

PUERPERAL INFECTIONS

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Infertility Fellowship

PUERPERAL INFECTIONS

- ▶ Bacterial infection of the genital tract after delivery
- ▶ Maternal mortality from infection has become uncommon
- ▶ cardiovascular disease , venous thromboembolism and hemorrhage currently are leading noninfectious puerperal complications

Puerperal Fever

- ▶ A temperature of 38.0°C (100.4°F) or higher in the puerperium .
- ▶ *Most are caused by genital tract infection.*

Other causes are:

- ▶ breast engorgement
- ▶ urinary infections
- ▶ episiotomy and abdominal incisions
- ▶ Perineal lacerations
- ▶ respiratory complications

Uterine Infection

- ▶ *endometritis, endomyometritis, and endoparametritis.*

Predisposing Factors

The route of delivery is the single most significant risk factor

Vaginal Delivery: 1-2%

membrane rupture (5-6%), chorioamnionitis (13%)

Cesarean Delivery: 25 fold greater than V/D

prolonged labor, multiple cervical examinations, internal fetal monitoring

- ▶ **Other Risk Factors:** *lower socioeconomic status, Bacterial colonization (GBS)*

Chlamydia, Mycoplasma, Ureaplasma urealyticum, and Gardnerella vaginalis

- ▶ **Chlamydial infections** have been implicated in late-onset, indolent metritis

ACOG

- ▶ A single dose of perioperative antibiotics is recommended for all women undergoing cesarean delivery

Uterine Infection

- ▶ **Microbiology**
- ▶ infections are **polymicrobial** (Anaerobic and aerobic organisms were 63 percent, anaerobes alone 30 percent, and aerobes alone 7 percent .)
- ▶ **Group A streptococcal** had maternal mortality rate of almost 90 percent and fetal mortality rate > 50 percent.
- ▶ *Staphylococcus aureus* — *CA-MRSA*—is commonly implicated in abdominal incisional infections

TABLE 37-1. Bacteria Commonly Responsible for Female Genital Infections

Aerobes

Gram-positive cocci: group A, B, and D streptococci, enterococcus, *Staphylococcus aureus*, *Staphylococcus epidermidis*

Gram-negative bacteria: *Escherichia coli*, *Klebsiella*, *Proteus* spp.

Gram-variable—*Gardnerella vaginalis*

Others

Mycoplasma spp., *Chlamydia trachomatis*, *Neisseria gonorrhoeae*

Anaerobes

Cocci: *Peptostreptococcus*, *Peptococcus* spp.

Others: *Clostridium*, *Bacteroides*, *Fusobacterium*, *Mobiluncus* spp.

Bacterial Cultures

- ▶ Routine pretreatment genital tract cultures and blood cultures seldom modify care.
- ▶ Exceptions might be women with exceedingly high temperature spikes that may signify virulent infection with group A streptococci

Pathogenesis and Clinical Course

- ✦ **vaginal delivery** : placental implantation site, decidua and adjacent myometrium, or cervicovaginal lacerations.
- ✦ **cesarean delivery** : surgical incision
 - ▶ ***Fever** is the most important criterion for the diagnosis of postpartummetritis.*
 - ▶ Chills
 - ▶ abdominal pain
 - ▶ parametrial tenderness
 - ▶ Leukocytosis (15,000 to 30,000)
 - ▶ foul-smelling lochia

Alarm findings — The following findings are one academic teaching hospital's criteria for suspecting severe infection/sepsis in febrile postpartum patients, based on expert opinion:

- Fever $\geq 103^{\circ}\text{F}$ (39.4°C) **or**
- Fever $\geq 102^{\circ}\text{F}$ (38.9°C) plus one or more of the following:
 - Heart rate ≥ 110 beats/minute, sustained for at least 30 minutes
 - Respiratory rate ≥ 20 respirations/minute, sustained for at least 30 minutes
 - Manual white blood cell (WBC) differential showing ≥ 10 percent bands
 - Blood pressure $\leq 90/60$ mmHg, sustained for at least 30 minutes

Treatment

- ▶ **vaginal delivery** : oral or intramuscular antimicrobial agent
- ▶ **moderate to severe infections, intravenous therapy with a broad spectrum antibiotic** regimen is indicated.

