

Spinal Cord Compression and Cauda Equina

Cauda equina syndrome is a spine emergency. When something crushes the nerve bundle below L2, you lose feeling in the saddle area, cannot pee (then overflow leaks out), lose control of your bowels, get leg weakness and pain in both legs, and your anal tone goes soft. Get an MRI right away. Surgery must happen within 48 hours or the damage becomes permanent.

THE ONE-LINE TRUTH

A disc, tumor, blood clot, or infection squeezes the bundle of nerves at the bottom of the spine, cutting off the signals that control your legs, bladder, bowels, and saddle area all at once.

The chain — how it unfolds

1. A big disc, tumor, abscess, or blood clot squeezes the cauda equina nerve bundle below L2, blocking all the nerve signals going to and from the legs, bladder, bowels, and saddle area. — why: Because all those nerve roots run side by side in one tight bony tunnel, anything that takes up space in the canal—whether it pushes in from behind (disc), grows from inside (tumor), or fills the space with pus or blood—crushes the whole bundle at once. The nerves are soft and squishy; the bone around them is hard. When pressure goes up, the nerves get flattened like a garden hose pinched under a car tire.
2. The motor signals going down to the leg muscles are cut off, so both legs get weak. The sensory signals coming back up are also cut, so you lose feeling in both legs and in the saddle area (the skin around your bottom, genitals, and inner thighs). — why: The lumbar nerve roots (L2, L3, L4, L5) control the hip flexors, knee extensors (quadriceps), ankle dorsiflexors (the muscles that lift your foot up), and ankle plantarflexors (the muscles that point your foot down). The sacral roots (S1, S2) carry feeling from the back of the leg and the sole of the foot. When the bundle is crushed, all those wires go quiet. Weakness is often worse in the ankles (foot drop) and may be asymmetric at first, but it usually affects both legs because the compression is central.

3. The parasympathetic nerves that tell the bladder to squeeze (S2, S3, S4, carried in the pelvic splanchnic nerves) are blocked, so the detrusor muscle stops contracting and the bladder cannot empty. — why: Normally, when the bladder fills to about 300–400 mL, stretch receptors in the bladder wall send a signal up the sacral nerves to the brain. The brain sends a signal back down the same nerves to contract the detrusor and relax the internal sphincter, and you pee. When those sacral nerve roots are crushed, the whole loop is broken. The bladder fills but never gets the 'squeeze' command, so it just keeps filling—500, 800, 1000 mL or more (normal capacity is about 400–600 mL). Eventually the pressure inside the bladder is higher than the urethral sphincter can hold, and pee leaks out passively. That is overflow incontinence. The patient may say they are peeing all the time, but really they are retaining a huge volume and just dribbling the overflow.
4. Saddle anesthesia (loss of feeling in the saddle area) wipes out the normal sensation of a full bladder and the urge to pee or poop, so the patient does not realize anything is wrong until overflow or fecal incontinence starts. — why: The sacral dermatomes (S2, S3, S4, S5) cover the skin around the anus, genitals, perineum, and inner thighs—the exact area that would touch a saddle. When those sensory nerves are crushed, that whole patch of skin goes numb. You lose not just light touch but also the deep sensation of fullness in the bladder and rectum. That is why patients often present late—they did not feel the problem building.
5. Anal sphincter tone goes soft and the bulbocavernosus reflex and anal wink reflex disappear, because the motor nerves to the external anal sphincter and the reflex arcs through S2–S4 are cut. — why: The external anal sphincter is controlled by the pudendal nerve (S2, S3, S4). When you do a rectal exam, you normally feel the sphincter squeeze tight around your finger. In cauda equina syndrome, the sphincter feels loose and floppy, like a rubber band that lost its stretch. The anal wink reflex (when you scratch the skin next to the anus, the sphincter should twitch) and the bulbocavernosus reflex (when you squeeze the glans penis or tap the clitoris, the anus should contract) both disappear because the reflex arc is broken. These are objective signs that the sacral nerves are dead or dying.
6. Lower-extremity reflexes (especially the ankle jerk, S1) become diminished or absent, and you may also lose the knee jerk (L3–L4) if the compression is high or severe. — why: A reflex is a loop: tap the tendon → stretch receptor fires → sensory nerve carries signal to spinal cord → motor nerve carries signal back to muscle → muscle contracts. When the nerve roots are crushed, the loop is broken, so the reflex disappears. This is a lower motor neuron pattern (flaccid weakness, lost reflexes) because the damage is to the peripheral nerve roots, not the spinal cord itself. If the spinal cord were crushed (above L1), you would see upper motor neuron signs (spasticity, overactive reflexes (hyperreflexia), Babinski). The pattern of lost reflexes helps you know exactly where the damage is.

7. Bowel control is lost because the sensory nerves that signal 'I need to poop' and the motor nerves that squeeze the anal sphincter are both cut, leading to fecal incontinence or severe constipation. — why: The rectum fills with stool, but the patient does not feel it because the sensory nerves (S2–S4) are numb. The internal anal sphincter (smooth muscle, controlled by autonomic nerves) and external anal sphincter (skeletal muscle, controlled by the pudendal nerve) both lose tone. Stool either leaks out passively or gets impacted in the rectum because the patient cannot coordinate a bowel movement. Either way, bowel control is gone.
8. If the compression is not relieved by surgery within 48 hours, the nerve axons die, scar tissue forms, and the damage becomes permanent—especially bladder and bowel function, which almost never recover after that window closes. — why: Peripheral nerves can heal if the cell body is alive and the crush injury is relieved quickly. But if the nerve is squashed for too long, the axon (the long wire part) degenerates and the myelin sheath (the insulation) breaks down. Even if you take the pressure off later, the nerve cannot regrow all the way back to the muscle or skin—it scars and stops halfway. The sacral nerves that control the bladder and bowels are especially vulnerable. After 48 hours, even perfect decompression surgery leaves most patients with permanent bladder dysfunction (needing intermittent catheterization for life) and bowel incontinence. Leg strength may recover partially because those nerves are shorter and closer to the spinal cord, but the autonomic and sphincter nerves rarely come back. That is why every guideline (AANS/CNS, NICE, Cochrane) says surgery must happen within 48 hours—ideally within 24 hours if symptoms are rapidly progressive.

