Posterior Instrumentation for Thorocolumbar Spine

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Bones and Spine

Harrington Instrumentation

- History
- "Gold Standard" from 1960-80's.
- Good for adolescent idiopathic scoliosis with thoracic curve.
  - 40-50% curve correction.
  - 1-2% pseudarthrosis

Harrington Instrumentation

- Flat Back syndrome.
- Loss of fixation 5-20%
- Inability to perform short-segment fixation after Laminectomy.
- Poor results with adult and neuromuscular scoliosis.

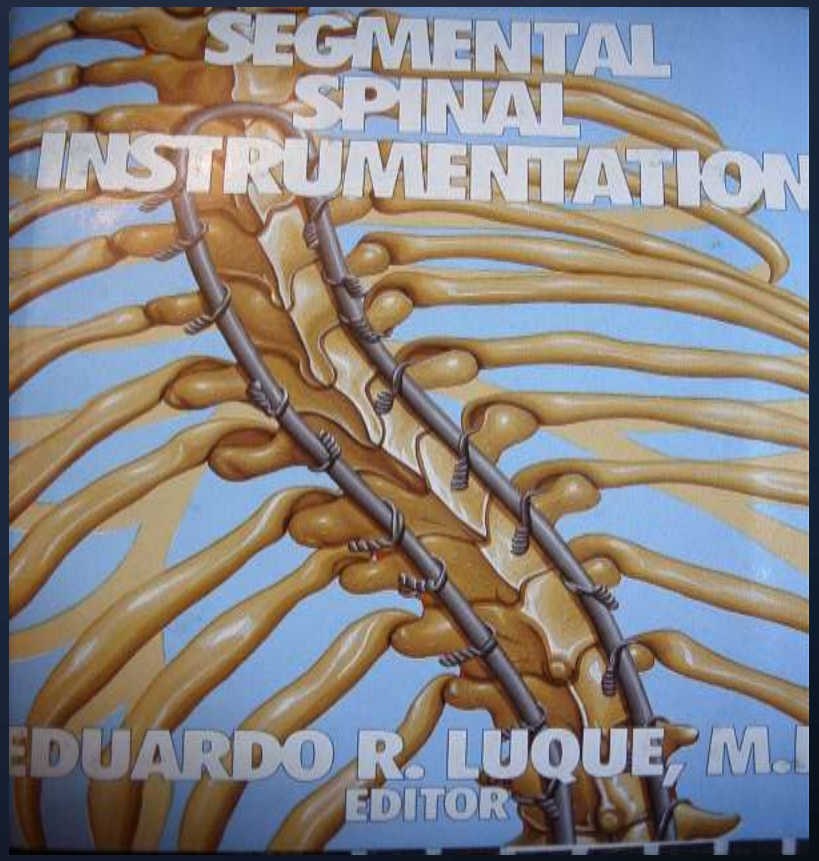
  -neuro. Deterioration

  -dislodgement

  -Pseudarthroses

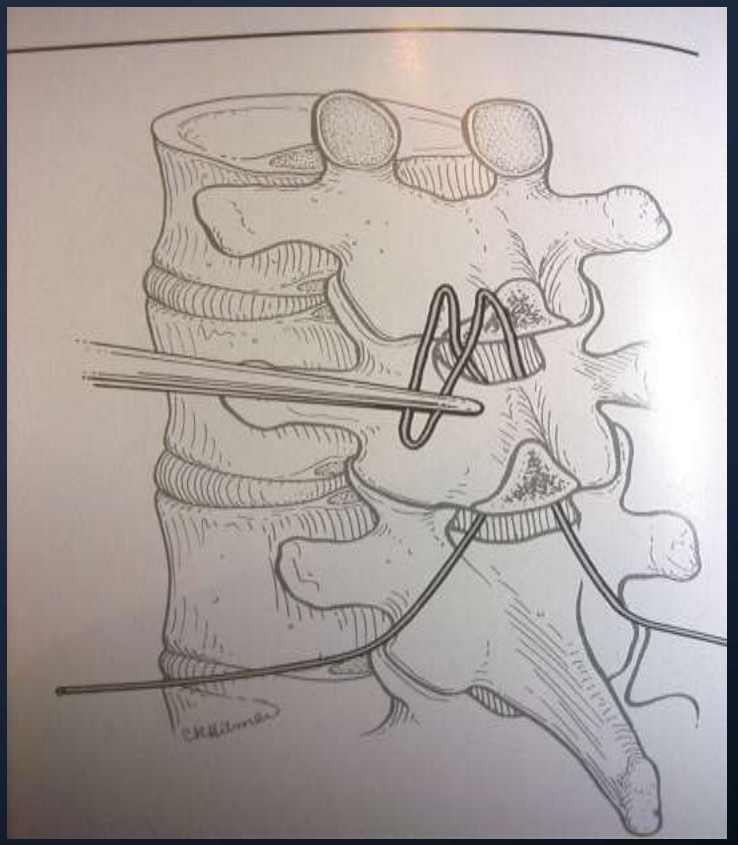
Luque Instrumentation with Subliminar Wiring

