Chris has a bulging disc

Chris, a 41 year old tiler , presents to your surgery due to persisting low back pain. He has been attending your surgery on/off about his back for the last few years and has been managed with physiotherapy and simple analgesia. Chris is requesting his back be further investigated to try and find the cause of his pain. He had hoped that his back would settle with time, but he is finding it harder and harder to continue with work. He has no red flag symptoms except for the persistence of his pain. He has no major psychosocial issues and is otherwise well.

He describes his pain as being deep and aching, worse with physical activity and settling with rest. There are no shooting pains, no numbness or weakness associated with the pain.

Chris runs his own business and is married with 2 teenage children. The only investigation he has undergone for his low back pain has been a plain X-ray, which did not reveal any pathological lesions

Q.1. Should Chris be further investigated?

The answer to this depends on what the doctor and the patient are trying to achieve. If they are trying to rule out red flags, then MRI is the single best investigation. Chris is extremely unlikely to have a red flag cause for his low back pain given his history and examination. He has expressed a desire to understand further what is causing his pain and there is some evidence that the more patients understand their pain, the better their prognosis[1] . It may also allow more specific advice re the level and intensity of exercise and recreational pursuits.

Q.2. Is it possible to determine the source of his pain?

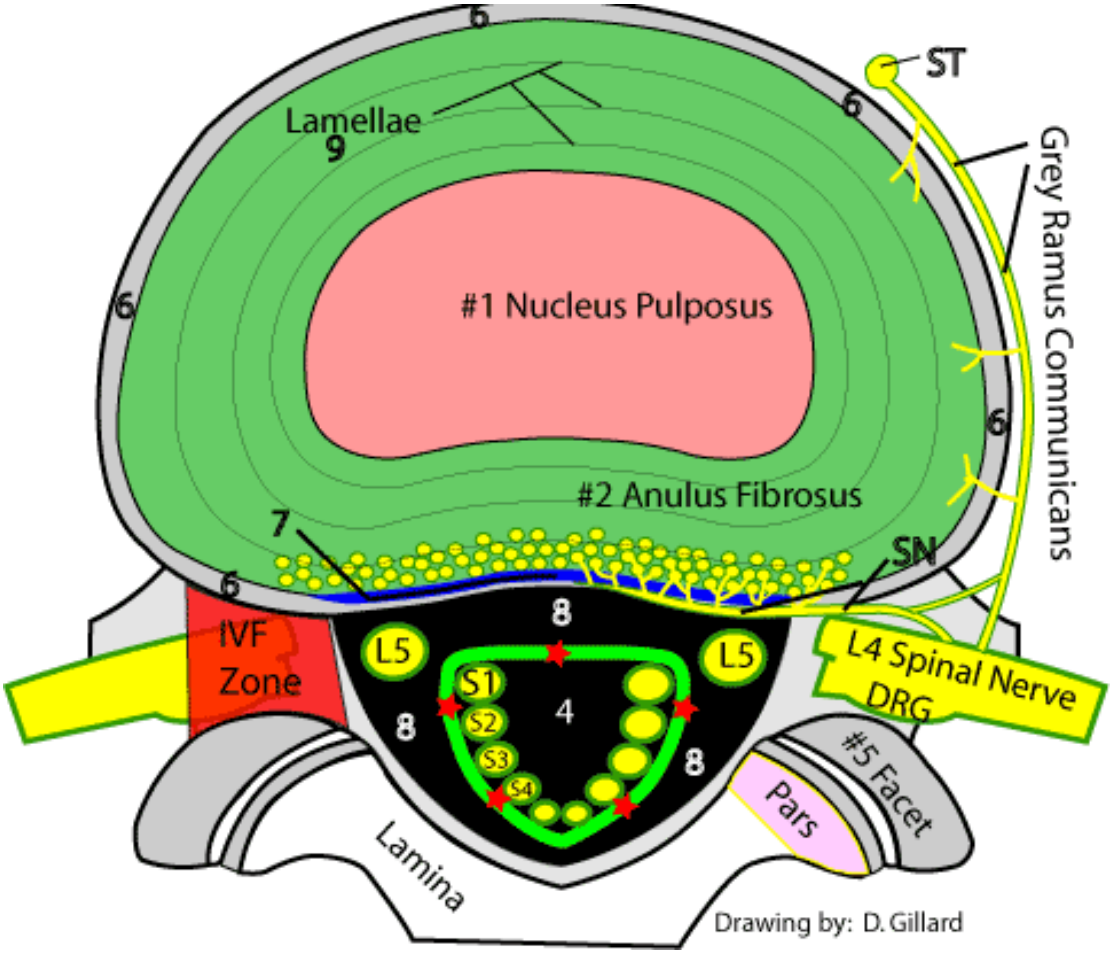
Determining the pain generator is often a challenge in clinical medicine. Chris has a number of possible pain generators. The 3 main structures that have been researched regarding being a cause of persistent low back pain are:

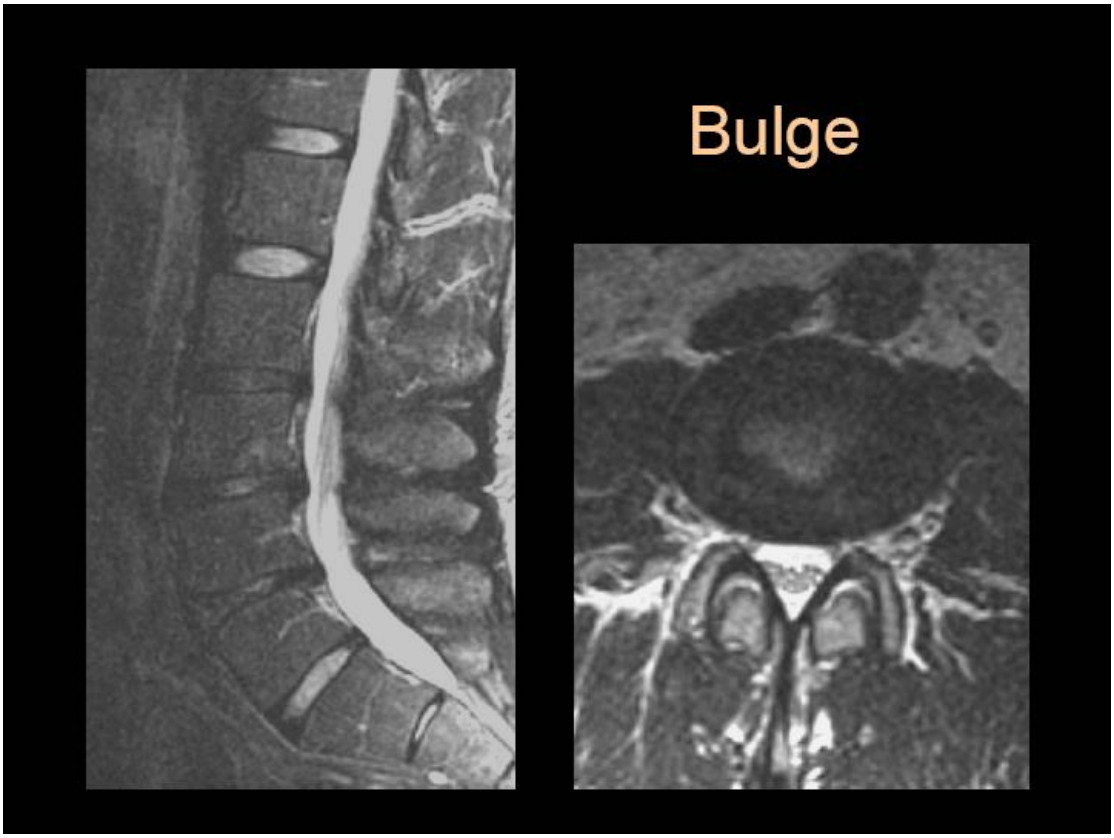
- Zygapophysial joints
- Intervertebral discs
- Sacro-iliac joints

