

DEGENERATIVE DISC DISEASE

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DEGENERATIVE DISC DISEASE

- ▶ Degenerative disc disease is degeneration of the annular fibres of the intervertebral disc.
- ▶ Intervertebral discs function as shock absorbers between the vertebrae when these bones are load bearing.
- ▶ The discs allow for movement to occur between the vertebrae, they are flexible yet strong.
- ▶ Discs have two distinct components, the **annulus fibrosus** and the **nucleus pulposus**.
- ▶ Annulus fibrosus are concentric layers of collagen forming a laminated band which holds two vertebrae together. Each layer is on a diagonal at right angles to its neighbour.
- ▶ The annular fibres are thicker anteriorly and laterally and are firmly attached to the end plates of the vertebrae above and below.

DEGENERATIVE DISC DISEASE

- ▶ The posterior portion is thinner and less firmly attached.
- ▶ The nucleus pulposus is a transparent jelly in the central part of the disc, surrounded by the annular fibres.
- ▶ The nucleus has a high water content and behaves as a viscous fluid.
- ▶ The disc has the capacity to swell when compressive forces are reduced. There is more movement possible in the lumbar and cervical spine than in the thoracic spine.
- ▶ Vertebral discs are not very pain sensitive, with only the posterior peripheral aspect of the annulus fibrosus being innervated. The anterior and posterior longitudinal ligament, nerve roots, and vertebral bodies are pain sensitive, as well as the highly innervated facet joints.

DEGENERATION OF THE DISC

- ▶ Degeneration of the disc is a normal process.
- ▶ With age, the vertebral discs undergo slow wear and tear.
- ▶ Consists of fibrous changes in the nucleus and in the organization of the annulus fibrosus rings, and disappearance of the cartilaginous end-plates.
- ▶ The discs of the lumbar and cervical spine are most affected.
- ▶ As early as 20 years of age, changes in the lumbar discs can be noticed as the vascular supply to the disc becomes occluded, affecting its nutrition.
- ▶ The posterior portions of the annulus become compressed and bulge as a result of the lumbar lordosis. Posterior annular fibres appear to be thinner and shorter than the anterior ones.
- ▶ Although this degeneration process is a normal one, pathological disc degeneration occurs when changes happen either at an accelerated rate or prematurely. Pain and disability result when the surrounding tissues cannot adapt to the changes.

ACUTE INJURIES TO THE DISC

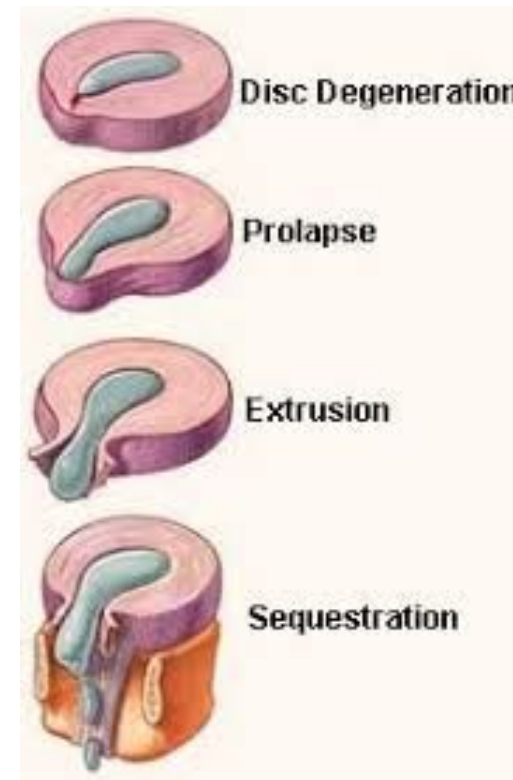
- ▶ At any point in this continuum of degeneration, an acute rupture can occur.
- ▶ Ages 30-45, is the most common for a traumatic rupture in the lumbar spine to occur, the annular fibres are weaker and less able to withstand higher stress.
- ▶ Acute rupture before the age 20 years of age can occur, that show no signs of degeneration.
- ▶ 50 years of age or older, a rupture is less likely to occur as the nucleus of the disc has fibrosed.
- ▶ Herniation is commonly used term to describe a disc injury that results from rupture of the annular fibres. Men are more affected than women 3:2 ratio.
- ▶ Herniation at L4-L5 to S1 accounts for 98% of all low back disc injuries.

