

Degenerative Lower Back Pain

Lower back pain is extremely prevalent in the wider community with 80 per cent of people experiencing it at some point in their lives (Yin-Gang, 2009). It is the most common pain symptom experienced in American adults and it is the second most common reason why patients seek out a primary care physician (GP, Chiropractor, Osteopathy) (Binder and Nampiaparamil, 2009).

Lower back pain is usually multi-factoral (meaning there is more than one region involved) with the most common pain generation sources being the lumbar disc (39% of all cases of chronic lower back pain) and the facet joints (present in 15-52% of chronic lower back pain) (Yin-Gang, 2009 and Binder and Nampiaparamil, 2009).

Anatomy

The lumbar discs are cartilage structures, comprised of the Annulus fibrosus (cartilage fibers which make up the outer 1/3 of the disc), the Nucleus pulposus (a small ball shaped gel like structure that sits in the centre of the disc) and two endplates (the top and bottom of the disc which binds the disc to the bone of the vertebra above and below). The role of the disc is to provide axial load bearing, shock absorption and movement.

The facet joints help make up the bony structure at the back of the vertebra. The facet joint is formed by the superior (top) facet of the lower vertebra and the inferior (bottom) facet of the upper vertebra. The orientation or alignment of the facet joints determine the type of movement allowed in that region. For example, the facet joints in the lower lumbar region (L4/L5) are orientated to allow for rotation, while the facets higher up in the lumbar spine (L2-L4) are orientated to allow for greater flexion and extension (Binder and Nampiaparamil, 2009). The facet joints play a supportive role in axial load bearing, carrying 35 percent of axial load and as the spine moves further into extension (backwards) the load requirements of the facet joints increases.

Risk Factors

Lower back pain can usually be attributed to two pain generating processes, degeneration and damage to the lumbar discs or degeneration within the facet joints. Factors which increase the risk and rate of degeneration to these areas include aging, smoking, obesity, vibrations from transportation, excessive axial loading and mechanical loading (Yin-Gang, 2009).

The Disc and Facet Degenerative Cycle

Lumbar Discs

Disc injuries and hence degeneration usually follows a certain pattern. Initially small tears called "circumferential tears", split the annular fibers in a circumferential direction. These tears can then progress to become "radial tears". Radial tears usually extend horizontally from the centre of the disc to the outer margins. The tearing disrupts the internal architecture causing a reduction in the height of the disc as well as a loss of structural rigidity of the supportive annular fibers resulting in a bulging or "herniation" of the disc. The last stage of the cycle occurs when the bulging disc ruptures or bursts which is called a "prolapsed disc".

As the disc height decreases it alters the load bearing capacity of the disc, placing greater loading on the facet joints. As a result of this osteophytes (bone spurs) begin to arise off the vertebra at the disc margin. The added loading onto the facets starts initiates the degenerative process in the facet joints.

Facet Joint

Facet degeneration begins with a synovitis (inflammation of the fluid inside the joint), this progresses to destruction of the articular cartilage in between the joint. The capsule around the joint then becomes redundant and finally subluxation (misalignment of the joint) joint occurs. Osteophytes then begin to form at the margins of the joint and periarticular fibrosis results in stiff facet joints (Yong-Soo, 2009).

As the facets and disc degenerate, the reduction in the disc height then leads to buckling of the ligaments around the spinal column (the column which houses the spinal cord). Buckling ligaments, in addition to the laxity of the disc and osteophyte formation around the joint and disc margins can lead to a narrowing of the neuroforaminal canal (which houses the nerve roots) and spinal canal (which houses the spinal cord) (Yong-Soo, 2009). This ultimately can cause unilateral and bilateral sciatica which is called neurogenic claudication or stenosis.

Pain Sources

Pain associated with a degenerative lower back will vary depending on how significant the level of degeneration is. Mild cases, with early degeneration usually involve local lower back pain which is dull in nature with occasional sharp twinges/stabs, the pain may refer into the buttock and posterior thigh but not below the knee. The pain may come and go, is usually worse with movements such as bending forward and extending. Cases involving more prominent degeneration commonly involve lower back pain with shooting/radiating pain into the leg (below the knee) and foot on one or both sides, there may also be associated numbness in the leg and/or foot. There can be difficulty walking, sitting or standing and weakness in the legs.

Pain that is associated with the degenerative process of the disc and facet joints can be due to triggering of pain receptors inside the disc without stimulation of the nerve root (sciatica). Research has shown that injured discs have a higher concentration of cytokines (inflammatory mediators) and more scar tissue formation. The inflammatory markers pass out to the end plate and annulus fibrosis via fissures (radial tears) in the disc, stimulating pain receptors in these regions (Yin-Gang, 2009). The pH levels inside the disc is also reduced due to increased levels of lactic acid which can then trigger neurogenic pain mediators (pain arising from a lesion or a dysfunction in the nervous system) and non-neurogenic pain mediators (pain resulting from actual or potential tissue damage), causing pain (Yong-Soo, 2009). In the facet joint, pain can be generated by the ligamentous capsule surrounding the joint as well as the synovial folds inside the joint (Binder and Nampiaparamil, 2009).

