



Reviewed By
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Video Case

Puerperal Sepsis

Objectives:

- Define puerperal sepsis
- Identify the incidence of puerperal sepsis
- Explain the pathophysiology of puerperal sepsis
- List the risk factors for postpartum infection
- Describe the clinical features of puerperal sepsis
- List common postpartum infections
- Develop an evaluation and management plan for the patient with postpartum infection



- Slides
- **Important**
- **Golden notes**
- Extra
- **439 Doctor's notes**
- **441 Doctor's notes**
- **441 Female Presentation**
- **Reference**

Female presentation

Video Case | Editing File

Puerperal sepsis

Introduction :

- The rate of postpartum complications have been increasing in the last decades, thought to be secondary to the increase of cesarean deliveries.
- Early recognition and treatment of postpartum infections decrease maternal morbidity and mortality.
- About 70% of puerperal infections are caused by anaerobic organisms.
 - Most of these are anaerobic cocci (Peptostreptococcus, Peptococcus, and Streptococcus).
 - The aerobic organisms, E.coli is the most common pathogen.
- Patients with a puerperal genital tract infection are susceptible to the development of septic shock, pelvic thrombophlebitis, and pelvic abscess.
- Following a vaginal delivery, about 6-7% of women demonstrate febrile morbidity, while the incidence of febrile morbidity following primary cesarean delivery, is about twice that following vaginal delivery.

Postpartum Fever :

Postpartum fever is defined as fever ≥ 38 C (≥ 100.4 F) on ≥ 2 occasions ≥ 6 hours apart, excluding first 24 hours postpartum. during the first 10 days

Approach to Postpartum Fever :



-Start with a good history:

- Ask the patient if she has Pain? Redness? Drainage?
- Find out if the patient had a vaginal delivery or cesarean section?
- Any Complications during pregnancy or labor course?
- If she has any medical issues? Or any other risk factors that may increase her risk of poor wound healing such as Smoking.

- Physical examination:

- try to identify the source of the infection by focusing on the important organ system that could be infected during the postpartum time.

Common Postpartum Infection :

5 W's

1- Wind > atelectasis. 2- Water > UTI 3- Wound > wound infection 4- Woum > endometritis 5-Walk > DVT

PP DAY 0 : ATELECTASIS:

- Risk Factors: General anesthesia with incisional pain (most common) and cigarette smoking.
- Clinical Findings: Mild fever with mild rales on auscultation. Patient is unable to take deep breaths.
- Management:
 - Pulmonary exercises (e.g., deep breaths, incentive spirometry) and ambulation.
 - Chest x - rays are unnecessary.

Puerperal sepsis

PP DAY 1-2 : URINARY TRACT INFECTION:

- Etiology: Common pathogens: Bacteria of the normal bowel flora including (E.coli, Klebsiella, Proteus, Enterobacter).
- Source : ascending or hematogenous like TB
- Risk Factors: Multiple intrapartum catheterizations and vaginal examinations due to prolonged labor.
- Clinical Findings: High fever, costovertebral flank tenderness, positive urinalysis (e.g., WBC, bacteria) and urine culture.
- Management:
 - In term of therapy don't forget to ask her if she is Breastfeeding? To know which antibiotic to use.
 - Single - agent intravenous antibiotics. (e.g., Nitrofurantoin and cephalosporins)

PP DAY 2-3 : ENDOMETRITIS: The most common cause of postpartum fever.

