

# OBSTETRICS AND GYNECOLOGY

## (Tutorial 5) PUERPERIUM & PUERPERAL SEPSIS

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**Doctor's note** **Team's note** Not important **Important** **431 teamwork**

# Puerperium and Puerperal Sepsis

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## Definition of Puerperium

Puerperium is defined as the time from the delivery of the placenta through the first few weeks after the delivery. This period is usually considered to be 6 weeks in duration. By 6 weeks after delivery, most of the changes of pregnancy, labor, and delivery have resolved and the body has reverted to the nonpregnant state <sup>(1)</sup>. The Pelvic organs return to their previous state, and endocrine influence of the placenta is removed. The changes are rapid in the first few weeks and become slower thereafter.

## Anatomical and Physiological Changes after Pregnancy

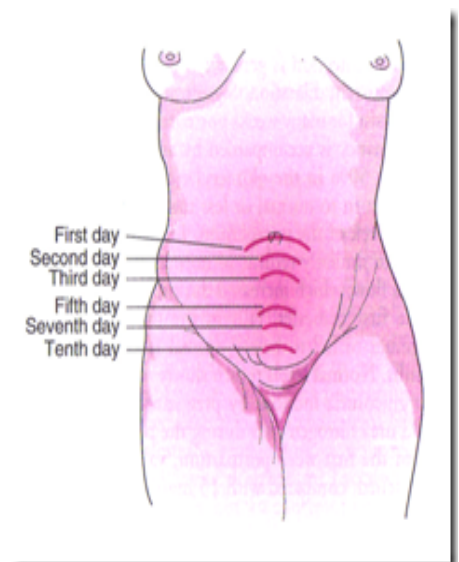
### 1. The Pelvic Organs:

#### 1. Uterine involution

- After delivery: uterine fundus palpable at level of umbilicus, **but it should not be tender.**
- 14 10 days later, it disappears behind the symphysis pubis.
- This process is aided by oxytocin during breastfeeding.
- **Delay in involution caused by infection or retained products of placenta.**
- The uterus rapidly decreases in weight from 1000 g at delivery to 100 to 200 g at about 3 weeks postpartum through the process of tissue catabolism <sup>(1)</sup>.
- In the first few days, the uterine discharge (**lochia**) appears red (**lochia rubra**), owing to the presence of erythrocytes. After 3 to 4 days, the lochia becomes paler (**lochia serosa**), and by the 10<sup>th</sup> day, it assumes a white or yellow-white color (**lochia alba**). Foul smelling lochia suggests endometritis <sup>(1)</sup>.

#### 2. Cervix:

- After delivery: flaccid and curtain like.
- It returns to its original form and elasticity within few days.
- External os dilated to one finger.
- Internal os is closed to less than one finger by the 2nd week of the puerperium.



### 3. **Vagina:**

- 1st few days of puerperium, vaginal wall is smooth, soft and edematous.
- Slight distention return to normal capacity in few days.
- Episiotomy and tears of vagina and perineum heal well.
- Healing is impaired in the presence of hematoma or infection.  
Episiotomy must be checked in the 2nd day after delivery to check if there are signs of hematoma.

### 4. **Perineum (2):**

- The perineum has been stretched and traumatized, and sometimes torn or cut, during the process of labor and delivery.
- The swollen and engorged vulva rapidly resolves within 1-2 weeks.
- Most of the muscle tone is regained by 6 weeks and continue to improve over the following few months, it may not return to normal depending on the extent of injury.

## 2. **Cardiovascular System**

- There is a marked increase in peripheral vascular resistance due to the removal of the low-pressure uteroplacental circulatory shunt <sup>(1)</sup>.
- The cardiac output and plasma volume gradually return to normal during the first two weeks of puerperium.
- Plasma volume decreases; blood clotting factors and platelet count rise after delivery.
- Fibrinolytic activity, which occurs during pregnancy, is reversed within 30 minute of placental delivery.