Treatment

Treatment options for degenerative disc disease and facet degeneration is quiet vast, but will depend on the individuals specific findings and pain levels.

Surgical:

Intradiscal electrothermal therapy-heat is used to retract the collagen fibers in the disc to reduce the bulge and to destroy the pain fibers. Research shows it can be beneficial in highly selected candidates with mild disc degeneration that also have MRI evidence of annular disruption (Assietti, 2010). High quality randomised clinical trials are lacking though.

Lamectomy-or fusion of two or more vertebra, the fusion unfortunately accelerates the degeneration of the adjacent discs (Ekman, 2009). Fusion using implants also increases the risk of nerve injury, blood loss, operating times, overall complications while not adding to improvements in pain and function levels (Deyo, 2009)

Discectomy-removing the bulging part of the disc, seems to be beneficial in patients with disc herniations (bulges) (Chin, 2008).

Disc replacement/prosthesis-the insertion of artificial discs lacks long term studies.

Future treatment options are looking at injecting stem and chondrocyte cells (the cells which build/make cartilage), in an attempt to regrow and restore the cartilage in the disc.

Conservative:

Manipulation/Mobilisation-is effective for the treatment of acute and chronic lower back pain (Bronfort, et.al, 2010).

Flexion-Distracton Therapy-uses a table which flexes and distracts (tractions) the lower back which aims to reduce intradiscal pressure, widen the spinal canal, reduce pressure on the nerve roots and return motion to the spinal joints.

McKenzie Method-a series of movements are used to identify which aggravate the lower back pain and/or leg pain and which reduce or centralise the pain. The movements which reduce the pain are then used to reduce the lower back and/or leg pain. It has been shown to reduce short term (<3mnths) pain and disability for patients with lower back pain (Busanich & Verscheure, 2006).

Exercise-research shows that exercise programmes can aid in the reduction of lower back pain as well as reducing the re-occurrence rate (Smith and Grimmer-Sommers, 2010).

Acupuncture-high quality studies are lacking, but the general consensus is that it provides short term pain relief and may work well as part of a multidisciplinary approach (Furlan, 2005).

Chiropractic care:

Chiropractic care utilises a combination of the conservative therapies listed above with a focus on improving spinal joint motion to improve range of motion, strengthening and balancing muscles around the lower back and pelvis, as well as gating (reducing) the pain pathways in the body.

It must be remembered that no matter what treatment option is selected there will always be risks associated with any benefits. There is also no guarantee that a specific treatment intervention will work and there is no silver bullet for chronic pain. Chronic pain falls into the

same long standing illnesses like Diabetes and Asthma. Emerging evidence shows that patient management strategies utilised by health care practitioners need to focus on patient involvement within the therapeutic decision making, self management and education, group based activity/exercise and realistic expectations.

Sources:

Assietti R, et al "Intradiscal electrothermal therapy for symptomatic internal disc disruption: 24 month results and predictors of clinic success", *Journal of neurosurgery, spine*, March 2010, 12 (3), pg 320-6

Binder SD and Nampiaparampil ED "The provocative lumbar facet joint", *Current reviews in musculoskeletal medicine*, March 2009, 2 (1), pg 15-24

Busanich BM and Verscheure SD "Does McKenzie therapy improve outcomes for back pain?", *Journal of Athletic Training*, 2006 41 (1), pg 117-119

Chin KR, et al "Success of lumbar microdiscectomy in patients with Modic changes and lower back pain: a prospective pilot study" *Journal of spinal disorders and techniques*, April 2008, 21 (2), pg 139-44

Deyo, A. et.al "Overtreating chronic back pain: time to back off?", *Journal of the American Board of Family Medicine*, March, 2009

Ekman P, et al "A prospective randomised study on the long-term effect of lumbar fusion on adjacent disc degeneration." *European spine journal*, 2009, 18 (8), pg 1175-86

Furlan AD, et al "Acupuncture and dry needling for lower back pain" *Cochrane database systematic reviews*, Jan 2005, 25 (1)

Smith C and Grimmer-Somers K "The treatment effect of exercise programmes for chronic lower back pain" *Journal of evaluation in clinical practice*, April 2010

Yin-Gang Zhang, et al "Clinical diagnosis for discogenic lower back pain" *International journal of biological science*, 2009, 5 (7), pg 647-658

Yong-Soo, Choi "Pathophysiology of degenerative disc disease" *Asian spine journal*, June 2009, 3 (1), pg 39-44