

LUMBAR SPINAL INSTABILITY

Instability of the spine can be a result of a purely mechanical disorder or a disorder of another origin. Unrecognized and untreated instability exposes the patient to an increased risk of neurologic injury and pain.

White and Panjabi defined clinical instability as “the loss of the ability of the spine under physiologic loads to maintain its pattern of displacement so that there is no initial or additional neurological deficit, no major deformity, and no incapacitating pain. Trauma, degeneration, and certain clinical procedures can severely alter the spine's normal pattern of displacement and lead to instability.

A checklist based on clinical and radiographic criteria for instability

Elements	Points
Anterior column destruction	2
Posterior column destruction	2
Flexion- Extension X ray or resting X rays	2
Sagittal plane translation >4.5 mm or 15°	2
Sagittal rotation >20 °	2
Cauda Equina lesion	3
Dangerous loading anticipated	1
More than 5 points is instability	

The large amount of variability found in studies that examine movement velocity for diagnostic purposes has limited the clinical usefulness of such measurements. Therefore, a dynamic analysis of the spine should be used as a supplement to static radiographs for the determination of spinal instability

Complete facetectomy (unilateral or bilateral) increased motion by 78% in extension, 63% in flexion, 15% in lateral bending, and 126% in axial rotation as compared with the intact controls, confirming that the degree of instability can be directly correlated with amount of facet removal.

Spinal stabilization and fusion procedures have been used to treat fractures, tumours, spondylolisthesis and disc degeneration. Eliminating motion between the affected segments increases the likelihood of fusion and may reduce the degree of pain.

Indication for surgery

Severe disabling intractable back pain

Degenerated disc spaces with resultant pain

Absence of degeneration at adjacent, neighboring disc spaces

The disabling back pain had been present for at least one year and refractory to extensive Non-operative care.

If single level an anterior approach is preferred and if more than 2 level, than a Posterior stabilization is indicated.

Instrumentation systems: anterior, posterior, or interbody.

I Anterior devices

Fixed to the anterior or anterolateral aspect of the vertebral body.

Typically, the plate or rod construct

II Posterior systems

Use laminar hooks, pedicle screw systems, facet screws and wiring techniques.

III Interbody fusion systems

Anterior lumbar interbody fusion (ALIF): Crock

Posterior lumbar interbody fusion (PLIF)

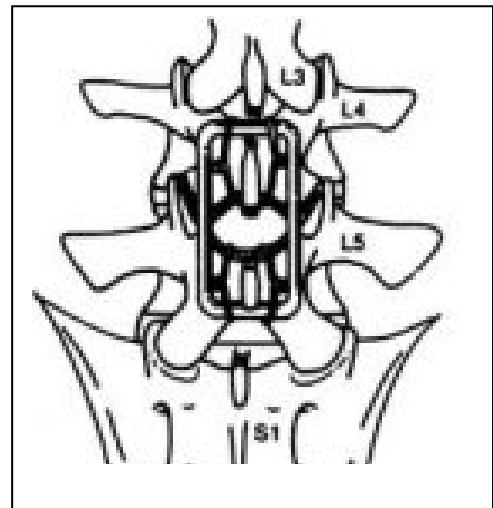
procedures: Cloward

Posterior Devices

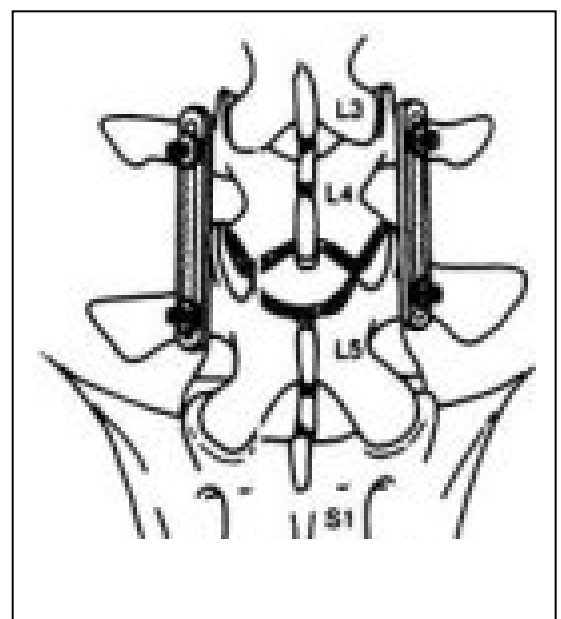
Hartshill/Luque rectangle and posterior fusion.

