

Vertebral Haemangioma

A patient guide

In brief: A vertebral haemangioma is a common, benign collection of blood vessels within the bone of a vertebra. It is one of the most frequently encountered findings on scans of the spine and is, in the great majority of cases, an incidental discovery: something noticed by chance when an MRI or CT scan is performed for an entirely separate reason. These lesions are present in roughly one in ten spines at post-mortem examination, and on modern imaging they are seen even more often. The overwhelming majority cause no symptoms whatever, do not grow in any meaningful way, and require nothing beyond recognition for what they are. They have such a characteristic appearance on imaging that a radiologist can usually identify them with confidence. Only a very small minority ever become symptomatic or behave in a so-called aggressive fashion, and those rare cases are recognised and managed by specialist spinal and multidisciplinary teams. The single most important idea is that, for nearly everyone, a vertebral haemangioma is a harmless incidental finding rather than a disease.

What a vertebral haemangioma is

A vertebral haemangioma is a benign, non-cancerous lesion made up of a tangle of small, thin-walled blood vessels and blood-filled spaces within the spongy bone of a vertebra, the building block of the spinal column. These vessels are interspersed among the bony struts, or trabeculae, of the vertebral body, set within a stroma that is typically rich in fat. It is widely regarded not as a true tumour in the ordinary sense but as a developmental or hamartomatous lesion, a localised overgrowth of normal tissue elements, and it is slow-growing or static in nature.

The lesions are most commonly found within the vertebral body, the rounded front portion of the vertebra. In a smaller proportion, perhaps ten to fifteen per cent, the lesion extends into the posterior elements, the bony arch behind the body, and it is uncommon for a haemangioma to arise there in the first place. Under the microscope they are usually classified as cavernous or capillary types, depending on the calibre of the vessels involved, although this distinction is of more interest to the pathologist than to the person in whom the lesion is found.

The crucial point is that these are vascular lesions of bone, not growths of the spinal cord or nerves, and not cancer. They neither spread to other parts of the body nor arise from the spread of cancer elsewhere. In the typical case, a vertebral haemangioma simply occupies a small portion of a single vertebra and does nothing more.

How common they are

Vertebral haemangiomas are among the most common lesions encountered anywhere in the spine, and indeed the vertebral body haemangioma is frequently described as the most common tumour-like lesion of the spinal axis. The classic figure, drawn from large post-mortem series performed in the early twentieth century, is that they are present in around eleven per cent of adult spines, that is, roughly one person in nine or ten.

Modern cross-sectional imaging detects them more often still, because it can pick up smaller lesions that an autopsy examination might miss. Studies based on computed tomography have reported a prevalence of around a quarter of those scanned, and magnetic resonance imaging studies report figures in a similar range, of the order of a quarter to over a quarter. Estimates of ten to twenty per cent of adults are commonly quoted. The difference between the older autopsy figures and the higher imaging figures reflects the sensitivity of modern scanners rather than any true increase in how often these lesions occur.

They can be found at any age but are seen most often in middle age, around the fourth and fifth decades of life. Reports on the balance between men and women vary: some series describe a modest female predominance of around two to one, while others find an equal distribution, with the observation that it is specifically the rare

symptomatic lesions that appear somewhat more often in women. A proportion of people, perhaps a fifth to a third in some series, have more than one haemangioma, particularly in the thoracic region of the spine.

In terms of where they sit, the thoracic spine, the part of the back attached to the ribs, is the most frequent location, followed by the lumbar spine in the lower back, then the cervical spine in the neck; involvement of the sacrum, at the very base of the spine, is uncommon.

Why they are usually an incidental finding

The defining feature of vertebral haemangiomas, from a practical standpoint, is that the vast majority are silent. They are typically discovered by chance, when a scan of the spine is carried out to investigate something else entirely, such as back pain arising from a different cause, an injury, or a problem in a neighbouring organ. The figures quoted in the literature are consistent on this point: somewhere between eighty-nine and ninety-nine per cent of vertebral haemangiomas are asymptomatic, causing no symptoms at all.

Because they are so common and so frequently silent, a haemangioma seen on a scan in a person who has back pain is, more often than not, simply coincidental. The lesion and the symptom happen to coexist, but the haemangioma is not the source of the pain. This is an important distinction, because it explains why the discovery of a vertebral haemangioma on a report usually carries no particular significance of its own and is best understood as part of the normal anatomical landscape revealed by the scan rather than as the explanation for any complaint.

The natural history of these lesions reinforces this picture. Longitudinal studies that have followed haemangiomas over many years describe most of them as stable, with progression to any neurological consequence being a rare event observed in only a tiny fraction of cases over long periods of follow-up. Where lesions do show some measurable growth, they typically retain the reassuring features of an ordinary benign haemangioma.

