

Malignant Spinal Cord Compression

A tumor presses on the spinal cord and cuts off its signals.

THE STORY IN ONE SENTENCE

A tumor presses on the spinal cord and cuts off its signals.

“Tumor squeezing the cord — give steroids fast, then radiation or surgery to take the pressure off before permanent damage sets in.”

Normal anatomy — the body's job

The spinal cord is a thick bundle of nerves that runs down the center of your backbone, protected by a bony tunnel made of stacked vertebrae (the small bones in your spine).

BODY'S JOB

The spinal cord carries every signal between your brain and your body — orders to move your legs, messages about pain and touch, and commands that tell your bladder and bowels when to squeeze and when to relax. The bones around it keep it safe from bumps and pressure.

1. Your brain sends a signal to move your leg.
2. The signal travels down the spinal cord like electricity through a wire.
3. The cord passes the signal to nerves that branch out to your leg muscles.
4. Your leg moves.
5. At the same time, signals about touch, pain, and temperature travel up the cord from your body to your brain so you can feel the world around you.
6. Special nerves near the bottom of the cord control your bladder and bowel, telling them when to hold and when to empty.

What breaks

A tumor grows into or presses on the spine bones, squeezing the spinal cord inside and blocking the signals that run through it.

CLINICAL TERM

Metastatic cancer (most often from lung, breast, prostate, or multiple myeloma) invades the vertebral body or grows in the epidural space (the cushion layer just outside the cord), compressing the spinal cord or cauda equina (the bundle of nerve roots below the cord) and cutting off blood flow and signal transmission.

How the body compensates

The body has almost no way to compensate for a squeezed spinal cord. Once the pressure builds, signals stop and function drops fast. Early symptoms like pain are the only warning before permanent damage sets in.

1. {'what': 'Pain signals fire early', 'why': 'Nerves in the bone and around the cord send pain messages to the brain as soon as the tumor starts to press, giving an early alarm that something is wrong.'}
2. {'what': 'Muscles try to keep working', 'why': 'For a short time, the cord sends weak signals through the squeeze, so legs feel heavy and clumsy instead of completely paralyzed — but this window closes fast.'}
3. {'what': 'Reflexes change', 'why': 'As the cord gets more damaged, reflexes below the squeeze first disappear (spinal shock), then later become overactive and stiff (spasticity), showing that the brain has lost its calming control over the spinal nerves.'}
4. {'what': 'No real compensation for bladder or bowel', 'why': 'Once the nerves that control the bladder and bowel are cut off, the body cannot reroute those signals — you lose the ability to feel the urge or control emptying.'}
5. {'what': 'The clock is ticking', 'why': 'If the cord stays compressed for more than 24 to 48 hours, the nerve cells start to die permanently. Steroids can buy a little time by reducing swelling, but only lifting the pressure (with radiation or surgery) can stop the damage.'}

Domino effect

1. Cancer cells land in the spine bone — Cancer from the lung, breast, prostate, or bone marrow (multiple myeloma) spreads through the blood and settles in the vertebrae (spine bones), where the rich blood supply feeds the tumor and lets it grow.
2. Tumor grows and presses on the cord — The tumor eats into the bone or grows in the epidural space (the cushion layer just outside the cord), taking up room inside the tight bony tunnel and squeezing the spinal cord like a hand around a garden hose.
3. Back pain starts, worse at night — The growing tumor stretches the bone and presses on nearby nerves, causing deep, aching pain. It feels worse at night because lying flat shifts fluid into the already crowded space and increases pressure.

4. Legs feel weak and clumsy — The squeezed cord cannot carry the brain's movement signals down to the leg muscles anymore, so the legs don't obey commands and feel heavy or wobbly.
5. Feeling fades below the squeeze — The sensory signals traveling up the cord — touch, pain, temperature — get blocked by the pressure, so the area below the tumor goes numb or tingly.
6. Bladder and bowel stop working — The sacral nerves (the nerves near the bottom of the cord that control the bladder and bowel) lose their connection to the brain, so you can't feel the urge to go or control when you empty.
7. Permanent paralysis if pressure stays — If the cord stays crushed for more than a day or two, the nerve cells run out of oxygen and die. Once they die, they don't grow back, and the loss of movement and feeling becomes permanent.
8. Lifting the pressure early can reverse the damage — Giving high-dose steroids (dexamethasone) shrinks swelling around the tumor and buys time. Radiation or surgery removes the tumor and takes the squeeze off the cord, letting blood flow return and nerve signals restart — but only if you act fast, before the cells die.

