PHYSIOTHERAPY MANAGEMENT OF LOW BACKACHE

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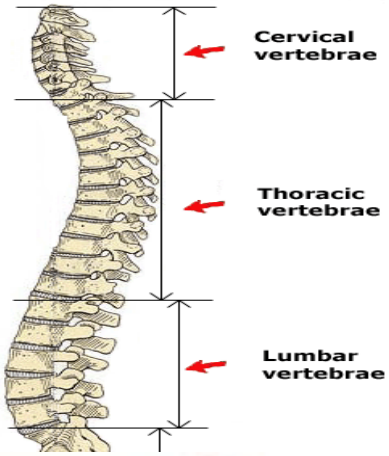
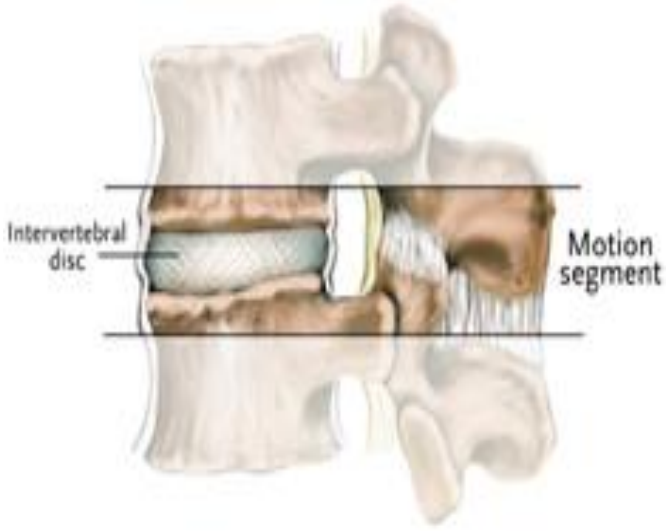
The spine is a flexible multicurved column, which has at least four biomechanical functions: 1) housing & protection to spinal cord, 2) support the body weight & bending moments, 3) mobility and 4) control. Vertebral bodies, intervertebral discs, posterior elements & articular facet joint constitute the support system: whereas the control system consists of both contractile (muscles) & non- contractile (ligaments, fascia, capsules & vertebral innervations).



The basic functional unit of the spine is the spinal motion segment, which may be defined as comprising the adjacent halves of two vertebral bodies, the interposed intervertebral disc & articular facet joints as well as the supporting structures such as ligaments, muscles, nerves and vessels.



The posterior elements of the spine include the zygapophyseal (facet) joints, pedicle, lamina, & pars interarticularis. The zygapophyseal joints carry little vertical load except in certain positions such as excessive lumber lordosis.

A gradual decrease in cortical bone of 3% per decade in both the sexes increases to about 9% per decade in post-menopausal women. A 6-8% decrease in trabecular bone per decade begins between 20-40 years of age in both sexes. Before 40 years of age about 55% of load bearing capacity is attributed to cancellous bone, which decreases to about 35% after 40 years of age. Bone strength decreases more rapidly than bone quantity, which accounts for the end plates bending away from the disc, anterior wedge fracture, end plate fracture.

The IVDs undergo a normal process of degeneration. Early changes in the lumbal IVD are common as early as the 2nd decade, when vascular channels begins to become obliterated. With the developing lumbar Lordosis the posterior lamellae of the annulus become somewhat compressed vertically and also horizontally, with an associated tendency towards posterior bulging of the annular fibres. The nucleus remains a viscous, incompressible gel with a few collagen fibres imbedded within it.

The nucleus gradually changes from gel to more of a viscous, fibrous structure. With the loss of mucopolysaccharide/ GAG, there is decrease in water binding capacityand a slight increase in collagen content (from 15% in the 1st decade to about 20%). The water content will decrease from 88% to about 70%.

Beginning at 3rd decade there will be a 55% decrease in mucopolysaccharide. The posterior annulus gradually becomes more weight bearing, cleft or gap appears on the posterolateral direction due to combined vertical compression of weight bearing and horizontal pressure from nucleus.

