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Patient Management in Obstetrics & Gynecology



Rashida Begum

Foreword
TA Chowdhury

JAYPEE

CONTENTS

1. **Placenta Previa** 1
   Rashida Begum

2. **Abruptio Placenta** 14
   Rashida Begum

3. **Third Stage Complications** 24
   Rashida Begum

4. **Premature Birth** 39
   Rashida Begum

5. **Preterm Premature Rupture Membrane** 53
   Hosne Ara Baby, Rashida Begum

6. **Labor Dystocia** 61
   Rashida Begum

7. **Gestational Diabetes Mellitus** 78
   Rashida Begum

8. **Rhesus Isoimmunization** 89
   Nurun Nahar Khanam, Rashida Begum

9. **Pregnancy-induced Hypertension** 104
   Rashida Begum

10. **Ectopic Pregnancy** 128
    Rashida Begum

11. **Gestational Trophoblastic Diseases** 142
    Farhat Hossain, Rashida Begum

12. **Ovarian Masses** 162
    Rashida Begum, Rehana Parveen

13. **Ovarian Malignancy** 176
    Rehana Parveen, Rashida Begum, Farhat Hossain

14. Cervical Cancer **201**
Farhat Hossain, Rashida Begum

15. Precancerous Disease of Cervix and its Prevention **221**
Farhat Hossain

16. Endometriosis **238**
Rashida Begum

17. Infertility **253**
Rashida Begum

18. Abnormal Uterine Bleeding **286**
Saria Tasnim, Rashida Begum

19. Postmenopausal Bleeding **298**
Saria Tasnim, Farhat Hossain

20. Recurrent Pregnancy Loss **303**
Rashida Begum, Firoza Begum

21. Genitourinary Fistula **318**
Muna Shalima Jahan, Rashida Begum, Sayeba Akhter

Index *339*

CHAPTER 4

Premature Birth

Rashida Begum

INTRODUCTION

Premature birth is defined as birth of the baby before 37 completed weeks before the organs become mature enough for extrauterine survival. It may be due to spontaneous or induced preterm labor. Premature infants are at greater risk for short- and long-term complications, including disabilities, and impediments in growth and development both mentally and physically. Approximately 12.9 million preterm births take place annually worldwide (Martin et al. 2010). It is an important cause of low birth weight and the major cause of death of infants worldwide. Management and prevention of spontaneous preterm labor is very challenging for obstetrician.

Case scenario: *Mrs Rabeya, a 30-year-old lady has come with history of pregnancy for 30 weeks and lower abdominal pain for 5 hours.*

How will you proceed for diagnosis?

Detailed History is to be Taken First

- About pain:
  - Is it rhythmic in nature?
  - Is it progressively increasing in intensity and frequency?
    - Rhythmically progressive increasing pain is characteristics of labor pain.
  - Did she take any pain killer? If so, did it reduce the pain?
    - Labor pain does not subside by any painkiller.
- About gestational age:
  - When was her last menstrual period (LMP)?
  - Was her cycle regular? Chance of miscalculation of date is less in regular cycle.
  - Did she take any contraceptive before this pregnancy?
    - Oral contraceptive pill (OCP) causes post pill amenorrhea. So chance of miscalculation of date is more in case of pregnancy after withdrawal of OCP.
  - Date of positive pregnancy test: It will give clue of gestational age.
  - Any ultrasound done in early weeks: More informative about gestational age.
- Past obstetric history:
  - History of previous abortions: Recurrent abortions are risk factors for premature labor.
  - History of previous premature labor: Risk of premature labor, 7 times more, who has history of previous premature labor.
  - Number of live children.
- History of any medical and obstetrical diseases:
  - Diabetes
  - Hypertension
  - Pregnancy-induced hypertension
  - Antepartum hemorrhage
  - Fever due to any cause
  - Infection in urinary tract and genital tract: Genitourinary tract infection is responsible for 20–40% of all cases of preterm birth
  - Query about fetal movement.
- History of any trauma: Fall or blow in the abdomen may initiate labor pain

Patient is to be examined thoroughly to evaluate.

- Pulse
- Blood pressure (BP)

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- Temperature, anemia
- Per abdominal examination to assess:
  - Gestational age of the fetus by assessing height of the uterus
  - Fetal heart activity
  - Fetal movement
  - Pattern of contraction and its association with pain, if there is any. Number of contraction per 10 minutes and duration of each contraction.
- Per vaginal examination:
  - Cervical effacement
  - Cervical dilatation
  - Any show.

After history taking and performing examination, you elicited that her pregnancy is for 30 weeks according to her LMP and ultrasound done at 7 weeks of pregnancy. Her pulse, temperature, BP is within normal limit. She has got no medical or obstetrical complications. Per abdominal examination revealed corresponding uterine height. Fetal movement and heart sound is normal. Uterine contraction is 3–10 minutes, which is associated with pain and persists for 20 seconds. Per vaginal examination revealed short cervix 50% effaced and 2.5 cm dilated, slight show is present. She is first gravid, so no significant past history is present.