## 3. **Reproductive System**

- In women who don't nurse, menstrual flow returns usually by 6 to 8 weeks, although this is highly variable <sup>(1)</sup>.
- The delay in the return to normal ovarian function in the lactating mother is caused by the suppression of ovulation due to elevation in prolactin <sup>(2)</sup>.
- Although ovulation may not occur for several months, particularly in nursing mothers, contraceptive counseling and use should be emphasized to avoid any undesired pregnancy <sup>(1)</sup>.
- The mother who doesn't breastfeed may ovulate as early as 27 days after delivery, whereas with breastfeeding the mother might have a longer period of amenorrhea and anovulation <sup>(2)</sup>.

## 4. Bladder and Urethra

- Hydroureter and calyceal dilatation of pregnancy is much less evident within 2 to 3 weeks.
- Complete return to normal within 6 to 8 weeks.
- Diuresis during the first day after delivery.

## 5. Breastfeeding

### Advantages of Breastfeeding <sup>(1)</sup>:

1. It contains all the necessary nutrients for the newborn.
2. Accelerate the involution of the uterus; by the release of oxytocin, which is stimulated by suckling, thereby causing increased uterine contractions.
3. There are immunologic advantages for the baby. Various types of maternal antibodies are present in the breast milk, mainly IgA, which provide protection to the infant's gut by preventing attachment of harmful bacteria (*e.g. Escherichia Coli*) to cells in the mucosal surface.

### Hormonal Influence on Lactation <sup>(1)</sup>:

1. The drop in estrogen level after delivery initiates lactation.
2. Suckling stimulates the release of prolactin and oxytocin.
3. Colostrum is secreted by the second day after delivery; it contains protein, fat, minerals, and secretory IgA.
4. The colostrum is replaced by milk after about 3 to 6 days; its contents vary depending on the nutritional status of the mother. In general, the major components are proteins, lactose, water, and fat.

## Abnormal Puerperium

### 1. Hemorrhage

#### Definition <sup>(2)</sup>:

Postpartum hemorrhage (PPH) is defined as excessive blood loss during or after the third stage of labor. **The average blood loss is 500 mL at vaginal delivery and 1000 mL at cesarean delivery.**

#### Types of Postpartum Hemorrhage <sup>(3)</sup>:

**Primary PPH** is the loss of more than 500 ml of blood from the genital tract **in the first 24 hours after the delivery.** **Secondary PPH** is excessive blood loss from the genital tract between 24 hours and 6 weeks postpartum.

Table 1 **Postpartum haemorrhage**

Type	Timescale	Presentation	Predisposing factors
Primary haemorrhage	In the first 24 hours	Fresh bleeding, often severely heavy. Uterus may be soft and poorly contracted with the fundus still above the umbilicus	Uterine atony (90%) Trauma, vaginal or cervical lacerations, labial tears (Fig. 1) Coagulation disorders
Secondary haemorrhage	After 24 hours and up to 6 weeks	May be fresh loss or old, altered blood, often malodorous. The uterus may feel soft, poorly contracted and possibly tender, with the cervical os open	Retained products of conception Endometritis Dysfunctional bleeding

### Management of Postpartum Hemorrhage (2):

1. Complete blood count (**CBC**) and prothrombin time/activated partial thromboplastin time (**PT/aPTT**) to exclude resulting anemia or coagulopathy.
2. Oxygen delivery, bimanual massage, removal of any blood clots from the uterus, emptying of the bladder, and the routine administration of dilute oxytocin infusion (10-40 U in 1000 mL of lactated Ringer solution [LRS] or isotonic sodium chloride solution). If retained products of conception are noted, perform manual removal or uterine curettage.
3. If oxytocin is ineffective, carboprost in an intramuscularly administered dose of 0.25 mg can be administered every 15 minutes.
4. Methylergonovine and Misoprostol are another alternatives.

Doctor's notes:

**Risk factors for PPH:** grand multipara, atonic uterus, anemia, retained products of conception, laceration, DIC, and uterine inversion.