How they appear on imaging: the polka-dot and corduroy signs

Vertebral haemangiomas are, in the typical case, one of the more readily recognisable findings in spinal imaging, because their internal structure produces such a characteristic pattern. As the lesion develops, the horizontal struts of bone within the vertebra are lost while the vertical struts thicken and become prominent. This rearrangement of the bony architecture creates two classic signs.

Viewed end-on, in cross-section, the thickened vertical struts appear as multiple small, round dots scattered through the vertebral body. This is the so-called **polka-dot sign**, sometimes likened to a salt-and-pepper appearance, seen on the axial images of a CT or MRI scan. Viewed lengthways, the same thickened vertical struts produce a striped or striated pattern, which has been described as resembling **corduroy cloth** or jail bars. These appearances are sufficiently distinctive that an experienced radiologist can usually make the diagnosis on imaging alone.

On magnetic resonance imaging, the typical haemangioma owes its appearance to its fatty content. The fat within the lesion makes it appear bright on the T1-weighted images, while its water and vascular content make it bright on the T2-weighted images as well. This combination of brightness on both sequences, together with the coarse internal trabeculae, is highly characteristic and helps to distinguish a haemangioma from other lesions.

Computed tomography is regarded as the best means of demonstrating the bony architecture, and it shows the polka-dot pattern with particular clarity. CT is often the preferred way of confirming the diagnosis in cases where the MRI appearance is less clear-cut. Because the diagnosis can usually be made confidently from these imaging features, it is only in rare and genuinely uncertain cases that a tissue sample, or biopsy, is needed.

Typical versus atypical and aggressive haemangiomas

It is helpful to distinguish three patterns, recognising that they sit along a spectrum and that the great majority of lesions belong firmly to the first.

Typical haemangiomas are the everyday, fat-rich lesions that account for the large majority. They are bright on both T1- and T2-weighted MRI because of their fat content, show the classic polka-dot and corduroy patterns, are confined within the bone, and are essentially always incidental and harmless. In one MRI-based classification, fat-rich lesions of this kind made up the large majority of all haemangiomas encountered.

Atypical haemangiomas contain less fat and more vascular tissue. Because of the reduced fat, they lose some of the characteristic brightness on the T1-weighted MRI images and may appear darker or intermediate in signal. This altered appearance can, on occasion, resemble more sinister lesions such as a metastatic deposit, and so an atypical haemangioma is principally an imaging puzzle, a lesion whose appearance needs careful interpretation, rather than a lesion that is behaving dangerously. The presence of the coarse, thickened trabeculae and the use of additional imaging techniques, including CT and specialised MRI sequences, usually allow the benign nature of the lesion to be confirmed.

Aggressive haemangiomas are the genuinely rare entity at the far end of the spectrum, representing only about one per cent of all vertebral haemangiomas. The term aggressive here describes behaviour, not malignancy: these lesions remain benign and non-cancerous, but they have expanded beyond their usual confines, often filling the whole vertebral body and extending into the bony arch behind, sometimes with a soft-tissue component pushing into the space around the spinal cord. They show a marked predilection for the thoracic spine, classically between the third and ninth thoracic vertebrae, and characteristically contain little fat and a great deal of vascular tissue. It is this small subgroup that accounts for the rare instances in which a haemangioma causes symptoms.

When, rarely, a haemangioma becomes symptomatic

Although the overwhelming majority of vertebral haemangiomas are silent, a very small proportion, of the order of one in a hundred, become symptomatic. Understanding the mechanisms involved helps to put this rarity in context. Symptoms, when they arise, generally do so through one of a few routes.

The first is **local expansion**. An aggressive haemangioma may enlarge the vertebra and narrow the spinal canal, the bony channel that houses the spinal cord, reducing the space available to the cord and nerves.

The second is **extension beyond the bone**. A soft-tissue component of the haemangioma may grow outward into the epidural space, the area immediately surrounding the spinal cord, where it can press upon the cord or nerve roots.

The third is **fracture**. A vertebra substantially replaced by a haemangioma may be weakened to the point that it gives way, producing a compression fracture, which in turn may cause pain or, occasionally, narrow the spinal canal.

Less commonly, bleeding from the abnormal vessels into the epidural space, or interference with the blood supply to the cord, has been described as a route to symptoms.

When symptoms do occur, they may include localised back pain at the level of the lesion, or, if the spinal cord or nerves are being compressed, neurological features such as altered sensation, weakness, or changes in the function of the legs. The thoracic spine is the site where these rare symptomatic and aggressive lesions are most often found. There is also a recognised, though uncommon, association with pregnancy: the hormonal and circulatory changes of pregnancy, particularly in the later stages, can cause a previously silent thoracic haemangioma to enlarge and, very occasionally, to compress the cord, with improvement frequently described after delivery.

It bears repeating that these scenarios are genuinely rare. In long-term follow-up studies, the progression of a silent or merely painful lesion to one causing neurological problems is an unusual event observed in only a handful of cases across many years.