What is your diagnosis?

This is a case of premature labor. This is an early preterm labor as dilatation is less than 3 cm.

How you will evaluate the case for management?

When cervix is 80% effaced or more, but dilatation is less than 3 cm then it is called early preterm labor. Dilatation 3 cm or more is advanced preterm labor. If labor is in early stage 60–65% of women respond to tocolysis and pregnancy can be continued till term or near term.

Test to be done for Assessment

Following tests are to be done for assessment:

- Complete blood count (CBC) and C-reactive protein (CRP) to assess any sign of infection. Elevated white blood cell (WBC) count and CRP will raise the suspicion of intra-amniotic infection. Upper limit of CRP during pregnancy is 0.9 mg/dL with no variation due to gestational age (Watts et al. 1991).
- *Blood sugar*: 2 hours postprandial.
- Transabdominal ultrasonography is to be done to assess the fetal condition, whether there is any congenital anomaly, which may be an initiator of labor pain. Fetal weight is to be measured. Localization of placenta, placental size and any retroplacental bleeding is to be sought for.
- Color Doppler USG to see placental circulation to evaluate placental insufficiency, which may cause intrauterine growth restriction (IUGR), fetal stress and might initiate labor.
- Urine routine, microscopic and culture and sensitivity (C/S)
- High vaginal swab, intracervical swab culture and sensitivity.

Note:

- *Fetal fibronectin (FFN) test:* Presence of FFN in the vaginal secretion is a predictor of premature labor. It is a glycoprotein acts as glue between the fetal membranes and decidua. Any interruption due to uterine contraction or infection releases the fibronectin in cervicovaginal secretion. Value less than 50 ng/mL is negative and ≥ 50 ng/mL is positive. It is a valuable test for predicting preterm birth in both symptomatic and asymptomatic women (Faron et al, 1998) but fallacy is that speculum or digital examination, endovaginal ultrasound examination even sexual intercourse interferes with the accuracy of the test. Here digital examination was done. So 24–48 hours interval is to be given in these situations to get the accurate result.
- *Transvaginal ultrasound (TVS) to measure cervical length:* Though cervical length can be measured by TVS, digital examination also can assess at a time. Cervical effacement 50% corresponds with 0.50 cm cervical length, 75% corresponds with 0.25 cm and 100% is paper-thin.
- Amniocentesis for amniotic fluid C/S and test for fetal lung maturity can be done after initial management.

RELATED INFORMATION

Preterm labor is defined as onset of labor after the age of viability (20–28 weeks depending upon

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definition of different societies), but before 37 completed weeks. There should be documented uterine contractions at least 1/10 minutes, ruptured membranes, or cervical change like cervical length <1 cm or cervical dilatation of more than 2 cm. Uterine contraction without cervical change is known as threatened preterm labor.

Causes of Premature Birth

The exact cause of preterm birth is remained undetermined. In 50% cases, the cause of preterm births is never determined.

Primarily four factors are responsible for premature birth:

1. Activation of myometrium due to any cause resulting premature contraction and premature labor.
2. Premature rupture of the membrane due to premature activation of membrane for any reason leads to premature labor.
3. Premature ripening of the cervix due to cervical incompetence or other causes leads to premature rupture of membrane and labor.
4. Iatrogenic preterm delivery for fetal and maternal indications.

Following conditions are responsible for preterm activation of common pathways of labor:

1. Complications during present pregnancy are:
   A. Maternal:
      a. *Obstetrical complications:*
         - Pregnancy-induced hypertension
         - Antepartum hemorrhage
         - Gestational diabetes mellitus
         - Polyhydramnios
         - Premature rupture of the membrane.

      b. *Uterine defect:*
         - Cervical insufficiency
         - Maldevelopment of the uterus (bicornuate, didelphus, septate and subseptate uterus).

      c. *Medical and surgical illness:*
         - High fever
         - Acute pyelonephritis
         - Recurrent urinary tract infection (UTI)
         - Acute appendicitis
         - Toxoplasmosis
         - Diarrhea
         - Chronic renal disease
         - Hypertension
         - Hepatitis
         - Diabetes mellitus
         - Decompensated heart lesion
         - Severe anemia.

      d. *Genital tract infection:*
         - Bacterial vaginosis
         - Group B streptococcus (GBS)
         - Bacteroids
         - Chlamydia
         - Mycoplasma

   B. Fetal:
      - Multiple pregnancy
      - Congenital malformation
      - Intrauterine fetal death.

   C. Placental: Abnormalities in morphology, implantation and function of the placenta is associated with preterm birth.
      - Placental insufficiency
      - Abnormal placentation: Lack of physiological changes of spiral arteries causing small placenta having extensive infarction, fibrosis and calcification.
      - Anatomic abnormalities of placenta: Battledore placenta, circumvallate placenta and marginal insertion of the umbilical cord are associated with preterm birth.

