

Degenerative Disc Disease (Lumbar)

A patient guide

In brief: Degenerative disc disease is a term used to describe the age-related changes that occur within the intervertebral discs of the lower spine. Despite its name, it is not strictly a disease in the conventional sense, and the changes it describes are present in the majority of adults as they grow older. When these changes are associated with symptoms, the typical pattern is axial, or discogenic, low back pain arising from the disc itself rather than from compression of a nerve. This distinction matters, because degenerative disc disease is frequently confused with conditions such as a prolapsed disc or spinal stenosis, in which nerve structures are involved. A further and important point is that disc degeneration is extremely common on imaging, is very often entirely painless, and is in part a radiographic label. The relationship between what is seen on a scan and what a person experiences is genuinely uncertain, and much of the evidence in this area is conflicting. The sections below describe the condition, the way it is investigated, and what the research literature reports about its management and natural course, framed as a description of the evidence rather than as guidance for any individual.

What degenerative disc disease is, and what it is not

Degenerative disc disease refers to the gradual structural change that develops within the intervertebral discs, the cushioning structures that sit between the vertebrae of the spine. In the lumbar region these changes can, in some people, give rise to a deep, mechanical, aching pain felt in the lower back. This is described as axial or discogenic pain because it originates in or around the disc and the central axis of the spine.

A common source of confusion is the assumption that degenerative disc disease involves a trapped or compressed nerve. In its typical form it does not. It is helpful to distinguish it from several related but separate conditions. A disc herniation, also called a prolapse or extrusion, occurs when part of the disc displaces and presses upon a nerve root, characteristically producing sciatica, a pain radiating down the leg in the distribution of that nerve. Lumbar spinal stenosis describes narrowing of the spinal canal, which can produce neurogenic claudication, a pattern of leg discomfort related to standing and walking. Facet joint pain arises from the small paired joints at the back of the spine. Degenerative disc disease, by contrast, is primarily a condition of the disc as a pain source in its own right, without nerve compression being the central feature.

It is also worth stating plainly that attributing axial back pain to one specific disc is itself uncertain. The disc cannot be examined directly in a way that reliably proves it to be the source of a person's symptoms, and this uncertainty runs through much of what follows.

The disc and how it changes with age

A healthy intervertebral disc consists of a soft, well-hydrated central core, the nucleus pulposus, surrounded by concentric rings of fibrous tissue called the annulus fibrosus, with cartilage endplates above and below connecting the disc to the adjacent vertebrae. With age, the disc loses water content, a process known as desiccation, and becomes less able to distribute load. Small tears or fissures can develop within the annulus, the disc may lose height, and changes can appear in the bony endplates and the marrow of the vertebrae adjacent to the disc.

One of the more interesting observations from research is that the normal disc is largely without nerve supply, being mostly aneural in its inner portion. In degenerate and painful discs, however, studies have described an ingrowth of small nerves and blood vessels into deeper layers that are normally free of them. This nerve and vessel ingrowth has been proposed as one mechanism by which a degenerate disc might become a source of pain, although it does not occur in every degenerate disc and its significance in the individual remains incompletely

understood.

Genetics appear to play a substantial role. Studies of twins have estimated that the heritability of disc degeneration is high, in the region of fifty to seventy-five per cent, suggesting that inherited factors influence disc ageing at least as much as, and possibly more than, mechanical wear from occupation or activity.

How degeneration is graded and described on imaging

When the discs and the vertebrae adjacent to them are examined on magnetic resonance imaging, radiologists use descriptive systems to record what is seen. The Pfirrmann grading system classifies disc degeneration from grade I, a normal well-hydrated disc, through to grade V, a severely degenerate and collapsed disc, based on the brightness, structure, and height of the disc on the scan. It is a way of describing the appearance of the disc rather than a measure of pain.

Modic changes describe alterations in the vertebral endplates and the bone marrow next to a degenerate disc. They are classified into three types. Type I reflects an inflammatory, oedematous pattern, Type II a fattier marrow change, and Type III a sclerotic, denser bony change. The research literature has examined whether these changes relate to symptoms, and systematic reviews report an association between Modic changes and low back pain, with Type I changes most consistently linked to pain. The association is, however, a statistical one across groups of people, and the presence of a Modic change does not establish that it is the cause of any particular person's symptoms.

How common degeneration is, and how often it is painless

Perhaps the single most important point about degenerative disc disease is how common the underlying changes are in people who have no back pain at all. Imaging studies of pain-free volunteers have repeatedly shown that disc degeneration is close to universal with advancing age.

A large analysis of imaging in asymptomatic individuals reported that signs of disc degeneration were present in around thirty-seven per cent of people aged twenty, rising steadily to roughly ninety-six per cent of those aged eighty. Disc bulges and other changes followed a similar age-related pattern. Earlier work in the 1990s, including studies using both computed tomography and magnetic resonance imaging, had already shown that disc bulges and protrusions were frequently found in adults with no back pain whatsoever, including a well-known report in the New England Journal of Medicine describing such findings in people who were entirely symptom-free.

Research that compared imaging in people with and without back pain has found that some degenerative features are somewhat more prevalent among those with symptoms. The differences, however, are modest and the findings are far too non-specific to diagnose the cause of pain in any one individual. In other words, the changes are part of normal ageing, and seeing them on a scan does not by itself explain a person's symptoms.

How symptoms typically present

When degenerative disc disease is symptomatic, it usually presents as axial mechanical low back pain. This tends to be a deep, aching discomfort in the lower back that varies with posture, loading, and activity, often worse with sustained sitting, bending, or lifting. Some people describe pain that is referred into the buttock or thigh in a pattern that does not follow the distribution of a single nerve, which is termed non-dermatomal referral and differs from the radiating leg pain of true sciatica.