- Etiology: mostly polymicrobial infections, aerobic and anaerobic organisms from the genital tract.
- Pathophysiology: The uterine cavity is normally free of bacteria during pregnancy. After parturition, the pH of the vagina changes from acidic to alkaline because of the neutralizing effect of the alkaline amniotic fluid, blood, and lochia, as well as the decreased population of lactobacilli. This change in pH favors an increased growth of aerobic organisms. About 48 hours postpartum, progressive necrosis of the endometrial and placental remnants produces a favorable intrauterine environment for the multiplication of anaerobic bacteria.
- Risk Factors:
 - 1) Emergency cesarean section after prolonged membrane rupture and prolonged labor.
There are 2 common indications for emergency C-section:
 - a. The cervix is not adequately dilated.
 - b. The head of fetus is not coming down.
 - C. Other indications :
 - Failure to progress (During labor) and fetal distress.
 - 2) Prolong internal fetal monitoring.
 - 3) Anemia.
 - 4) Decreased Socioeconomic status.
- Clinical Findings. Moderate - to - high fever (you can't diagnose it without fever) with exquisite uterine tenderness. Peritoneal signs should be absent and peristalsis should be present. Can't take vaginal swab because it is multimicrobial
- Management. Multiple - agent intravenous antibiotics (e.g., **gentamicin and clindamycin**) to cover polymicrobial genital tract flora. stop the ABx if no fever for 48 to 72 hours
- Gentamicin is contraindicated with renal failure
- Diagnosis: fever of 38 and above with one or more of the following : Uterine tenderness, Abdominal pain or, Foul smelling vaginal discharge or, leukocytosis
- Failure to respond to the antibiotic therapy within 48-72 hours may be due to pelvic abscess, septic pelvic thrombophlebitis and/or the emergence of a resistant organism.
- Q: lady was admitted as a case of endometritis and not responding to ABx still has a spiking fever Most likely she has phlebitis

Puerperal sepsis

PP DAY 4-5 : WOUND INFECTION:

- Etiology: Streptococcus, Staphylococcus, Gram negative organisms.
- Risk Factors:
 - 1) Emergency cesarean section after prolonged membrane rupture and prolonged labor.
 - 2) Rarely after vaginal delivery even with laceration and episiotomy.
 - If it happens, she will present with: pain and purulent discharge from the perineal laceration repair side.
- Clinical Findings: Persistent spiking fever despite antibiotics, along with wound erythema, fluctuance, or drainage.
- Management:
 - Intravenous antibiotics for cellulitis.
 - Wound drainage with twice - daily, wet - to - dry wound packing used for an abscess, anticipating closure by secondary intention.
- Case by the Dr: **A woman developed perineal pain 6 hrs after delivery what could be the cause? It could be due to Hematoma or tight sutures.**
DON'T say wound infection!! No one develop infection within 6 hrs, it should be at least 2-3 days after delivery. **Imp in MCQs**

PP DAY 5-6 : SEPTIC THROMBOPHLEBITIS:

- Septic thrombophlebitis is characterized by venous thrombosis with associated bacterial or fungal infection. Superficial or deep veins may be involved.
- **Thrombosis occurs in gonadal vein mainly**
- Risk Factors. Emergency cesarean section after prolonged membrane rupture and prolonged labor.
- Clinical Findings. Persistent wide fever swings despite broad - spectrum antibiotics with normal pelvic and physical examination.
- Management: Intravenous **heparin** for 7-10 days, keeping PTT values at 1.5 to 2.0 times baseline.
- **Diagnosis: CT venogram**

PP DAY 7-21 : INFECTIOUS MASTITIS:

- Pain/Swelling **hotness and tenderness** in the breast. It is important to ask the patient about Recent delivery and Breastfeeding.
- Etiology: S. aureus is the most common organism involved.
 - Risk Factors. Lactational nipple trauma leading to nipple cracking and allowing Staphylococcus aureus bacteria to enter breast ducts and lobes **from the oral cavity of the baby.**
 - Clinical Findings. Fever of variable degree with localized, unilateral breast tenderness, erythema, and edema, **chills, rigors.**
 - Management
 - Oral penicillinase-resistant penicillin (e.g., dicloxacillin (**the best for mastitis**) or cloxacillin) **10 - 14 days.**
 - **If not responding to treatment it could be due to resistant (MRSA) or abscess (treated by drainage)**
 - Breast feeding can be continued.
 - Ultrasound imaging is needed to rule out an abscess if lactational mastitis does not respond to antibiotics.