2. Iatrogenic: When labor is induced due to maternal and obstetrical complications.
3. Maternal other predisposing factors:
   - Low and high body mass index (BMI)
   - Maternal stress
   - Smoking
   - History of recurrent pregnancy loss
   - History of previous premature labor
   - Pregnancy following assisted reproductive technology
   - Low social class.
4. Idiopathic.

Pathogenesis

1. **Premature activation of myometrium:** (Predominant causes endocrine factors and bleeding)
   A. *Maternal and fetal stress:* Both maternal and fetal stress causes premature acti-

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vation of myometrium. Under normal condition the uterus is under the effect of multiple inhibitors of uterine contraction. Progesterone, relaxin, nitric oxide and prostacyclin are the factors responsible to keep the uterus quiescent. As pregnancy advances myometrium becomes more responsive to estrogen and increases the synthesis of gap junctions, oxytocin and prostaglandin receptors and gets prepared for contraction. In certain situations where these phenomenon come in advance causes premature activation of myometrium and uterine contraction.

Maternal stress: It causes release of corticotropin releasing hormone (CRH) from maternal hypothalamus. Maternal CRH releases ACTH from pituitary, which in turn increases the synthesis of cortisol from maternal adrenal gland. This cortisol though inhibits maternal hypothalamic CRH, stimulates placental CRH production. Placenta is a major source of CRH during pregnancy. Placental CRH increases the production of fetal ACTH, which leads to production of fetal cortisol and dehydroepiandrosterone (DHEA). The fetal cortisol stimulates the production of placental CRH and a vicious circle established to produce more fetal DHEA. This DHEA eventually transformed into estriol having properties of multiple activities such as:

- Increment of myometrial gap junctions, density of prostaglandin and oxytocin receptors.
- Increase release of oxytocin from hypothalamus and prostaglandins from decidua. Prostaglandin cause cervical ripening and stimulates myometrial contraction and initiates onset of labor.

Fetal stress: It is due to sickness either by maternal disease such as pre-eclampsia, eclampsia, diabetes, anemia or by fetal congenital anomaly, metabolic and infectious disease. In these situations labor starts with the fetal production of CRH as a response to stress.

B. *Abnormal placentation:* Abnormal placental implantation decreases uteroplacental blood flow, which in turn causes fetal stress that in turn causes production of CRH for initiation of contraction.
C. *Bleeding in choriodecidual interface:* Separation of placenta and abruptio placenta causing bleeding in choriodecidual interface, thrombin release and activation of labor pain.
D. *Overdistention of the uterus:* Overdistention of the uterus induce myometrial contractility by possible early activation of CRH and mechanical force might activates protein kinase and increased expression of guanine nucleotide binding protein (G proteins).
E. *Uterine abnormalities:* Septate and bicornuate uterus is responsible for preterm labor. Most possible mechanism is initiation of myometrial activity.

2. **Premature activation of membranes:** (Predominant cause is infection)

Premature activation of the membrane causes premature rupture of the membrane (PROM). PROM may occur due to:

A. Reduction of membrane strength
B. Increased intrauterine pressure or both.

A. Reduction of membrane strength: The amniotic membranes are a connective tissue structure and their tensile strength depends on the synthesis, degradation and quality of their collagen.

Causes of decreased tensile strength are:

i. *Abnormal collagen structure:*
   - Connective tissue disorder
   - Tobacco smoking
   - Copper deficiency
   - Ascorbic acid deficiency.

   Degradation of collagen occurs due to sequential activity of several matrix metalloproteinases.

ii. *Infection:* Infection by ascending organism or colonial organism may cause alteration in the tensile strength of the fetal membranes. Microorganisms produce proteolytic enzymes that can weaken the fetal membranes (Mc Gregor and Frence, 1977).

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Another mechanism is host inflammatory response includes the production of cytokines that stimulates the production of prostaglandins by amnion and chorion. Prostaglandins stimulate uterine contractility and cause increased collagen degradation. In addition corticoids produced in response to stress may facilitate rupture of the membrane.

iii. *Genetic:* Genetic factors may responsible for reduced tensile strength for some races and which might explain the higher incidence of PROM in African American population.

B. Increased intrauterine pressure: The possibility of PROM by increased intrauterine pressure is less as patient can tolerate intrauterine pressure, secondary to polyhydramnios or to uterine contraction for long time without rupture:

3. **Premature ripening of the cervix in cervical insufficiency:** Predominant cause is anatomic or functional abnormalities of the cervix. Cervical insufficiency may be congenital or acquired.
   - *Congenital:*
     - Defect in embryologic development of mullerian duct
     - Defect in collagen composition in Ehlers Danlos syndrome and Marfan's syndrome.
   - *Acquired:*
     - Forceful mechanical cervical dilatation
     - Cervical trauma during childbirth
     - Cervical conization or loop electrocautery excision procedure (LEEP) for the treatment of cervical intraepithelial neoplasia.

4. **Iatrogenic preterm delivery:** Due to maternal and fetal complications. One third of preterm births are due to maternal and fetal indications.