**Risk factors for rupture uterus:** instrumental delivery and previous CS.

## 2. Infections

**Puerperal Pyrexia:** A puerperal pyrexia is defined as any febrile illness where the temperature is 38°C or higher during the first 14 days postpartum <sup>(3)</sup>. **Causes Of Puerperal pyrexia:**

1. **Urinary tract infection** associated with flank tenderness.
2. **Genital tract infection**
3. **Pelvic / intra-uterine infection**

Endometritis is the most common cause of postpartum fever, and it is associated with uterine tenderness.

4. Breast infection
5. Deep vein thrombosis (DVT)
6. Respiratory infection
7. Other non-obstetrics causes
8. Surgical wounds e.g. C.S.

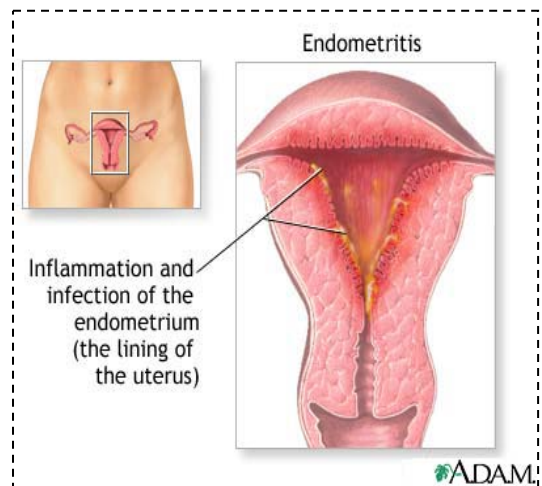
#### **DX / Investigation:**

- Full Clinical Examination.
- MSU "A midstream specimen of urine".
- Cervical and HVS "High vaginal swab"
- Sputum C/S (if possible).
- **Blood culture.**

#### **Management:**

After investigation is sent for.

- Start antibiotics if situation warrants



- Urinary tract infections are the commonest cause of puerperal pyrexia.
- Endometritis is more frequent following caesarean section than after vaginal delivery.

#### **Mastitis:**

##### **i. Acute Inflammatory Mastitis**

- Due to failure of milk withdrawal from a lobule
- Rx → breast feeding, cold compress, antibiotics if no improvement within 24 hrs.

##### **ii. Infective Mastitis**

- May be due to staph. Aureus
- Rx → Antibiotics according to sensitivity

##### **iii. Breast Abscess Formation**

- Rare but preventable
- Rx → Surgical drainage if established – antibiotics.

**Additional** <sup>(3)</sup>: Breast engorgement occurs in the first 2-3 days and can be associated with mild pyrexia. This should improve spontaneously within 24-48 hours, particularly if breastfeeding is encouraged. Mastitis is clinically obvious and prompt treatment should avoid abscess formation. If an abscess occurs the treatment of choice is drainage. Lactation need not be suppressed. The patient should continue to breast feed on the unaffected side expressing from the infected breast initially.

### 3. Venous Thromboembolism (3)

**This is still one of the leading causes of maternal mortality.** Clinical diagnosis of venous thromboembolism (VTE) can be difficult.

Clinical signs are not always clear and initial investigations can be normal. Venography or duplex Doppler blood flow assessment of the femoral veins may be necessary.

The most frequent incorrect diagnosis is one of **chest infection**. Treatment is mainly with subcutaneous, high-dose, twice-daily heparin to achieve anticoagulation. Initial treatment is followed by carefully monitored warfarin treatment for 3-4 months.

#### CONSUMPTIVE COAGULOPATHY (DIC)

##### Pathological Activation of Coagulation mechanisms:

- Extrinsic pathway activation by thromboplastin from tissue destruction.
- Intrinsic pathway activation by collagen and other tissue components.
- Direct activation of factor X by proteases.
- Induction of procoagulant activity in lymphocytes, neutrophils or platelets by stimulation with bacterial toxins.

##### Significance of Consumptive Coagulopathy:

- Bleeding
- Circulatory obstruction → organ hypoperfusion and ischemic tissue damage.
- Renal failure, ARDS.
- Microangiopathic hemolysis.