- Eduardo Luque, (Mexico City)
- Segmental Spinal Instrumentation

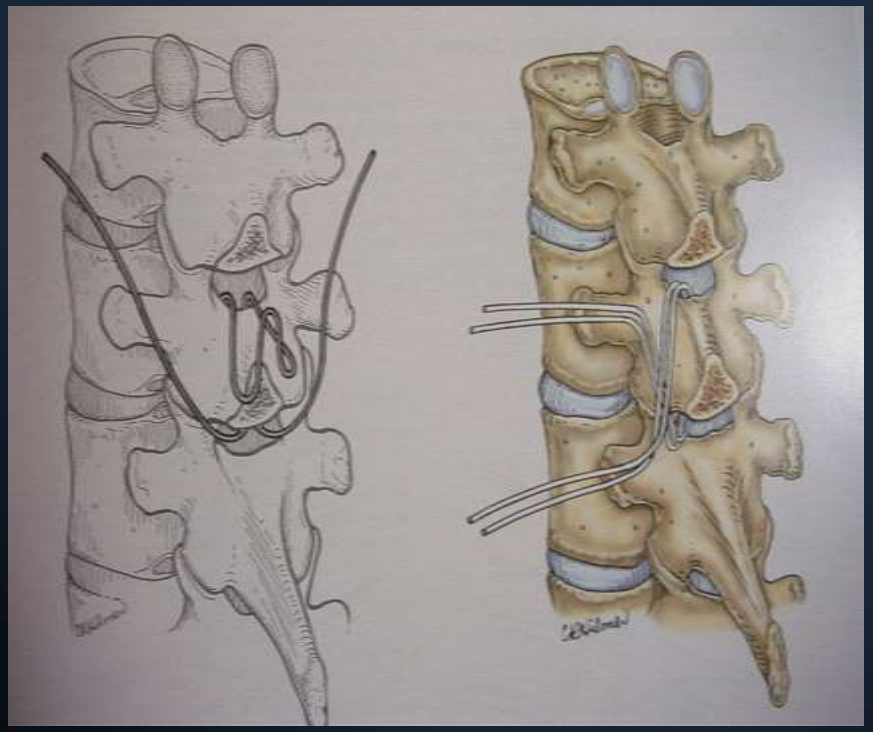


Sublaminar Wire Passage Technique

- Remove base of spinous process
- Laminotomy
- #16 wire bent over cobb
- Caudal to cranial
- Even tension