Mrs Rabeya's CBC is normal, CRP is negative, blood sugar is normal, ultrasonography shows gestational age is 30 weeks and normal fetus, liquor is adequate, placental size and localization is normal. According to menstrual history and early ultrasonogram, she is a case of 30 weeks pregnancy.

How will you manage the case?

Management depends upon the status of labor and maternal, and fetal condition. Here, it is a case of early preterm labor and there is no maternal infection or any fetal problem. So, pregnancy can be continued with follow-up.

Line of Management

Patient must be hospitalized.

A. *Use of tocolysis*
   Most of the women in their early preterm labor respond well to oral tocolysis:
   - *Drug and dose:* Nifedipine 30 mg stat followed by 20 mg every 6 hours is to be given to control uterine contraction. Drug should be continued till complete subsidence of contraction, but in some cases continuous administration is necessary to prevent further contraction.
   - *Mode of action:* It blocks uterine contraction by blocking calcium (Ca) channel (King et al. 2003). The drug is tolerable and only headache can occur in some cases and has no fetal effects.

B. *Steroids:* It is to be given to accelerate fetal lung maturity and to prevent neonatal respiratory distress syndrome.
   - *Drug and dose:* Injection betamethasone 12 mg intramuscularly in two consecutive doses, 24 hours apart is to be given. Though effect of glucocorticoids on the fetal lungs does not last more than 1 week, no booster or repeat dose is indicated, if woman continue pregnancy more than 7 days to avoid significant fetal and neonatal side effects.
     Alternatively injection dexamethasone 6 mg IM/IV every 12 hours for four doses can be given. In Bangladesh betamethasone is not available and dexamethasone is the drug of choice.

C. *Antibiotics:* To prevent infection, prophylactic antibiotics are to be given. If there is any growth in the HVS specific antibiotics are to be given after getting the result of culture and sensitivity.

D. *Expectant management:* Once the contraction subsides the woman can be managed on an outpatient basis provided FFN is negative. The woman should stop working and limit her activities at home and should have weekly antenatal check up.

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If FNF is positive, the risk of preterm delivery is substantial. So pregnancy is to be continued with bed rest in hospital. FNF testing is to be repeated every 2–3 weeks and if become negative then outpatient treatment can be allowed.

What other tocolytic drugs can be used to stop uterine contraction?

A number of tocolytic drugs are available for controlling premature uterine contraction.

Magnesium Sulfate

Mechanism of action: Calcium channel blocker and prevent myometrial contraction by preventing activity of calcium.

Dose and duration: About 4 g IV bolus over 20 minutes, followed by 1 g/hour maintenance dose for 24 hours or until delivery whichever occurred first (Crowther et al. 2003).

Side effects: Most frequent maternal side effects are flushing, nausea, vomiting, headache, pulmonary congestion, respiratory depression, hypothermia and neuromuscular toxicity. Fetal side effects are intraventricular hemorrhage and central nervous system (CNS) depression when high dose is needed to control contraction. A RCT shown 32% neonatal adverse effect with magnesium sulfate in comparison to 19% with placebo (Mittendorff et al. 2002).

Efficacy: According to Cochrane systematic review it is an ineffective tocolytic agent (Crowther et al. 2002; Cox et al. 1990).

Recommendation: Considering its poor efficacy and adverse effect to mother and fetus, it is recommended to abandoning magnesium sulfate as tocolytic therapy.

Beta-adrenergic Agents

Beta-adrenergic agents are β receptor blocker, which stop uterine contraction by inhibiting β receptors. The intravenous beta-adrenergic has the powerful tocolytic effect in established preterm labor. Commonly two forms are available for use:

1. Terbutaline.
2. Ritodrine.

Terbutaline

Dose and duration: About 5 mg of terbutaline is dissolved in 500 mL of Ringer's lactate solution and started at 5 μg/minute. It is to be increased by 5 μg/minute every 10–20 minutes until a dose adequate to stop contraction or till development of any side effects. Maximum dose is 30 μg/minute.

Side effects: Pulmonary edema, increased glucose level, lowering serum potassium level and tachyphylaxis in asthmatic patients who already are taking beta-adrenergic agents.

Contraindications of use: Include the following:

- Cardiac disease
- Hyperthyroidism
- Sickle-cell disease
- Uncontrolled insulin-dependent diabetes
- Chorioamnionitis
- Eclampsia and severe pre-eclampsia.

Retordine

Dose and duration: 100 μg/minute and increased by 50 μg/minute until the contractions stop or toxicity develops. Maximum dose is 350 μg/minute.

Side effect and contraindications are same as terbutaline.

Indomethacin

Dose and duration: 25–30 mg orally is starting dose followed by 25 mg orally every 4–6 hours and continued for 3 days.

Side effects: Mostly fetal side effects and these are premature closer of ductus arteriosus, necrotizing enterocolitis and grade III and IV intraventricular hemorrhage, pulmonary hypertension, persistent open ductus and reduced urinary output. Effects are rapidly reversible after discontinuing the drug.

The sensitivity of the fetal ductus increased with gestational age and that is why this drug is not used after 32 weeks of gestation.

