

Spinal Metastases & Metastatic Spinal Cord Compression (MSCC)

A patient guide

In brief: Spinal metastases are deposits of cancer that have spread to the bones of the spine from a primary tumour elsewhere in the body. The spine is the commonest site in the whole skeleton for cancer to settle, which is why these deposits are encountered so often in cancer care. They are frequently silent and are picked up by chance on scans performed to stage a known cancer; at other times they declare themselves through pain or, less commonly, through pressure on the nerves. The most serious development in this field is metastatic spinal cord compression, or MSCC, in which a deposit presses on the spinal cord or the nerve roots of the cauda equina. MSCC is recognised across specialist services as an oncological emergency, and a defined pathway exists to identify and act on it quickly. This is the single most important idea running through the whole subject: spinal metastases are a problem managed by specialist oncology and spinal multidisciplinary teams, and the management of any individual is a matter for those teams rather than something that can be read from a category or a scan alone. This page is informational only and describes the field in general, neutral terms.

What spinal metastases are, and why the spine is involved so often

A metastasis is a deposit of cancer that has travelled from a primary, or original, tumour and established itself in a new site. When such deposits settle in the bones of the spine, they are called spinal metastases. They are not a cancer that begins in the spine; rather they are a feature of a cancer that began somewhere else and has spread.

The spine holds a particular place in this story because it is the commonest site in the entire skeleton for cancer to spread to. Bone is, after the lung and the liver, among the most frequent destinations for metastatic disease, and within the skeleton the spine accounts for the largest share. Across the published literature, the spine is described as the site of around seventy per cent of bony metastases, and a substantial proportion of people with advanced cancer will at some point develop a deposit somewhere in the vertebral column.

Several features of the spine explain this. The vertebrae are rich in red marrow, the active blood-forming tissue through which tumour cells circulating in the bloodstream tend to lodge and grow. The pattern of veins draining the spine, a network sometimes called Batson's plexus, offers a route by which tumour cells can reach the vertebrae directly. And the vertebral bodies carry the load of the upright skeleton, so a deposit that weakens the bone there has mechanical consequences that a deposit in a less load-bearing bone might not.

The deposits are not evenly distributed along the spine. The thoracic, or mid-back, region is involved most often, followed by the lumbar region of the lower back, with the cervical spine of the neck the least commonly affected. This is the general pattern described in the literature rather than a rule for any individual.

The primary cancers that commonly spread to the spine

Almost any cancer can, in principle, spread to the spine, but a relatively small group of primary cancers accounts for the great majority of cases. This reflects partly how common these cancers are and partly their particular tendency to settle in bone.

Breast, prostate and lung cancers together account for the large majority of bony metastases, a figure often quoted at around eighty per cent, chiefly because these are common cancers with a strong tendency to involve the skeleton. **Kidney cancer**, particularly renal cell carcinoma, and **thyroid cancer** are also well-recognised sources, and both are noted for sometimes producing deposits that are highly vascular. **Multiple myeloma**, a

cancer of the plasma cells of the bone marrow, is mentioned alongside the metastatic carcinomas because it characteristically involves the spine and produces similar bony changes, although strictly it is a primary cancer of the marrow rather than a metastasis from elsewhere.

Other cancers, including lymphoma, melanoma and cancers of the gastrointestinal tract, are encountered too. The point of listing the common sources is not to assign a probability to any individual, but to convey that the field is dominated by a handful of cancer types and that identifying the primary, when it is not already known, is an important early step taken by the specialist team.

Lytic, blastic and mixed deposits

When cancer settles in bone it disturbs the normal, balanced process by which bone is continually broken down and rebuilt. The way it does so produces a pattern that radiologists describe in three broad categories, and the distinction is more than academic because it influences how the bone behaves mechanically.

****Lytic, or osteolytic, deposits**** are those in which bone is dissolved and removed faster than it is replaced, leaving an area of weakened, "moth-eaten" bone. Because bone is being lost, lytic deposits tend to weaken the vertebra and carry a greater tendency to collapse. Lung cancer, kidney cancer, thyroid cancer and myeloma characteristically produce lytic disease, and breast cancer is often lytic or mixed.

****Blastic, or osteoblastic, deposits**** are those in which excessive, disorganised new bone is laid down, producing an area of dense, sclerotic bone on imaging. Prostate cancer is the classic source of blastic disease, with the majority of its bony deposits being of this type. Although the bone is denser, it is abnormal and disorganised, and is not necessarily mechanically sound.

****Mixed deposits**** show both processes together, and breast cancer in particular produces a relatively even mixture of lytic, blastic and mixed lesions. Computed tomography distinguishes these patterns readily, because dense blastic bone and rarefied lytic bone differ markedly in their appearance. The pattern seen contributes to the specialist assessment of how stable a vertebra is and how it may respond to treatment.