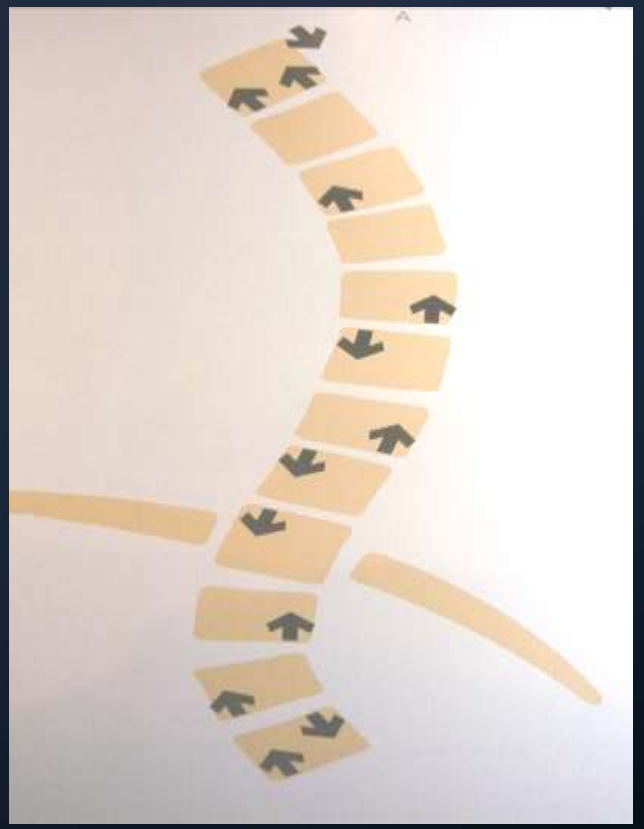
Luque Instrumentation



- Indication
  - Neuromuscular scoliosis
- Disadvantages
  - Neurologic deficit (0 – 17+ %)
  - Poor against axial loading

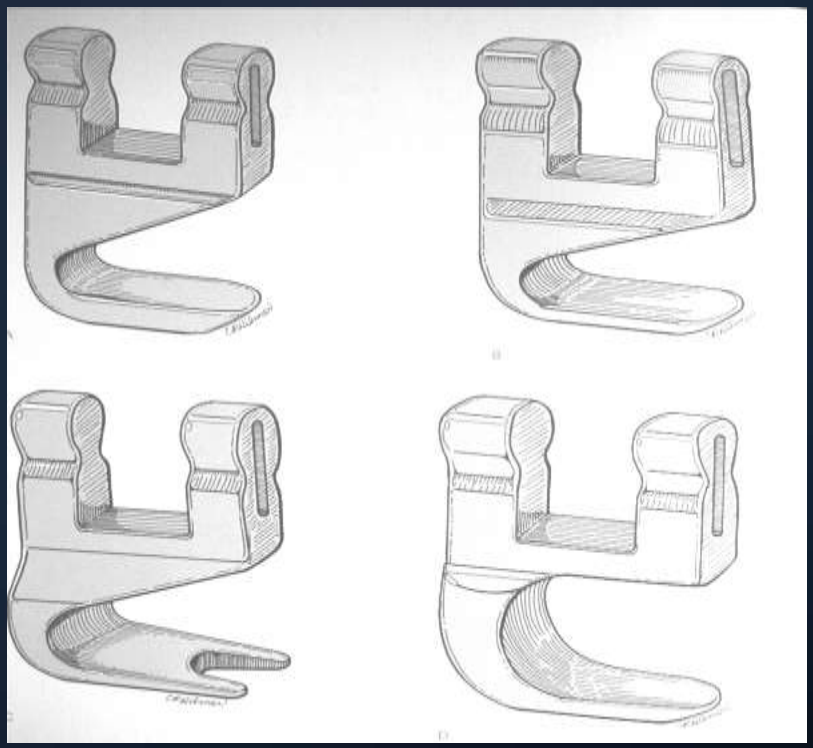
Cotrel-Dubousset Instrumentation

- Allow apical compression and distraction on one rod.
- Use of rod rotation to allow kyphosis and lordosis.
- 4-5 X more axial and rotation stability compare to Harrington.