Nitroglycerine

Nitroglycerine is a powerful smooth muscle relaxant and can prevent uterine contraction rapidly.

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Dose and duration: 100 µg IV bolus followed by a continuous infusion at a rate of 1 µg/kg/minute.

Side effects: Hypotension and headache. This drug is not commonly used.

Diazoxide

Diazoxide inhibits smooth muscle activity, hence uterine contractility.

Dose and duration: It can be given in bolus doses or as infusion. Bolus is given as 50–100 mg IV every 5 minutes till the contractions stop. Infusion is given as one ample dissolved in 250 mL normal saline and administered within 30 minutes. Contraction usually stops within 15 minutes and duration of action varies from patient to patient. In many cases one single dose stops uterine contraction indefinitely. Second dose, if needed can be used, but not beyond that.

Side effects: Most commonly maternal side effects and these are hypotension, tachycardia, hyperglycemia and decreased uteroplacental circulation secondary to hypotension. Fetal side effects are hyperglycemia secondary to maternal hyperglycemia and fetal distress secondary to reduced uteroplacental circulation. To avoid hypotension, administration of 500–1,000 mL Ringer's lactate or normal saline is desirable to expand maternal intravascular volume before diazoxide therapy. This drug is also not commonly used.

Suppose Mrs Rabeya's per vaginal findings at admission is short cervix with 80% effacement and cervix is 4 cm dilated instead of 50% effacement and 2.5 cm dilatation.

How will you manage her?

This is an advanced stage of preterm labor. In certain situations of advanced preterm labor such as infection and in placental insufficiency premature labor is protective mechanism for fetus. So, steps are to be taken to assess whether patient need to be delivered or patient might get benefit from prolongation of pregnancy by giving tocolysis and steroids.

As there is no signs of amnionitis prolongation of pregnancy can be tried with tocolysis and steroid. But, cervical dilatation is 4 cm here, which is an indicator of inevitable delivery, because more than 50% of patients deliver within 48 hours despite aggressive tocolysis if cervical dilatation is 4 cm or more. (Amon et al. 2000). So at least to administer the doses of steroids labor is to be delayed by applying tocolysis.

Note: Tocolysis and steroid is to be given as described before. Patient is to be monitored every 2 hours to avoid the consequence of high-dose tocolysis. If maternal pulse is >120/m, blood pressure is <100/60 mm Hg oxygen saturation is 95% and temperature raised treatment is to be discontinued.

Suppose with advanced labor Mrs Rabeya has foul smelling discharge, both maternal and fetal heart rate is increased, temperature is raised to 100.6°F, C-reactive protein is 5 mg/dL, leucocyte count is 15000/mm^3.

How will you manage her? Would you like to use tocolysis to halt the labor process?

No these are clearly the signs of amnionitis. So labor is to be allowed and measures are to be taken for quick delivery.

Broad-spectrum intravenous antibiotics are to be started in the form of ceftriaxone 2 g 12 hourly and clindamycin 900 mg 8 hourly and continued till the patient remains afebrile for 24 hours.

In some cases of amnionitis, there may be abnormal uterine action without further progress in cervical dilatation and descent of the head. If such occurs cesarean section is to be done.

RELATED INFORMATION

Role of cervical length measurement in predicting preterm labor.

Cervical length measurement using the three-dimensional endovaginal, ultrasound is precise and can be predictor of premature labor (Bega et al. 2000). The cervical length slowly decreases from a mean of 4 cm at 16 weeks to 3 cm at 40 weeks:

- Cervical length up to 2.5 cm is not risky for preterm delivery
- If cervical length is less than 2.5 cm, but >1.5 cm risk of preterm delivery is about 35%. If labor is threatened FNF and CRP should be done

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  - If CRP positive, it indicates intrauterine infection and pregnancy is to be terminated.
  - If CRP negative, FNF positive patient is to be treated by tocolysis and steroids for 48–72 hours to get the benefit of steroids
  - If CRP and FNF are negative chance of delivery within 2–3 weeks is minimum and patient can be managed on outpatient basis, so long FNF is negative with weekly FNF testing.
- If cervical length is 1.5 cm or less the risk of preterm delivery is substantial and 50% will deliver before 32 weeks and 90% will deliver before 34 weeks of gestation (Hassan et al. 2001). All patients with cervical length 1.5 or less should be managed in the hospital. If FNF is negative delivery might occur within 2–3 weeks of testing. In these cases CRP detection is indicated. If CRP present it indicates intrauterine infection, where termination is indicated. If CRP is negative pregnancy is to be continued with tocolytic agents, steroids and antibiotics.
- If cervical length is 1.5 cm or less and FNF is positive chance of delivery is within 1–2 weeks of testing. Steroid is to be given. Tocolysis will not be effective and it only can be given to get the time for effect of steroids.

