

Thoracic Radiculopathy

A patient guide

In brief: Thoracic radiculopathy is pain, altered sensation or, rarely, weakness arising from irritation or compression of one of the nerve roots in the thoracic spine, the long middle section of the backbone that lies behind the chest and upper abdomen. Its hallmark is a band of pain that wraps around the trunk like a belt, following the path of the affected nerve from the spine, around the side of the body, to the front of the chest or abdomen. It is an uncommon condition, far rarer than its well-known neighbours in the neck and lower back, and it is unusual in another respect too: because the affected nerves supply the chest and abdominal wall, its symptoms can closely imitate diseases of the heart, lungs and abdominal organs, and those diseases can in turn imitate it. This double resemblance, combined with the difficulty of pinpointing the responsible level by examination alone, makes thoracic radiculopathy one of the more challenging diagnoses in spinal practice.

What thoracic radiculopathy is (and where it sits in the spine)

The spine is conventionally divided into regions. At the top is the cervical spine in the neck; at the bottom is the lumbar spine in the lower back; and between them lies the thoracic spine, twelve vertebrae long, running the length of the chest and ending at the bottom of the rib cage. Each of these regions gives off pairs of spinal nerves, and when one of those nerve roots becomes irritated or compressed the result is called a radiculopathy. The familiar examples are cervical radiculopathy, which sends pain down the arm, and lumbar radiculopathy, better known as sciatica, which sends pain down the leg. Thoracic radiculopathy is the much less familiar middle sibling, and its symptoms travel not down a limb but around the trunk.

The reason lies in the anatomy of the thoracic nerves. There are twelve thoracic nerve roots on each side, numbered T1 to T12. After leaving the spinal canal through a small bony tunnel called the intervertebral foramen, each root continues as an intercostal nerve, running forward in a groove on the undersurface of its rib, sandwiched between the layers of muscle that line the spaces between the ribs. The lower nerves carry on past the end of the rib cage into the wall of the abdomen. Because each nerve follows its rib, the territory it supplies is a horizontal strip of skin and muscle that sweeps from the spine, around the flank, to the midline at the front. This is why thoracic nerve pain is felt as a band or girdle rather than as pain in an arm or leg.

A few landmarks help locate these bands. The nerve at the level of T4 reaches the nipple line; the nerve at T10 reaches the umbilicus, the navel; and the lowest thoracic nerves reach the lower abdomen and groin region. The very top thoracic nerve, T1, is a partial exception, because it joins the network of nerves supplying the arm and hand, so a problem at that very high level can produce hand and inner-arm symptoms rather than a pure trunk band.

Understanding this map is the foundation of everything that follows. Thoracic radiculopathy is, at its simplest, a disturbance of one of these encircling nerves, producing pain, tingling, numbness or hypersensitivity in the corresponding band of the chest or abdominal wall.

Why it is uncommon

Thoracic radiculopathy is genuinely rare, and the rarity is not an accident of reporting but a consequence of how the thoracic spine is built. The thoracic vertebrae are anchored to the ribs, and the ribs in turn join the breastbone at the front, so the whole region is splinted into a relatively rigid cage. Compared with the highly mobile neck and lower back, the thoracic spine bends and twists very little. Because so much of the wear and tear that damages discs comes from repeated movement and load, the thoracic discs are spared much of the degeneration that

troubles their cervical and lumbar counterparts.

The figures reflect this. Symptomatic herniations of a thoracic disc, one of the structural causes of thoracic radiculopathy, are usually quoted as making up only a fraction of one per cent to a few per cent of all symptomatic disc herniations, with a frequently cited rate of around one new symptomatic case per million people each year. Thoracic disc operations account for well under one per cent of all disc surgery. The condition tends to appear in the fourth to sixth decades of life, and where a disc is responsible it most often lies in the lower part of the thoracic spine, the region where a little flexibility returns because the lowest ribs are only loosely attached.

The shape of the spine matters too. The neck and lower back curve inwards, a posture called lordosis, and bear a good deal of the body's load; the thoracic spine curves gently outwards, a kyphosis, and is comparatively protected. The combined effect of the rib cage and this protective curvature is that the thoracic spine is the quietest part of the spinal column, and disease of its nerve roots is correspondingly infrequent.

What causes it

Although disc problems receive most attention, the thoracic nerve roots can be disturbed by a wide range of processes, and the list is broader than for the neck or lower back. The recognised causes fall into several groups.

The first is structural and degenerative. A thoracic disc herniation, in which the soft centre of a disc bulges outwards, can press on a nerve root or on the spinal cord itself. Wear and tear can also narrow the bony exit tunnel through a build-up of bony spurs, called osteophytes, a process known as foraminal stenosis. A particular condition called diffuse idiopathic skeletal hyperostosis, often abbreviated to DISH, in which the ligaments along the spine gradually turn to bone, has a special preference for the lower thoracic region and is most common in older men.