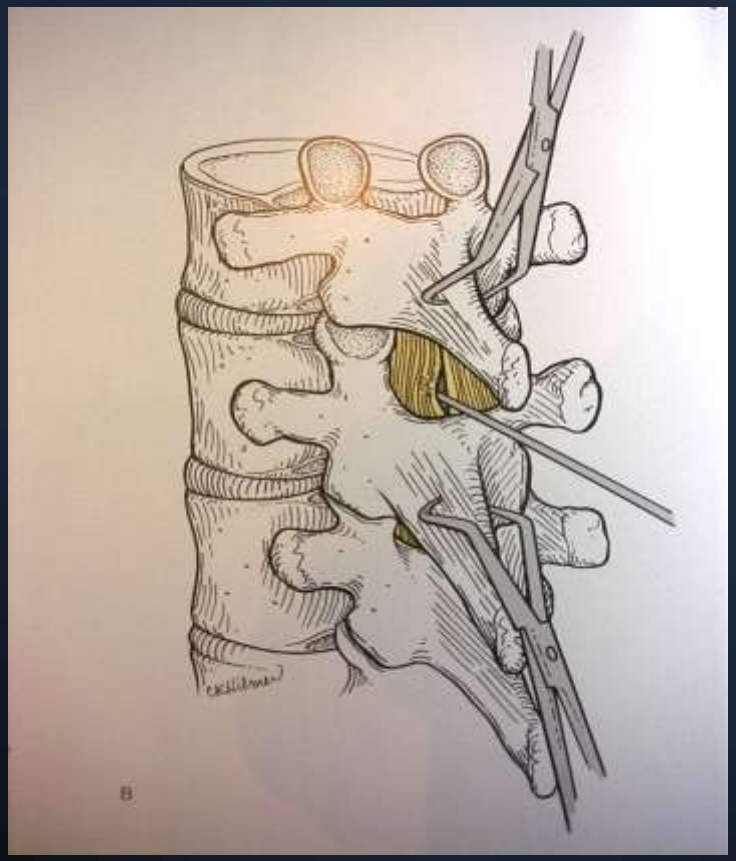


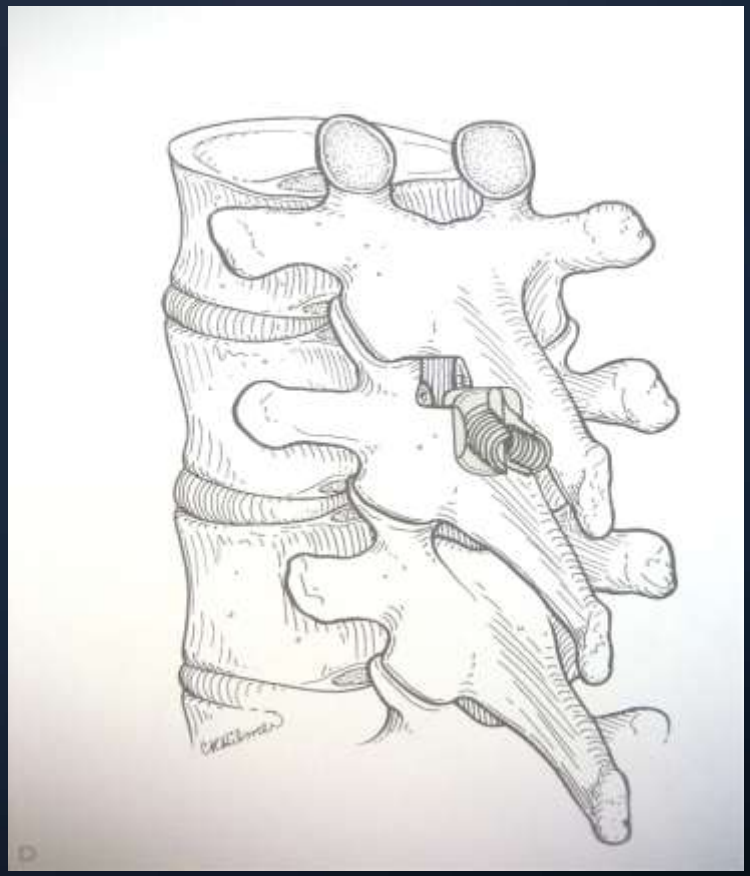
CD Instrumentation

- Pedicle Hook
- Laminar Hook