Improvement follows in 48 to 72 hours in nearly 90 percent

- ▶ **cesarean delivery** : clindamycin -gentamicin
had a 95 -percent response rate
- ▶ Diminished glomerular filtration: clindamycin and aztreonam
- ▶ *b -lactam antimicrobials*: cefoxitin, cefotetan , cefotaxime , and ceftriaxone
- ▶ *b -lactamase inhibitors*: clavulanic acid, sulbactam , and tazobactam
- ▶ *Imipenem* : broad -spectrum coverage
- ▶ *Vancomycin* : *Staphylococcus aureus* and *C difficile* colitis

TABLE 37-2. Antimicrobial Regimens for Pelvic Infections Following Cesarean Delivery

Regimen	Comments
Clindamycin + gentamicin	"Gold standard," 90–97% efficacy, once-daily gentamicin dosing acceptable Plus
Clindamycin + aztreonam	Ampicillin added to regimen with sepsis or suspected enterococcal infection
Extended-spectrum penicillins	Gentamicin substitute for renal insufficiency
Cephalosporins	Piperacillin, piperacillin/tazobactam, ampicillin/sulbactam, ticarcillin/clavulanate
Vancomycin	Cefotetan, cefoxitin, cefotaxime, ceftriaxone
Metronidazole + ampicillin + gentamicin	Added to other regimens for suspected <i>Staphylococcus aureus</i> infections
Carbapenems	Metronidazole has excellent anaerobic coverage
	Imipenem/cilastatin, meropenem, ertapenem; all reserved for special indications

Options when intravenous therapy is not possible — In resource-limited countries

where IV lines are not available, a systematic review concluded that the following five antibiotic regimens would provide >85 percent cure rates of early postpartum endometritis and were compatible with breastfeeding [75]:

- [Clindamycin](#) 600 mg orally every 6 hours plus [gentamicin](#) 4.5 mg/kg intramuscularly every 24 hours **or**
- Amoxicillin-clavulanic acid 875 mg orally every 12 hours **or**
- [Cefotetan](#) 2 g intramuscularly every 8 hours **or**
- [Meropenem](#) or [imipenem](#) with cilastatin 500 mg intramuscularly every 8 hours **or**
- [Amoxicillin](#) 500 mg plus [metronidazole](#) 500 mg orally every 8 hours

Perioperative Prophylaxis

- ▶ Single-dose prophylaxis with a first generation cephalosporin **at the time of cesarean delivery** is ideal(ACOG)
- ▶ A single antibiotic dose with third and fourth-degree perineal laceration is reasonable(ACOG)
- ▶ Single-dose prophylaxis with a 2g dose of a first-generation cephalosporin is ideal.(ACOG)
- ▶ In obese women a 3-g dose of cefazolin is needed to reach optimal tissue concentrations
- ▶ Some evidence supports addition of **Azithromycin** to lower postcesarean uterine infection rates
- ▶ with a stated **allergy** to penicillin **vancomycin** is given along with **clindamycin and gentamicin**

Perioperative Prophylaxis

- ▶ Preoperative **abdominal skin preparation**
- ▶ Skin preparation with chlorhexidine -alcohol is superior to iodine-alcohol
- ▶ preoperative **vaginal cleansing** with povidone-iodine rinse or application of metronidazole gel

Perioperative Prophylaxis

Other Methods of Prophylaxis:

- ▶ Allowing the placenta to separate spontaneously

Treatment of asymptomatic vaginal infections does not prevent these complications

Perioperative Prophylaxis

TABLE 37-3. Various Prophylactic Methods for Decreasing Pelvic and Wound Infection Rates Following Delivery

Route	Method	Study Results
Routine delivery	Peripartum antimicrobials	Limited evidence, may reduce risk (Bonet, 2017a)
Episiotomy	Perioperative prophylaxis	Insufficient evidence (Bonet, 2017b)
Operative vaginal delivery	Peripartum antimicrobials	Limited evidence, may reduce risk (Knight, 2019)
Cesarean delivery	Perioperative antimicrobial prophylaxis	Decreased 70–80% (Carter, 2017; Smaill, 2014)
Cesarean delivery	Skin preparation	Decreased incidence (Hadiati, 2018)