The second group is bony injury. Compression fractures of a thoracic vertebra, whether from osteoporosis in older people or from an underlying disease that has weakened the bone, can release fragments that narrow the nerve's exit or canal.

The third group is medical rather than mechanical, and it is important because these causes involve no compression at all. Shingles, the reactivation of the chickenpox virus, has a strong preference for the thoracic nerves and produces a painful band before the rash appears. Diabetes can damage the thoracic nerves directly, producing a distinct pattern called diabetic truncal neuropathy. Both are discussed in their own sections below.

The fourth group is tumours and infection. The thoracic spine is the commonest site in the spine for cancer to spread to, and benign growths of the nerve sheath, such as schwannomas and neurofibromas, can arise on a thoracic root or its intercostal nerve. Infections of the disc and bone, including tuberculosis of the spine, can also involve the nerve roots. These are uncommon but important, because they change the whole complexion of the problem.

The breadth of this list is one reason thoracic radiculopathy is approached with particular care: the same band of pain can arise from a worn disc, a fracture, a virus, diabetes or a tumour, and these are very different things.

Why thoracic discs are unusual, and often calcified

When a disc is responsible, the thoracic spine behaves differently from the rest of the spinal column in two respects that are worth understanding.

The first is calcification. A strikingly high proportion of symptomatic thoracic disc herniations, commonly cited as somewhere between a third and two-thirds of those that come to surgery, contain calcium and are therefore hard rather than soft. This is far more common than in the neck or lower back. The likely explanation is that, in such a slow-moving segment, a disc degenerates very gradually over many years, and calcium is gradually deposited within it. A calcified disc is not merely a curiosity; it is harder, more firmly stuck to surrounding structures, and occasionally erodes through the lining of the spinal canal to lie against, or even within, the covering of the spinal

cord. All of this makes a calcified disc considerably more difficult and more hazardous to remove than a soft one.

The second is the importance of location. A thoracic disc may bulge out to the side, towards the nerve's exit tunnel, or it may bulge backwards in the midline, directly towards the spinal cord. A disc that presses on the exiting nerve root tends to cause radiculopathy, the band of pain described throughout this guide. A disc that presses centrally on the cord can cause something more serious, a myelopathy, discussed in a later section. The largest of these central discs, sometimes called giant discs when they fill much of the canal, very often press on the cord and frequently require surgery.

These features explain why a thoracic disc is treated with more caution than a disc elsewhere, and why the precise position and nature of the disc, soft or calcified, central or lateral, matter so much to how it is assessed.

Why the level is hard to pinpoint

One of the genuine difficulties of thoracic radiculopathy is that working out exactly which nerve is responsible, from the symptoms and examination alone, is notoriously unreliable. There are several reasons.

The territories of neighbouring thoracic nerves overlap considerably, so the band of altered sensation is often vague and poorly demarcated rather than a crisp single stripe. There is also no convenient muscle to test. In the neck and lower back, a weak muscle or a lost reflex can point to the affected nerve, but the thoracic nerves supply the muscles between the ribs and of the abdominal wall, whose strength cannot be assessed in any ordinary examination. There is no specific bedside manoeuvre that reliably reproduces or localises thoracic root pain.

Compounding all this is a phenomenon called false localisation, well recognised in the thoracic spine, in which the level at which symptoms are felt does not match the level at which the problem actually lies. A compression in the mid-thoracic spine may declare itself with symptoms several segments lower, and pathology at the very top of the lumbar spine can refer pain up into the trunk. The practical consequence is that the clinical impression and the level seen on a scan do not always agree, and that imaging is relied upon to define what examination cannot.

The mimics: why the chest and abdomen must be considered first

If there is a single idea that sets thoracic radiculopathy apart, it is this: because the thoracic nerves supply the chest and abdominal wall, the pain they produce can closely imitate disease of the organs that lie beneath, and those organ diseases can in turn imitate thoracic nerve pain. The resemblance runs in both directions, and it is the reason this condition is approached with such caution.

In one direction, a thoracic nerve under pressure can produce pain that mimics a heart problem, sometimes called pseudo-angina when it sits over the front of the chest; pain that mimics pleurisy or other lung disease, worsening with breathing; pain in the right upper abdomen that mimics gallbladder disease; pain over the stomach that mimics an ulcer; flank pain that mimics a kidney stone; and, low down, pain that mimics appendicitis or another acute abdominal emergency. A lower thoracic radiculopathy can even weaken part of the abdominal wall enough to produce a visible bulge, a so-called pseudohernia, that resembles a true hernia.

In the other direction, and this is the part that matters most, genuine disease of the heart, the major blood vessels, the lungs, the gallbladder, the pancreas, the stomach and the kidneys can all refer pain to the back and trunk, and can therefore be mistaken for a spinal problem. A heart attack, an inflamed pancreas or a leaking blood vessel does not announce itself with a label.