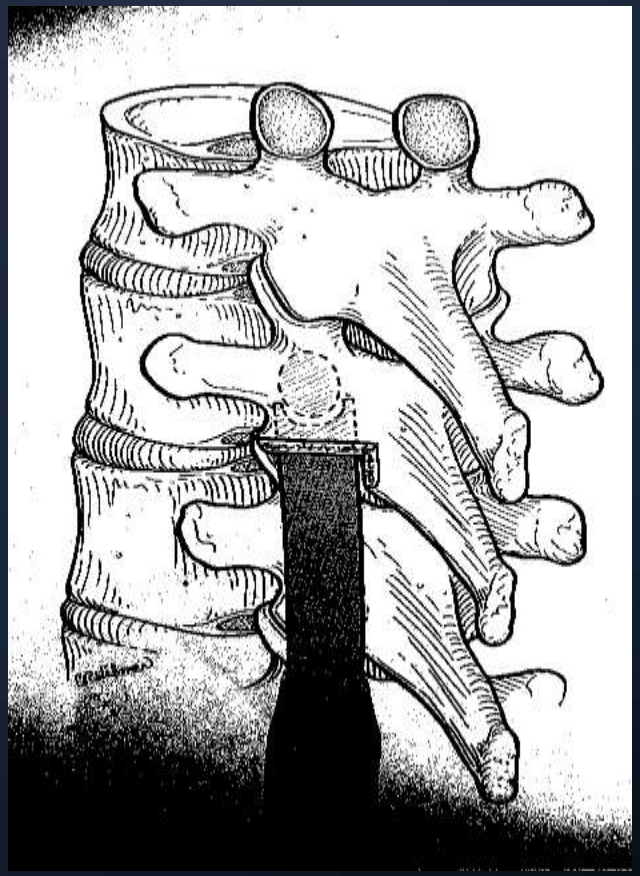
Insertion Techniques
Supralaminar hook



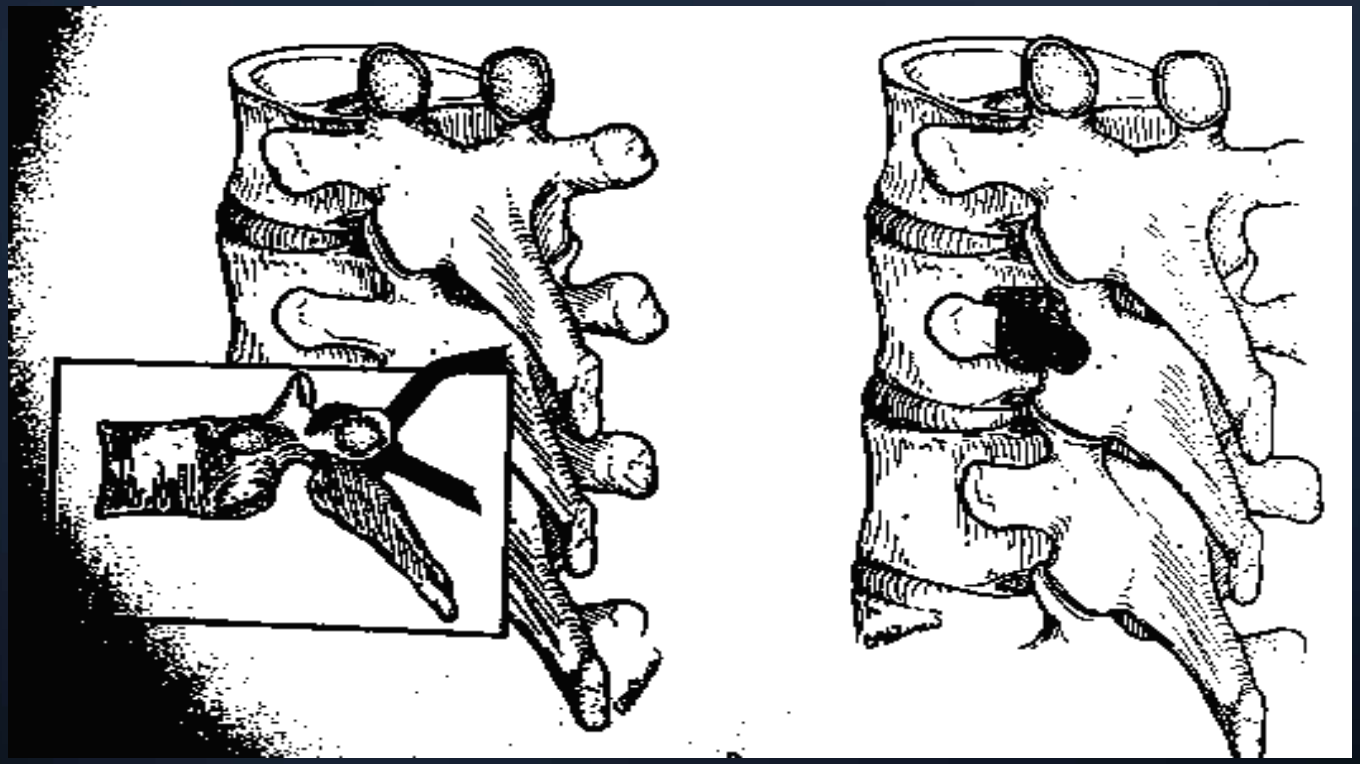


Insertion Technique Pedicle Hook