Teaching case

A 24 year-old G1P1 African-American woman, 3 days post op from a primary Cesarean delivery is evaluated for a fever of 102.2 ° F . She denies nausea or vomiting, but has noticed increased lower abdominal pain since last evening. Her pregnancy has been uncomplicated. She presented to the hospital at 38 6/7 days with rupture of membranes, with cervical dilation of 2 cm/50% effacement. She was given oxytocin to induce labor. She progressed slowly to the active phase, and 9 hours later, she was 5 cm/completely effaced and vertex at zero station, but her labor remained protracted. She had an intrauterine pressure catheter placed and the oxytocin dose was titrated to achieve adequate labor. Despite adequate contractions (240 Montevideo units per 10 minutes), she had no progress for the next 4 hours. The fetus developed tachycardia with a baseline heart rate of 170 beats per minute. At this time, a low transverse Cesarean delivery was performed. The surgery was uncomplicated. She delivered a viable male, 3750 grams, with Apgar scores of 9/9 at one and five minutes respectively. She was given perioperative antibiotic prophylaxis (Ancef 1 gm) at the time of the Cesarean delivery.

Q1: What findings in the history place this patient at risk for postpartum fever? Are there any other factors that place patients at risk for postpartum infection that we don't learn from this history?

- Postpartum febrile morbidity is defined as a temperature of 100.4 °F (38 °C) or higher that occurs for more than 2 consecutive days (exclusive of the first postpartum day) during the first 10 days postpartum.
- Puerperal infection is more common following Cesarean delivery than vaginal delivery and is most commonly due to ascending genital tract infection, resulting in endomyometritis. Maternal, intrapartum, and perioperative characteristics can increase the risk for puerperal infections.
- Difference between Emergency c-section and elective c-section is that in elective the surgery is planned from the beginning.
 - Common indications of elective c-section: 1. Repeated c-section (2 or more) 2. Breech presentation 3. Placenta previa

The following factors can increase the risk for infection:

Maternal \Antepartum Factors	<ul style="list-style-type: none"> - Poor nutrition - Anemia - Anything that cause immunosuppression (immunocompromised patient) like: DM, drugs, steroids. - General anesthesia causing atelectasis
Intrapartum Factors	<ul style="list-style-type: none"> - Prolonged membrane rupture more than 6 hours up to >16 hr and no delivery ->have to start AB prophylactic. - prolonged labour means she'll have frequent vaginal examination. - Frequent vaginal exams during labor especially with PROM. - Intrauterine monitors anything inserted into uterus can result in ascending infection. - Chorioamnionitis. - catheterization increases the risk of UTI infections - Instrumental delivery
Perioperative Factors	Cesarean delivery highest risk (cause it's not aseptic procedure)
The Route of Delivery	The incidence of endometritis following vaginal delivery rarely exceeds 2 – 3%; however, after Cesarean delivery(the most important risk factor)(frequency ranges from 10% in low-risk patients who have received prophylactic antibiotics given IV during surgery (for this patient, because she have prolonged labour and ROM we'll start the AB early in labour before going to the C-section) to as high as 95% in a high-risk population without prophylactic antibiotics.



Q2:What would you include in your differential for the cause of the postpartum fever?

Genital Tract	Endometritis, pelvic abscess
Breast	Breast engorgement, mastitis, breast abscess
Pulmonary	Pneumonia occurs more in general anesthesia (in c-section), atelectasis
Vascular	Pelvic thrombophlebitis because of venous stasis (can develop DVT in lower limbs or pelvic DVT (pregnant women have high risk to develop thrombophlebitis because of physiological rise in clotting factors & stasis due to enlarged uterus pressure on venous return, postpartum risk is further increased, because blood volume is starting to return to pre-pregnancy status, loss of fluid and immobility-> have to encourage patient to mobilize after c-section).
Urinary Tract	Pyelonephritis because of Foley catheter (we put catheter before section so that during surgery the bladder does not obstruct view, before doing the incision we have to open the visceral peritoneum and push the bladder down a little so that we don't accidentally injure bladder injury), even in vaginal delivery we sometimes catheterize them in labour because sometimes they're unable to pass urine and the bladder may prevent descent of fetal head, after delivery due to the trauma in perineal area and urethra the patient may have reflux urinary retention (increased UTI risk), pregnancy increase risk of UTI because of effect of progesterone on kidney (urine stasis) and pressure on ureter from uterus.
Wound	Surgical site infection like cesarean and episiotomy (cesarean more likely to be infected).