How spinal metastases come to light

Spinal metastases are found in two broad ways, and a large proportion are discovered before they have caused any symptom at all.

****Incidentally, on staging or surveillance scans.**** Many spinal deposits are first seen on imaging performed for another reason, typically the computed tomography, bone scan or PET-CT scans used to stage a known cancer or to monitor its response to treatment. A deposit may be present in the bone long before it causes any pain or pressure, and reporting radiologists examine the bones on every relevant scan precisely because incidental bony disease is so common. In this setting the finding is, in a sense, expected, and forms part of the overall picture of where a cancer has reached.

****Through symptoms.**** The other route is that a deposit makes itself felt. The commonest symptom is pain, classically pain felt in the back at the level of the deposit, which may differ from ordinary mechanical back pain in being persistent, present at night, or unrelieved by rest. Some deposits cause band-like pain around the chest or abdomen, or pain that radiates into a limb when a nerve root is involved. A minority of deposits press on the spinal cord or cauda equina and produce neurological symptoms, which are described in the section on MSCC below.

Importantly, a spinal metastasis is sometimes the very first sign that a person has cancer at all, with no prior diagnosis. For this reason the specialist literature treats new, unexplained spinal symptoms in certain patterns as warranting careful evaluation, and the assessment of a newly found spinal deposit routinely includes a search for the primary cancer if one is not already known.

Metastatic spinal cord compression (MSCC): the recognised emergency

The most serious complication of spinal metastasis is metastatic spinal cord compression. This occurs when a deposit, or a vertebra that has collapsed around a deposit, presses on the spinal cord itself or, lower down, on the bundle of nerve roots known as the cauda equina. The pressure interferes with the function of the cord or roots, and if it is not relieved the resulting loss of function can become permanent.

MSCC is recognised across cancer and spinal services as an oncological emergency, and dedicated pathways exist to identify and act on it without delay. The reason for this urgency is that the degree of neurological function at the time treatment begins is one of the strongest predictors of the eventual outcome: function that is preserved or only mildly affected is far more likely to be retained than function that has already been substantially lost. The pathway is therefore built around early recognition and rapid imaging.

The symptoms that specialist pathways associate with possible MSCC include escalating spinal pain, pain that is worse at night or when lying down, band-like pain around the trunk, pain provoked by coughing or straining, new weakness or heaviness of the legs, altered sensation, unsteadiness of gait, and disturbance of bladder or bowel control. The pathways emphasise that the more obvious neurological signs often develop late, which is why earlier features such as a change in the character of spinal pain are given weight. The detail of these features is set out here to explain how specialist services think, not as a checklist for self-assessment; the recognition and management of MSCC sit firmly within the specialist pathway.

Imaging: the central role of whole-spine MRI

Magnetic resonance imaging of the whole spine is the central investigation in suspected MSCC and in the assessment of spinal metastases more broadly. It is described in specialist guidance as the key test for diagnosis, for staging the extent of disease along the spine, and for planning treatment.

Several features explain why whole-spine MRI, rather than imaging of a single region, is the standard. Deposits are frequently present at more than one level, and a person may have several deposits scattered along the column, some causing symptoms and others silent; imaging the whole spine captures this full picture. MRI shows soft tissue and the spinal cord directly, so it demonstrates not only the bony deposit but the precise level and degree of any compression of the cord or cauda equina, and it can reveal deposits within the cord itself. Specialist guidance describes the standard study as including particular sequences of the whole spine, reported by a radiologist, performed within defined timeframes that are shorter when neurological features suggesting cord compression are present.

Computed tomography complements MRI by showing the bony architecture in detail, distinguishing lytic from blastic disease and assessing the integrity of the vertebra, while bone scans and PET-CT are used in staging the skeleton as a whole. The combination builds a complete picture of where the disease is and what it is doing mechanically and neurologically, which the multidisciplinary team then uses to plan.

How specialists assess stability and plan treatment

The decisions in spinal metastasis are complex, and specialist teams use a number of shared scoring systems and frameworks to bring structure and a common language to the assessment. These tools are described here in general terms to convey how the specialist process works; they are applied and interpreted by the multidisciplinary team.

****The Spinal Instability Neoplastic Score (SINS)**** is the most widely used instrument for judging whether a vertebra affected by tumour is mechanically stable. Developed by the Spine Oncology Study Group, it combines six factors: the location of the deposit in the spine, the presence and character of mechanical pain, whether the deposit is lytic or blastic, the alignment of the spine, the degree to which the vertebral body has collapsed, and whether the back parts of the vertebra are involved. The total, which runs from zero to eighteen, sorts vertebrae into stable, potentially unstable and unstable categories, and a score above a threshold prompts the team to consider whether a surgical opinion on stability is needed. SINS describes instability; it does not by itself dictate treatment.