Symptoms · what the patient feels, and why

- Back pain that gets worse when lying down or at night: The tumor presses on the bones of the spine or the spinal cord itself, and when you lie flat, the pressure shifts in a way that makes the pain sharper. Normal back pain usually feels better when you rest, but cancer pain does the opposite.
- Weakness in the legs: The tumor squeezes the spinal cord, blocking the nerve signals that tell your leg muscles to move. The spinal cord is like a bundle of electrical wires running down your back; when it gets crushed, the messages from your brain can't get through to your legs.
- Numbness or tingling below the level of the tumor: The compressed spinal cord can't carry feeling signals back up to your brain, so the skin below that spot starts to feel numb or tingly, like when your foot falls asleep but it doesn't go away.
- Trouble controlling your bladder or bowels: The nerves that control your bladder and bowel run through the lowest part of the spinal cord. When the tumor presses on those nerves, you may leak urine, be unable to pee, or lose control of your bowels because the signals between your brain and those muscles are cut off.
- A band of pain around your chest or belly: Nerves branch off the spinal cord and wrap around your body like belts. When the tumor irritates a nerve root at a certain level, you feel a sharp or burning stripe of pain in that band, even though the problem is in your spine.

- Trouble walking or a clumsy, unsteady gait: Your legs feel weak and your brain isn't getting clear feedback about where your feet are in space, because the spinal cord is being squeezed. This makes your steps wobbly and you may stumble or drag your feet.
- Known history of cancer, especially lung, breast, prostate, kidney, or myeloma: These cancers love to spread to bones, including the spine. Once cancer cells land in the vertebrae (the small bones stacked to make your spine), they grow and can push into the spinal canal, squeezing the cord. About 95 out of 100 cases of malignant spinal cord compression come from cancer that started somewhere else and traveled to the spine.
- Loss of reflexes in the legs: Reflexes are fast loops that run through the spinal cord without needing your brain. When the cord is crushed, those loops break and the reflex disappears, so a doctor tapping your knee won't make your leg kick.

Focused exam

- Back pain that wakes the patient from sleep at night or hurts more when lying flat: When a tumor pushes on the spine bone or nerves, it hurts more when the body is relaxed and still—this is the earliest alarm that something is squeezing the spinal cord from outside.
- Legs feel weak, heavy, or give out; trouble walking, climbing stairs, or standing from a chair: The spinal cord is the highway that carries movement commands from the brain down to the leg muscles. When a tumor squeezes the cord, those commands get blocked—muscle weakness is the body's way of showing the cord is under pressure.
- Numbness, tingling, or loss of feeling in the legs, belly, or groin area: Pressure on the spinal cord blocks feeling signals traveling up to the brain. The pattern of numbness tells you exactly which level of the cord is being squeezed—higher squeeze means numbness spreads wider.
- Loss of bladder or bowel control—cannot hold urine or stool, or cannot pass them at all: The spinal cord controls the muscles that open and close the bladder and bowel. When tumor pressure reaches the nerves that run those muscles, control is lost—this is a true emergency because it means the cord is severely compressed and permanent damage is hours to days away.
- Legs are stiff, reflexes are unusually brisk or unusually absent, toes curl up when the sole of the foot is stroked (Babinski sign): These signs show the spinal cord's upper motor neurons (the command wires) are being crushed. Brisk reflexes mean the brake signals from the brain are cut off; absent reflexes mean the local nerve loop is dying—either way, the cord is failing.
- Known history of cancer—especially breast, lung, prostate, kidney, or multiple myeloma: These cancers love to spread to spine bones. When a patient with one of these cancers gets new back pain plus leg weakness or numbness, malignant spinal cord compression jumps to the top of the list—the tumor is almost certainly in the spine now.