The midline fusion technique: is biomechanically disadvantageous.

The graft material is situated far from the center of rotation. The clinical outcome is delayed union or nonunion.



The posterolateral application of Steffee plates involves pedicle screw fixation



Anterior Devices

The advantage of the anterior approach to the spine is that it gives direct access to the area of disease, which is frequently the disc or vertebral body.

The anterior approach allows the surgeon to decompress the neural structures, resect the disease, reduce deformity, and stabilize the injured segment.

Fusion anteriorly has the mechanical advantage of being in closer proximity to the vertebral center of rotation, thus reducing the stresses on the graft and hardware, as well as being placed in compression.

Most anterior fixation systems use screws placed into the vertebral body with rods or plates, or both.

Interbody fusion

Both allograft and autograft bone grafts have been used as interbody spacers. The use of disc space inserts fabricated from synthetic materials has gained popularity. These inserts may be implanted through an anterior or posterior approach.

Interbody cages composed of titanium or carbon fiber mesh promote fusion by imparting immediate postoperative stability, promoting fusion through the incorporation of bone chips packed inside the cage.

Intervertebral Disc Prosthesis

1. Retains movement in the segment
2. Disc space is increased
3. Less stress on the adjacent disc
4. No problem with pseudarthrosis
5. Lordosis can be maintained

Recently approved by FDA

Summary

1. Intensive Non-operative treatment in all cases
2. Surgery is indicate in only a selected group.
 - Do not offer surgery Low compliance; Smoker; Failed MMPI
 - Positive Waddel sign
3. MRI and discogram should be used to assess adjacent disc is useful
4. No prospective study: which grafting is better and which fixation is good
5. Instrumentation: improves fusion but clinical outcome is not different
6. Not known: importance of pseudarthrosis
7. CT scan good for assessment of pseudarthrosis
8. Pedicle screw fixation is popular
 - (Breakage of screw 0.2%, Nerve root damage 0.5%, dural tear 1%)
 - 18% had repeat bone graft or removal of implant)

Provocative discogram is controversial

It is less used since MRI

Useful to determine disc above the fusion level.

In planning fusion, North Am Spine society: suggested use of discography in selected population.

1. Nonradicular chronic back +Abnormal on MRI + to select levels included in the arthrodesis.
2. Localization of discogenic sources of persistent pain after a failed back surgery

DEGENERATIVE SPONDYLOLISTHESIS

L4-5 is ten times more common than L5-1

Women : Men = 5:1

Usually slip is less than 30°

Facetal joint is more sagittal oriented facet

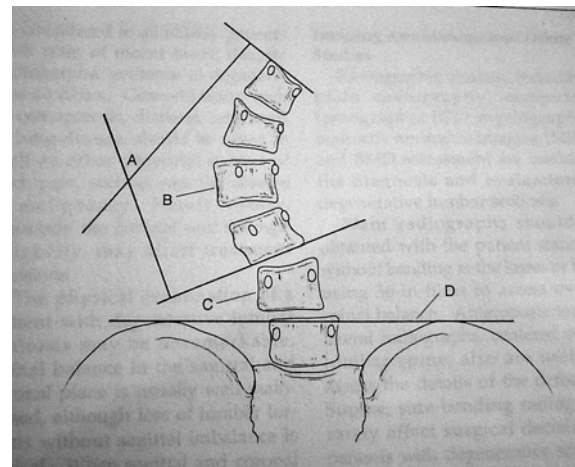
When surgery is indicated, instrumented fusion is indicated in addition to decompression

Degenerative scoliosis

Progression Risk

1. Cobb angle > 30°
2. Lateral listhesis > 6mm
3. Intercrest line below 4-5

70% increases by 3° /year



Treatment

Treatment principle is similar to degenerative spine

Decompression along is adequate when scoliosis is less than 30°

Decompression and instrumentation when scoliosis is more than 30° :Anterior and posterior fusion when scoliosis more than 50°