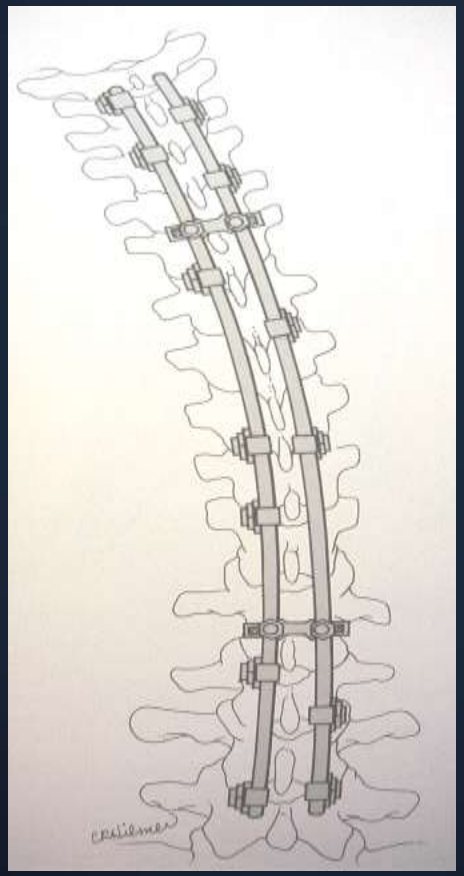
- Reliably T1 – T9
- Inferior portion of the inferior facet is removed with osteotome.