Spot it — what you see, and why

- Sudden trouble peeing or can't pee at all: The nerves that control the bladder (the sacral nerves at the very bottom of the spinal cord) get squashed, so the signal telling the bladder to squeeze and empty gets cut off. The bladder fills but can't empty itself.
- Pee left in the bladder over 100 mL after trying to go (called post-void residual): The bladder muscle can't squeeze hard enough because the nerves controlling it are damaged by the compression. Urine stays trapped inside even after the person tries to pee.
- Numbness or tingling in the saddle area (around the butt, inner thighs, and private parts): The sacral nerve roots carry feeling from this 'saddle' zone. When they're crushed, the signals can't get through, so the skin there feels numb or tingly—like when your foot falls asleep.
- Can't control bowel movements or don't feel when you need to go: The same sacral nerves also control the muscles that hold stool in and signal when the rectum is full. Compression cuts those signals, so you may leak stool or not realize you need to go.

- Weakness in both legs, especially trouble standing up or walking: Motor nerve roots to the legs are compressed, blocking the signals from the brain that tell leg muscles to contract. Without those signals, the muscles can't work properly and feel weak.
- Severe lower-back pain that may shoot down both legs: The compressed nerve roots themselves send out pain signals, and inflammation around the injury irritates the nerve fibers. The pain often radiates down the path of the nerves (both legs, following the sciatic nerves).

Red flags — act now

- New inability to pee, or bladder that stays full and won't empty (over 100 mL left after trying)
- Numbness in the saddle area (butt, groin, inner thighs, genitals)
- Loss of bowel or bladder control, or can't feel when you need to go
- Weakness in both legs that's getting worse, trouble walking or standing
- Severe back pain plus any of the above nerve symptoms—this is a surgical emergency

Treat it — in this order

1. Stat MRI of the lumbar and sacral spine (within 24 hours, ideally within 6–12 hours of symptom onset) → Shows exactly where and what is squeezing the cauda equina—a herniated disc, tumor, abscess, a pooled collection of blood (hematoma), or bone fragment—so the surgeon knows where to cut and what to remove. It also rules out mimics like transverse myelitis or Guillain-Barré syndrome that do not need surgery.
2. Emergency surgical decompression (laminectomy, discectomy, abscess drainage, tumor debulking, or a pooled collection of blood (hematoma) evacuation) within 48 hours—ideally within 24 hours → Physically removes or cuts away the disc, bone, pus, tumor, or blood clot squeezing the cauda equina nerve bundle, so blood flow and oxygen return to the nerve roots. This stops further nerve death and gives damaged nerves a chance to heal over weeks to months. Studies show surgery within 48 hours gives the best chance of recovering bladder, bowel, and leg function.
3. Dexamethasone 10 mg IV immediately, then 4 mg IV every 6 hours until surgery (if cause is tumor or severe disc herniation); hold steroids if infection (abscess) is suspected until antibiotics are on board → Shrinks swelling (edema) around the crushed nerve roots by blocking inflammation chemicals (cytokines and prostaglandins), giving the nerves a little more room inside the tight spinal canal while you arrange surgery. This buys time and may prevent a few more nerve cells from dying.

4. Insert a Foley (indwelling urinary) catheter immediately and measure post-void residual if not already done → Drains trapped urine from the bladder, stopping backup into the kidneys (which would cause hydronephrosis and acute kidney injury within days). It also prevents bladder overdistension, which damages the bladder wall muscle (detrusor) and makes recovery of bladder control even harder later.
5. Start broad-spectrum IV antibiotics immediately (e.g., vancomycin 15–20 mg/kg IV every 8–12 hours PLUS ceftriaxone 2 g IV daily, or meropenem 1 g IV every 8 hours) if epidural abscess or discitis is suspected, before or during MRI → Kills bacteria causing the spinal infection (most often Staph aureus, including MRSA) and stops the abscess from growing bigger and squeezing more nerve roots. Antibiotics also prevent the infection from spreading into the bloodstream (sepsis) or brain (meningitis).

Your top priorities at the bedside

1. Keep the patient flat in bed with log-roll turning only, no twisting at the waist. — why: Twisting can shift a herniated disc or unstable bone and crush more nerves. Log-rolling (turning the whole body as one unit) protects the spine until imaging and surgery.
2. Insert a Foley catheter and measure urine output every hour; record the amount of urine drained immediately after insertion. — why: A bladder holding more than 100 milliliters after voiding (post-void residual) confirms nerve damage. Continuous drainage prevents bladder overdistension (overstretching), which can damage the bladder muscle permanently.
3. Perform and document a focused neurologic exam every 2 hours: check leg strength, saddle sensation, and rectal tone with a gloved finger. — why: Cauda equina can worsen rapidly. Serial exams catch new weakness or numbness early so the surgeon knows if the window for nerve recovery is closing.