Case scenario: *Mrs Saleha a second gravid woman is carrying for 28 weeks. On examination and routine investigation she is found apparently normal. But her first pregnancy was a premature delivery on 30 weeks gestation and baby died in NICU on 4th postnatal day. She had no history of any cervical operations. Labor was sudden without any significant labor pain. This time she is worried about this pregnancy.*

How will you manage her?

This might be a case of cervical incompetency or insufficiency due to inherent weakness of the cervix.

Diagnosis is to be made by assessing cervical length and funneling of the cervix by ultrasonography. If cervical length is less than 2.5 cm and there is significant funneling, it indicates cervical insufficiency.

Cervical cerclage operation is to be done on the basis of cervical shortening and history of previous premature labor.

If cervical length is >2.5 cm then only on the ground of previous one premature labor cervical cerclage operation is not indicated.

RELATED INFORMATION

What is Cervical Insufficiency?

Inability of the cervix to retain a pregnancy in the absence of uterine contractions is known as cervical incompetence or cervical insufficiency. It causes painless dilatation of the cervix.

Predisposing and Risk Factors for Preterm Labor

- Congenital abnormality of the connective tissue (Marfan's syndrome, Ehlers-Danlos syndrome)
- Anatomical abnormalities of the uterus (Bicornual or septate uterus)
- Deep cervical laceration from previous childbirth or D&C
- Cervical treatment for abnormal cytology (Freezing, conization, LEEP and trachelorrhaphy)
- Short cervix <1 cm found in initial prenatal visit
- History of previous short labor
- History of two or more second trimester loss
- In 50% cases associated with intra-amniotic infection/inflammation (Romero et al. 1992).

Pathophysiology of Cervical Insufficiency

Cervix constitutes both muscular tissue and connective tissue with preponderance of connective tissue (90%) and capacity to retain the product of conception depends on the content of the connective tissue. Due to this connective tissue component cervix can withstand increased intrauterine pressure. During pregnancy, due to influence of estrogen and prostaglandins cervical connective tissue undergoes significant changes. Due to synthesis of collagenases, hyaluronic acid and infiltration of inflammatory cells such as neutrophil and macrophages, there is degradation of collagen, disruption of collagen structure, increased synthesis of proinflammatory cytokines and increased accumulation of water. As a result cervix becomes

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soft, easy to stretch, becomes short progressively and starts to dilate in response to uterine contractions. Gradually intrauterine pressure threshold decreased due to cervical ripening.

In certain situations, where significant amount of cervical tissue lost as a consequence of a surgical procedure or who have an abnormal composition of connective tissue, cervical threshold for intrauterine pressure decreased. As a result cervical canal opens up even without uterine contraction.

Presentations

- Painless dilatation of the cervix
- Pelvic or rectal pressure
- No uterine contraction
- Increased mucus (mucoid and curdy white) vaginal discharge: This is an important information as the cervical mucus comes out due to opening up of cervical canal.
- Digital or speculum examination reveals a cervix dilated 2 cm or more, effacement greater than or equal to 80% and bag of waters visible through the external os or protruding into the vagina (in acute cases).

Diagnosis

- *By history:* In most of the cases diagnosis is made on a historical basis and called historical diagnosis:
  - History of painless cervical dilatation
  - History of ruptured membrane without contraction
  - History of congenital abnormality, cervical laceration and trauma.
- *By ultrasonogram:* It is called sonographic diagnosis. Findings are:
  - Shortening of the cervical length
  - Funneling of the cervical canal ('Y' shaped and finally 'U' shaped instead of T)
  - Protruding of amniotic sac into cervical canal.

  Note: Serial sonographic surveillance is needed, when there is history of second trimester pregnancy loss or preterm birth.
- *Prepregnancy techniques:*
  - Hysterography
  - Cervical resistance indices
  - Insertion of cervical dilator.

Case scenario: *Mrs Rahela is a primigravid woman has come to you at 32 weeks of pregnancy with the complaints of thick curdy white vaginal discharge for 2 days. On speculum examination you found that cervix is dilated about 2–2.5 cm and membrane is protruding through the external cervical os.*

How will you manage the case?

This is an acute presentation of cervical insufficiency. Cervical cerclage (*Rescue cerclage*) operation in an emergency basis is to be done. Curdy white discharge is indicator of opening of cervical canal.

As in 50% cases, it is associated with intra-amniotic infection it is to be excluded first before cerclage operation. Cerclage operation is contraindicated in case of intra-amniotic infection.

So, CRP and WBC count are to be done. If WBC is ≥14,000/mm^3 and CRP >3 mg/dL, it indicates infection and cervical cerclage will not help.

Note: Cervical cerclage is also not applicable when cervical dilatation is >4 cm.

RELATED INFORMATION

Cervical Cerclage

Cervical cerclage is a suture around the cervix, which is commonly performed as prophylactic intervention in cervical insufficiency. Cerclage may provide a degree of structural support to a weak cervix, maintains the cervical length and endocervical mucus plug. There are a lots of controversies about indications, timing and type of cerclage operation.