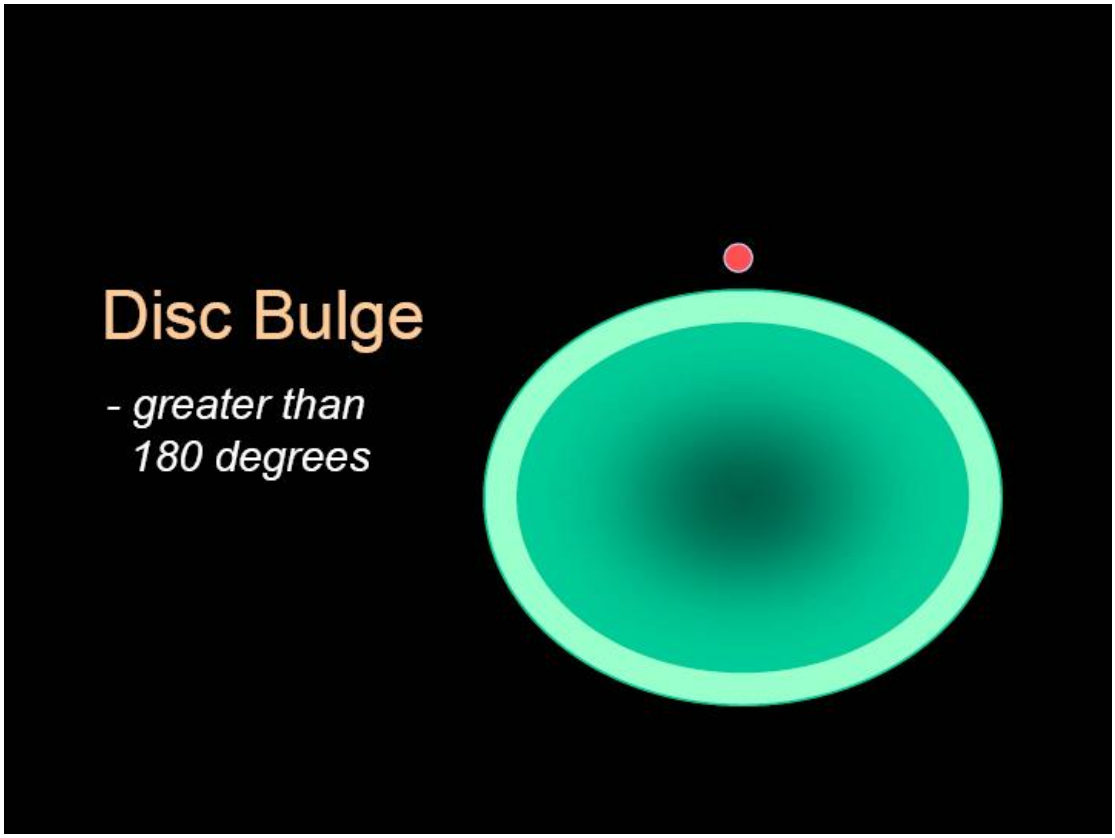
The International Spine Intervention Society (ISIS) has specific evidence-based guidelines on determining if these structures are the cause of low back pain. For the joints this involves controlled anaesthetic blocks, for the disc it involves pressure-controlled discography.

After discussing the pros and cons of investigations, Chris is keen to have a magnetic resonance imaging scan of his lumbar spine. His report describes a disc bulge at the L5/S1 level.

Normal L4/5 disc




Bulge



Q.3. What is the significance of this finding?
Disc bulges do not carry any prognostic significance for low back pain and should be considered a non-significant finding. Patients can be reassured that a disc bulge is common finding amongst people without low back pain and do not predict future back pain. There is a high prevalence of 'abnormal' findings on MRI in pain-free populations (disc degeneration [91%], disc bulges [56%], disc protrusion [32%], annular tears [38%][2]. Clinical context is paramount.