During the 4th decade transformation of nucleus from gel to a largely fibrous mass becomes complete and the nucleus gradually becomes less distinguishable from the surrounding annulus. The cleft in the annulus continues to increase. After 60 years the disc space is essentially filled with a mass of relatively unrecognized fibrous materialsconnecting adjacent vertebral bodies- **spondylosis**. With the gradual decrease in disc height, the load increases on the vertebral bodies resulting in hypertrophic bony reaction with the development of osteophytes.

The **disc lesion** is more susceptible to occur in between 30 to 50 years of age because the nucleus is still gel like exerting horizontal forces on the annulus, which is beginning to weaken and form cleft. Before this age annulus is strong enough to withstand the forces exerted by nucleus and after this period nucleus loses its water content, becomes fibrous and no longer has the capacity to bulge.

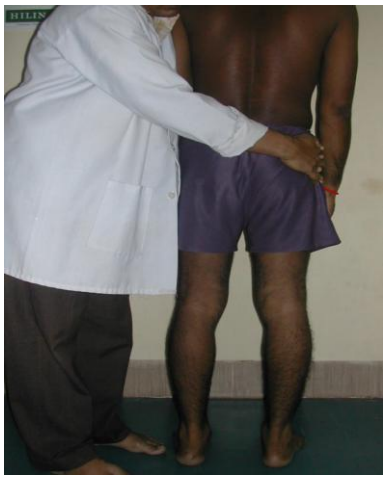
PID is more common in the lumbar spine because the load on lumbar disc is more, the disc height is less posteriorly than anteriorly, the nucleus lies more posteriorly, the posterior reinforcement to the disc by the PLL is poor as it is narrower caudally.

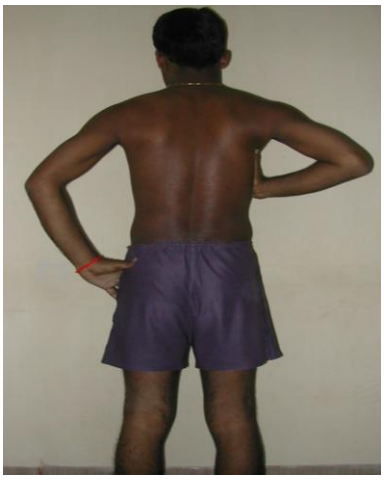
Facet joint abnormality may predispose/ precipitate the disc lesion. Lack of mobility on one side of a facet at a motion segment results in asymmetrical movements and increase in pressure from the nucleus on an isolated portion of the annulus.This portion of annulus tend to tear resulting in herniation of nucleus. If the entire segment lacks mobility the segment above or below tend to become hypermobile with added stress on the disc at hypermobile segment. The annulus at this segment may not withstand the increased horizontal forces exerted by nucleus and give way prematurely.

Posture (sitting) and occupation (lifting) that requires prolonged or repeated forward bending also predispose/ precipitate the disc lesion. During movement of the spine a positional change to the nucleus pulposes take place. Spinal flexion displaces the nucleus backward pre-disposing / precipitating to herniation where as extension move it forward and corrects the posterior derangement of nucleus.

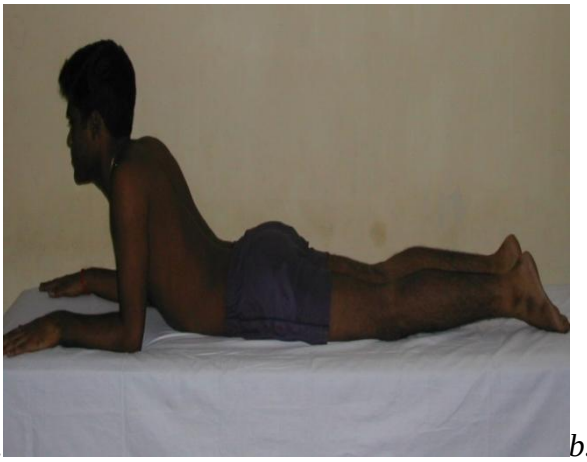
McKenzie recommends repeated spinal extension exercises for the posterior disc herniation. In the presence of listing, listing correction must be done before extension exercises start. Restoration and maintain the lumbar Lordosis is the aim of McKenzie programme. Spinal flexion can be initiated to prevent flexion dysfunction once the patient becomes pain-free.

