

LUMBAR DISC HERNIATION

Anatomy

The disc has outer annulus fibrosus

and inner nucleus pulposus

The annulus fibrosus has twelve lamellae

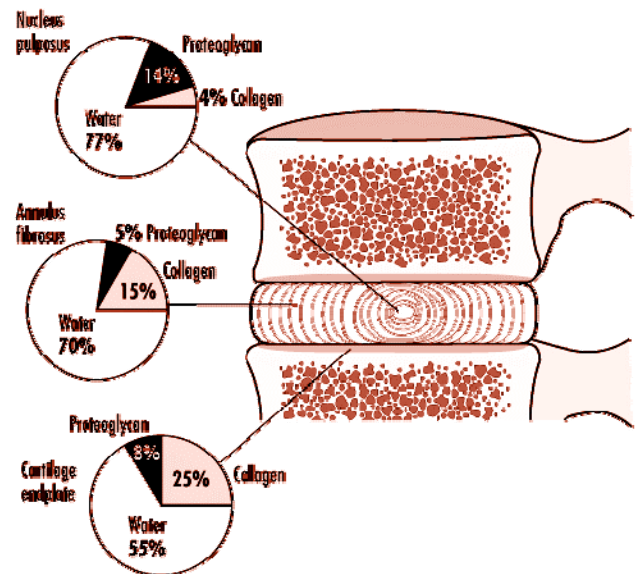
The nucleus pulposus has notocordal cells

and may persist up to the age of 5 years

At birth, the disc receives vessels that penetrate

the annulus fibrosus and end plate to supply

Nucleus pulposus



AF

NP

Disc function

PLL

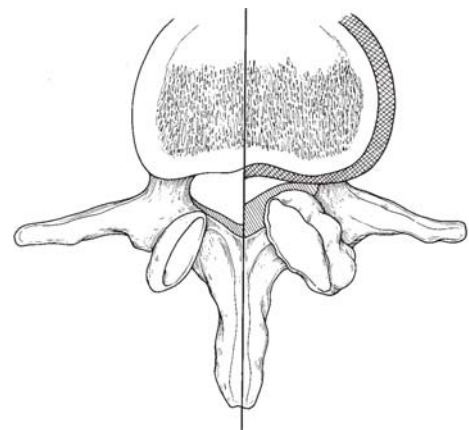
Transit root

Proteoglycan imbibes water and collagen resist swelling.

Disc acts as buffer

The compressive load is converted to tension load on the

annulus fibrosus



Kirkaldy Willis stages

3 stage of disc degeneration

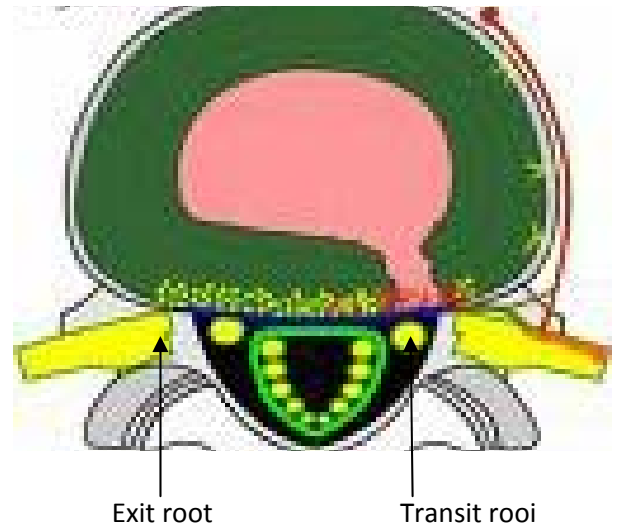
I Stage of disc dysfunction

II Stage of instability

III Stage of stability

Pathophysiology of disc herniation

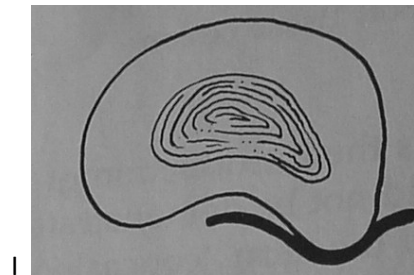
- 1 Pressure on the nerve root has been responsible for the sciatic pain [Mixer, Barr]
2. Rate of compression is more important
3. More recent (TNF- α) is a major mediators of radicular pain



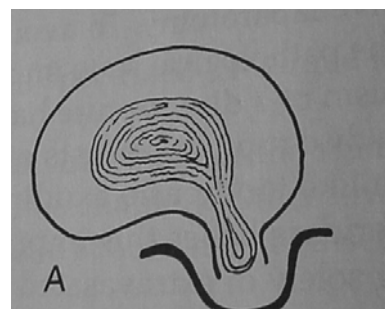
From a biomedical perspective, Farfan has shown that lumbar disc herniation may be reflective of high stresses at the posterolateral region of the disc secondary to torsion. These high loads cause fatigue failure of the annulus fibrosis that enables the inner nucleus pulposus to penetrate the laminations of the annulus gradually until a herniation occurs .