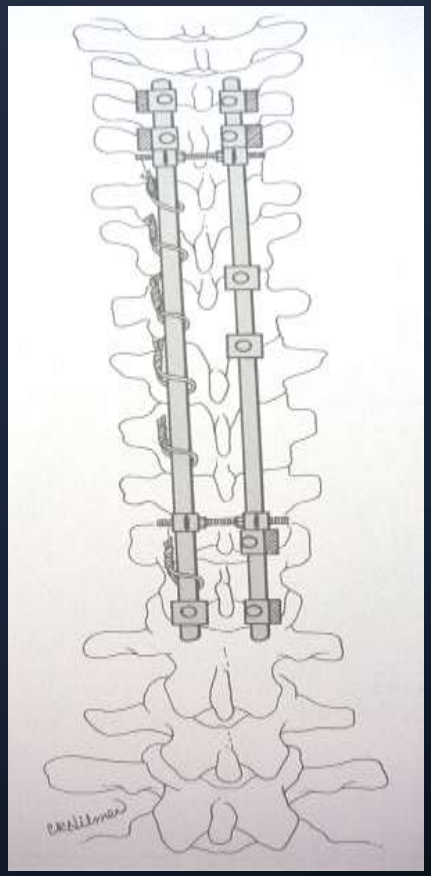


Insertion Technique Transverse Process Hook



TSRH and ISOLA



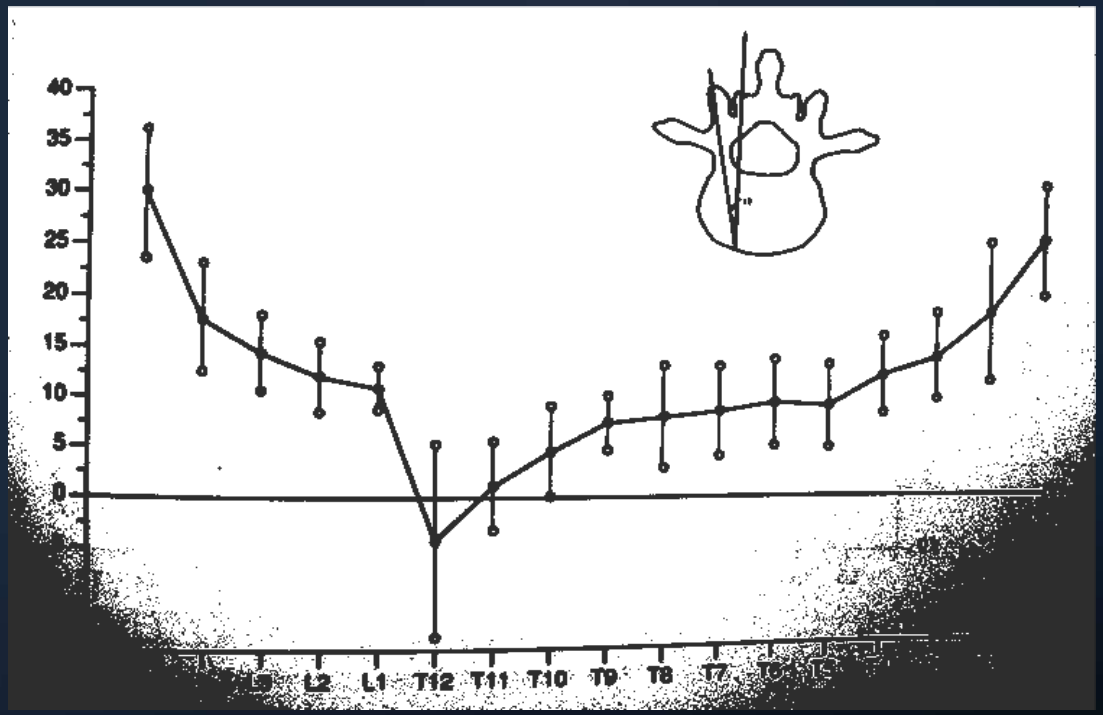


Transpedicular Screw Instrumentation
Current Indication

- Reduction & stablization of degenerative or Isthmic spondylolisthesis
- Selected unstable low lumbar fractures.
- Extensive decompression or resection of tumor.
- Revision of symptomatic lumbar pseudarthrosis.
- Instability after extensive decompression.

Morphometry
Transverse pedicle angles

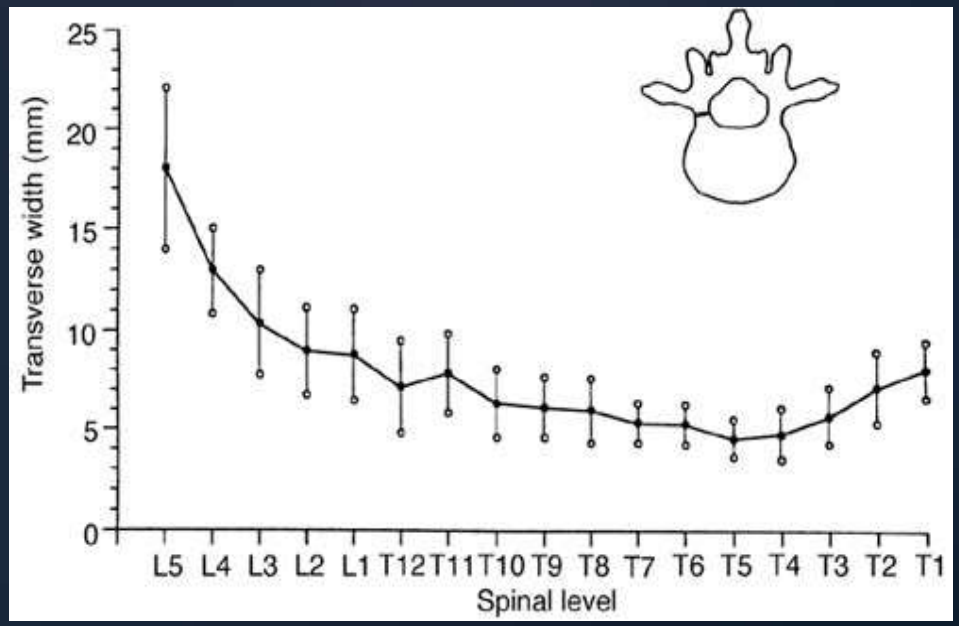
- Angle reversal at T12
- Highest at Lower lumbar