Postpartum endometritis is also termed endometritis, metritis, endomyometritis and endomyoparametritis. Of these, endometritis is the most commonly used term to describe postpartum uterine infection risk increased with c-section.



Q3:How would you approach evaluating this patient?

Evaluation of a patient should always commence with a careful history and physical exam ask about symptoms of endometritis (foul smelling lochia, is it heavy or light, puss discharge, blood clots (in case of retained parts of placenta)retained product of conception is a risk factor (in examination the cervix is open & see some tissue coming from cervix-> if not see do US ->if >3cm size do evacuation and curettage,broad spectrum AB).ask about fever(for how long,how measured, how high is it, persistent, fluctuating, associated symptoms rigor, chills, vomiting (pyelonephritis), ask about breastfeeding, pain, discharge, ask about wound and mode of delivery, hours of labour and ROM.

Examination: general> systematic> pelvic.(**vital signs** septicemia & septic shock, appearance> examine breast >abdomen (feel uterus suprapubic region)> pelvic examination (speculum, check lochia, descending tissue, take swab lower cervix), bimanual examination> check lower limbs (signs of DVT).

Postpartum: examination should include the breast

The most common reported clinical signs and symptoms of postpartum endometritis include fever, leukocytosis, lower abdominal pain, uterine tenderness and foul-smelling vaginal discharge. Clearly, the most important sign and symptom is that of fever.

Since the differential includes a number of extra-pelvic sources, students should not forget to elicit history about and perform examination of these organ systems.

This diagnosis is based on clinical findings alone and there has been no laboratory and/or culture. techniques used to increase the likelihood of this diagnosis:

- **Examination:** Breast – Pelvic – Wound
- **Laboratories:** CBC – Bacterial cultures
- **Imaging:** Usually reserved when there is no response to empiric therapy

Start with CBC (wbc,Hb (anaemia following delivery >harder to fight infection) , ESR & C-reactive protein (detect infection), septic screening (all patients with temperature >38 for 2 consecutive days)>take swab from all possible areas of infection (blood, urine, sputum, lochia, breast milk(& culture them)) pelvic US (see retained product and abscess) Chest x-ray (if there's respiratory symptoms) MRI & CT & Doppler (as needed) Angiogram (suspected DVT).

Teaching case

Q4: How would you approach managing this patient?

- It is well established that the pathogenesis of postpartum endometritis involves both anaerobic and aerobic organisms.
- This infection is an ascending infection and is caused by the organisms found in the normal vaginal flora. These included the aerobic organisms of Group A and B Streptococcus, Enterococcus, as well as Staphylococcus, Gram-negative aerobic organisms include E.coli, Klebsiella pneumoniae, and Proteus mirabilis, as well as a whole host of anaerobic organisms.
- Therefore, the primary management of puerperal infection is to institute empiric antibiotic therapy. Therefore broad-spectrum coverage is indicated:

Regimen	Comments
Clindamycin 900 mg + gentamicin 1.5 mg/kg, q8h intravenously	"Gold standard," 90-97% efficacy, once daily gentamicin acceptable Ampicillin added to regimen with sepsis syndrome or suspected enterococcal infection
Clindamycin + aztreonam	Gentamicin substitute with renal insufficiency
Extended-spectrum penicillin	Piperacillin, ampicillin/sulbactam
Extended-spectrum cephalosporin	Cefotetan, ceftiofex, cefotaxime
Imipenem + cilastatin	Reserved for special indications

- Failure to respond to the antibiotic therapy within 48-72 hours may be due to pelvic abscess, septic pelvic thrombophlebitis and/or the emergence of a resistant organism.
- The treatment should be continued until the patient is afebrile, as well as asymptomatic, for 24-36 hours.
- Patient may be discharged from the hospital at this time with no antibiotic therapy, as follow up oral antibiotics are generally unnecessary.

If we find pelvic abscess > antibiotics

if continue on AB for 72 hrs and no response > drain

All patient need empirical broad spectrum AB once diagnosed with puerperal sepsis(they're febrile), then you can change management according to findings.

AB given for 2-3 days until patient is afebrile for >=24hrs >> dc AB & discharge patient (no need for oral AB) if patient continue to be febrile >> continue AB and investigate further the not responding.

