

PID · STI & Pelvic Inflammatory Disease

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THE STORY IN ONE SENTENCE

Bacteria from a sexually transmitted infection in the cervix climb up into the uterus, fallopian tubes, and sometimes the belly, causing infection and scarring that never fully heals.

“PID means germs from the cervix travel up into the tubes and belly. Even after treatment, the tubes stay scarred and may never work right again.”

Normal anatomy — the body's job

The cervix (neck of the womb) makes thick mucus that blocks germs from climbing up. The fallopian tubes (the tubes connecting ovaries to the uterus) have tiny sweeping hairs called cilia that push any debris back down and keep the inside sterile. Hormones—estrogen and progesterone—and your immune system adjust this barrier through the monthly cycle to stay strong.

BODY'S JOB

The cervix acts like a locked gate: its mucus plug stops bacteria from swimming up into the uterus. The fallopian tubes sweep constantly with cilia—like tiny brooms—to clear out anything that does not belong and guide the egg safely down to the uterus. Together, they keep the upper reproductive tract (uterus, tubes, ovaries, and the space around them) germ-free.

1. Cervix produces thick mucus
2. Mucus barrier blocks bacteria
3. Estrogen and progesterone tune barrier strength
4. Cilia in fallopian tubes sweep constantly
5. Upper tract stays sterile

What breaks

Bacteria—most often chlamydia (*Chlamydia trachomatis*) or gonorrhea (*Neisseria gonorrhoeae*), sometimes both or a mix of other germs—break through the cervix mucus barrier, swim up into the uterus, plant themselves in the lining, then climb into the fallopian tubes, and sometimes spill into the belly. The infection triggers swelling that kills the sweeping cilia and scars the tubes, even after the germs are gone.

CLINICAL TERM

Chlamydia trachomatis, *Neisseria gonorrhoeae*, or polymicrobial flora (a mix including anaerobes like *Bacteroides*, *Peptostreptococcus*, and facultative bacteria such as *Gardnerella vaginalis* and *Haemophilus influenzae*) breach the cervical mucus barrier—often during menses when the barrier is thinnest—and ascend through the endocervix into the endometrial cavity. From there, bacteria seed the endometrium (causing endometritis), then travel through the fallopian tubes (causing salpingitis), and may spill into the peritoneal cavity (causing peritonitis) or form a tubo-ovarian abscess. Inflammatory cytokines and neutrophil infiltration damage or destroy the ciliated epithelium lining the tubes; even when antibiotics clear the infection, scarring, adhesions, and loss of cilia permanently impair tubal function.

How the body compensates

Your body tries to wall off the infection by flooding the pelvis with white blood cells and inflammatory fluid. This response causes the pain, tenderness, and swelling you feel, but it does not kill the bacteria—only antibiotics can do that. Vital signs (heart rate, blood pressure, temperature) may look normal or only mildly abnormal at first, even while the infection spreads and scars the tubes. The danger is missing the infection because someone 'looks okay' on the outside, then letting it progress to abscess, rupture, sepsis (bloodstream infection), or permanent infertility.

1. {'what': 'Body sends white blood cells to the infection site', 'why': 'Your immune system detects bacteria in the tubes and uterus and ships white blood cells (neutrophils) there to surround and kill the germs—like sending firefighters to a blaze.'}
2. {'what': 'Inflammatory fluid floods the pelvis', 'why': 'Blood vessels in the pelvis leak fluid and immune chemicals (cytokines) into the tissue to help fight the infection and wall it off. This fluid causes swelling, which stretches the tissues and nerves, making you feel deep pelvic pain.'}

