107, August 2009

Transcervical Foley Balloon



- Advantages

- Decreased risk of tachysystole (with or without fetal heart rate changes)
- Low cost, stable at room temperature
- Reversible

- Disadvantages/Risks

- Premature rupture of membranes, chorioamnionitis, bleeding
- Increased patient discomfort, displacement of the presenting part
- Feasibility of insertion

Foley balloon +/- extraamniotic saline



- RCT comparing Foley alone to Foley + extraamniotic saline infusion
- Singleton, cephalic, intact membranes, Bishop ≤ 6
- Concurrent oxytocin administration
- 181 women randomized
- No significant differences

	Foley	Foley + saline
Induction to delivery interval (h)	13.4	12.6
Delivered within 24 h (%)	87.9	89.7
Cesarean delivery (%)	18.7	27.8

Lin et al. Obstet Gynecol 2007;110:558–65



Induction of Labor

- Balloons and Foley
 - Systematic review with unfavorable cervix showed Foley balloon before oxytocin reduced duration of labor (Gelber, Clin ObGyn 2006)
 - Foley to PGE₂ gel
 - Majority of studies found no difference in duration of induction to delivery interval or cesarean rates
 - Foley with EASI
 - Conflicting results due to methodology

Induction of Labor



- Misoprostol versus dinoprostone for labor induction
 - Compared 119 labor inductions with 200 µg misoprostol with 124 inductions with 10 mg of dinoprostone
 - reduction in time to vaginal delivery and delivery within 24 hours and time from insert application to vaginal delivery
 - Results
 - Vaginal delivery within 24 hours of insert placement occurred in 77.3% of the women in the misoprostol versus 74.2% of those who received dinoprostone ($P=0.654$)
 - Cesarean delivery was performed in 10.1% of those who received misoprostol versus 10.5% of those who received dinoprostone.
 - lower modified Bishop scores, higher body mass index (BMI) and a higher rate of fetal scalp blood testing was seen in the group that received misoprostol
 - European Journal of Obstetrics & Gynecology and Reproductive Biology

Labor Induction and cesarean delivery: The US Perspective



- Ehrental, Obstet Gynecol 116:35-42
 - 7804 nulliparous women with singleton gestation 27-42 weeks of which 39.9% underwent elective induction
 - 40.7% had cervical ripening (Bishop score < 6) with foley bulb
 - Induction increased odds for cesarean
 - Crude OR -2.67, CI 2.40-2.96
 - Adjusted OR -1.93, CI 1.71-2.2
 - BMI \geq 40 kg/m² – AOR 4.51, CI 2.92 -6.96
 - Contribution to cesarean in the cohort 20%

Induction of Labor



- Induction of Labor
 - Does not appear to increase cesarean when compared to expectant management
 - Risk of cesarean lower in randomized trial for those induced in cohort of women at 41 weeks gestation.
 - Caughey AB. Systematic review: elective induction vs expectant management. Ann Intern Med. 2009;151:252
 - Defining Length of time to define failed induction leads to increased cesarean
 - No failed induction until at least 24 hours of induction attempt or 12-18 hours of rupture of membranes
 - ACOG/SMFM consensus : safe prevention of primary cesarean. Obstet Gynecol. 2014;123:693-711

Induction of Labor



- When does active labor begin?
 - Most common indication for cesarean is “arrest of labor” or cephalo-pelvic disproportion
- Friedman’s labor curve based on 500 women published in 1954 and divided up phases of labor into latent and active phases demarcated by cervical dilation of 3 to 4 cm

Induction of Labor



- **Redefining Active Labor**

- 95th centile of progress in labor from 4-5 cm is 6.4 hours and from 5 to 6 cm 3.2 hours*
- Active labor may not begin until 6 cm
 - Waiting for change in active labor for at least 4 hours with adequate contractions and 6 hours without adequate contractions
 - 60% of women ultimately deliver vaginally**

*Zhang J Consortium on Safe labor, Obstet Gynecol 2010;116:1281-1287

Rouse DJ, et al: active phase labor arrest: revisiting the 2 hour minimum. Obstet Gynecol 2001;98:550-554

**Henry DE Perinatal outcomes in setting of active phase arrest of labor. Obstet Gynecol 2008;112:1109-1115

Extreme Obesity and Failed Trial of Labor



- Study 357 women > 275 lbs attempting trial of labor
 - Women with cesarean had greater BMI (51.6 vs 49.9 kg/m²)
 - Women with cesarean more likely to be induced (80.5% vs 57.8%) compared to those having vaginal birth
 - Multivariate analysis
 - Nulliparous women – cervical dilation at time of admission was independent predictor for cesarean
 - Every increase in BMI of 10 kg/m² associated with 3.5 increased odds for cesarean
- Gunatilake et al. AJOG 2013:209:

Risks of Labor Induction



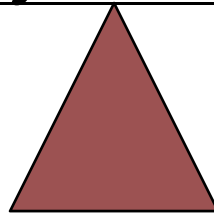
- Tachysystole +/- fetal heart rate changes
- Uterine rupture
- Cord prolapse, cord compression, chorioamnionitis
- Water intoxication
- Failed trial of labor

Summary

What is the appropriate method of Labor induction?



Benefit Efficacy Feasibility Risk



Induction of Labor



The American College of
Obstetricians and Gynecologists



FREQUENTLY ASKED QUESTIONS
FAQ154
LABOR, DELIVERY, AND POSTPARTUM CARE

Labor Induction

- What is labor induction?
- Why is labor induced?
- What is the Bishop score?
- What is "ripening the cervix"?
- How is cervical ripening performed?
- What are prostaglandins?
- What devices are used to ripen and dilate the cervix?
- What is "stripping the membranes?"
- How can rupturing the amniotic sac bring on labor?
- When is amniotomy done?
- What is oxytocin?
- What are the risks associated with labor induction?
- Is labor induction always effective?
- Glossary

What is labor induction?