Complications of Uterine and Pelvic Infections

- ▶ metritis responds to treatment within 48 to 72 hours over 90%
- ▶ **Complication includes:**
 - ▶ wound infections
 - ▶ complex pelvic infections such as phlegmons or abscesses
 - ▶ septic pelvic thrombophlebitis

Abdominal Incisional Infections

- ▶ **Risk factors:**
 - ▶ obesity, diabetes, corticosteroid therapy, immunosuppression,
 - ▶ anemia, hypertension, and inadequate hemostasis with hematoma formation
- ▶ **Incidence:** If prophylactic antimicrobials are given, the incidence ranges from 2 to 10 percent depending on risk factors

Incisional abscesses cause persistent fever or fever beginning **about the fourth day**.

- ▶ **Treatment:** antimicrobials, surgical drainage, and debridement twice daily
- ▶ The fascia is carefully inspected to document integrity.
- ▶ **At 4 to 6 days, secondary en bloc closure**
- ▶ closure, with polypropylene or nylon suture 3 cm from one wound edge

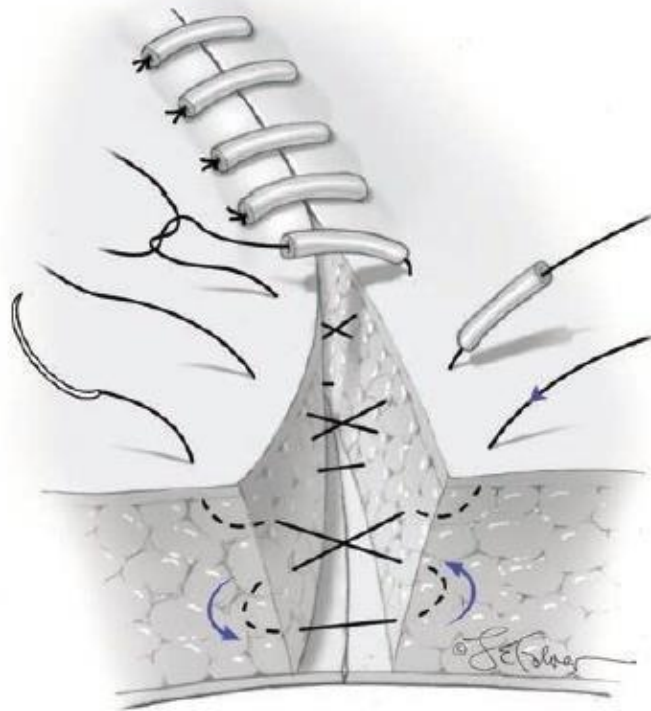


FIGURE 37-1 Secondary abdominal wound closure technique.
(Reproduced with permission from Worley KC: Postoperative complications. In Yeomans ER, Hoffman BL, Gilstrap LC III, et al [eds]: Cunningham and Gilstrap's Operative Obstetrics, 3rd ed. New York, NY: McGraw Hill; 2017).

Vacuum-Assisted Wound Closure

- ▶ **This system promotes healing by applying negative pressure to the wound**
- ▶ vacuum-assisted closure (VAC)
- ▶ topical negative pressure (TNP)
- ▶ negative-pressure wound therapy (NPWT)
- ▶ Open abdominal wounds once infection has cleared or an “open surgical abdomen” is a major indication for NPWT