3. {'what': 'Pain and tenderness warn you something is wrong', 'why': "When the doctor moves your cervix or presses on the area near your tubes and ovaries (adnexa), it hurts sharply because those tissues are inflamed and swollen. This pain is your body's alarm system saying, 'There is infection here—get help.'"}
4. {'what': 'Vital signs may stay normal early on', 'why': 'In mild to moderate PID, your heart rate, blood pressure, and even temperature can be normal or only slightly high because your body is compensating—keeping things stable while the infection is still walled off. This is the dangerous middle: you may not feel that sick, so you or your doctor might underestimate how serious it is.'}
5. {'what': 'Watch for the crash point: abscess or sepsis', 'why': 'If the infection is not treated, it can form a pocket of pus (tubo-ovarian abscess) that can rupture, spilling bacteria into the belly and bloodstream (sepsis). Signs include high fever, severe belly pain, fast heart rate, low blood pressure, and feeling very ill. Once this happens, the window to recover narrows fast—surgery may be needed, and even with treatment, scarring and infertility are more likely.'}
6. {'what': 'Fitz-Hugh-Curtis syndrome (liver capsule infection)', 'why': 'Rarely, bacteria travel up the right side of the belly and inflame the lining around the liver (perihepatitis), causing sharp pain in the upper right belly that can be confused with gallbladder or liver disease. It happens because the infection spreads along the peritoneal lining.'}
7. {'what': 'Look at trends, not just one snapshot', 'why': "A patient whose pain is worsening, whose fever is climbing, or who is starting to look sicker is on a downhill slope—even if vital signs are still 'okay' right now. Treat the trajectory, not just the number on the monitor."}

Domino effect

1. Bacteria breach the cervix and enter the uterus — Chlamydia, gonorrhea, or mixed bacteria swim past the cervical mucus—especially during menstruation when the barrier is thinnest—and plant themselves in the endometrium (uterine lining), starting the infection.
2. Infection spreads up into the fallopian tubes — Bacteria multiply in the endometrium and are carried by uterine contractions or swim on their own into the fallopian tubes, where they trigger salpingitis (tube infection) and begin to damage the delicate ciliated lining.
3. Inflammation kills the cilia and scars the tubes — White blood cells flood the tubes and release enzymes and cytokines to kill bacteria, but this inflammatory response also destroys the sweeping cilia and leaves behind scar tissue and adhesions that block or narrow the tube permanently—even after antibiotics clear the germs.
4. You feel pelvic pain and tenderness — Swelling and inflammation in the uterus, tubes, and surrounding tissue stretch nerve endings, causing constant aching or cramping pain. When the doctor moves your cervix or presses near the tubes and ovaries, it hurts sharply because those tissues are inflamed and full of fluid.

5. Fever and discharge may or may not appear — Fever happens when bacterial toxins and inflammatory chemicals (cytokines like IL-1 and TNF- α) reach the bloodstream and reset your brain's thermostat. Vaginal discharge appears when the infected endometrium and cervix shed inflamed cells and pus. But mild or early PID may have no fever or discharge at all, which is why the diagnosis is often missed.
6. Untreated infection can form a tubo-ovarian abscess — If bacteria are not killed quickly, they can collect in a walled-off pocket of pus next to or inside the tube and ovary. This abscess can rupture, spilling bacteria into the belly and bloodstream, causing peritonitis and sepsis—a life-threatening emergency.
7. Scarred tubes lead to infertility or ectopic pregnancy — Because the cilia are destroyed and scar tissue blocks or narrows the tubes, eggs cannot travel down to the uterus normally. This can prevent pregnancy altogether (infertility) or cause a fertilized egg to get stuck in the tube (ectopic pregnancy), which is dangerous and requires urgent treatment.
8. Chronic pelvic pain can persist even after treatment — Adhesions (bands of scar tissue) form between the tubes, ovaries, uterus, and bowel during healing. These adhesions tug and pull on nerves and organs, causing ongoing pain that can last months or years, even when the infection is long gone.

Symptoms · what the patient feels, and why

- Lower belly pain that gets worse when the doctor pushes on the cervix or ovary area during an exam (cervical motion tenderness or adnexal tenderness): Infection has climbed from the cervix into the uterus, fallopian tubes, or ovaries, making those tissues swollen and sore. When the doctor nudges the cervix or presses near the ovaries, it moves the inflamed organs and triggers pain.
- Cervix that bleeds easily when touched (friable cervix): Bacteria such as chlamydia or gonorrhea inflame the surface of the cervix, making tiny blood vessels fragile and raw so they break open with the lightest touch.
- Abnormal vaginal discharge—often cloudy, yellowish, or foul-smelling: The infection triggers the cervix and upper genital tract to pour out white blood cells and fluid mixed with bacteria and dead tissue, which drains down as discharge.
- Bleeding after sex (post-coital bleeding): The inflamed, friable cervix has fragile blood vessels that break open from the friction of intercourse.
- Fever (often low-grade, sometimes higher): The immune system raises the body's temperature to fight the bacteria spreading through the reproductive organs.
- Pain during sex (dyspareunia): Swollen, tender pelvic organs get bumped or stretched during intercourse, triggering pain.