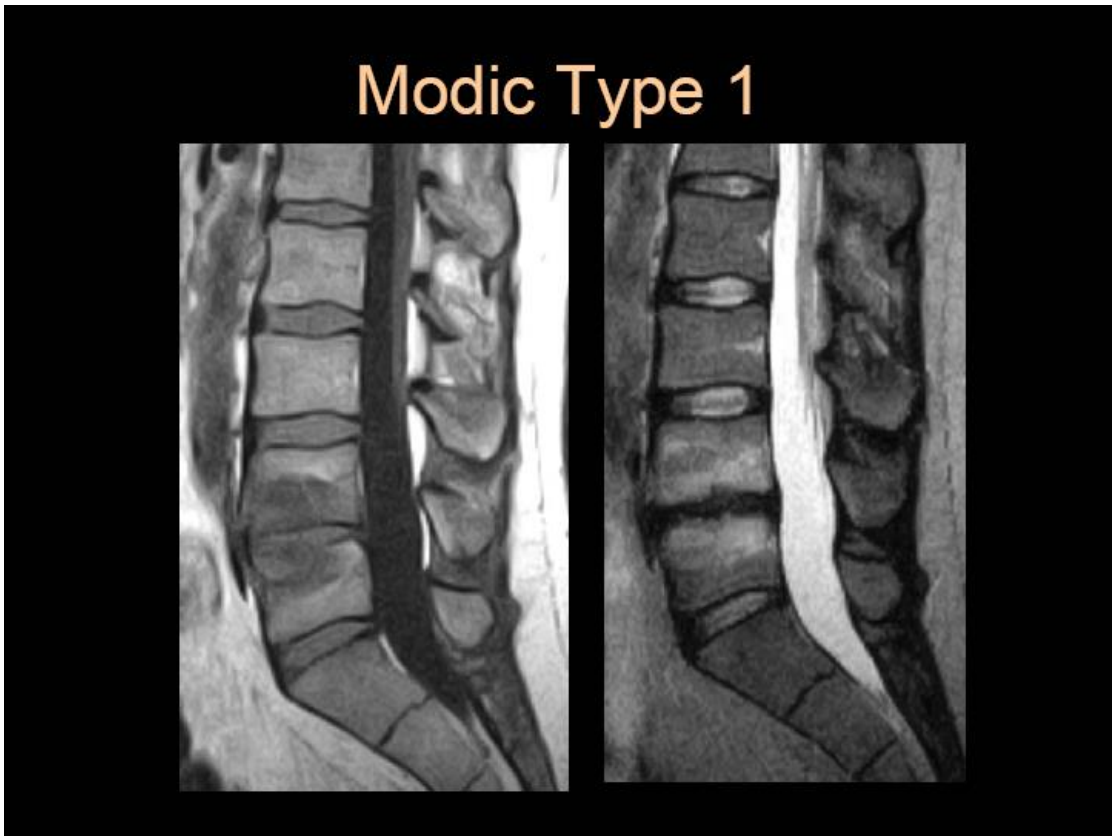
Q.4. What MRI changes are significant for discogenic pain?

Two features evident on MRI correlate strongly with the affected disc being painful upon disc stimulation: high-intensity zone (HIZ) lesions and Modic

lesions. The former appear in the anulus fibrosus, the latter in the vertebral end plate. HIZs are defined as spots of intensely high signal within the posterior anulus of a disc viewed in heavily T2-weighted MR images [44] (Figure 7). They represent the appearance, in sagittal images, of large radial or circumferential fissures [3].

A likelyhood ratio of 4 means that an investigator can be 73% confident that the affected disc will be painful on disc stimulation. This figure indicates that an HIZ is not absolutely diagnostic of a painful disc, but its presence substantially increases the chances that the affected disc will be the source of pain

Modic changes are patches of abnormal signal in the vertebral bodies adjacent to a disc . They occur as three types . Type 1 changes appear hypo-intense of T1-weighted MR images and hyper-intense on T2-weighted images (Figure 8). Type 2 changes appear hyper-intense on both T1-weighted and T2-weighted images . Type 3 changes appear hypo-intense on both T1-weighted and T2-weighted images.



T1 **T2**

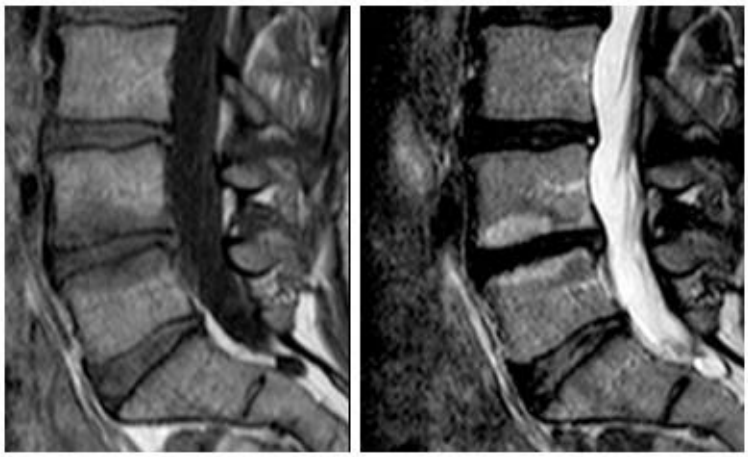
Type 1 changes represent inflammatory edema surrounding the disc. They are associated with disruption and fissuring of the endplate, and the presence of