For this reason the established approach is that serious disease of the heart, chest and abdomen is considered and excluded before trunk pain is confidently attributed to a thoracic nerve root. In practice the diagnosis of thoracic radiculopathy is, to a large degree, one of exclusion. The literature describes diagnostic errors as common precisely because of this protean, shape-shifting presentation, and this is a descriptive observation about the condition rather than guidance for any individual.

How it differs from cervical and lumbar radiculopathy, and from thoracic myelopathy

Thoracic radiculopathy is best understood by setting it alongside its relatives.

Cervical radiculopathy is a nerve-root problem in the neck, and it sends its pain, tingling and weakness down into the arm and hand. Lumbar radiculopathy, or sciatica, is a nerve-root problem in the lower back, and it sends its symptoms down into the leg and foot. Thoracic radiculopathy is the equivalent in the middle of the spine, and rather than travelling down a limb its symptoms travel around the trunk as a band. A simple way to hold the three together is that the neck refers to the arm, the lower back to the leg, and the thoracic spine to the chest and abdominal wall.

A separate and more important distinction is between radiculopathy and myelopathy. Radiculopathy is a problem of a nerve root, producing a band of pain or numbness without any disturbance of the spinal cord. Myelopathy is a problem of the spinal cord itself, and it produces a quite different picture: weakness and stiffness in the legs, problems with walking and balance, exaggerated reflexes, and sometimes disturbance of bladder control. These cord signs occur because the damage is below the level of the cord and affects everything carried within it.

This distinction matters more in the thoracic spine than anywhere else, for two reasons of anatomy. The thoracic spinal canal is relatively narrow, leaving the cord little room to spare, and the blood supply to the middle of the thoracic cord is comparatively sparse, a so-called watershed region that tolerates pressure poorly. As a result, a central thoracic disc or other central compression can press on the cord and cause myelopathy rather than a simple band of nerve pain, and the cord copes badly with it. This is the chief reason a thoracic disc is regarded as potentially more serious than a disc in the neck or lower back, why the large central calcified discs so often cause cord symptoms, and why the surgical approaches described below are chosen with such care.

How it is assessed

Because examination cannot reliably localise a thoracic radiculopathy and because so many other conditions can mimic it, assessment leans heavily on imaging, considered alongside the broader question of whether the chest and abdomen need attention in their own right.

Magnetic resonance imaging, the MRI scan, is the principal investigation. It shows the discs, the nerve roots, the spinal cord and the surrounding tissues in detail, and it can reveal a herniated disc, a compressed root, swelling within the cord, and the warning signs of a tumour or infection. It is the test best suited to distinguishing the various causes from one another.

Computed tomography, the CT scan, has a particular and complementary value in the thoracic spine, because it shows bone and calcium far better than MRI does. Since so many thoracic discs are calcified, a CT scan is often important for understanding the true nature of the problem and for planning any surgery, as a hard calcified disc behaves very differently from a soft one. Where MRI cannot be performed, or where the relationship between a disc and the cord needs to be defined very precisely, a CT scan combined with a contrast dye placed around the cord, known as CT myelography, may be used. Plain X-rays have a more limited role but can show calcified discs, fractures, the changes of DISH and the overall alignment of the spine.

One important caveat threads through all of this. Thoracic disc abnormalities are surprisingly common on scans of people who have no symptoms at all. Studies of healthy volunteers have found thoracic disc herniations in a substantial minority, in one well-known study around a third, with many showing some indentation of the cord and yet remaining entirely free of trouble. No single imaging feature reliably separates a disc that is causing symptoms from one that is silent. The consequence is that a finding on a scan must always be interpreted in the light of the symptoms; the mere presence of a disc on an image is not proof that it is the source of a person's pain.

What the evidence shows about management — impersonal

It is worth stating plainly that the evidence base for thoracic radiculopathy is modest. Because the condition is rare, there are no large randomised trials comparing treatments; the literature is built from case series, surgical experience and reviews. What follows describes what that literature reports, not guidance for any individual, whose situation is a matter for assessment by the treating team.

The general message about the natural history is reassuring. Most thoracic radiculopathy, and most thoracic disc herniation, does not require surgery. In one frequently cited series following patients with thoracic disc herniations over time, only around a quarter eventually came to operation, and many returned to full and vigorous activity without it. Asymptomatic herniations seen incidentally on scans rarely went on to cause trouble. Conservative, non-surgical care is therefore the first approach in the great majority of cases. It centres on pain relief, including medicines aimed specifically at nerve pain, on time and reassurance, on activity modification and physiotherapy, and in selected cases on targeted injections around the nerve or in the epidural space, which can serve both to relieve pain and to help confirm which nerve is responsible. A large proportion of pain-predominant cases settle over a period of weeks to a few months.