##### Causes:

1. **Abruptio placentae** (most common cause in obstetrics).
2. **Sever Hemorrhage** (PPH).
3. Fetal Death and Delayed Delivery > 2wks
4. Amniotic Fluid Embolus.
5. Septicemia.

##### Treatment:

- Identify and treat source of coagulopathy.
- Correct coagulopathy.
- FFP, cryoprecipitate, platelets.



### Fetal Death and Delayed Delivery:

- Spontaneous labor usually in 2 weeks post fetal death.
- Maternal coagulation problems < 1 month post fetal death
- If retained longer, 25% develop coagulopathy.
- Consumptive coagulopathy mediated by thromboplastin from dead fetus.
- Tx: correct coagulation defects and delivery.

### Amniotic Fluid Embolus: (very rare but bad prognosis)

- Complex condition characterized by abrupt onset of hypotension, hypoxia and consumptive coagulopathy.
- 1 in 8000 to 1 in 30 000 pregnancies.
- “Anaphylactoid syndrome of pregnancy”.
- Pathophysiology: brief pulmonary and systemic hypertension→transient, profound oxygen desaturation (neurological injury in survivors) → secondary phase: lung injury and coagulopathy.
- Diagnosis is clinical
- **Management: supportive**
- Prognosis: 60% maternal mortality, profound neurological impairment is the rule in survivors “if patient survive she might end up in vegetative state”.

Fetal: outcome poor; related to arrest-to-delivery time interval; 70% neonatal survival, with half of survivors having neurological impairment.

### Septicemia:

- Due to septic abortion, antepartum pyelonephritis, puerperal infection.
- Endotoxin activates extrinsic clotting mechanism through TNF (tumor necrosis factor)
- Treat the cause.

### Abortion:

Coagulation defects from:

- Sepsis (*Clostridium perfringens* highest at Parkland) during instrumental termination of pregnancy.
- Thromboplastin released from placenta, fetus, decidua or all three (prolonged retention of dead fetus).

## 4. Psychiatric Disorders

- i. **Postnatal blues** <sup>(2)</sup>: Postpartum blues is a mild, transient, self-limited disorder that usually develops when the patient returns home. It commonly arises during the first 2 weeks after delivery and is characterized by bouts of sadness, crying, anxiety, irritation, restlessness, mood liability, headache, confusion, forgetfulness, and insomnia.
- ii. **Postpartum Depression (PPD)** <sup>(2)</sup>: Patients suffering from PPD report insomnia, lethargy, loss of libido, diminished appetite, pessimism, incapacity for familial love, feelings of inadequacy.
- iii. **Puerperal psychosis** <sup>(2)</sup>: The signs and symptoms of postpartum psychosis typically do not differ from those of acute psychosis in other settings. Patients with postpartum psychosis usually present with schizophrenia or manic depression, which signals the emergence of preexisting mental illness induced by the physical and emotional stresses of pregnancy and delivery.

**TREATMENT:** According to the severity.

- Observe, discuss, mild sedatives
- If severe → heavy sedation + transfer to psychiatric ward

## 5. Bowel and Bladder Problems <sup>(3)</sup>

Urinary retention or voiding difficulties may occur postnatally secondary to painful episiotomies or use of epidurals in labor. Decompression by an indwelling catheter for 24-48 hours and careful observation of bladder function once the catheter has been removed is usually all that is required.

Incontinence can also occur in the immediate postnatal period but usually improves after a course of pelvic floor exercises.

Haemorrhoids are a common problem after childbirth, exacerbated by bearing down during the second stage of labor.

**Additional** <sup>(2)</sup>: Sheehan syndrome is the result of ischemia, congestion, and infarction of the pituitary gland, resulting in panhypopituitarism caused by severe blood loss at the time of delivery. Patients have trouble lactating and develop amenorrhea, as well as symptoms of cortisol and thyroid hormone deficiency. Treatment is with hormone replacement in order to maintain normal metabolism and response to stress.