- No symptoms at all in many cases—silent infection that only shows up years later as trouble getting pregnant (infertility): Mild or low-grade infections can quietly scar the fallopian tubes without causing obvious pain or fever. By the time scar tissue has blocked the tubes, the infection is long gone and the patient never knew it happened.
- Severe lower belly pain, high fever, and feeling very sick: The infection has formed a walled-off pocket of pus (tubo-ovarian abscess) or spread into the abdominal cavity (peritonitis), triggering a strong immune response and systemic illness.

Focused exam

- Cervical motion tenderness (pain when the cervix is gently moved side-to-side during the pelvic exam): In PID, bacteria climb from the cervix into the uterus and fallopian tubes. When you nudge the cervix, you pull on the infected tubes and uterus above it, which are swollen and inflamed, so it hurts. This is the single most telling sign that infection has moved upward into the pelvis.
- Adnexal tenderness (pain on one or both sides of the lower belly when you press, where the tubes and ovaries sit): The adnexa are the tubes and ovaries. When they hurt, it means infection has already reached the tubes. Pressing on swollen, inflamed tubes causes pain. This finding tells you bacteria crossed the cervix barrier and climbed upstream.
- Lower belly tenderness without rebound or guarding (hurts when pressed, but the belly stays soft and does not tighten): In uncomplicated PID, the tubes and uterus are inflamed but the belly lining (peritoneum) is only mildly irritated. The belly is soft because nothing has ruptured yet. This helps separate PID from a surgical emergency like a burst abscess or appendix.
- Mucopurulent cervical discharge (thick yellow or green discharge from the cervix): The discharge is pus from the cervix fighting infection. It shows bacteria—usually chlamydia or gonorrhea—are damaging the cervix, which is the entry gate to the upper genital tract. This points to the spot where the bacteria broke through.
- Friable cervix (the cervix bleeds easily when touched with a swab): A friable cervix means the tissue is inflamed and fragile because bacteria have invaded and damaged the cells. It shows the cervix is the site of injury where chlamydia or gonorrhea first attacked.
- Fever (oral temperature $\geq 100.4^{\circ}\text{F}$ or 38°C): Fever means the immune system is fighting back against spreading infection. In PID, fever can come and go or be absent entirely. Absence of fever does not rule out PID, but when present it signals active inflammation.

Diagnostics · every test answers a question

- Nucleic acid amplification test (NAAT) for chlamydia and gonorrhea from cervical or vaginal swab → Is *Chlamydia trachomatis* or *Neisseria gonorrhoeae*—the two most common bacteria that cause PID—present in the genital tract?
- Complete blood count (CBC) with white blood cell count and differential → Is the body mounting a strong immune response to infection, suggesting more severe or widespread inflammation?
- C-reactive protein (CRP) or red blood cell (erythrocyte) sedimentation rate (ESR) → Are there signs of body-wide inflammation that suggest PID is not just limited to the cervix?
- Pregnancy test (urine or serum beta-hCG) → Is the patient pregnant, which would change the diagnosis to ectopic pregnancy or pregnancy-related complications instead of PID?
- Pelvic ultrasound (transvaginal preferred) → Is there a tubo-ovarian abscess (a pus-filled pocket in the tube or ovary), thickened inflamed tubes, or free fluid in the pelvis that signals severe PID?
- Wet mount or vaginal pH (point-of-care microscopy) → Is there bacterial vaginosis or trichomoniasis, which often travel alongside chlamydia and gonorrhea and contribute to PID?