Drug of choice: clindamycin & gentamicin.

If patient allergic to gentamicin (or have renal problems & can't take gentamicin) & clindamycin >> aztreonam , 2nd or 3rd gen cephalosporin , penicillins.

Doctor's notes (441)

- The risk of having a atelectasis after general anesthesia is 30%, so after surgery we give the patients spirometer to open the alveoli obstructions.
- When you have low threshold symptoms "fever, lower abdominal pain" start empiric antibiotics early until diagnosis is confirmed
- Clinically culture test doesn't help much, except to ruled out the multidrug resistance bacteria
- The most important is septic screen as: Chest X-ray, Blood culture, culture from secretion site and urine culture"
- In endometritis case always do blood culture
- **Prophylactic antibiotics (Ancef / Cefazolin "1st generation cephalosporin") are given to the patient before the C-section** to prevent infections, but there's no need for continuous prophylactic antibiotics after C-section
- There is no specific routine care for the C-section wound, just make sure to cover the first it first 24 hours
- Breastfeeding is not risk factor for mastitis but pathophysiology of infection rout

Summary

Physical Exam	Diagnosis	Management
Lung "crackles" PP Day 0	Atelectasis	Ambulation, pulmonary exercises
Flank pain, dysuria PP Day 1–2	Pyelonephritis	Single IV antibiotic
Tender uterus PP Day 2–3	Endometritis	IV gentamicin and clindamycin
Wound purulence PP Day 5–6	Wound infection	Wet-to-dry packs
Pelvic mass PP Day 5–6	Pelvic abscess	Percutaneous drainage
"Picket fence" fever PP Day 5–6	Septic thrombophlebitis	Full heparinization

Table I-18-2. Postpartum Fever

Reference

COMPLICATIONS

Complications associated with any abdominal or pelvic surgery include anesthetic complications, hemorrhage, atelectasis, wound infection, urinary tract infection, thrombophlebitis, and pulmonary embolism. **Rectectasis occurs most commonly in the first 24 to 48 hours** and can be prevented and treated with aggressive pulmonary toilet. **Wound infection usually occurs about 5 days postoperatively** and is associated with redness, tenderness, swelling, and increased warmth around the wound.

Treatment may require systemic antibiotics, opening the incision, draining the discharge, local debridement, and wound care. **Urinary tract infection can occur at any time in the postoperative period**, and urine for microscopy and culture should be obtained from any patient with a postoperative fever. **Thrombophlebitis (with possible subsequent pulmonary embolism) is manifested by fever and leg swelling or pain. It usually occurs 7 to 12 days postoperatively.** A pulmonary embolism may occur even in the absence of signs of thrombophlebitis. **Wound disruption after abdominal hysterectomy with eversion of intestines is generally heralded by a profuse serous discharge from the wound (peritoneal fluid) 4 to 8 days postoperatively.** When eversion is suspected, the wound should be explored in the operating room.

in the mother as well as initiating intrapartum treatment of the fetus while awaiting delivery. **Improved neonatal and maternal outcome is noted when antibiotic therapy is begun intrapartum rather than immediately postpartum.** Delivery of the fetus and placenta removes the sites of infection, much like draining an abscess, making this intervention a significant part of therapy. Because group B streptococci and *E. coli* are the most common isolates from infected newborns and maternal therapy initiates fetal therapy, **a combination of ampicillin plus gentamicin is a reasonable initial regimen for IAS.** This regimen is sufficient to treat the mother if the delivery is vaginal with only one additional dose of the antibiotic regimen needed postpartum. **If cesarean delivery is required, up to 15% of patients given only ampicillin and gentamicin will develop postpartum endometritis.** These patients require continued broad-spectrum antibiotic coverage, and a drug such as clindamycin or metronidazole should be added to the treatment regimen. This antibiotic regimen should be continued until the patient has been afebrile (temperature $<38^{\circ}\text{C}$ or $<100^{\circ}\text{F}$) for 24 hours.

Although delivery is essential for cure, no critical diagnosis-to-delivery interval has been identified. Accordingly, labor must be managed actively, but cesarean delivery should be performed only for accepted obstetric indications.