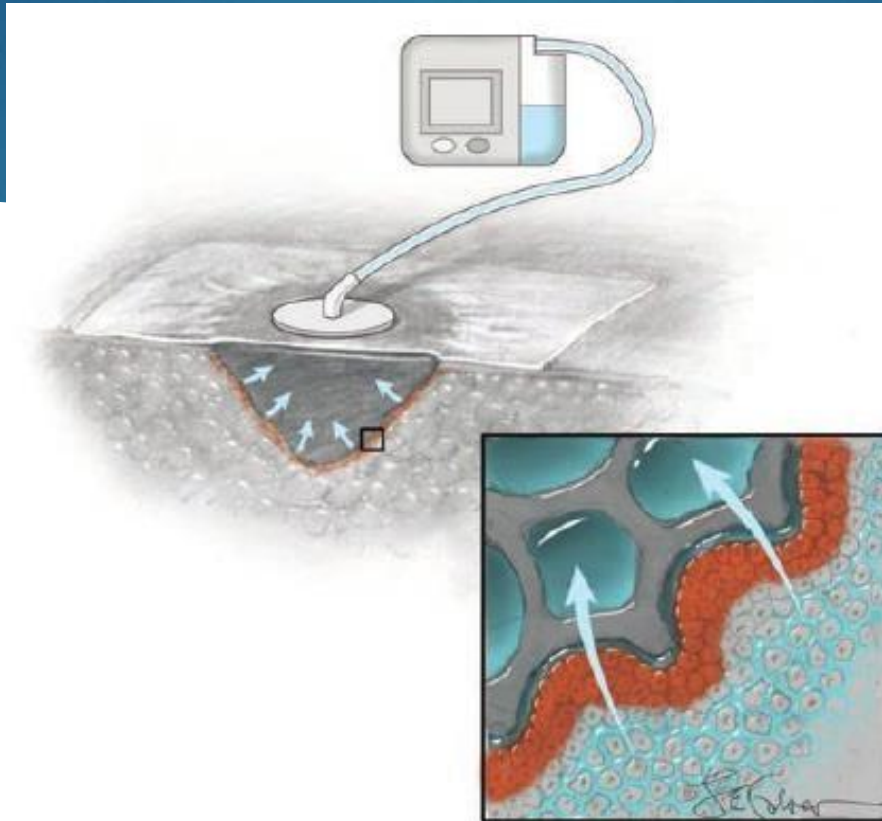


FIGURE 37-2 Theoretical effects of negative-pressure wound therapy include macro- and microdeformation, removal of tissue fluid, and creation of a warm and moist environment. As shown in the inset, tissue fluid is drawn out by suction tubing. It travels through the porous sponge dressing that fills the wound and into an adjacent collection canister. As healing progresses, a layer of granulation tissue (*red*) forms at the wound-sponge interface.



▶ **Prophylaxis.**

▶ Negative-pressure devices are also marketed to prevent wound infections in incisions closed to heal by primary intention.

▶ Routine use of prophylactic NPWT needs more evaluation before its widespread acceptance.

Facial Dehiscence

- ▶ Separation of the fascial layer
- ▶ Dehiscence is a surgical emergency
- requires secondary closure of the incision in the operating room.
- ▶ presents within the first 7 to 10 postoperative day
- ▶ **General surgery consultation** is considered in bowel ischemia or difficult fascial closure is anticipated.

Necrotizing Fasciitis

- ▶ uncommon, **severe wound infection** is associated with high mortality rates
- ▶ risk factors: *diabetes* , *obesity* , and *hypertension*
- ▶ usually are **polymicrobial** organisms

In some cases group A β -hemolytic streptococcus

- ▶ Do not cause symptoms until 3 to 5 days after delivery.
- ▶ **We aggressively pursue early exploration**
- ▶ **Death** is virtually universal without surgical treatment,
even if exhaustive debridement is performed and rates approach **50 percent**

Adnexal Abscesses and Peritonitis

- ▶ An *ovarian abscess* **rarely** develops in the puerperium .
- ▶ usually unilateral, present 1 to 2 weeks after delivery
- ▶ Rupture is common, and peritonitis may be severe.
- ▶ Peritonitis is almost invariably preceded by **metritis**
- ▶ *Importantly in postpartum women, abdominal rigidity may not be prominent*
- ▶ first symptoms of peritonitis are *adynamic ileus*
- ▶ Peritonitis caused by uterine incisional necrosis, or from bowel perforation, must be treated promptly with surgical intervention.