Types disc lesions

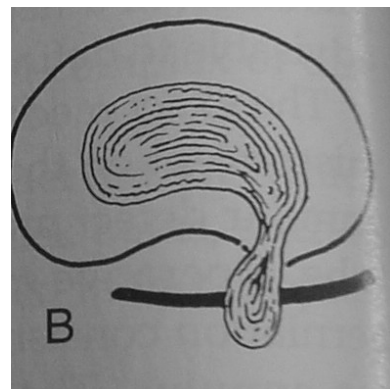
I Annular Bulge: Circuferential



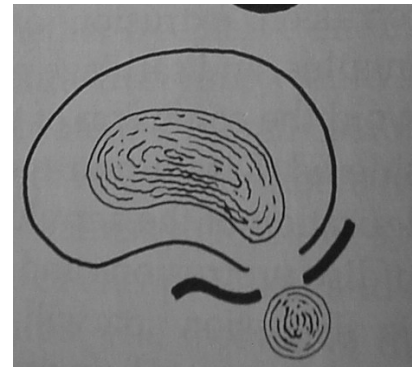
II Disc Protrusions [Annulus fibrosus is still intact [A]



III Extruded [Out of annulus but in continuity] [B]



IV Sequestered [not continuous with the disc]

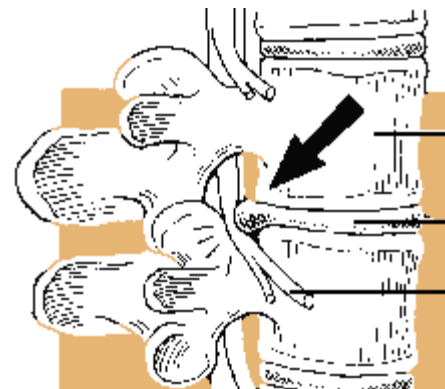


V Far out disc

Incidence of far out disc: 4%

Pressure on the nerve root outside the foramen

Exit root is involved



Location of the disc herniation

Central

Postero-central

Foraminal

Extraforaminal [Far Out Disc]

Predictors or risk factors for a lumbar disc

1. Tall men
2. Heavy women
3. Individuals with a small spinal canal
4. Work in an environment with considerable vibration

Transit nerve root and exit nerve root

Normal at L4-5 intervertebral foramen, L4 nerve root emerge called "Exit nerve root" and L5 nerve traverse in the canal "Transit nerve root".

With a disc lesion, it is transit nerve that is commonly involved. In a far out lesion, it is exit nerve root that is commonly involved.

Common disc lesions are: L4-5 [L5 nerve root involved]

L5-S1 [S1 nerve root involved]

Nerve Root Affected

In classic disc lesion, a transit nerve root is involved and the exit nerve root is involved in a far out lesion is commonly involved.

Disc Prolapse	Posterolateral disc	Far Lateral disc
L2/3	L3	L2
L3/4	L4	L3
L4/5	L5	L4
L5/S1	S1	L5

Natural history of disc lesion

1. Initially treated non-operative for sciatica: At one year

30% had back pain, decreased working ability and limitation in recreational activities.

20% had not resumed work

4 % patients had been treated by operation.

2. Surgery Vs non operative [Weber]

Years post treatment	Nonsurgical	Surgical
1 year	60%	90% [Full recovery]
2 year	No statistical difference	

Assessment of disc lesion

1. History: Onset of pain

Back or leg pain

How far down in the leg

Associated weakness or numbness

Symptoms of cauda equina

2. Physical examination

1. Routine spine examination

Root	Motor	Sensory	Reflexes
L4	Tibialis Anterior	Over the Shin	Knee reflex
L5	EHL	Dorsum of the foot	None
S1	FHL, Perone	Sole	Ankle

4. Straight leg raising test

Technique [refer spine examination]