ACUTE INJURIES TO THE DISC

- ▶ The mechanism of disc herniation is a combination of flexion and torsional forces.
- ▶ The damage to the annular fibres may extend through many or all layers at one time; as a result the disc bulges far enough posteriorly or posterolaterally, pain sensitive structures, such as nerve roots and ligaments are compressed.
- ▶ Symptoms than are produced as such, paresthesia, pain and possibly motor weakness.
- ▶ According to one source, before the injury occurs the disc may bulge, with the annular fibres intact. This is referred as protrusion.
- ▶ Herniation may then follow as the annular fibres tear. Herniation has the following subcategories.

ACUTE INJURIES TO THE DISC

- ▶ In a **prolapse**, only the outermost annular fibres hold the nucleus.
- ▶ **Extrusion** the annulus fibrosus is pierced, allowing the nucleus to enter the epidural space.
- ▶ **Sequestration**, fragments of the nucleus and annulus are found outside the disc.



OTHER TERMS THAT ARE USED WITH DDD

- ▶ **Spondylosis:** Is degenerative changes in the facet joints and eventual ankylosing of the joint capsules.
- ▶ **Slipped disc:** Is a lay term for disc herniation.
- ▶ **Lumbago:** Is a general, non-specific term for low back pain.
- ▶ **Sciatica:** When used as a lay term, means P in the back of the leg; it does not identify the origin of the P. True sciatica is compression or inflammation of the sciatic nerve.

CAUSE OF DDD

- ▶ The leading cause is **chronic overloading of the disc leading to annular fibre micro tearing and migration of the nucleus.**
- ▶ Contributing factors: trauma, mm imbalances leading to asymmetric loading of the spine, postural dysfunction such as head forward posture, chronic degenerative changes in the disc, poor blood supply to the disc, lack of flexibility, improper back support, and poor posture.

MEDICAL TX OF DISC INJURY

- ▶ X-rays are not necessarily indicative of a person's symptoms.
- ▶ DDD is usually treated conservatively at first with analgesics and mm relaxants, a few days of bed rest, and functional positioning so the person finds and maintains a position of symptom reduction and optimal comfort.
- ▶ Simple movements and exercises are interspersed with maintenance of the functional position. As symptoms reduced, strengthening is introduced.
- ▶ Chiropractic and physiotherapy are usually indicated.

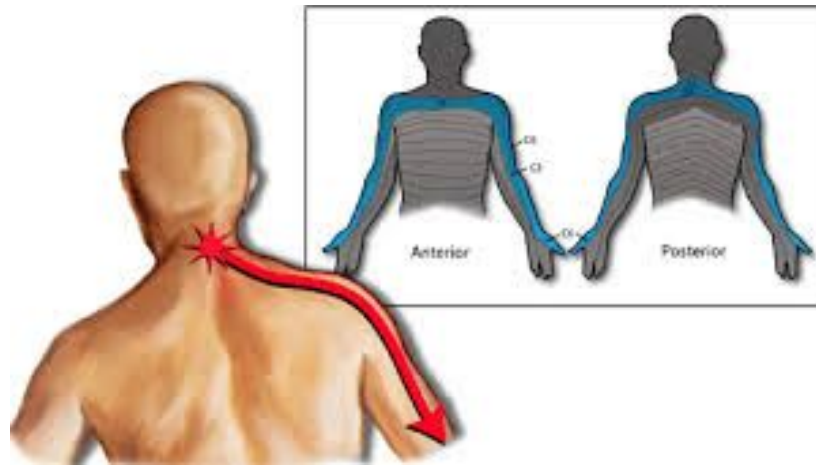
STAGES OF DEGENERATION

- ▶ DDD is thought to go through 3 stages of degeneration.
- ▶ **Dysfunction stage:** biomechanical changes over many years result in weakness, bulging and minor tears in the annulus which heal slowly. Disc protrusions may be asymptomatic, also painful chronic facet joint irritation, joint effusion, and mm spasm. The dysfunction stage is considered reversible.
- ▶ **Instability stage:** the posterior annular fibres and joint capsules become lax causing the vertebral segment to become hypermobile. Pain may result from the stress on the ligaments and joint capsules due to this increased mobility. Nerve entrapment may occur. Tissue change in this stage is considered permanent.
- ▶ **Stabilization stage:** there is loss of disc material and decreased disc height, the intervertebral foramen narrows, joint capsules and posterior ligaments fibrose. Degeneration may spread to other vertebral levels.