The correlation between symptoms and imaging is weak, as the prevalence data make clear. One clinical feature that has been reported as modestly useful is centralisation, the phenomenon whereby pain that is felt further from the spine moves towards the midline with certain repeated movements. Even this is only modestly informative, and the overall picture is one of a condition that is difficult to localise with confidence.

How it is investigated

Magnetic resonance imaging is the principal means by which disc degeneration is visualised, and the Pfirrmann and Modic systems described above are used to record findings descriptively. A further feature sometimes reported is the high-intensity zone, a bright signal within the posterior annulus thought to represent an annular fissure. While it has attracted interest as a possible marker of a painful disc, it is non-specific and is also seen in people without symptoms.

Provocative discography is an invasive test in which contrast is injected into a disc with the intention of reproducing a person's pain and thereby identifying a symptomatic disc. It has a long and controversial history. Detailed research, particularly the work of Carragee and colleagues, has shown that the test has poor specificity and a notable rate of false-positive results, with a best-case positive predictive value reported at only around fifty to sixty per cent. A further study published in 2009 raised the concern that the act of performing discography may itself accelerate degeneration in the injected disc when compared with discs that were not injected. For these reasons, discography has substantially fallen out of favour as a means of identifying a pain source.

What the evidence reports about management

The management of axial low back pain attributed to disc degeneration has been studied extensively, and the evidence is genuinely conflicted. The sections that follow describe what the research has reported, rather than offering any recommendation.

Non-operative care

Structured, active rehabilitation within a biopsychosocial framework, addressing physical conditioning alongside the psychological and social factors that influence pain, is described in the literature as the usual first approach. The evidence supporting it is generally regarded as modest, but it forms the comparator against which surgical treatments have been measured in the major trials.

Fusion compared with conservative care

Four landmark randomised controlled trials have examined spinal fusion for chronic low back pain attributed to degeneration. A Swedish study by Fritzell and colleagues reported that fusion was superior to conservative care, although the conservative arm in that trial was relatively unstructured. Two later trials, the work of Brox and colleagues and the British MRC spine stabilisation trial reported by Fairbank and colleagues, found that fusion was no better than a structured programme of cognitive-behavioural rehabilitation. A systematic review by Mirza and Deyo drew these together. The collective message of this body of work is that fusion does not clearly outperform good, structured non-operative care, and that the apparent benefit of surgery in earlier studies may reflect the quality of the conservative treatment it was compared against.

Total disc replacement

Total disc replacement, in which the degenerate disc is replaced with an artificial implant intended to preserve movement, has been studied as an alternative to fusion. Trials of devices such as the CHARITE and ProDisc-L implants reported that disc replacement was non-inferior to fusion in carefully selected patients with single-level disease. An important caveat is that these comparisons were made against fusion, not against conservative care, so they speak to how one operation compares with another rather than to whether surgery is superior to non-operative treatment.

Biologic and regenerative therapies

A range of biologic and regenerative approaches, intended to repair or restore the disc, have attracted considerable interest. At present these remain unproven and investigational, and they are not established treatments.

Outlook

The natural course of axial low back pain associated with disc degeneration is often episodic and, in many people, self-limiting, with symptoms fluctuating over time. There is some suggestion in the literature that the inflammatory Type I Modic change may settle as it matures into the fattier Type II pattern, which may correspond to a settling of symptoms in some individuals. Overall, however, prognostic uncertainty is high, and it is difficult to predict the course in any single person.

Common questions

What is degenerative disc disease?

It is a term describing the age-related changes that develop within the intervertebral discs of the spine, such as loss of water content, small tears in the outer fibres, and loss of disc height. In the lumbar spine, when these changes are associated with symptoms, the usual pattern is a deep, mechanical low back pain arising from the disc itself.

Is it really a "disease"?

The name is somewhat misleading. The changes it describes are part of normal ageing and are present in most adults as they get older. Many doctors regard the term as overstated, and it is in part a radiographic label describing how a disc appears on a scan rather than a distinct illness.

Why is disc degeneration so common?

The discs naturally lose hydration and structural integrity with age, and this process is influenced strongly by inherited factors. Studies of twins suggest that genetics account for a large proportion of the variation in disc degeneration between people, more so than occupation or physical activity.

Can disc degeneration be present without any pain?

Yes, and very frequently so. Imaging studies of people with no back pain show that disc degeneration is close to universal with age, found in around a third of people in their twenties and the large majority of people in their eighties. Many of these individuals have never had back pain.

How does it differ from a slipped disc?

A slipped disc, more properly a herniation or prolapse, occurs when part of the disc displaces and presses on a nerve, typically causing sciatica, a pain that radiates down the leg. Degenerative disc disease, by contrast, is not principally about nerve compression; it describes the disc as a potential source of back pain in its own right.

How does it differ from spinal stenosis?

Spinal stenosis is a narrowing of the spinal canal that can cause neurogenic claudication, a pattern of leg symptoms brought on by standing and walking. Degenerative disc disease describes changes within the disc and an associated axial back pain, rather than narrowing of the canal around the nerves.

What is discogenic, or axial, pain?

Discogenic or axial pain is back pain thought to arise from the disc itself and felt along the central axis of the spine. It is typically a deep, aching, mechanical discomfort in the lower back that varies with posture and load, as distinct from pain radiating into the leg.

Why might a degenerate disc become painful when most are not?

Research has shown that the inner part of a normal disc has very little nerve supply, but that some degenerate and painful discs develop an ingrowth of small nerves and blood vessels into deeper layers. This has been proposed as one mechanism of pain, although it does not occur in every degenerate disc.

The full set of questions and answers, with references, is available on the condition page.