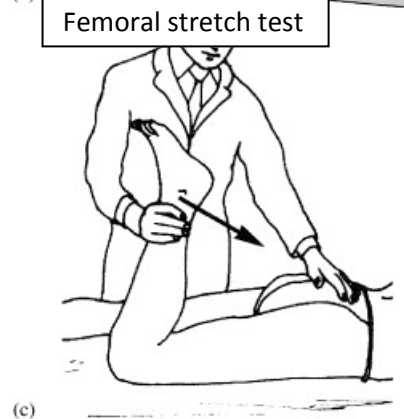
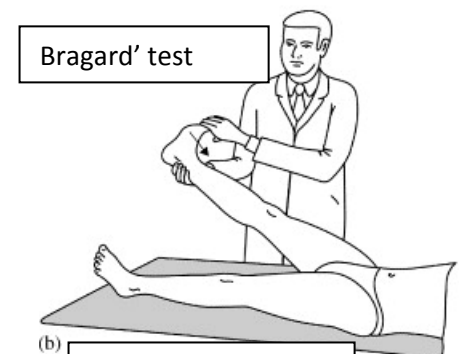
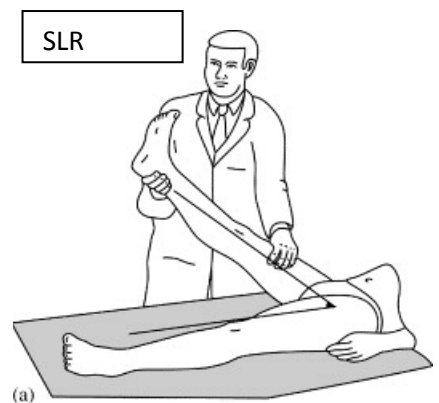
Positive between 30 to 60°

Cross SLR is very suggestive of Disc lesion

Reverse SLR indicates high disc [L4]: femoral nerve stretch

SLR manoeuvre: The nerve roots moves as much as five mm within the neuroforamen

The flip test : Patient sitting on the edge of the examination couch with the knees flexed and the legs dangling. On the pretext of examining the knees, the knee can then be extended and if the patient has genuine pathology as the knee extends thus the sciatic pain will be reproduced.



5. Gait: Sciatic list [list to opposite side of sciatica]

6. Look for cauda equine lesion

Perianal sensation [Pin prick]

Anal tone

Bulbocavernous reflex



Patients who present with profound neurologic deficits, such as complete foot drop or cauda equina syndrome, require prompt and early surgical decompression.

Referred Vs Radiating Pain

	Referred Pain	Radiating pain
Nerve irritated	Sinu vertebral nerve	Roots of sciatic nerve
Anatomy		
Type	Nondermatomal referral	Dermatomal radiation
Area of referral	Referred pain is usually pain is referred above the knee	Usually below the knee
Localization	Less localization	Good localization
	Usually dull	Sharp with needles

Wadell's Sign

1. Non organic tenderness: superficial tenderness
2. Regional distribution rather than dermatomal: glove and stocking
3. Stimulation tests: Flexing neck or axial pressure, increases in sciatic plain
4. Distraction test: Sit with leg straight [Flip test]
5. Overreaction pain

Differential Diagnosis

1. Intrapelvic pathology

1. Firstly intrapelvic pathology: Abscess
2. Intrapelvic tumours
3. Endometriosis
4. Large or great vessel aneurysms

2. Extra-pelvic

1. Piriformis syndrome,
2. Abscesses and gluteal artery aneurysm,
3. SI joint problem.

3. Intraneural causes

1. Tumours of neural origin,
2. Polyneuritis secondary to diabetes
3. Fibrosis of the sciatic nerves.

Diagnosis

Plain X ray

Rule out other possibility like pars defect

Disc narrowing [chronic]

Instability signs: 3.5 mm of translation or 11° angulation

CT

Soft tissue less sensitivity than MRI

CT myelogram [indicated in a claustrophobic patient]

MRI

Gold standard: T1 and T2 Sagittal; T2 axial and Sagittal

T1 Sagittal: Start in the middle and go to right and left

T2 axial: Look at the Pedicle level for Lumbar canal stenoses.
Look for: The shape of the canal, Comment about disc herniation,
Relation of disc lesion to the nerve root.

Gadolinium Very useful in failed back.
Enhances scar means scarring
No enhancement means recurrent disc

MRI abnormality in asymptomatic

<60 yrs = 25%

>60 yrs = 50%

Modic changes

Type I Decreased signal on T1 and increased in T2

4% of all patients undergoing MRI

Type II Increased signal on T1 and Isointense on T2



Non-operative

1. Maximum rest: 2-3 days. Beyond this period has no scientific support for being beneficial
2. Modification of activities: Back care with respect for bending and lifting weight.
3. Orthosis: Routine use is discouraged. Only Hip spica controls
4. Traction is not helpful.
5. Medication: NSAID's, Codeine, Muscle relaxant, Narcotics, Antidepressant (amitriptyline)
6. Ice and heat
7. Manipulation and Massage: Chiropractor useful in acute back without neurology.
8. Physio: William's abdominal strengthening exercises
Mckenzie's spinal extension muscle exercises.
9. Back care
Do not stoop
Do not lift weight in front of you (>15 lb); Never lift >50 lbs in first 6 months

Do not put on weight

Do not get overtired

Do not maintain any one position for a prolonged period

Firm mattress

Whenever possible sit with knees higher level than hips

Stand with one leg higher than other

Never bend with knee straight

Avoid stairs

10. Epidural steroid

Transforaminal better than interlaminar approach

3 doses of methylprednisone with marcaine at 2 wks interval

Recent report on randomised for Sciatica

95% with surgery and 50% with epidural steroid : got better

Randomised study on Disc herniation and LCS: who are considered for surgery were given epidural. In both, there was substantial decrease in need for surgery

Surgical Treatment

Indications

Absolute Cauda equina syndrome

Progressive neurology

Intractable pain

Relative Radicular symptoms, if present more than 2 Months

Type and size: Large disc unlikely symptoms disappear [this has been disproved recently].