The epidural spinal cord compression scale, often called the Bilsky grade, describes on MRI how far a deposit has encroached on the space around the spinal cord, running from disease confined to bone, through progressive deformation of the sac of fluid around the cord, to frank compression of the cord with no fluid visible around it. It gives the team a precise, shared way of describing the degree of compression, which is a major factor in deciding between approaches.

Decision frameworks such as NOMS bring these threads together. NOMS stands for the four considerations the team weighs: the **Neurological** status, including the degree of any cord compression; the **Onco**logical behaviour of the particular tumour, especially how it is likely to respond to radiotherapy and systemic treatment; the **Mechanical** stability of the spine, informed by SINS; and the **Systemic** burden of disease and the person's general fitness. By working through these together, the team arrives at a plan tailored to the individual.

Prognostic scores such as the Tokuhashi and Tomita systems were developed to estimate likely survival and have historically informed how extensive any surgery should be. They draw on factors such as the type of primary cancer, the spread of disease to other organs, and neurological status. These scores are understood as aids to specialist judgement rather than precise predictions, and their role has evolved as cancer treatments have improved. All of these tools, taken together, support the multidisciplinary decision rather than replacing it.

The general menu of management options

The management of spinal metastases is led by specialist oncology and spinal multidisciplinary teams, and the options are best understood as a menu from which the team selects and combines, guided by the frameworks above and by what matters to the individual. The descriptions that follow are general and neutral; they set out what the options are, not what any particular person should have.

Systemic therapy addresses the cancer throughout the body and includes treatments such as chemotherapy, hormonal therapy, targeted agents and immunotherapy, chosen according to the type of primary cancer, together with bone-targeted medicines that act on the way tumour affects bone. For cancers that are highly responsive, systemic treatment can itself shrink spinal deposits.

Radiotherapy is a mainstay for many spinal deposits, used to relieve pain and to control the local growth of tumour. Conventional external beam radiotherapy has long been used for this purpose. In recent years stereotactic body radiotherapy, which delivers a high, precisely shaped dose in a small number of treatments, has become an important option for achieving more durable local control in selected situations, including some tumours that respond poorly to conventional radiotherapy.

Surgery has several distinct roles. It may be used to relieve pressure on the spinal cord, to stabilise a spine that has become or is at risk of becoming mechanically unstable, or both. A widely described modern strategy is "separation surgery", in which the cord is decompressed and the spine stabilised with the aim of creating a small margin around the cord, after which stereotactic radiotherapy delivers durable tumour control. A landmark randomised trial reported that, for selected people with cord compression, surgery followed by radiotherapy preserved the ability to walk better than radiotherapy alone, and this finding helped shape the modern combined approach. Vertebral collapse may also be addressed with minimally invasive cement techniques in appropriate cases.

In practice these modalities are frequently combined, and the balance struck depends on the neurological situation, the tumour type, the mechanical stability of the spine and the person's overall condition and wishes. This is the heart of why management is an MDT decision: no single tool or score determines it, and the plan is assembled from several disciplines around the individual.

The multidisciplinary pathway and onward referral

The thread running through this whole subject is that spinal metastases are managed within a specialist multidisciplinary structure. In the United Kingdom this is reflected in national guidance and in the MSCC pathway, which brings together oncologists, radiologists, radiation oncologists, spinal surgeons, palliative care specialists and specialist nurses, often coordinated through a named MSCC coordinator who can mobilise rapid imaging and specialist opinion.

The purpose of this structure is to ensure that the several considerations, the cancer, the bone, the cord and the person, are weighed together rather than in isolation, and that anyone with a spinal deposit, and especially anyone in whom cord compression is suspected, reaches the right specialists quickly. From the standpoint of recognition and onward referral, the essential message is simply that this is specialist territory: the role of general information, and of clinicians outside the specialist team, is to recognise the possibility and ensure the person is connected with the multidisciplinary team that manages it. This page exists to support that recognition and understanding, not to direct the care of any individual.

Outlook

The outlook in spinal metastasis varies enormously, and it depends far more on the particular circumstances than on the diagnosis alone. The type of primary cancer, how it has responded to treatment, the extent of disease elsewhere in the body, the person's general fitness, the mechanical state of the spine and, above all, the neurological situation at the time of treatment all bear on it. Some primary cancers are now controlled for years with modern systemic therapy, and spinal disease in that setting is managed as one part of a long-term picture; in other situations the emphasis is on relieving pain and preserving function and quality of life.

Two themes recur across the literature. The first is that early recognition matters, particularly for cord compression, because neurological function preserved at the start of treatment is far more likely to be retained. The second is that outcomes have improved as the tools have advanced, with precise radiotherapy, refined surgery and better systemic agents combined through multidisciplinary decision-making. For any individual, the outlook is a matter for assessment by the treating oncology and spinal teams, who can weigh all of these factors together. It cannot be read from a category, a score or a single scan.