POSTPARTUM ENDOMETRITIS

Postpartum infection of the uterus, the most common cause of puerperal fever, is designated endomyometritis. **Cesarean delivery, particularly after labor or rupture of the membranes of any duration, is the most accurate predictor of postpartum endomyometritis (PPE).** The pathogenesis of this infection involves inoculation of the amniotic fluid after membrane rupture or during labor with vaginal microorganisms. The myometrium, leaves of the broad ligament, and the peritoneal cavity are then exposed to this contaminated fluid during cesarean surgery. **The reported incidence of PPE after cesarean delivery is less than 10% in patients receiving appropriate antibiotic prophylaxis.** The diagnosis is uncommon after vaginal delivery.

Risk factors for postcesarean endomyometritis include prolonged labor or rupture of the membranes, presence of bacterial vaginosis, frequent vaginal examinations, and use of internal fetal monitoring. Antimicrobial prophylaxis is associated with a 50% reduction in infection in all populations studied. All patients undergoing cesarean delivery, either elective or emergent, are candidates for antibiotic prophylaxis. When given before the skin incision rather than after cord clamping, the incidence of postcesarean endomyometritis and total infectious morbidities are decreased, without adversely affecting neonatal out-

comes. Many patients who develop postcesarean endometritis despite antibiotic prophylaxis have histologic evidence of incipient infection.

PPE is a polymicrobial infection caused by a wide variety of bacteria: Group B streptococci, enterococci, other aerobic streptococci, *G. vaginalis*, *E. coli*, *P. bivia*, *Bacteroides* spp., and peptostreptococci are the most common endometrial isolates, with group B streptococci and *G. vaginalis* the most common isolates from the blood.

Chlamydia trachomatis has been associated with a late form of PPE that occurs more than 2 days to 6 weeks after delivery in women who deliver vaginally. Group A beta-hemolytic streptococcal endometritis is rare. It is characterized by early onset and rapid progression, with few localizing symptoms or physical signs.

The diagnosis of PPE is suggested by the development of fever, usually on the first or second postpartum day. Significant fever is defined as an oral temperature of 38.3°C or higher in the first 24 hours after delivery or 38°C or higher for at least four consecutive hours 24 or more hours after delivery. Other consistently associated findings are lower abdominal pain, uterine tenderness, and leukocytosis. These women may also exhibit a delayed postoperative return of bowel function due to an associated local peritonitis.

Patients with suspected PPE should have the uterus assessed for size, consistency, and tenderness. A test for *Chlamydia* should be performed in patients with mild PPE commencing more than 7 days after delivery. Adolescents in particular are at high risk of chlamydial infection.

Clindamycin plus gentamicin has proved to be the most effective regimen in treating PPE, especially if PPE occurs after cesarean delivery. Alternative regimens used for the treatment of PPE include one of the extended-spectrum penicillins or second-generation cephalosporins (e.g., ampicillin/sulbactam, ticarcillin/clavulanic acid, piperacillin/tazobactam, cefotetan, cefoxitin). Antimicrobial regimens used in the treatment of postcesarean endometritis should provide satisfactory coverage of penicillin-resistant anaerobic microorganisms (e.g., *P. bivia*).

Parenteral therapy should be continued until the temperature has remained lower than 37.8°C (100°F) for 24 hours, the patient is pain free, and the leukocyte count is normalizing. **The use of oral antibiotics after discharge has been shown to be unnecessary.** Women with late-onset PPE can be treated as outpatients with oral azithromycin or doxycycline therapy, with or without metronidazole, depending on whether or not they have coexistent bacterial vaginosis.

Early-onset PPE should respond to parental antimicrobial therapy within 48 hours, with the

patient becoming afebrile within 96 hours. If fever persists despite apparently appropriate antimicrobial therapy, the differential diagnosis includes a wound or pelvic abscess, refractory postpartum fever, and non-infectious fever (e.g., drug fever, breast engorgement). **Appropriate imaging studies, usually pelvic ultrasonography or computed tomography, may confirm the presence of a wound or pelvic hematoma or abscess. Pelvic collections usually involve the space between the lower uterine segment and bladder.** If present, percutaneous drainage by interventional radiology should be considered.



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Good Luck!



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