# Puerperal Sepsis (1)

## Etiology

The vaginal flora during pregnancy resembles the non-pregnant state. Potentially pathogenic organisms can be cultured from the vagina in about 80% of pregnant women; these organisms include *enterococci*, *hemolytic and nonhemolytic streptococci*, *anaerobic streptococci*, *enteric bacilli*, *psuedodiphtheria bacteria*, and *Neisseria species*. Excessive overgrowth of these organisms is inhibited during pregnancy by the vaginal acidity, as a result of the production of lactic acid by the lactobacilli. After delivery, the pH of the vagina changes from acidic to alkaline because of the neutralizing effect of the alkaline amniotic fluid, blood, and lochia, in addition to the decreased population of lactobacilli.

**Anaerobic organisms (*Peptostreptococcus*, *Peptococcus*, and *Streptococcus*) cause about 70% of puerperal infections. Of the aerobic organisms, *Escherichia coli* is the most common pathogen.**

## Predisposing Factors

- Poor nutrition and hygiene
- Anemia
- Premature rupture of membranes (PROM)
- Prolong rupture of membrane
- Prolonged labor
- Frequent vaginal examination during labor
- Cesarean section
- Instrumental delivery (forceps or vacuum)
- Cervical or vaginal lacerations
- Manual removal of placenta
- Retained products of conception

## Clinical Features

- Rising fever and increasing uterine tenderness on postpartum day 2 or 3.
- Pelvic thrombophlebitis is characterized by a persistent spiking fever for 7 to 10 days after delivery, despite antibiotic therapy.
- Parametritis (pelvic cellulitis) is accompanied with a sustained elevation in temperature with signs of pelvic peritonitis.

## Diagnosis

- ✓ Careful history and physical examination.
- ✓ Exclude other causes of fever like breast engorgement.
- ✓ Abdominal CT scan or ultrasound.
- ✓ Blood, endocervix, uterine, and a catheterized urine specimen obtained for culture.

## Treatment

- Broad-spectrum antibiotics, such as Ampicillin and the cephalosporins, are effective first line drugs for mild to moderate cases of puerperal infection.
- For moderate to severe cases, a penicillin-aminoglycoside combination has traditionally been used as first line therapy.
- The use of antibiotics should be continued for at least 48 hours after the patient becomes afebrile.
- For pelvic thrombophlebitis or thromboembolism, unfractionated heparin therapy should be instituted.

## MCQs:

**Q1. A postpartum woman has acute puerperal mastitis. Which of the following statements is true?**

- a. The initial treatment is penicillin
- b. The source of the infection is usually the infant's gastrointestinal (GI) tract
- c. Frank abscesses may develop and require drainage
- d. The most common offending organism is Escherichia coli
- e. The symptoms include lethargy

**Q2. A 24-year primigravida woman, who is intent on breastfeeding, decides on a home delivery. Immediately after birth of a 4.1 kg (9-lb) infant, the patient bleeds massively from extensive vaginal and cervical lacerations. She is brought to the nearest hospital in shock. Over 2 hours, 9 units of blood are transfused, and the patient's blood pressure returns to a reasonable level. A hemoglobin value the next day is 7.5 g/dl, and 3 units of packed red blood cells are given. The most likely late sequela to consider in this woman is which of the following?**

- a. Hemochromatosis
- b. Stein-Leventhal syndrome
- c. Sheehan syndrome
- d. Simmonds syndrome
- e. Cushing syndrome

**Q3. A 38-year-old G3P3 begins to breastfeed her 5-day-old infant. The baby latches on appropriately begins to suckle. In the mother, which of the following is a response to suckling?**

- a. Decrease of oxytocin
- b. Increase of prolactin-inhibiting factor
- c. Increase of hypothalamic dopamine
- d. Increase of hypothalamic prolactin
- e. Increase of luteinizing hormone-releasing factor

**Q4. A 34-year-old G1P1 who delivered her first baby 5 weeks ago call your office and asks to speak with you. She tells you that she is feeling very overwhelmed and anxious. She feels that she cannot do anything right and feels sad throughout the day. She tells you that she finds herself crying all the time and is unable to sleep at night. Which of the following is the most likely diagnosis?**