SYMPTOM PICTURE OF ACUTE DISC HERNIATION

- ▶ Acute herniation can occur at any time, but more common at the end of the dysfunction or beginning of the instability stage, usually between 30-45 years of age. Posterolateral protrusion is most common.
- ▶ Repeated minor strains or sustained flexion may cause an **acute rupture**. Edema and protective mm spasms.
- ▶ **Pain** arises from the compression of pain-sensitive structures by the protrusion. Structures affected, nerve roots, ligaments, dura mater, and blood vessels. Pain is worse in the morning, pain also increases when the person is inactive. The pain is likely sclerotomic, deep, and poorly localized.
- ▶ An **acute scoliosis** or other spinal distortion may occur in response to the acute herniation.

NEUROLOGICAL SIGNS OF HERNIATION



- ▶ Signs occur with pressure on the nerve roots or spinal cord.
- ▶ True neurological signs are motor weakness specific to the level of the lesion and specific dermatomal sensory changes, such as numbness. More likely with prolapse and sequestration, where the nucleus leaks out of the annular fibres and impinges on the nerves.
- ▶ **Nerve root impingement syndrome**: where the symptoms change with ongoing pressure. A central prolapse can lead to the upper motor neuron lesions in the cervical spine. The lumbar spine, a central prolapse can lead to compression of the sacral nerve roots with bladder or bowel dysfunction and numbness at the low back, gluteals, and around the hips (saddle anesthesia).

HOW HERNIATION POSITION AFFECTS THE SYMPTOM PICTURE

- ▶ Large cervical posterolateral protrusion: may cause nerve root signs in the upper limbs.
- ▶ Small lumbar posterolateral protrusion: may produce P spreading across the back into the glutes and thighs.
- ▶ Large lumbar posterior protrusion: may cause spinal cord compression with loss of bladder control. Symptoms may shift if the annulus is intact. If the annulus ruptures this allows material to leak, symptoms cannot be relieved by movements of the spine.
- ▶ Acute posterior neck lesions may refer P and paresthesia across the shoulder and down the affected arm in a specific dermatomal pattern. P may be sharp or deep and aching. Worse with weight bearing, anterior disc lesion may produce difficulty in swallowing.

HOW HERNIATION POSITION AFFECTS THE SYMPTOM PICTURE

- ▶ Acute lumbar lesions start as sudden back P that progresses to mainly leg P. P is sharp, deep, or aching. Herniation is always painful, with the onset often before noon when the disc is most dehydrated and the nucleus is able to move the most. Calf cramping may be present. Standing and walking are less painful than sitting with a posterior lesion, while P on standing or walking suggests an anterior lesion.
- ▶ Healing slow due to the hypo vascular nature of the disc. As the condition resolves through subacute to chronic stages, as spinal deformity reduces, ROM increased and ortho tests such as straight leg raises, slump, ULTT's are negative. Worsening signs in the lumbar spine are a lack of back P, but an escalation of neurological symptoms.
- ▶ ****Please read observations and palpation on Pg.626**

TESTING

DDD & ACUTE HERNIATION

- ▶ **DDD: AF ROM & PR ROM:** either C/sp or L/sp may reveal reduced ROM.
- ▶ Stiffness is likely, P may not be present. The end feel is likely capsular in the affected areas.
- ▶ **AR Isometric testing:** may reveal weakness in affected muscles, depending on the stage of degeneration.
- ▶ **Acute herniation: AF ROM & PR ROM:** either the C/sp or L/sp reveal ranges limited P and muscle spasm, passive range less so than active.
- ▶ **Lumbar spine active free flexion** may have a deviation to one side. Movement away from the painful side, vertebral joint derangement may be present. If the movement is towards the painful side, an entrapped or adhered nerve root may be present. Side bending away from the painful side increases the symptoms, the problem may be a disc herniation medial to the nerve root, or muscular or articular origin. If Side bending towards the painful side increases the symptoms, disc herniation is lateral to the nerve root or the lesion is inside the vertebral jts.

TESTING

DDD & ACUTE HERNIATION

- ▶ Posterior or posterolateral herniation that are contained by the annular fibres: movements can reduce the symptoms; flexion is limited and symptoms peripheralized with movement; extension is also limited and symptoms centralize with movement.
- ▶ Complete annular rupture and sequestered nucleus: movements cannot relieve the symptoms as the hydrostatic disc mechanism is no longer intact.
- ▶ **SOTS**: Cervical disc herniation may give positive results with ULTT's 1-4, Spurling's, Valsalva, Deep tendon reflex tests.
- ▶ Lumbar disc herniation may give positive results with Slump, Valsalva, Kemps, Kernig's, Straight leg raise, and deep tendon reflex tests.