Treatment logic

- Ceftriaxone 500 mg intramuscular (IM) once (updated 2020 CDC guideline dose) → Kills *Neisseria gonorrhoeae* (gonorrhea bacteria) immediately at the cervix and in the tubes. Stops gonorrhea from multiplying and spreading deeper into the pelvis. Gonorrhea is resistant to many older antibiotics, so ceftriaxone is the only reliable first choice.
- Doxycycline 100 mg by mouth twice daily for 14 days → Kills *Chlamydia trachomatis* (chlamydia bacteria) inside the cells lining the uterus and tubes. Chlamydia hides inside cells and damages the cilia even after the bacteria die, so 14 days of treatment is needed to clear the infection fully and reduce long-term scarring.
- Metronidazole 500 mg by mouth twice daily for 14 days → Kills anaerobic bacteria (bacteria that grow without oxygen) such as *Bacteroides* and *Prevotella*, which seed the pelvis alongside chlamydia and gonorrhea. Anaerobes drive abscess formation and add to the inflammatory damage. Metronidazole reduces the total bacterial load and lowers the risk of tubo-ovarian abscess.
- Test and treat all sexual partners from the past 60 days with the same antibiotic regimen (ceftriaxone plus doxycycline) → Breaks the reinfection loop. If the partner still carries chlamydia or gonorrhea, the patient will be reinfected days or weeks after finishing her antibiotics. Treating the partner stops transmission and protects the patient from repeat episodes of PID, which multiply the risk of infertility.

- Abstain from sex until both the patient and all partners complete the full antibiotic course and symptoms resolve → Prevents reinfection during treatment. Allows the swelling in the tubes and uterus to settle and gives the cilia a chance to begin repair. Reduces mechanical irritation of inflamed tissues.
- Hospitalize for intravenous (IV) antibiotics (ceftriaxone or cefotetan plus doxycycline) if the patient has severe illness: high fever ($\geq 101^{\circ}\text{F}$), nausea and vomiting, tubo-ovarian abscess, pregnancy, or no improvement after 72 hours of outpatient antibiotics → Delivers higher, more reliable antibiotic levels directly into the bloodstream when the infection is severe or the patient cannot take pills. Allows close monitoring for abscess rupture or sepsis (body-wide infection). If an abscess is present, IV antibiotics combined with imaging-guided drainage can prevent surgery.
- Remove intrauterine device (IUD) if present and symptoms do not improve within 48–72 hours of starting antibiotics → The IUD can act as a surface where bacteria stick and form a biofilm (a protective slime layer that shields bacteria from antibiotics). Removing the IUD eliminates this hiding place and allows antibiotics to clear the infection. Most women with PID and an IUD improve on antibiotics alone, so removal is reserved for treatment failure.

Medications

Ceftriaxone 500 mg intramuscular (IM) once · Third-generation cephalosporin antibiotic

Ceftriaxone kills *Neisseria gonorrhoeae* (the germ that causes gonorrhea) by punching holes in its outer wall. Without a sturdy wall, the germ bursts and dies. This stops the gonorrhea bacteria from multiplying inside the pelvis and helps clear the infection.

1. The drug enters the bloodstream after the shot goes into muscle
2. It travels to infected tissue in the pelvis and reproductive organs
3. It binds to proteins on the gonorrhea germ's wall that help build the wall
4. Without those proteins working, the wall cannot stay together
5. The germ swells and breaks apart, and the infection starts to clear

SAFETY WATCH

Allergic reaction: severe allergy to penicillin may also mean allergy to cephalosporins—tell your doctor about ANY drug allergies before the shot · Pain or soreness at the injection site for a day or two · Rarely, diarrhea or stomach upset

Doxycycline 100 mg by mouth twice a day for 14 days · Tetracycline antibiotic

Doxycycline kills *Chlamydia trachomatis* (the germ that causes chlamydia) and some other bacteria by blocking their ability to make proteins. Without proteins, the germs cannot grow, repair themselves, or multiply, so the infection dies out over two weeks.

