

Transverse Process Fracture

A patient guide

In brief: A transverse process fracture is a break of one of the small bony "wings" that project sideways from the back of a spinal vertebra, most often in the lower back (lumbar spine). It is one of the most mechanically minor of all spinal fractures: the transverse process is not part of the weight-bearing column, so an isolated break here does not make the spine unstable and does not threaten the spinal cord or nerves. Its main significance is as a marker of a high-energy injury, which is why it prompts a careful search for damage to nearby organs, the chest and the pelvis.

What a transverse process fracture is

Each vertebra in the spine has a solid front part, called the vertebral body, and a ring of bone behind it that surrounds and protects the spinal cord. Projecting outwards from this back portion are several bony prominences. The two that point sideways, one to the left and one to the right, are the transverse processes. They are slender, wing-like struts of bone, and their job is to serve as anchor points for muscles and ligaments rather than to bear the body's weight.

A transverse process fracture is simply a break of one or more of these bony wings. The fracture may affect a single process, several processes at different levels, or the processes on both sides. It occurs far more commonly in the lumbar (lower back) region than in the thoracic (mid-back) region, and it is the most frequently identified type of lumbar spine fracture seen after blunt trauma.

The key point that runs through everything written about this injury is that it has a dual nature. On the one hand, the fracture itself is trivial in mechanical terms and heals without any specific treatment of the bone. On the other hand, the force required to produce it is often considerable, so its presence acts as a warning sign that other, more serious injuries may have occurred nearby. Understanding the difference between these two aspects is what makes the injury straightforward to put into context.

The two mechanisms (direct blow and muscular avulsion)

The literature describes two broad ways in which a transverse process can break.

The first is a ****direct blow or violent bending force****. A heavy impact to the side of the trunk, or an extreme sideways bending and twisting of the spine, can snap the bony wing. This is the pattern typically seen in high-energy events such as road traffic collisions, motorcycle crashes, falls from a height, and pedestrians being struck by a vehicle. In these situations, the same forces that break the transverse process are often distributed across a wide area of the body.

The second mechanism is ****muscular avulsion****. Several powerful muscles attach directly to the transverse processes, including the psoas major (a deep hip flexor), the quadratus lumborum (a side muscle of the lower back) and the transversus abdominis (a deep abdominal muscle). A sudden, forceful contraction of one of these muscles can pull hard enough on its bony attachment to tear a fragment of bone away. This is an avulsion fracture: the bone is pulled apart rather than struck. Avulsion is the mechanism that explains how transverse process fractures can occur in athletes, particularly in sports involving rapid rotation or sideways bending, and it accounts for the fact that the injury can sometimes happen without any direct impact at all.

There is one further, specific point at the lowest lumbar level. The fifth lumbar vertebra (L5) is tethered to the pelvis by a strong band of tissue called the iliolumbar ligament, which attaches to the L5 transverse process. When this ligament avulses a fragment of the L5 transverse process, it can be an indirect signal that the back part of the pelvic ring may have been disrupted. For this reason an L5 transverse process fracture is regarded with particular

attention as a possible flag for pelvic injury.

Why the fracture itself is stable

Spinal stability depends on the structures that bear and transmit load: the vertebral bodies at the front, the cushioning discs between them, the facet joints that guide movement, and the strong band of posterior ligaments that hold the back of the spine together. Classification systems used by spinal surgeons, such as the Denis three-column model and the AO thoracolumbar system, group spinal injuries according to how many of these load-bearing elements are involved.

The transverse process lies entirely outside this load-bearing column. It is a posterior, non-weight-bearing element. Losing the integrity of a transverse process does not change the ability of the vertebral body, disc, facet joints or posterior ligaments to do their work. For that reason, an isolated transverse process fracture is classified as a **stable** injury.

The practical consequences of this stability are well documented. Large retrospective studies and systematic reviews of patients with isolated transverse process fractures report that essentially none required surgery and essentially none required rigid bracing. Neurological problems do not arise from the fracture itself, and long-term function is excellent, with patients typically being pain-free, fully mobile and neurologically intact. This holds true even when the fractures are at several levels or on both sides, provided that adequate imaging has confirmed there is no other, non-transverse-process spinal injury present. Several trauma centres have concluded that routine referral to a spinal surgery service is unnecessary for an isolated transverse process fracture once the rest of the spine has been cleared, a finding that also carries a significant cost-saving message.

Why it matters as a marker of other injury

If the fracture is mechanically trivial, its importance must lie elsewhere, and it does. A transverse process fracture is valued chiefly as a **sentinel marker**: a sign that the body has absorbed a substantial force, and therefore a prompt to look carefully for injuries to the structures that lie close to the spine.

The associations described in the literature include:

- **Abdominal and retroperitoneal organ injury.** A classic series found that a high proportion of patients with lumbar transverse process fractures also had injuries to abdominal organs, a rate markedly higher than in comparable trauma patients without such fractures.
- **Kidney and urinary tract injury.** A transverse process fracture sits alongside flank bruising, lower-rib fractures, visible blood in the urine, low blood pressure and a severe mechanism of injury as a recognised reason to image the kidneys and urinary tract after blunt trauma. Bruising around the kidney and kidney contusions or lacerations are documented associations.
- **Pelvic ring injury.** Fractures on both sides, and L5 transverse process fractures in particular, carry a notable association with pelvic fractures, owing to the iliolumbar ligament connection described above.
- **Chest, great vessel, spleen and liver injury.** At thoracic levels, transverse process fractures correlate with injury to the chest, the major blood vessels such as the aorta, and the spleen and liver, and they mark a higher overall severity of trauma.
- **Overall injury severity.** Larger studies show that an isolated transverse process fracture raises the statistical odds of accompanying visceral and pelvic injuries, with the spinal level offering a clue to the likely site: thoracic fractures point towards chest injuries, lumbar fractures towards abdominal and pelvic ones.