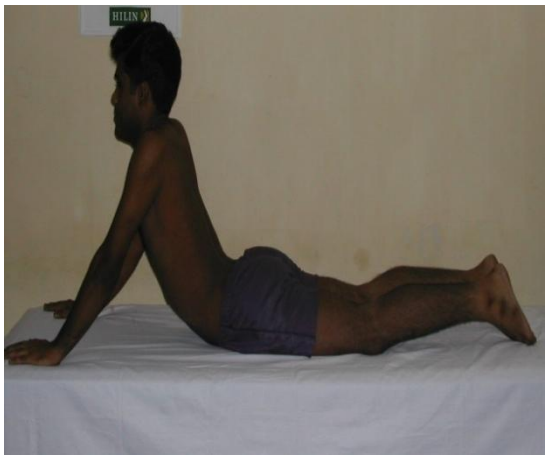
Listing correction





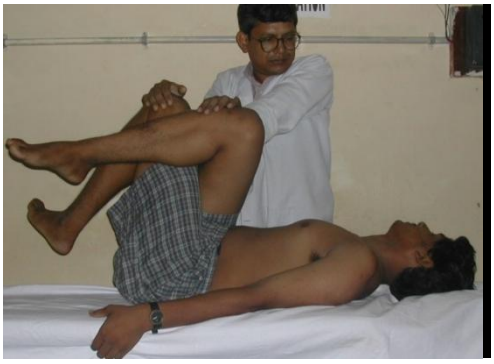
Lateral shift correction

a.  *b.*

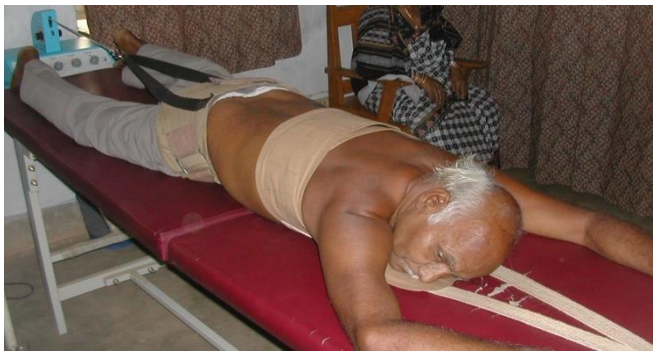


McKenzie Extension Exercise (a. prone on elbow, b. prone on hand)

According to Cyriax one complains of some aching in the back following forward bending, which gets worsen gradually is indicative of protrusion of nucleus. Pain in the calf or thigh without back pain and side flexion towards painful side hurts. If one of the lumbar movements other than flexion hurts in thigh or calf rather than back, patient under 60 years of age, who have greatest pain on side flexion towards painful side. Correction of trunk deviation followed by traction is helpful and manipulation is contraindicated.



Cyriax Listing correction technique



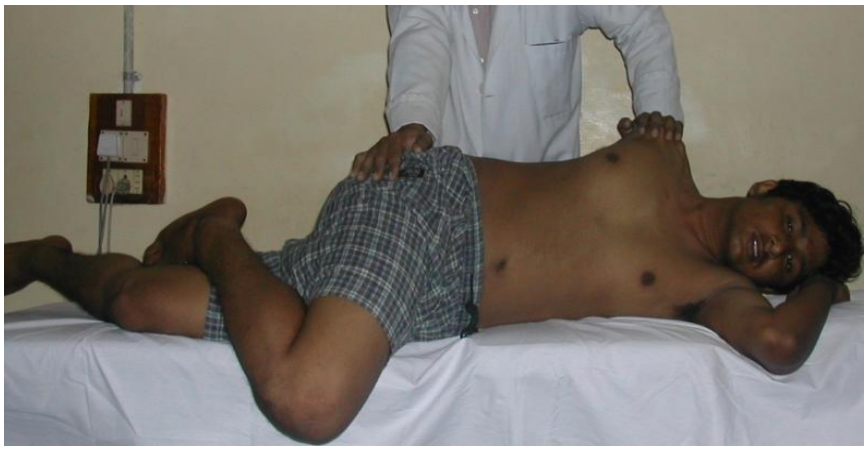
Lumbar Traction

Facet joint degeneration starts with erosion of the articular cartilage lining the facet surfaces, loss of normal relationship of the facets, synovial proliferation and segmental hyper-mobility. Progressive degeneration of articular surfaces leads to compensatory capsular fibrosis and thickening, marginal osteophyte formation and

hypomobility – referred as **Spondylosis**.