Indications of Cerclage

History Indicated Cerclage

Cervical cerclage is given based on previous obstetric and gynecological history, which are the risk factors for cervical insufficiency and previous preterm birth. It is given as prophylactic measure in asymptomatic women electively at 12–14 weeks of gestation. Followings are the conditions for history indicated cerclage.

- History of two or more previous preterm birth or second trimester loss.
- One or two losses with other risk factor like short cervix ≤2.5 cm.

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Note:
Following conditions individually are not an indication of cervical cerclage

- Previous painless dilatation of the cervix
- History of one or two losses without short cervix
- History of previous premature ruptured membrane
- Risk factors such as cervical surgery, cervical trauma
- Multiple pregnancy
- Uterine anomaly

Ultrasound Indicated Cerclage

Cerclage is given prophylactically in an asymptomatic woman on the basis of ultrasonographically diagnosed risk factors between 14–24 weeks of gestation. Risk factors are a) short cervix ≤2.5 cm along with history of previous preterm birth or midtrimester loss b) funneling with short cervix.

Note:

- Short cervix alone is not an indication for cerclage
- Funneling alone is not an indication for cerclage.

Rescue Cerclage

When cerclage is given as an emergency basis by senior obstetrician in case of premature dilatation of the cervix >4 cm with exposed fetal membrane in the vagina. Dilatation of cervix can be diagnosed by ultrasonography or speculum examination in women with symptoms such as vaginal discharge, bleeding and sensation of pressure. Study shows that following rescue cerclage average prolongation of pregnancy was 7 weeks 1 day and average neonatal survival was more than 70% (Cockwell and Smith, 2005). It should be individualized with assessing risk benefit ratio.

Success of rescue cerclage depends on the following conditions:

- Proper placement of the patient and proper exposure
- Good light
- Good anesthesia, regional is preferable, general anesthesia increases intra-abdominal pressure
- Avoidance of contact of the exposed membranes with chemical irritants.

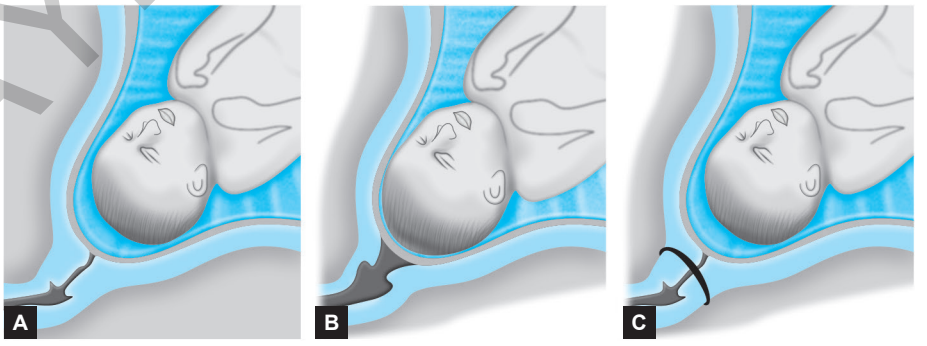
Types of Cerclage Operation

McDonald Suture (Transvaginal)

The procedure is done transvaginally and a purse-string suture is given at the level of cervicovaginal junction without mobilization of the bladder (McDonald, 1957) **(Figs 4.1A to C)**.

Shirodkar Suture (High Transvaginal)

It is also done vaginally and a purse-string suture is given at a higher level than McDonald suture above the level of cardinal ligament after mobilization of the bladder (Shirodkar, 1955).



Figs 4.1A to C (A) Competent cervix; (B) Incompetent cervix and; (C) McDonald suture

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Occlusion Cerclage

Occlusion of the external os by placing continuous non-absorbable suture in an intention to retain the cervical mucus plug (Secher et al. 2007).

Espinosa-flores Operation

It is done as rescue cerclage where membrane is visualized. In this operation after displacing the bag of water (BOW) by inflated balloon (30 mL) of Foley catheter anterior and posterior lips are grasped with a ring forceps. Cardinal ligament is exposed and suture is given by Mersaline band at this level from posterior to anterior then anterior to posterior in other side of the cervix. The two ends tied over the posterior aspect of the cervix. It is simple and effective, and can be used for both prophylactic and rescue cerclage.

Wurm Operation

It is also done as rescue operation where cervix is dilated and BOW is visible, cervical effacement is >80% and cervical dilatation is 3 cm or more. In this operation BOW is displaced inside by using Foley catheter balloon (30 mL), the lips of cervix are grasped with the ring forceps. Two 'U' suture are placed by prolene, one is vertically from 2 to 12 o'clock position and other is transversely from 3 to 9 o'clock position through whole thickness of the cervix.

Transabdominal Cerclage

Suture is given via laparotomy or laparoscopy at the level of cervicoisthmic junction. Laparotomy is preferable. It is usually done in following cases:

- Severe trauma to the cervix like.
  - Deep lacerations following a difficult vaginal delivery
  - Extensive conization
  - Repeated LEEP for treatment of carcinoma cervix (Davis et al. 2000; Zaveri et al. 2002).
- Repeated second trimester loss
- Failed vaginal cerclage.