- a. Postpartum depression
- b. Maternity blues
- c. Bipolar disease
- d. Postpartum blues

**Answers:**

Q1: C

Q2: C

Q3: D

Q4: A

**Explanation:**

**Q2:** A disadvantage of home delivery is the lack of facilities to control postpartum hemorrhage. The woman described in the question delivered a large baby, suffered multiple soft tissue injuries, and went into shock; needing 9 units of blood by the time she reached the hospital. Sheehan syndrome seems a likely possibility in this woman. This syndrome of anterior pituitary necrosis related to obstetric hemorrhage can be diagnosed by 1 week postpartum, as lactation fails to commence normally. Although many modern women choose hormonal therapy to prevent lactation, the woman described in the question was intent on breastfeeding and so would have received suppressant. She therefore could have been expected to begin lactation at the usual time. Other symptoms of Sheehan syndrome include amenorrhea, atrophy of the breasts, and loss of thyroid and adrenal function. The other presented choices for late sequela are rather farfetched. Hemochromatosis would not be expected to occur in this healthy young woman, especially since she did not receive prolonged transfusions. Cushing, Simmonds, and Stein-Leventhal syndromes are not known to be related to postpartum hemorrhage. It is important to note that home delivery is not a predisposing factor to postpartum hemorrhage.

**Q3:** The normal sequence of events triggered by suckling is as follows: through a response of the central nervous system, dopamine is decreased in the hypothalamus. Dopamine suppression decreases production of prolactin-inhibiting factor (PIF), which normally travels through a portal system to the pituitary gland; because PIF production is decreased, production of prolactin by the pituitary is increased. At this time, the pituitary also releases oxytocin, which causes milk to be expressed from the alveoli into the lactiferous ducts. Suckling suppresses the production of luteinizing hormone-releasing factor and, as a result, acts as a mild contraceptive (because the midcycle surge of luteinizing hormone does not occur).

**Q4:** This patient is exhibiting classic symptoms of postpartum depression. Postpartum depression develops in about 80% to 15% of women and generally is characterized by an onset about 2 weeks to 12 months postdelivery and an average duration of 3 to 4 months. Women with postpartum depression have the following symptoms: irritability, labile mood, difficulty sleeping, phobias, and anxiety. About 50% of women experience postpartum blues, or maternity blues, within 3 to 6 days after delivery. This mood disturbance is thought to be precipitated by progesterone withdrawal following delivery and usually resolves in 10 days. Maternity blues is characterized by mild insomnia, tearfulness, fatigue, irritability, poor concentration, and depressed affect. Postpartum psychosis usually has its onset within a few days of delivery and is characterized by confusion, disorientation, and loss of touch with reality. Postpartum psychosis is very rare and occurs in only 1 to 4 in 1000 births. Bipolar disorder or manic-depressive illness is a psychiatric disorder characterized by episodes of depression followed by mania.

## Summary

- Puerperium: is the time during which all the physiological changes of pregnancy is reversed and the pelvic organs return to their previous state and endocrine influence of the placenta is removed it last for ~6 weeks.
- Uterine involution delay is caused by infection or retained products of placenta.
- Impaired healing of the vagina caused of presence of hematoma or infection
- Thrombosis & embolism if one of the main causes of maternal death.
- **The most common cause of postpartum fever is Endometritis its associated with uterine tenderness.**
- Secondary postpartum hemorrhage causes are retained placental fragments and Blood clots
- Acute intramammary mastitis management is breastfeeding, cold compress, and antibiotics if no improvement within 24 hrs.
- Most common cause of DIC in obstetrics is **Abruption placentae.**
- Amniotic Fluid Embolus is very rare and prognosis is bad.
- **Postnatal blue is different from the true psychiatric disorders that there is no history of antidepressant medications or psychiatric disorders, and it is temporary.**
- Cesarean section increases the risk of puerperal infections.

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*For mistakes or feedback*

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