Parametrial Phlegmon

- ▶ parametrial cellulitis is intensive and forms an area of induration a *phlegmon*
- ▶ unilateral, and limited to the parametrium at the base of the broad ligament.
- ▶ Tendency to extend to the pelvic sidewall
- ▶ Typically, fever resolves in 5 to 7 days, but in some cases, it persists longer.
- ▶ severe cellulitis of the uterine incision may lead to necrosis and separation
hysterectomy and surgical debridement are needed

Imaging Studies

- ▶ Computed tomography (CT)
- ▶ magnetic resonance (MR)
- ▶ Abnormal CT findings in almost 60 percent of women with refractory fever persisting >3 days.

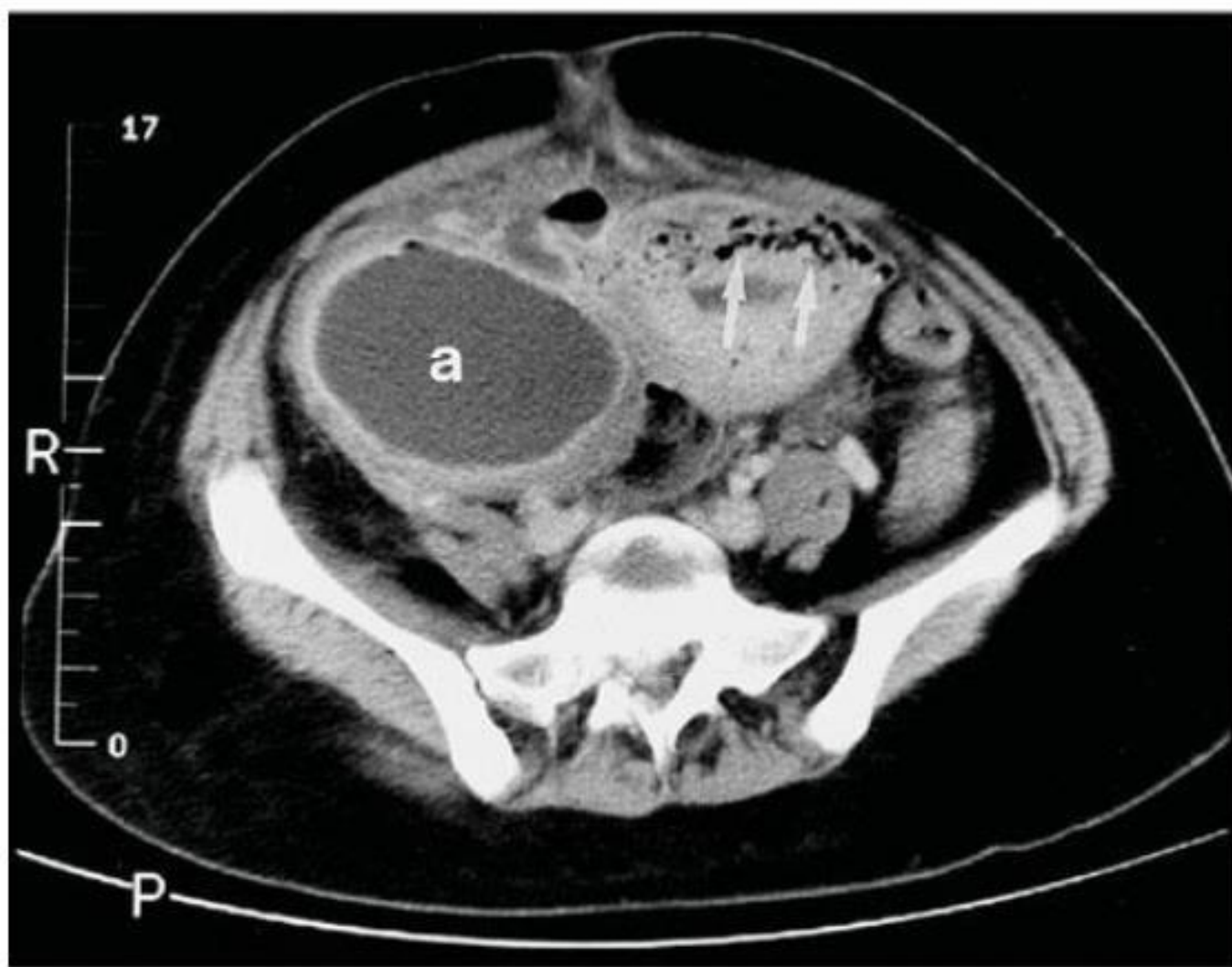


FIGURE 37-5 Pelvic computed tomography scan showing necrosis of the uterine incision with gas in the myometrium (*arrows*). There is also a large right-sided parametrial abscess (*a*).