Diagnostics · every test answers a question

- MRI of the entire spine with gadolinium contrast → Is there a tumor or mass pressing on the spinal cord, and exactly where is it?
- Plain X-ray of the spine (if MRI is not immediately available) → Is there a broken or collapsed vertebra, or bone eaten away by tumor?
- Complete blood count (CBC) → Is the bone marrow being crowded out by cancer, or is the patient anemic from bleeding tumor?
- Serum calcium → Is the tumor eating so much bone that calcium is flooding into the blood?
- Prostate-specific antigen (PSA) in men, or tumor markers (CA-125, CEA, CA 19-9) if cancer type is unknown → What kind of cancer is causing the spinal tumor, so we can pick the right treatment?
- Red blood cell (Erythrocyte) sedimentation rate (ESR) or C-reactive protein (CRP) → Is there inflammation or infection mimicking cancer, or is the body reacting to tumor?

Treatment logic

- Dexamethasone 10 mg IV bolus immediately, then 4 mg IV or by mouth every 6 hours → Dexamethasone is a powerful steroid that shrinks swelling around the tumor and inside the spinal cord itself. This gives the cord a little more breathing room, slows nerve damage, and buys time (hours to days) for radiation or surgery to work. Start it the moment you suspect cord compression—do not wait for the MRI.
- Emergency MRI of the entire spine with gadolinium within 24 hours (ideally within hours) → Shows exactly where the tumor is, how badly it is squeezing the cord, and how many levels of spine are involved. This image decides whether the patient needs surgery, radiation, or both—and it maps the target for the neurosurgeon or radiation oncologist.
- Radiation therapy to the tumor site, started within 24 hours if the patient can still walk or move legs → High-energy beams kill tumor cells and shrink the mass pressing on the cord over days to weeks. Radiation is the standard first treatment if the patient still has some leg function and the spine bone is stable (not crumbling). Typical course is 10 fractions (doses) over 2 weeks or a single 8-Gy dose in emergencies.
- Emergency decompression surgery (laminectomy or vertebrectomy) if the patient is paralyzed, rapidly worsening, or the spine bone is unstable → Surgeon removes the back of the vertebra (laminectomy) or the entire tumor-filled vertebra (vertebrectomy) to lift pressure off the cord instantly. Metal rods and screws stabilize the spine if bone is destroyed. Surgery offers the best chance to save walking if done within 48 hours of leg weakness starting.

- Systemic cancer treatment—chemotherapy, hormone therapy, or immunotherapy—chosen based on the type of cancer → Treats the cancer itself throughout the body, stops new tumors from seeding in other spine bones, and shrinks existing tumors over weeks to months. For example, hormone therapy (e.g., enzalutamide for prostate cancer, letrozole for breast cancer) starves hormone-driven cancers; chemotherapy kills fast-dividing cells.
- Bone-strengthening drugs—zoledronic acid 4 mg IV every 3–4 weeks or denosumab 120 mg subcutaneous every 4 weeks → These drugs (bisphosphonates or RANKL inhibitors) tell bone cells (osteoclasts) to stop breaking down bone. This slows tumor invasion into bone, reduces fracture risk, lowers calcium levels, and eases bone pain over weeks.
- Bladder catheterization if urine retention, bowel program if constipation or incontinence, and physical therapy as soon as the cord pressure is relieved → Catheter drains urine so it does not back up into kidneys and cause infection or kidney damage. Bowel program (scheduled stool softeners, digital stimulation) prevents impaction. Physical therapy retrains nerves and muscles to move again as the cord heals.

Medications

Dexamethasone · Corticosteroid (a strong anti-swelling hormone-like drug)

Dexamethasone is a powerful steroid that shrinks swelling around the spinal cord. When a tumor presses on the cord, the tissue around it swells like a sprained ankle, and that extra swelling makes the squeezing worse. Dexamethasone calms down that inflammation fast, buying time and protecting nerve cells from dying.

1. The tumor is pressing on the spinal cord, and the body's alarm system floods the area with inflammatory signals (like cytokines and prostaglandins).
2. Those signals make blood vessels leaky, so fluid builds up in the tight space around the cord—picture a garden hose inside a stiff pipe, and now someone is pouring extra water into that pipe.
3. Dexamethasone enters cells and attaches to glucocorticoid receptors (the cell's steering wheel for inflammation).
4. It shuts off genes that make swelling chemicals and turns on genes that calm things down.
5. Swelling drops within hours, the pressure eases, and nerve cells get more room and blood flow.