Surgery is reserved in the literature for a narrower set of circumstances: signs of pressure on the spinal cord, that is myelopathy; a neurological deficit that is progressing; or radicular pain that remains severe and intractable despite thorough conservative treatment. When surgery is undertaken, the choice of approach is governed by one overriding safety principle. A simple operation from directly behind, a posterior laminectomy of the kind sometimes used elsewhere in the spine, is regarded as unsuitable for a disc lying in front of the thoracic cord, because reaching the disc that way would require pulling on the cord, which the thoracic cord tolerates poorly; historically this was associated with a high risk of paralysis. Instead, the recognised operations approach the disc from the side or the front, so that it can be removed without retracting the cord. These include, from behind and to the side, the transpedicular, transfacet, costotransversectomy and lateral extracavitary approaches, generally suited to discs lying to the side; and, from the front and side, transthoracic approaches through the chest and minimally invasive thoracoscopic, or keyhole, techniques, generally suited to central, calcified or large discs that need to be reached from in front of the cord.

The reported outcomes of these operations, in appropriately selected patients, are generally good, with improvement in both cord symptoms and nerve pain in the majority. A shorter duration of symptoms before surgery is one factor associated with better recovery. The recognised risks include leakage of spinal fluid, which is more likely with hard calcified or intradural discs, operating at the wrong level in a region where the levels are hard to count, persistent pain in the chest wall, complications affecting the lung and chest, and, rarely, worsening of neurological function. In summary, the literature points towards conservative care for most, with carefully chosen and carefully approached surgery reserved for cord compression, progressive deficit or intractable pain, all within a framework of individualised decision-making.

Diabetic thoracic radiculopathy

A distinctive cause deserves a section of its own, because it involves no compression at all and follows a quite different course. Diabetic thoracic radiculopathy, also called diabetic truncal or thoracoabdominal neuropathy, is a condition in which the thoracic nerves are damaged by the effects of diabetes on their tiny blood supply, rather than by any disc or bony spur.

The typical picture is of an older person with diabetes, often type 2 and sometimes only mild or newly recognised, who develops severe burning, aching or stabbing pain in a band across the trunk or abdomen, frequently on one side, characteristically worse at night, and often with marked sensitivity of the overlying skin. In some cases the abdominal-wall muscles are weakened enough to produce a localised bulge that can be mistaken for a hernia or an abdominal mass, and weight loss is common. The diagnosis is made clinically, supported where necessary by nerve and muscle electrical studies. Its importance lies partly in recognition, as a known cause of otherwise unexplained truncal pain or asymmetrical abdominal swelling in a person with diabetes, and partly in its outlook, because the condition is usually self-limiting, tending to improve and settle over a period of several months with attention to blood sugar control and to the relief of nerve pain.

Shingles and the thoracic nerves

The other major non-compressive cause is shingles, the reactivation of the chickenpox virus within a nerve root. The thoracic dermatomes are the commonest site in the body for shingles, accounting for roughly half to three-fifths of cases, with the middle of the thoracic region most often affected.

Shingles characteristically begins with a band of burning, neuropathic pain on one side that does not cross the midline, and the pain often precedes the appearance of the rash by some days. During this early phase, before the rash declares itself, the painful band can readily be mistaken for a heart, lung or abdominal problem, or for a compressive thoracic radiculopathy; the later appearance of the blistering rash usually clarifies matters. The principal complication is postherpetic neuralgia, in which dermatomal pain persists for months after the rash has healed; its likelihood and severity rise steeply with age. This overlap between a shingles band and a radicular band is one more reason the thoracic trunk is a region where careful thought about the cause of pain is rewarded.

Outlook

The outlook in thoracic radiculopathy depends heavily on the cause, and the causes are so varied that no single prognosis can capture them all. For the common, pain-predominant presentations from degenerative change or a soft disc, the general picture reported in the literature is favourable: most settle with conservative care over weeks to a few months and do not require surgery. For diabetic truncal neuropathy the natural tendency is towards spontaneous recovery over several months. For shingles, most pain resolves as the rash heals, though a minority, particularly older people, are left with persistent postherpetic pain.

Where the cause is a central or calcified disc pressing on the spinal cord, the picture is more serious, because this is a question of myelopathy rather than simple nerve pain, and the outlook then turns on the degree of cord involvement and the duration of symptoms before treatment. Where the cause is a tumour, a fracture or an infection, the outlook is governed by that underlying condition. Across the whole field, the recurring themes are that an accurate diagnosis, including the deliberate exclusion of disease in the chest and abdomen, is the foundation of good care; that the distinction between a nerve-root problem and a cord problem shapes how seriously a thoracic disc is regarded; and that recovery is best understood as a process shaped by the individual cause rather than something that can be read from the label of thoracic radiculopathy alone.