1. You swallow the pill and it absorbs into your bloodstream through your stomach and intestines
2. The drug travels to infected tissue in the pelvis
3. It sneaks inside chlamydia bacteria and binds to their ribosomes (the tiny factories that make proteins)
4. The ribosome cannot read the germ's instructions anymore, so no new proteins get made
5. Without proteins, the bacteria stop growing and eventually die, and your immune system clears them away

SAFETY WATCH

Take it with food to avoid stomach upset or nausea · Stay out of strong sun and tanning beds—doxycycline makes your skin burn more easily · Do NOT take it with dairy products, calcium, or antacids at the same time; wait at least 2 hours—they block the drug from absorbing · Do NOT use during pregnancy—it can harm the baby's growing bones and teeth · Finish all 14 days even if you feel better—stopping early lets the infection come back stronger

Metronidazole 500 mg by mouth twice a day for 14 days · Nitroimidazole antibiotic

Metronidazole kills anaerobic bacteria (germs that live without oxygen, like *Bacteroides* and *Prevotella* species) and some other pathogens by breaking their DNA. Once inside the germ, the drug gets activated and then cuts up the germ's genetic instructions. Without working DNA, the bacteria die. This is important because anaerobes from the vagina often travel up and join the PID infection.

1. You swallow the pill and it absorbs into your bloodstream
2. The drug travels to infected pelvic tissue
3. Anaerobic bacteria pull the drug inside and chemically activate it
4. The activated drug breaks the bacteria's DNA strands into pieces
5. Without intact DNA, the germs cannot copy themselves or survive, and the infection clears

SAFETY WATCH

Do NOT drink ANY alcohol while taking metronidazole and for at least 48 hours after your last dose—mixing them causes severe nausea, vomiting, fast heartbeat, and flushing · Metallic taste in your mouth is common and goes away after you finish the pills · May cause nausea or stomach upset—take with food if needed · Dark or reddish-brown urine is harmless and temporary · Finish all 14 days to fully clear the infection

Inpatient regimen (if admitted to the hospital): Cefoxitin 2 g IV every 6 hours OR Cefotetan 2 g IV every 12 hours PLUS Doxycycline 100 mg IV or by mouth every 12 hours, then switch to doxycycline 100 mg by mouth twice a day plus metronidazole 500 mg by mouth twice a day to finish 14 days total ·

Intravenous (IV) cephalosporin antibiotics plus tetracycline antibiotic, often with metronidazole added

When PID is severe—meaning high fever, a tubo-ovarian abscess (a pocket of pus on the tube or ovary), pregnancy, inability to take pills, or no improvement after 72 hours of outpatient treatment—doctors admit you to the hospital and give antibiotics through an IV (a tiny tube in your vein). Cefoxitin or cefotetan kill gonorrhea and many anaerobes by breaking their cell walls. Doxycycline kills chlamydia by blocking protein-making. Together they cover all the germs quickly and at high doses. Once you are better (no fever, less pain, eating normally), you switch to pills and finish 14 days total at home. Metronidazole is often added to make sure anaerobes are fully covered.

1. The nurse starts an IV and the antibiotics drip directly into your bloodstream
2. High levels of drug reach infected tissue in the pelvis very quickly
3. Cefoxitin or cefotetan break the walls of gonorrhea and anaerobic bacteria, causing them to burst
4. Doxycycline stops chlamydia from making proteins, so it cannot grow or multiply
5. After 24–48 hours of IV treatment, if you feel better and can eat, you switch to pills and go home to finish the full 14 days

SAFETY WATCH

IV site may be sore or bruised where the needle sits · Allergic reactions are rare but serious—tell the nurse immediately if you feel itchy, short of breath, or notice swelling of your face or throat · Diarrhea or yeast infection may happen because IV antibiotics also kill helpful germs · You must stay in the hospital until fever is gone for 24 hours and pain is better—usually 1–3 days · Finish all 14 days of treatment after leaving the hospital to fully clear the infection

Alternative oral outpatient regimen (if ceftriaxone is not available): Cefixime 800 mg by mouth once (or levofloxacin 500 mg by mouth once daily for 14 days if severe penicillin allergy), PLUS Doxycycline 100 mg by mouth twice a day for 14 days, PLUS Metronidazole 500 mg by mouth twice a day for 14 days · Oral cephalosporin or fluoroquinolone antibiotic, plus tetracycline and nitroimidazole

If the ceftriaxone shot is not available or you have a severe penicillin allergy, doctors may use cefixime (a pill form of cephalosporin) or levofloxacin (a fluoroquinolone antibiotic) instead. Cefixime works like ceftriaxone—it breaks gonorrhea's cell wall. Levofloxacin works by cutting the DNA inside gonorrhea and other bacteria so they cannot copy themselves. HOWEVER, gonorrhea is becoming resistant to fluoroquinolones in many places, so levofloxacin is used ONLY if you are truly allergic to cephalosporins and local resistance rates are low. You still take doxycycline for chlamydia and metronidazole for anaerobes, just as in the standard regimen.