SAFETY WATCH

High blood sugar (steroids make the body resist insulin, so glucose climbs—watch closely in people with diabetes). · Infection risk (it turns down the immune system, so the body may not fight germs as well). · Stomach irritation or bleeding (especially if the person is also on blood thinners or NSAIDs). · Mood swings, trouble sleeping, or feeling revved up (steroids can make the brain feel wired). · Muscle weakness if used for weeks (steroids can break down muscle over time). · Bone thinning with long use (not usually a problem in this short, urgent setting).

Bisphosphonates (zoledronic acid) or Denosumab · Bone-protecting agents (bisphosphonates block bone-eating cells; denosumab is a monoclonal antibody that does the same job a different way)

Cancer in the spine often eats away at the bone, making it weak and more likely to collapse or cause pain. Bisphosphonates and denosumab both stop the cells that break down bone—called osteoclasts—from doing their job. Think of osteoclasts as demolition crews: these drugs either poison the crew (bisphosphonates) or take away their work orders (denosumab). Either way, the bone stops crumbling as fast, which lowers the chance of fractures and new areas of nerve squeezing.

1. Cancers like breast, prostate, lung, and myeloma release signals (such as RANKL and parathyroid hormone-related protein) that wake up osteoclasts and tell them to chew up bone.
2. Bisphosphonates (like zoledronic acid) stick to bone mineral and get eaten by osteoclasts; once inside, they jam the cell's energy factory (mitochondria) and the osteoclast dies.
3. Denosumab grabs RANKL (the main 'eat bone' signal) before it reaches the osteoclast, so the demolition crew never gets the message to start.
4. With fewer active osteoclasts, bone breakdown slows, calcium stays in the bone instead of flooding the blood, and the skeleton stays stronger.
5. Pain often drops because bone is more stable and there are fewer tiny fractures and less inflammation.

SAFETY WATCH

Low calcium in the blood (hypocalcemia)—the drugs lock calcium into bone, so blood levels can drop; people need calcium and vitamin D supplements. · Kidney damage (especially with bisphosphonates)—the drug is filtered by the kidneys, so dose must be adjusted if kidney function is low, and people need good hydration. · Jaw bone death (osteonecrosis of the jaw)—rare but serious; risk is higher with dental work or poor mouth care, so see a dentist before starting if possible and keep teeth clean. · Flu-like aching and fever after the first dose (common with bisphosphonates, usually mild and goes away). · Atypical femur fractures (very rare, with years of use—not usually a concern in cancer care where survival is the bigger picture).

Opioid analgesics (morphine, oxycodone, hydromorphone, or fentanyl) · Opioid pain relievers (strong medications that block pain signals in the brain and spinal cord)

When a tumor crushes the spinal cord or eats into bone, the pain can be severe—sharp, aching, or burning. Opioids attach to opioid receptors (special landing docks) in the spinal cord and brain, and they turn down the volume on pain signals traveling up to the brain. Think of pain like an alarm bell ringing loudly; opioids muffle the bell so the brain hears it as a quieter hum. They do not fix the tumor or the pressure, but they make the pain bearable while the team works on the real problem.

1. The tumor and bone damage release inflammatory chemicals (prostaglandins, substance P, bradykinin) that fire up pain nerve endings (nociceptors).
2. Those nerves send rapid-fire electrical signals up the spinal cord toward the brain.
3. Opioid molecules lock onto mu receptors on the nerve cells and open potassium channels while closing calcium channels—this makes the nerve less likely to fire.
4. Fewer pain signals reach the thalamus (the brain's relay station) and the cortex (where you become aware of pain), so the person feels less hurt.
5. Opioids also dampen the fear and distress that come with severe pain by acting in the amygdala (the brain's alarm center) and the anterior cingulate cortex (the part that adds emotional color to pain).