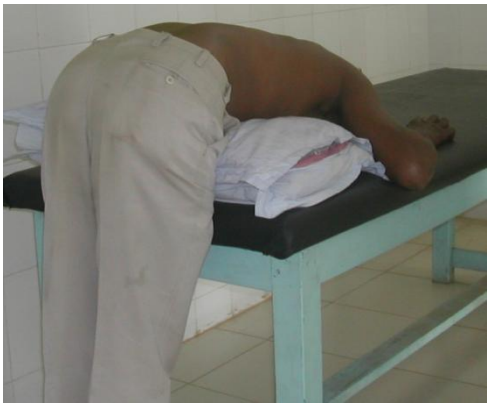
Elastic recoil of the ligamentum flavum pulls the joint capsule, synovium or meniscoid bodies during re-extension following forward bending. Loss of elasticity and hypertrophy of ligamentum flavum with ageing fails to do so resulting in entrapment of either of the structures within the articular facets referred as **locked back**.

Clinically one develops sudden onset of localized pain and spasm. The back gets stuck in flexion, rotation and side bending away from the involved side. During the instability stage at middle age facet locking occurs. Locked facet, if diagnosed appropriately and localized accurately can be reduced by manipulation. Mobilisation of hypomobile thoracic spines reduces compensatory hyper-mobility at the unstable site and segmental stabilization exercises help.



Cyriax Manipulation technique

Instability may also lead to **spondylolisthesis.** Short hip flexors may pull its bone of origin, the lumbar vertebral body forward. Short hamstrings may pull its bone of origin, the pelvic bone backward. Increased lumbar lordosis associated with hip flexors tightness, abdominal weakness, tightness of posterior structures may predispose/ precipitate listhesis. Spinal extension, loss of flexion, weakness of muscles also may predispose/ precipitate listhesis.



Self traction lumbar

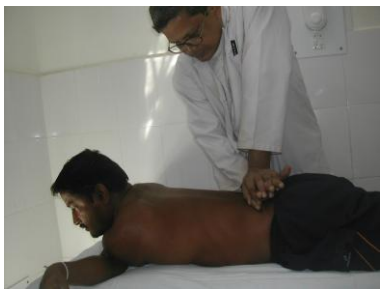
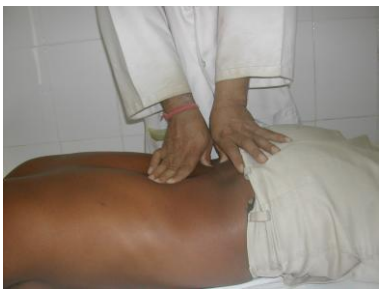
Use of spinal brace in anti-lordotic posture, spinal flexion exercises, stretching of hamstrings and hip flexors, strengthening of abdominals and segmental stabilization exercises are recommended. One must avoid spinal extension. Mobilisation of hypomobile thoracic spines reduces compensatory lumbar spine extension at the unstable site and prevents further slippage.

Stenosis: The boundary of IVF is formed superiorly and inferiorly by respective pedicles of the adjacent vertebrae, dorsally by the capsule of the facet joint and ligamentum flavum, and ventrally by IVD covered by the PLL. Swelling of the facet joint, capsular fibrosis and thickening of joint capsule, and thickening of ligamentum flavum lead to narrowing of the foramen. Reduced disc height due to degeneration, PID and osteophyte also decreases the space within the foramen and compresses the spinal nerve exiting through it.

Compression of healthy nerve does not produce pain, but paresthesia like tingling or numbness. Compression of ischemic nerve gives rise to pain. Manual therapy, traction facilitates fluid exchange i.e. improves venous and lymphatic drainage and increases arterial circulation. Rhythmic oscillatory mobilisation facilitates the mechano-receptors and helps in pain reduction. Maitland's lateral PA on the affected side and transverse from the sound side open up the IVF and relieves the compression. Mobilisation improves the flexibility and mobility.