Presence of Stenosis in addition to herniation

Recurrent pain

Technique

Kneeling position [no pressure over the abdomen]; Protect pressure areas

Confirm the level of disc herniation with an image intensifier

Open the interlaminar space [Traditional laminectomy or fenestration technique] but

prepared to extend the incision and do formal laminectomy.

Find the lateral border of the nerve root and reflect the nerve root medially to expose the disc

Start subperiosteal dissection from midline and extend it to the level of the facet joint

With a Watson Chyne dissect the ligamentum flavum from the superior border of the vertebra below and then dissect proximally and laterally from the dural sac

Now identify the nerve root and retract it medially with nerve root retractor

Beware of disc vessel and cauterize with bipolar

Identify disc herniation and if required cruciate incision

Remove the disc material with a pituitary forceps

Fat graft

Outcome

Primary surgery 90% good to excellent results

Revision disc excision 70%

Complications

Recurrence disc	4%
Instability	10%
Discitis	<1%
Dural injury	1% [up to 10% in revision]

Prognosis

1. Duration of signs: More than 6 months, results are less satisfactory.
2. Surgery for annular bulge is poorer than on a herniated disc
3. Results are good on a patient with a marked positive nerve tension sign
4. Complete Cauda equina: 60% have incomplete recovery despite surgery
5. Neurology: The probability of recovery is inversely proportional to the severity and duration of impairment.
6. Results are poor in case of compensation, litigation, psychological, smokers
7. When not worked for more than two years, patient is unlikely will return to work even after surgery

Disc Herniation in children below 16 years

Accounts for 0.4% of all patients who had discectomy.

Common site is L4 or L5 disc [95%]

Clinical symptoms are similar that of adults but may present with only leg symptoms.

Treatment is controversial

Operative Vs Non-operative. More surgical than non-operative

No arthrodesis is necessary

Cauda Equina Syndrome

Causes: Disc herniation, Post surgery, Trauma, Tumor, and Infection

Red flags Severe Back ache with bilateral or unilateral sciatica

Bladder or bowel dysfunction

Perianal anesthesia

significant lower limb weakness

Sexual dysfunction

Signs Perianal sensation

Weakness of anal sphincter

Loss of Bulbocavernous reflex

Extensive weakness of leg musculature

Treatment

Is surgical emergency should be treated within 24 hours.

Even early surgery does not guarantee

Proposed factor is preoperative intrathecal pressure ie., high intrathecal pressure causes irreversible damage. This explains why some early decompression do not recover.

Far out lesion

Common in the older population

Common with higher disc

Radicular pain is quite severe. And only relief position may be the fetal position

Neurology is almost always positive

50% occur at L4-5

MRI is diagnostic [Myelography may miss]

D/D: Diabetic Mononeuropathy; Retroperitoneal problem: Renal cell carcinoma=

Treatment

1. Interlaminar approach

Resulted in fracturing the pars and losing the inferior facet

Present: Approach is lateral to the pars

2. Wiltse's paraspinal approach

Paraspinal incision, one and a half finger lateral from midline

Split the paraspinal and elevate just lateral to the facet joint

Make sure lateral border of the pars is visible

Visualize the nerve below the transverse process and trace it medially

Recent advances in spinal surgery for chronic disc problems

Disc replacement is controversial but used in spinal centre for selected cases.

Link SB Charite III is an unconstrained 3 part anatomic disc replacement.

The endplates are titanium with apatite coating and polyethylene in between.

Question for consideration?

1. Long term results
2. Durability
3. Best suited at the moment for single level
4. Imaging for assessment of fixation

Thoracic Disc

Rare; < 1%

Lower Thoracic [T8-L12]. Very rare above T4

Small disc can cause gross neurology

Presentation Mechanical local Pain

Radicular pain along the intercostal area

Myelopathic: Paraplegia. Usually anterior cord syndrome

Bladder and bowel

X ray

Decrease disc space

May show calcified disc material [high incidence: 50%]

MRI

Treatment

Always surgical

Thoracotomy [Transthoracic] and anterior discectomy

Entire discectomy and fusion with graft from the rib

Internal fixation is rarely necessary