Labor induction is the use of medications or other methods to bring on (induce) labor.

Why is labor induced?

Labor is induced to stimulate contractions of the **uterus** in an effort to have a vaginal birth. Labor induction may be recommended if the health of the mother or **fetus** is at risk. In special situations, labor is induced for nonmedical reasons such as living far away from the hospital. This is called elective induction. Elective induction should not occur before 39 weeks of pregnancy.

What is the Bishop score?

To prepare for labor and delivery, the **cervix** begins to soften (ripen), thin out, and open. These changes usually start a few weeks before labor begins. Health care providers use the Bishop score to rate the readiness of the cervix for labor. With this scoring system, a number ranging from 0–13 is given to rate the condition of the cervix. A Bishop score of less than 6 means that your cervix may not be ready for labor.

What is "ripening the cervix"?

Ripening the cervix is a process that helps the cervix soften and thin out in preparation for labor. Medications or devices may be used to soften the cervix so it will stretch (dilate) for labor.

How is cervical ripening performed?

Ripening of the cervix can be done with **prostaglandins** or with special devices.

What are prostaglandins?

Prostaglandins are drugs that can be used to ripen the cervix. They are forms of chemicals produced naturally by the body. These drugs can be inserted into the vagina or taken by mouth. Some of these drugs are not used in women who have had a previous **cesarean delivery** or other uterine surgery to avoid increasing the possible risk of uterine rupture (tearing).

What devices are used to ripen and dilate the cervix?

Laminaria (a substance that absorbs water) can be inserted to expand the cervix. A catheter (small tube) with an inflatable balloon on the end also can be inserted to widen the cervix.

What is "stripping the membranes?"

Stripping the membranes is a way to induce labor. The health care provider sweeps a gloved finger over the thin membranes that connect the **amniotic sac** to the wall of your uterus. This action may cause your body to release prostaglandins, which soften the cervix and may cause contractions.

How can rupturing the amniotic sac bring on labor?

Rupturing the amniotic sac can start contractions. It also can make them stronger if they have already begun. The health care provider makes a small hole in the amniotic sac with a special tool. This procedure, called an **amniotomy**, may cause some discomfort.

When is amniotomy done?

Amniotomy is done to start labor when the cervix is dilated and thinned and the baby's head has moved down into the pelvis. Most women go into labor within hours after the amniotic sac breaks (their "water breaks").

What is oxytocin?

Oxytocin is a hormone that causes contractions of the uterus. It can be used to start labor or to speed up labor that began on its own. Contractions usually start in about 30 minutes after oxytocin is given.

What are the risks associated with labor induction?

With some methods, the uterus can be overstimulated, causing it to contract too frequently. Too many contractions may lead to changes in the fetal heart rate, **umbilical cord** problems, and other problems. Other risks of cervical ripening and labor induction include the following:

- Infection in the mother or baby
- Uterine rupture
- Increased risk of cesarean birth
- Fetal death

Medical problems that were present before pregnancy or occurred during pregnancy may contribute to these complications.

Is labor induction always effective?

Sometimes labor induction does not work. A failed attempt at induction may mean that you will need to try another induction or have a cesarean delivery. The chance of having a cesarean delivery is greatly increased for first-time mothers who have labor induction, especially if the cervix is not ready for labor.

Glossary

Amniotic Sac: Fluid-filled sac in the mother's uterus in which the fetus develops.

Amniotomy: Artificial rupture of the amniotic sac.

Cervix: The opening of the uterus at the top of the vagina.

Cesarean Delivery: Delivery of a baby through incisions made in the mother's abdomen and uterus.

Fetus: The developing offspring in the uterus from the ninth week of pregnancy until the end of pregnancy.

Laminaria: A natural or artificial substance inserted in the cervix that expands when it absorbs water.

Oxytocin: A hormone used to help bring on contractions of the uterus.

Prostaglandins: Chemicals that are made by the body that have many effects, including causing the muscle of the uterus to contract, usually causing cramps.

Umbilical Cord: A cord-like structure containing blood vessels that connects the fetus to the placenta.

Uterus: A muscular organ located in the female pelvis that contains and nourishes the developing fetus during pregnancy.

If you have further questions, contact your obstetrician–gynecologist.

FAQ154: Designed as an aid to patients, this document sets forth current information and opinions related to women's health. The information does not dictate an exclusive course of treatment or procedure to be followed and should not be construed as excluding other acceptable methods of practice. Variations, taking into account the needs of the individual patient, resources, and limitations unique to the institution or type of practice, may be appropriate.

Copyright January 2012 by the American College of Obstetricians and Gynecologists. No part of this publication may be reproduced, stored in a retrieval system, posted on the

ACOG Recommendations



- Prostaglandin E analogues are effective for cervical ripening and inducing labor
- Low- or high-dose oxytocin regimens are appropriate for women in whom induction of labor is indicated
- Before 28 weeks of gestation, vaginal misoprostol appears to be the most efficient method of labor induction regardless of Bishop score
- Approximately 25 mcg of misoprostol should be considered as the initial dose for cervical ripening and labor induction. The frequency of administration should not be more than every 3-6 hrs.
- Intravaginal PGE2 for induction of labor in women with premature rupture of membranes appears to be safe and effective.
- The use of misoprostol in women with prior cesarean delivery or major uterine surgery should be avoided in the third trimester.
- The Balloon catheter is a reasonable and effective alternative for cervical ripening and inducing labor