CONTRAINDICATIONS

- ▶ Tx is CI'd with saddle anesthesia and bladder weakness; this indicates herniation and compression of the fourth sacral nerve root, refer out for immediate medical attention.
- ▶ If no position can be found that relieve the P, TX is CI'd until the client is referred to a physician for assessment.
- ▶ Positions that aggravate symptoms are avoided.
- ▶ Do not mobilize hypermobile jts.
- ▶ Do not remove all protective spasming with acute disc lesions; spasm stabilizes the hypermobile segments.
- ▶ Pressure and direction of techniques are modified and deep or longitudinal techniques are not used on areas of mm atrophy.

TREATMENT DDD of the C/sp and L/sp

- ▶ Positioning: Prone, supine, and side lying are all indicated. The treatment is in the context of a relaxation massage.
- ▶ Hydro: Heat
- ▶ DDD for the C/Sp, Treat compensatory structures, DDB
- ▶ Fascial techniques, GSM, TP work, Joint play.
- ▶ Shortened suboccipitals and posterior cervical muscles are tx'd with GTO.
- ▶ DDD for the L/Sp, Treat compensatory structures, DDB
- ▶ Facial, GSM, TP's, Joint play.
- ▶ Passive stretching, specific to hip flexors.

SELF-CARE FOR DDD OF THE C/SP AND L/SP

- ▶ Heat is used on the shortened tissues.
- ▶ Self massage is useful for hypertonic areas. DDB is encouraged for P management.
- ▶ Pain free ROM is maintained. Stretching of specific shortened muscles is followed by isometric strengthening of weaker muscles. Spine extension exercises.
- ▶ C/sp, passive positional traction of the cervical spine is used to relieve P. This term is also called unloading the spine. The supine client rests the head on a small towel roll, positioning the neck in flexion and side bending away from the painful side.
- ▶ L/sp, positional traction is achieved by lying prone on a kitchen or dining room table so the pelvis and legs hang over the end of the table. The hips and knees are in flexion, the feet do not touch the ground. Unloading of the spine is also achieved with swimming.

TREATMENT FOR ACUTE HERNIATION

- ▶ **Positioning**: Prone, side lying, or supine. Passive positioning and the location of the pillows is crucial to the acute treatment, and is most comfortable.
- ▶ The treatment is in the context of a relaxation massage.
- ▶ **Hydro**: Ice
- ▶ Posterior lumbar protrusion: Supine position lumbar extension is most comfortable; the legs are extended with no pillow under the knees. The prone position the lumbar spine is extended with no pillow.
- ▶ Cervical protrusion: A small towel roll under the neck while the client is supine maintains a cervical lordosis. The neck is kept in alignment using a face cradle in prone position. In the side lying position, pillows are placed under the head so the cervical spine is in alignment.

TREATMENT FOR ACUTE HERNIATION

- ▶ **Lumbar anterior protrusion:** The supine position of the lumbar spine is flexed with pillows under the knee's. The prone position the lumbar spine is maintained in flexion with an abdominal pillow.
- ▶ **Cervical anterior protrusion:** Is flexed with a pillow under the head. Pillowing under the thorax maintains cervical flexion.
- ▶ Treat compensatory structures, DDB
- ▶ MLD, GSM, gentle fascial techniques on shortened fascia. TP's are tx'd with mm stripping and ischemic compressions.
- ▶ Gentle long axis tractions.

SELF-CARE ACUTE HERNIATION

- ▶ Periods of rest in a pain-reduced position interspersed with slow, controlled pain-reduced movement are indicated.
- ▶ The client is taught to find a pain reduced position, whether standing, sitting or lying.
- ▶ Hydrotherapy application is cold to reduce P and spasm. Stress reduction, DB and self massage.
- ▶ Self traction mentioned in the DDD section is implemented as long as symptoms are reduced.
- ▶ Gentle pain free strengthening exercises are introduced.
- ▶ Anterior and Posterior pelvic tilts.
- ▶ Back extension strengthening exercises while lying prone.
- ▶ Correct lifting procedures and correct posture during activities of daily living.
- ▶ Postural awareness exercises.
- ▶ Refer out to their physician if the symptoms become worse. Physiotherapy and chiropractic care can also help with managing the symptoms.

TREATMENT FREQUENCY AND EXPECTED OUTCOME

- ▶ Treatment frequency for DDD and acute herniation 2x/week for 3 weeks, followed by re-assessment. 1x/week for a month.
- ▶ The prognosis for C/sp DDD is better if the symptoms are of recent and sudden onset. The lumbar spine is similar.
- ▶ The prognosis for acute herniation symptoms in the cervical spine is good. The most severe symptoms may diminish in a few days with full healing taking up 2-6 months. The lumbar spine can take up to 8 weeks to heal in most cases.
- ▶ **Please read McKenzie Exercises on Pg.635