1. You swallow the pills and they absorb into your bloodstream
2. Cefixime or levofloxacin travels to infected tissue and attacks gonorrhea (cefixime breaks the wall; levofloxacin cuts the DNA)
3. Doxycycline blocks chlamydia's protein factories
4. Metronidazole breaks anaerobic bacteria's DNA
5. Over 14 days, all three types of germs die and the infection clears

SAFETY WATCH

Levofloxacin can cause tendon pain or rupture (especially the Achilles tendon at the back of your ankle)—stop the drug and call your doctor if you feel sudden pain or cannot walk normally · Levofloxacin may also cause nerve pain, dizziness, or mood changes in rare cases · Cefixime may cause diarrhea or stomach upset—take with food · Avoid sun exposure with levofloxacin (like doxycycline, it makes you burn easily) · Do NOT use levofloxacin if you are pregnant or under 18 unless absolutely necessary

Red flags

- Severe lower belly pain with high fever and vomiting—may signal a tubo-ovarian abscess (a pus-filled pocket near the ovary) or peritonitis (infection spreading into the belly)
- Unable to walk or stand upright because of pain—suggests very swollen, inflamed pelvic organs or an abscess
- Signs of sepsis: racing heart, very low blood pressure, confusion, or extremely high or very low body temperature—bacteria may be spilling into the bloodstream

Nursing priorities

1. Give ceftriaxone 250 mg intramuscular injection in first visit and watch patient take first doses of doxycycline 100 mg and metronidazole 500 mg by mouth — Early antibiotics stop bacteria from spreading higher into tubes and ovaries where they cause abscesses and permanent scarring that blocks tubes and causes infertility
2. Teach patient to take doxycycline 100 mg twice daily and metronidazole 500 mg twice daily for full 14 days even when pain stops — Stopping antibiotics early leaves live bacteria that continue damaging tubes; complete course kills all gonorrhea and chlamydia bacteria plus anaerobes (bacteria that grow without oxygen) that cause deep infection
3. Explain that patient and all sexual partners from last 60 days must get tested and treated with same antibiotics before any sex happens again — Untreated partners carry gonorrhea or chlamydia bacteria and re-infect the patient immediately after her treatment ends; ping-pong infection back and forth causes repeated tube damage
4. Schedule follow-up visit in 72 hours to check if belly pain and tenderness are improving — If pain gets worse or fever develops, abscess may be forming; patient needs pelvic ultrasound or CT scan and possible hospital admission for IV antibiotics or surgery to drain abscess
5. Tell patient no alcohol while taking metronidazole and for 24 hours after last dose — Metronidazole blocks enzyme (chemical helper) that breaks down alcohol; drinking causes severe nausea, vomiting, fast heart rate, and dangerously low blood pressure called disulfiram reaction
6. Educate patient that condoms for every sex act prevent re-infection and future PID episodes — Each PID episode doubles the infertility risk because infection creates more scar tissue blocking fallopian tubes; after three episodes, 40 percent of women cannot get pregnant
7. Teach warning signs to return immediately: fever over 101, vomiting, severe pain, dizziness, or fainting — These symptoms signal abscess rupture or spreading infection into bloodstream (sepsis) causing shock where blood pressure drops too low to deliver oxygen to organs
8. Offer HIV and hepatitis testing because STI exposure risk is same for all bloodborne infections — Patients with one STI often have others; gonorrhea and chlamydia damage genital skin making it easier for HIV and hepatitis viruses to enter bloodstream during sex

Sources

- CDC Sexually Transmitted Infections Treatment Guidelines 2021
- American College of Obstetricians and Gynecologists (ACOG)
- Infectious Diseases Society of America (IDSA)

- Cochrane

Last reviewed: 2026-07-07