Septic Pelvic Thrombophlebitis

- ▶ mortality rate and need for surgical therapy for these infections diminished.
- ▶ The ovarian veins may involved
- ▶ inferior vena cava and occasionally renal vein.
- ▶ Symptomatic improvement with antimicrobial treatment, however, they continue to have fever.
- ▶ Addition of heparin to antimicrobial therapy for septic pelvic thrombophlebitis did not hasten recovery or improve outcome.

Perineal Infections

- ▶ Episiotomy infections **are not common**
- ▶ 1-percent dehiscence rate and attributed two thirds to infection
- ▶ Infection of a fourth -degree laceration can be more serious
- ▶ **intrapartum antimicrobials** were protective against infection

TABLE 37-5. Preoperative Protocol for Early Repair of
Episiotomy Dehiscence

Open wound, remove sutures, begin intravenous antimicrobials

Initiate wound care:

Institute sitz bath several times daily or hydrotherapy

Provide adequate analgesia or anesthesia—regional analgesia or general anesthesia may be necessary for initial debridements

Scrub wound twice daily with a povidone-iodine solution

Debride necrotic tissue

Close wound when afebrile and pink, healthy granulation tissue present

Provide enemas prior to fourth-degree repair

Institute postoperative stool softeners; normal diet, nothing per vagina or rectum

Toxic Shock Syndrome

- ▶ Acute febrile illness with severe multisystem derangement
- ▶ case -fatality rate of 10 to 15 percent .
- ▶ Fever, headache , mental confusion, diffuse macular erythematous rash, subcutaneous edema, and marked hemoconcentration .
- ▶ *Staphylococcus aureus* was recovered from almost all afflicted persons.
- ▶ Delayed diagnosis and treatment may be associated with maternal mortality
- ▶ Antimicrobial therapy that includes staphylococcal and streptococcal and against polymicrobial coverage is given.
- ▶ extensive wound debridement and possibly hysterectomy

BREAST INFECTIONS

- ▶ Parenchymal infection of the mammary glands
- ▶ A rare antepartum complication but is estimated to develop in up to a third of breast -feeding women
- ▶ Risk factors include nursing difficulties, cracked nipples, and oral antibiotic therapy
- ▶ Symptoms of suppurative mastitis seldom appear before **the end of the first week postpartum**
- ▶ Symptoms include **chills or actual rigors**, which are soon **followed by fever and tachycardia**.

BREAST INFECTIONS

- ▶ *Staphylococcus aureus* , especially its **methicillin-resistant** strain, is the most commonly isolated organism
- ▶ **milk cultured** before therapy is begun.
- ▶ Vigorous milk expression may be sufficient treatment alone
- ▶ **Dicloxacillin**, 500 mg orally four times daily
- ▶ **Erythromycin** is given to women who are penicillin sensitive
- ▶ **Vancomycin, clindamycin** or trimethoprim-sulfamethoxazole :if resistant organisms are suspected
- ▶ treatment is recommended for 10 days.

Breast Abscess

- ▶ An **abscess** should be suspected when defervescence does not follow within **48 to 72 hours of mastitis treatment** or when a **mass** is palpable.
- ▶ the incidence of breast abscess was 0.1 percent
- ▶ sonographic imaging is valuable
- ▶ Traditional therapy is surgical drainage, which usually requires general anesthesia.
- ▶ A more recently used technique that is less invasive is **sonographically guided needle aspiration using local analgesia**
- ▶ In the setting of a **nonhealing abscess**. Rarely, granulomatous mastitis presents as puerperal mastitis Cancer or tuberculosis are other considerations