SAFETY WATCH

Slowed breathing (respiratory depression)—high doses can make the brainstem forget to tell the lungs to breathe deeply, especially dangerous if the person is also on sedatives or has lung disease. · Severe constipation (opioids slow the gut by blocking receptors in the intestine wall; nearly everyone needs a stool softener and stimulant laxative from day one). · Drowsiness and confusion (especially in older adults or people with kidney or liver trouble, because the drug or its breakdown products build up). · Nausea and vomiting (opioids trigger the chemoreceptor zone in the brainstem; an anti-nausea medicine often helps). · Risk of addiction is real but should NOT stop appropriate pain relief in someone with cancer-related pain; the goal is comfort and function, and the team monitors closely. · Tolerance (over time, the same dose may work less well, and the dose may need to go up—this is expected and okay in cancer pain management).

Low-molecular-weight heparin (enoxaparin) or unfractionated heparin · Anticoagulant (a blood thinner that prevents clots from forming or growing)

People with cancer and people who cannot move their legs (because of spinal cord compression) are at very high risk for blood clots in the deep veins of the legs (deep vein clot formation (thrombosis), or DVT). If a clot breaks off and travels to the lungs (pulmonary a traveling clot lodging in a vessel (embolism), or PE), it can be deadly. Heparin works by turbocharging antithrombin (a natural brake on clotting), so the blood's clotting cascade gets stopped before a clot forms or a small clot gets bigger. Think of clotting like a chain reaction—heparin cuts the chain early.

1. Cancer releases substances (like tissue factor) that make the blood stickier and more likely to clot, and paralysis or bedrest means blood flow slows in the leg veins—stagnant blood clots easily.
2. Heparin binds to antithrombin and makes it thousands of times more active.
3. Supercharged antithrombin grabs and inactivates factor Xa and factor IIa (thrombin)—two key enzymes in the clotting chain.
4. Without active factor Xa and thrombin, fibrin threads (the mesh that makes a clot solid) cannot form, so clots do not grow and new clots do not start.
5. The body's natural clot-dissolving system (fibrinolysis) can slowly break down any small clots that are already there.

SAFETY WATCH

Bleeding (the biggest risk—heparin makes it harder for blood to clot, so any cut, nose bleed, or internal injury can bleed more and longer; watch for blood in urine, stool, or unusual bruising). · A low platelet count (Thrombocytopenia) (low platelet count)—heparin can rarely trigger the immune system to destroy platelets (called HIT, heparin-induced a low platelet count), which is dangerous; platelet counts are checked regularly. · Epidural a pooled collection of blood (hematoma) (a collection of blood around the spinal cord)—if a person has a spinal needle placed (for anesthesia or pain control) while on heparin, there is a small risk of bleeding into the spinal canal, which can cause permanent paralysis; timing and coordination with the anesthesia team are critical. · Osteoporosis (with months of unfractionated heparin, not usually a concern in short-term cancer care).

Red flags

- New or worsening back pain in anyone with a history of cancer
- Any leg weakness, numbness, or trouble walking that comes on quickly
- Loss of bladder or bowel control (this is a true emergency — permanent damage can happen in hours)
- Back pain that is worse at night or when lying flat, especially if pain medicine doesn't help

Nursing priorities

1. Complete a full neurologic exam every 2 hours, checking motor strength in all four limbs using a 0-to-5 scale, sensory level by testing where the patient can feel a light touch or pinprick moving up from the feet, and reflexes in knees and ankles — The spinal cord can be crushed further within hours as the tumor grows or swelling increases around the compression site. A motor score (muscle strength rating) dropping from 4 out of 5 to 3 out of 5 or the sensory level (the line where feeling stops) moving higher up the body means cord damage is progressing. Catching these changes early triggers emergency escalation to surgery before permanent paralysis occurs. Once complete paralysis happens, fewer than 10 percent of patients ever walk again.
2. Keep the patient on strict bed rest with log-rolling technique for any position changes, using at least three staff members to turn the patient as one solid unit without twisting the spine — An unstable spinal tumor can cause vertebrae (spine bones) to collapse or shift suddenly if the patient bends or twists. Log-rolling keeps the head, shoulders, and hips aligned in one straight plane, preventing spinal movement that could crush the cord completely. Even small movements can cause a partially compressed cord to become completely severed if the bone around it breaks.