Facet degeneration starts first in the upper lumbar spine, whereas in the lower lumbar spine disc changes begins to occur in the late teens and facet changes in mid-twenties. The degeneration of spine is a normal process that occurs gradually over the years resulting in stiffness - spondylosis. The involved tissues adapt to the altered mechanics so that no/ a little problem develops. It becomes symptomatic due to overactivity, undue activity, injury etc. Maitland's mobilisation, stretching, traction are useful to improve the flexibility and mobility and relief pain.

Central PA & Lateral PA

Manual therapy technique.

An important brief paper is that of Nachemson in 1976, which is perhaps the most quoted paper in the field, states that 80% of society will suffer "back pain to some extent,"men as often as women, "white collar as often as blue collar workers. Nachemson in 1976 states that 97% of causes are unknown, 2% attributed to disc problems and 1% to apophyseal joint disorders. 88% backache will be asymptomatic in 6 weeks, 98% in 24 weeks and 99% in 52 weeks. 29% require conservative measures, 1% surgery and 70% recover spontaneously. No more than 29% will require conservative measures, 1% surgery, and the remainder will recover spontaneously.

In general , the diagnosis can be broken into three major categories : Mechanical (Osteoarthritis , Spinal stenosis , Spondylolisthesis , compression fracture) ; Non-mechanical (Tumor , Infection , Inflammatory arthritis) and Miscellaneous

(Osteoporosis , Psychosomatic disorders , neuropathic joints , visceral diseases) Although 98% of LBP may be caused by mechanical factors, it is the other 2% caused by malignancy , infection ,visceral diseases and other red herrings that must be considered most seriously and are most important to diagnose quickly .

It must be kept in mind that a specific diagnosis can only be made in a minority of cases of back pain, probably only in 12 15% e.g. Disc degeneration, Pathological fracture (metastases, osteoporosis, Stress fracture, Sacro-iliac pain, Facet pain, Spondylolysis, spondylolisthesis, Infection etc.

Consequently, the majority of patients can only be treated symptomatically and expectantly. Non-specific back pain are predominantly mechanical back pain. The prognosis is extremely good. Sixty per cent of acute non-specific back pain will return to work within a week, and 90% within 6 weeks. Only 4% will go on to develop chronic back disability.

Chronic non-specific back pain have abnormal pain physiology, and have a high incidence of psychological disorders such as depression or alcoholism, and are dissatisfied at work.

EVALUATION LUMBAR SPINE

History

site of pain , duration , onset , constant or intermittent , aggravating & relieving factors , pain on cough /sneeze ,diurnal variation, disturbed sleep , morning pain ,posture, movement, activities, previous episodes , medication , steroids ,general health , weight loss , trauma , surgery , associated symptoms such as anesthesia , weakness or bowel / bladder dysfunction

Determine neural or neuralgic pain

-unrelated to activity or trauma

- superficial, stimulating in quality or electric

- Follows the pattern of innervation of a cranial or peripheral nerve

Observation in standing

- From behind:- lateral shift, Scoliosis, Rotation, Level of shoulder, iliac crests, PSIS, waist, gluteal & knee creases, Lower limb rotation, Muscle bulk, spinous process step

- From side:- pelvic tilt, Hip/knee position,Kyphotic&lordotic curves, Abdominal, glutei bulk

- From front:- Lateral shift, Lower limb rotation, Abdominal bulk,

Observation in sitting

-from the front:symmetry, respiratory pattern

- from the back : spinal curves , muscle bulk , alignment (shoulder girdle)

- from the side : spinal curves

Active physiological movements in standing

- flexion – extension, side flexion, rotation, Combined movements, Repeated movements

Passive physiological movements in supine

- flexion, extension, side flexion, rotation

Passive physiological movements with segmental palpation in side lying

- flexion, extension, side flexion, rotation

Neurological examination

- sensation
- muscle power :- L2-Iliopsoas, L3-Quad, L4-Tib. Ant., L5-EHL, S1-GS, Peronei, S2-toe flexion, L5 S1-Ham,
- reflexes : DTR - Patellar tendon L3,4,

  - Achilles tendon S1

  Superficial reflexes - Plantar

- neural tissue provocative tests:- SLR, Femoral nerve, Slump

- Passive accessory movements:

  Central PA, Unilateral PA, Transverse pressure

Palpation

- Skin - temperature , texture , tenderness, moisture & mobility
- Soft tissue - tenderness, trigger point
- Bony alignment
  - Peripheral pulsation