Timing of Cerclage

- It can be given at prepregnancy period where in anticipated future pregnancy
- During pregnancy between 12 and 14 weeks of gestation, when uterus come out of the pelvic cavity.

Contraindications of Cerclage Operation

- Active premature labor
- Clinical evidence of chorioamnionitis
- Vaginal bleeding
- PPROM
- Fetal compromise
- Fetal anomaly
- Fetal death.

Precaution to be Taken before and after Cerclage Operation

- Ultrasonogram to see fetal viability and to exclude fetal anomaly whenever applicable.
- In suspected cases amniocentesis to exclude both aneuploidy and intra-amniotic infection. Amniocentesis does not increase the risk of preterm delivery.
- Routine perioperative antibiotic therapy is not recommended, it depends on clinicians choice. But in case of positive culture of vaginal swab antibiotic therapy is to be given.
- Prophylactic tocolysis is not recommended as there is no evidence to support the use of this. A retrospective study shows no difference in premature labor before 35 weeks with or without prophylactic tocolysis (Visintine et al. 2008).
- Routine bed rest and avoidance of coitus is not recommended as there is no evidence of risk of preterm delivery, if those are allowed or not. Decision should be individualized according to clinical manifestation.
- Progesterone supplement has not any effect on premature labor before 35 weeks of gestation (Owen et al. 2009). So routine use of progesterone is not recommended to prevent premature labor.

Patients should be informed about potential risk of cerclage operation.

- Maternal pyrexia may develop, but chance of chorioamnionitis is least.
- It is not associated with induction of labor, preterm delivery or cesarean section.

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- There is a small chance of bladder damage, cervical trauma, membrane rupture and bleeding during surgery.
- Suture must be removed immediately, if labor starts as there is risk of cervical laceration and trauma.
- Removal of Shirodker suture may need anesthesia.
- Elective transvaginal cerclage can be done as a day case basis.
- Those who need rescue cerclage or cerclage for short cervix have risk of PPROM, preterm delivery or infection may benefit from hospital stay at least for 24 hours.
- Abdominal cerclage by laparotomy needs to stay at hospital at least for 48 hours.

Time of Removal of Cerclage Suture

- At any time, if patient starts pain and bleeding to minimize potential trauma to the cervix and to allow quick expulsion to stop bleeding.
- If vaginal delivery planned, suture should be removed between 36 and 37 weeks of gestation as any time labor may start and there is potential risk of cervical injury.
- In case of elective cesarean section suture is to be removed at that time.
- All women with transabdominal suture require cesarean section and suture may be left in place following delivery.
- In emergency situation, where cesarean section is not applicable, abdominal suture is to be removed by colpotomy.

Case scenario: *Mrs Ayesa has undergone Shirodker suture due to historical indication during 30 weeks of pregnancy. After two weeks at 32 weeks pregnancy she suddenly developed PPROM. There is no sign of maternal infection and fetus is normal.*

How will you manage her?

Cerclage is to be removed but a latency period can be taken for 48 hours as there is no sign of infection and fetal condition is good to get the benefit of steroid. A course of prophylactic steroid is to be given for lung maturation.

Suppose along with PPROM you found that she has tachycardia, her CRP is >4.5 mg/dL and WBC is 15,000/c mm.

How will you manage her?

There is increased risk of maternal and neonatal sepsis, if suture removal is delayed. So, it should be removed without delay.

Suppose she developed PPROM at 34 weeks and 5 days. She has no sign of infection and fetus is in good condition.

How will you manage her?

Here fetus reached to a stage where extrauterine survival rate is good. Delayed suture removal is unlikely to be advantageous in this situation. So suture should be removed without delay and no need of giving prophylactic steroids. Labor is to be allowed with prophylactic antibiotic coverage.

Case scenario: *Mrs Rumana has history of three consecutive pregnancy losses between 18–30 weeks. Every time delivery occurred within very short time of starting pain. She again gets pregnant and has come to you for advice. Now her pregnancy is 8 weeks. She is nondiabetic, no-PCOS and has no other medical disorder. All three labors were spontaneous, sudden and with short period of labor pain.*

How will you manage her?

This might be a case of cervical insufficiency. To test cervical insufficiency it is ideal to test cervical length as early as 18 weeks of pregnancy. FNF test is not useful before 22 weeks of pregnancy. So, at the 8 weeks of pregnancy no need of testing anything for cervical insufficiency. But she had history of 3 mid- and last-trimester loss. So she must be treated for prevention.

Preventive Measures

Following preventive measures are to be taken:

1. **Modification of working pattern:**
   - Works standing up on feet most of the time are to be avoided
   - Vibrating works and which need to move around are to be avoided
   - Strenuous activities should be avoided
   - Complete bed rest should be discouraged.
2. **Coitus should be prohibited:** Though one study showed no association between coitus and preterm labor (Sayle et al. 2001), one very old study found significant amniotic fluid infection with intact membranes in women who had coitus one or more per week than

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