interleukin 6, interleukin 8, and prostaglandin E2 . They can resolve, or evolve into Type 2 changes . Type 2 changes represent fatty infiltration, ostensibly after the acute inflammation represented by Type 1 changes. They tend to persist and not change in appearance [4].

A likelihood ratio of 3.4 means that investigators can be 69% confident that the affected disc will be the source of pain. The condition IDD is not uncommon and accounts for some 40% of patients with chronic low back pain[5].

Nucleus dehydration and matrix degeneration can result in a low signal on T2 weighted MRI signal resulting in the so-called "black disc". It has an almost 100% sensitivity for discogenic pain but a low specificity. It's absence thus makes discogenic pain extremely unlikely[6].

Q..5. A closer look at Chris' MRI shows Modic type 1changes with a HIZ at the L4/5 level with decreased signal intensity in the disc. What specific treatment could be considered?
The MRI below shows Modic type 1 change at L45, a HIZ at L34 and slight increased signal in the posterior annulus of L45 perhaps representing an annuar fissure but not satisfying the criteria for a HIZ.



Chris now has a very high probability that his chronic somatic low back pain is discogenic in origin. This means that the pain arises form nociceptors in the outer one-third of the disc (somatic) **NOT** from spinal nerve root (radicular). Treatment options are between conservative verses surgical. They include:

- Educating Chris about the nature of the pain and assuring him that the long term prognosis is quite good, especially if he stays active and keeps his mood healthy
- Formal multidisciplinary pain management program involving analgesics, physical therapy and psychological interventions.
- The use of analgaesics should be individualized using the WHO guidelines as a framework. Recent studies showing an apparent ineffectiveness of paracetamol in pain, does not take into account individual experience. For some patients, paracetamol is effective and should be tried in all patients

as a first-line. Similar trials of therapy should be tried with nsaids, tricyclics, etc in a pragmatic fashion.[x]

- Although psychological interventions are valuable in helping Chris re-frame his understanding and reaction to his pain problem, it should be stressed that he does have pathology consistent with his pain experience. The use of psychological interventions in his case does not imply his pain is simply a "short-circuit" in his central nervous system.
- With respect to physical therapy, there are conflicting data as to the beneficial effects of specific approaches such as core strengthening programmes vs McKenzies exercises when compared to self-directed maintenance or resumption of general activity. Any intervention should be individualized and like medications, used as part of a pragmatic trial, and assessed on its merits. Chris should understand that these interventions are not expected to abolish his pain though he should expect some improvement.
- Injection techniques such as intradsical electrothermy therapy (IDET) and methylene blue injections have had mixed success and are still undergoing further trials and refinement
- Antibiotic therapy for persistent low back pain patients with Modic type 1 on MRI changes has been promoted after successful trials in Scandanavia[7.] Researchers showed that 3 months of Augmentin resulted in clinically significant reductions in pain and disability at 12 months
- Neuromodulation has improved over the last five years and is becoming a more viable option for persistent somatic low back pain if less invasive/expensive fail to help.
- Surgery. Differing surgical approaches are available involving minimally invasive fusion techniques and disc replacement. Controversy still persists about best patient selection techniques. Morbidity needs to be carefully considered. If surgery is considered and the changes (HIZ and Modic) are subtle, some surgeons would consider the use of discography to confirm the source of the pain prior to considereing embarking on fusion or disc replacement. The use of discography is somewhat controversial however, especially since the reliability is heavily dependent upon the technique used. (There are guidelines which, if followed, lead to higher reliability – unfortunately these are not always followed). There is also a risk of the procedure itself leading to degeneration or discitis in asymptomatic discs,

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