3. Administer dexamethasone (a powerful steroid medicine) exactly on time every 6 hours via IV, and monitor blood glucose levels every 6 hours — Dexamethasone shrinks the swelling around the compressed spinal cord within hours, creating more space inside the tight spinal canal (the bony tunnel where the cord runs). The medication reduces inflammation (the body's swelling response) that makes compression worse even after the tumor stops growing. Steroids raise blood sugar to dangerous levels, so glucose must be monitored and treated with insulin if it goes above 180 milligrams per deciliter to prevent diabetic complications.
4. Place a urinary catheter if the patient has urinary retention (cannot empty bladder completely), measure residual urine volume, and monitor output every hour — A bladder that cannot empty because of nerve damage will stretch and permanently lose its muscle tone if it stays overfilled for more than 6 hours. Measuring urine output also detects early spinal shock (sudden loss of all nerve function below the compression), which causes the bladder to stop squeezing. Output less than 30 milliliters per hour may also signal low blood pressure from high-dose steroids or dehydration, which reduces blood flow to the already injured spinal cord and causes more damage.
5. Assess pain intensity using a 0-to-10 numeric scale every 2 hours and give IV opioid analgesics (strong pain medicines like morphine or hydromorphone) as ordered, avoiding delays in dosing — Severe uncontrolled pain causes the sympathetic nervous system (the body's stress response) to release hormones that raise blood pressure and increase swelling around the tumor, making cord compression worse. Pain also prevents patients from resting in bed, leading to dangerous spinal movement. Adequate pain control with opioids is not just for comfort—it is a medical necessity to prevent further cord injury. IV opioids work within 5 to 10 minutes, while oral medicines take 30 to 60 minutes and may not be absorbed well in patients who are vomiting from increased spinal pressure.
6. Monitor for signs of a clot in a deep leg vein (deep vein thrombosis) (blood clots in leg veins) by checking for calf swelling, warmth, redness, or pain, and apply sequential compression devices (inflatable leg sleeves) to both legs unless the patient has existing clots — Patients with cancer and paralysis have three major risk factors for clotting: cancer releases chemicals that make blood clot faster, immobility allows blood to pool in leg veins, and spinal cord injury causes blood vessels to dilate and blood flow to slow. Up to 15 percent of these patients develop clots within the first week. A clot that breaks loose and travels to the lungs (called a pulmonary embolism (a clot lodging in a lung artery)) can cause sudden death. Compression devices squeeze the legs rhythmically to keep blood moving back to the heart.

7. Check skin every 4 hours for pressure injury (bed sores), especially over the sacrum (tailbone), heels, and any bony area, and reposition the patient every 2 hours using pressure-relieving devices under heels and a specialty mattress — Patients with spinal cord compression lose sensation below the injury level, so they cannot feel pain when tissue is being damaged by pressure. Paralysis also prevents them from shifting weight naturally to relieve pressure points. Pressure injuries can develop in as little as 2 hours when blood flow to skin is blocked. Cancer patients have additional risk because poor nutrition and low albumin (a blood protein) make skin fragile and slow to heal. Once a deep pressure ulcer forms, it can take months to heal and becomes infected easily.
8. Establish bowel program with daily stool softeners and stimulant laxatives, monitor for bowel movement every 24 hours, and perform digital stimulation or suppository insertion if no stool for 48 hours — Opioid pain medicines, immobility, and spinal cord injury all cause the bowels to stop moving normally, leading to severe constipation or fecal impaction (hard stool stuck in the rectum). High-dose steroids like dexamethasone also slow gut movement. Impaction causes abdominal distension (swollen belly) that presses on the diaphragm (breathing muscle), making it hard to breathe. Straining to pass hard stool raises pressure inside the skull and spine, which can worsen cord compression. Starting a bowel program on day one prevents this dangerous complication.

Sources

- NCCN Clinical Practice Guidelines in Oncology: Central Nervous System Cancers
- ASCO guideline on palliative care for patients with cancer
- Cochrane review: radiotherapy and surgery for metastatic spinal cord compression
- NICE guideline: Metastatic spinal cord compression in adults

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