In short, the fracture is the warning, not usually the main problem. The structures it flags are what the trauma team focuses on.

How it differs from injuries that affect spinal stability

It is helpful to distinguish a transverse process fracture from the spinal fractures that genuinely do threaten stability, because the two are often confused by their shared label of "spinal fracture".

Unstable spinal fractures involve the load-bearing column. A burst fracture, for example, shatters the vertebral body and can push fragments of bone towards the spinal cord. A fracture-dislocation disrupts the front and back of the spine together and allows one vertebra to shift on another. Injuries to the posterior ligamentous complex undermine the band of tissue that holds the back of the spine in alignment. Each of these can compromise the spinal cord or nerve roots and may require bracing or surgery to restore alignment and protect the nervous system.

A transverse process fracture does none of this. Because the broken bone lies outside the load-bearing column, the alignment and integrity of the spine are unaffected, the spinal cord and nerve roots are not placed at risk by the fracture, and there is no instability to correct. The distinction matters: the word "fracture" can sound alarming, but the type of fracture determines its consequences, and a transverse process fracture sits firmly at the benign end of that spectrum.

How it tends to present

Because a transverse process fracture is usually part of a high-energy injury, it is most often identified in the setting of major trauma, where the priority is the assessment of the patient as a whole. The local features of the fracture itself tend to be muscular in character: localised pain and tenderness to one side of the spine, discomfort that is worsened by movements which load the attached muscles, such as bending or twisting, and muscle spasm in the surrounding area.

In the athletic, avulsion-type presentation, the picture may be more isolated: localised lower-back pain on one side that comes on with or after a forceful rotational or bending effort, without the wider injuries seen after a road collision or a fall.

Plain bruising over the flank, blood in the urine, abdominal tenderness or signs of injury elsewhere are not features of the transverse process fracture as such; rather, they are the associated findings that the fracture prompts clinicians to look for. The fracture is frequently discovered incidentally, on a scan performed to assess the trunk after trauma, rather than being the reason the scan was requested.

How it is assessed (CT)

Computed tomography (CT) is the imaging method of choice for transverse process fractures. Plain radiographs (ordinary X-rays) are relatively insensitive for these breaks and miss them easily, because the bony wings overlap with bowel gas and other structures on a flat image.

In practice, transverse process fractures are very often found on the CT scan of the abdomen and pelvis that is performed to assess a trauma patient, where they appear in a noticeable minority of such scans and are frequently multiple. Modern multidetector CT, particularly with three-dimensional reconstructed images, detects lumbar transverse process fractures with very high sensitivity and specificity.

The convenience of CT in this context is considerable, because the very same scan that reveals the fracture also examines the abdomen, the retroperitoneum (the space behind the abdominal cavity that contains the kidneys), the pelvis and, where included, the chest. In other words, the investigation that finds the warning sign simultaneously screens for the injuries that the warning sign is pointing towards.

What the evidence shows about management (symptomatic)

The consistent conclusion of the published literature is that an isolated transverse process fracture is managed conservatively, with symptomatic and supportive care directed at comfort rather than at the bone itself.

Reported approaches centre on pain relief, using simple analgesia or anti-inflammatory medication, occasionally with a short course of a muscle relaxant where spasm is troublesome. Early and largely unrestricted movement, as

comfort allows, is the norm rather than prolonged rest. A flexible corset may be used purely for comfort in some cases, but it is not a structural requirement. Surgery, rigid bracing and prolonged immobilisation are not needed for the isolated fracture, because there is no instability to address.

The fracture heals over time, either by bony union or by the formation of fibrous tissue across the fracture line, and either outcome is compatible with full, pain-free function. In the athletic literature, conservative management with a graded, criteria-based rehabilitation programme typically allows a near-complete recovery, with documented professional sportspeople returning to competitive play after a number of weeks. None of this constitutes guidance for any individual; it is a summary of what the evidence describes about the condition in general.

Outlook

The outlook for an isolated transverse process fracture, considered in its own right, is very good. Because the injury is stable and does not involve the load-bearing spine or the nervous system, it does not lead to long-term spinal problems, deformity or instability, and recovery to full function is the usual outcome. Many people, including high-level athletes, recover over a period ranging from a few weeks to a couple of months, depending on the number of fractures and the demands they wish to return to.

The overall picture for a person who has sustained the injury depends far more on the wider context than on the fracture. Where the transverse process fracture is the only injury, as in many avulsion cases, the outlook is excellent and uncomplicated. Where it is part of a major high-energy injury, the prognosis is governed by the associated injuries to the organs, chest or pelvis that the fracture helped to flag, rather than by the bony wing itself. This dual nature, trivial as a fracture but valuable as a marker, is the central theme of everything that is known about the injury.