How they are assessed

The assessment of a vertebral haemangioma rests principally on imaging, and in the typical case the diagnosis is made on the scan that discovered it.

Magnetic resonance imaging is the workhorse. It demonstrates the characteristic signal pattern, the brightness on T1- and T2-weighted images that reflects the fatty and vascular content, and it is uniquely able to show any extension of the lesion beyond the bone and any effect upon the spinal cord or nerves. Where a lesion has an atypical appearance, additional MRI sequences, including fat-suppression techniques and contrast-enhanced imaging, are used to clarify its nature.

Computed tomography is the best modality for displaying the bony architecture, showing the thickened vertical trabeculae and the polka-dot pattern with great clarity. CT is frequently used to confirm the diagnosis when the MRI appearance is indeterminate, because the osseous remodelling of a haemangioma is so distinctive.

Plain radiographs, or X-rays, may show the vertical striations, the corduroy or jail-bar appearance, when a lesion is large enough, although they are less sensitive than cross-sectional imaging.

Biopsy, the taking of a tissue sample, is needed only rarely, in those uncommon cases where the imaging remains genuinely uncertain after MRI and CT have been considered together. For the great majority of incidentally found, typical lesions, the imaging appearance alone is sufficient and no further test is required.

What the evidence shows about management — impersonal

It is important to be clear that decisions about vertebral haemangiomas are individualised and rest with the treating clinicians and, for the rare complex cases, with specialist multidisciplinary teams. The descriptions that follow report what the published literature observes about management in general terms, not guidance for any particular person. The evidence base for the rare aggressive lesions is built largely on case series and reviews rather than large trials, which is one reason management is tailored to the individual situation.

Observation is the course described for the overwhelming majority of vertebral haemangiomas, which are typical, incidental and without symptoms. The literature is consistent that such lesions require nothing more than recognition, and several authors note that routine repeat scanning of an asymptomatic, typical haemangioma is generally regarded as unnecessary in the absence of any new development at the relevant level. The lesion is simply acknowledged for what it is and noted in the records.

Onward referral and multidisciplinary assessment is the pathway described for the small minority of lesions that are atypical on imaging, that are causing symptoms, or that show aggressive features. In such cases the literature describes assessment within a specialist setting, which may bring together spinal surgeons, interventional radiologists, radiation oncologists and others, so that the appropriate course can be determined collectively. Where the diagnosis itself is in doubt, this assessment is also directed at confirming the benign nature of the lesion.

The range of treatment options described for the rare symptomatic or aggressive haemangioma includes several modalities, used singly or in combination, and chosen by the specialist team according to the circumstances. These include continued observation; **vertebroplasty**, the injection of bone cement into the affected vertebra, which can strengthen the bone and relieve pain; **embolisation**, in which the blood supply to the lesion is deliberately reduced through a catheter, used either to control symptoms or to reduce bleeding before surgery; **radiotherapy**, including focused stereotactic techniques, which can shrink the vascular tissue and relieve pain; and **surgery**, ranging from decompression to relieve pressure on the spinal cord through to more extensive removal of the lesion, generally reserved for cases with cord compression or neurological deficit. Combinations, such as embolisation followed by surgery, or decompression combined with vertebroplasty, are described in the literature for the most challenging cases.

In summary, the literature points towards simple observation and recognition for the common, typical, incidental haemangioma, and towards specialist multidisciplinary assessment, with a tailored choice from the available treatments, for the rare lesion that is atypical, symptomatic or aggressive. Throughout, the emphasis is on

individualised decisions made within an appropriate specialist framework rather than on fixed rules.

Outlook

The outlook for vertebral haemangiomas is, for the overwhelming majority of people, entirely reassuring. The typical lesion is a benign, slow-growing or static collection of blood vessels within a vertebra that causes no symptoms, does not spread, is not cancer, and tends to remain stable over the years. Discovered incidentally on a scan performed for another reason, it requires nothing beyond recognition, and the long-term studies that have followed such lesions describe them as stable in the great majority of cases.

The concern, where it exists at all, attaches only to the very small minority of aggressive lesions that expand, extend beyond the bone, or weaken the vertebra to the point of fracture, and to the equally uncommon atypical lesions whose imaging appearance needs careful interpretation. Even here, the lesions remain benign, and a range of effective specialist treatments exists for the rare cases that require intervention. These uncommon situations are recognised and managed within specialist and multidisciplinary settings.

The consistent themes across the whole subject are that vertebral haemangiomas are very common, that they are usually incidental and harmless, that they have a characteristic and recognisable appearance on imaging, that the appearance on a scan rarely has anything to do with a person's symptoms, and that the rare exceptions are well understood and well catered for by specialist teams. Any individual outlook is a matter for assessment by the treating team rather than something to be read from the mere presence of a haemangioma on a report.