•Zindric, Wiltse: Spine, Vol 12, 2, 1987

Morphometry
Transverse Pedicle Isthmus width

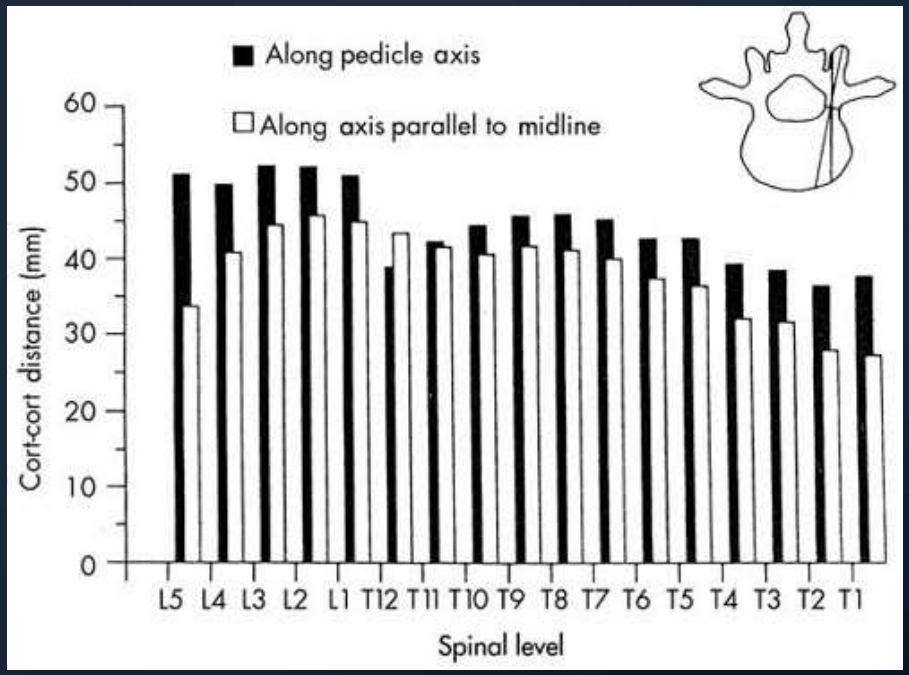
- Below T10, avg > 7mm.
- L4, L5 all >8mm.
- T4-T9 = very narrow



•Zindric, Wiltse: Spine, Vol. 12, 2, 1987

Morphometry pedicle length and cord length

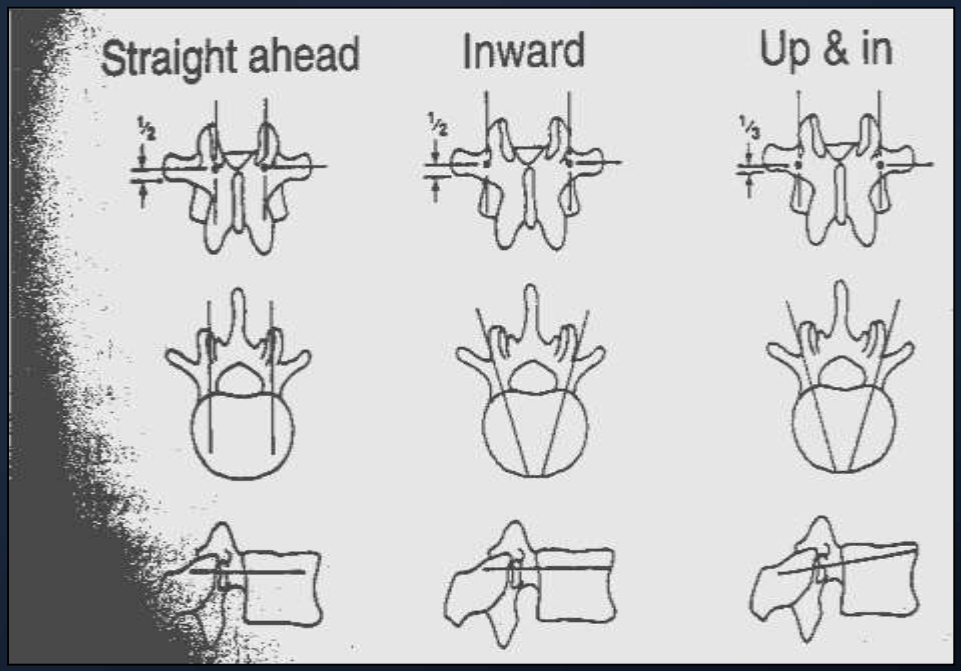
- L1 – L5 average cord length is 50mm at 15 degree angulation.



•Zindric, Wiltse: Spine, Vol. 12, 2, 1987

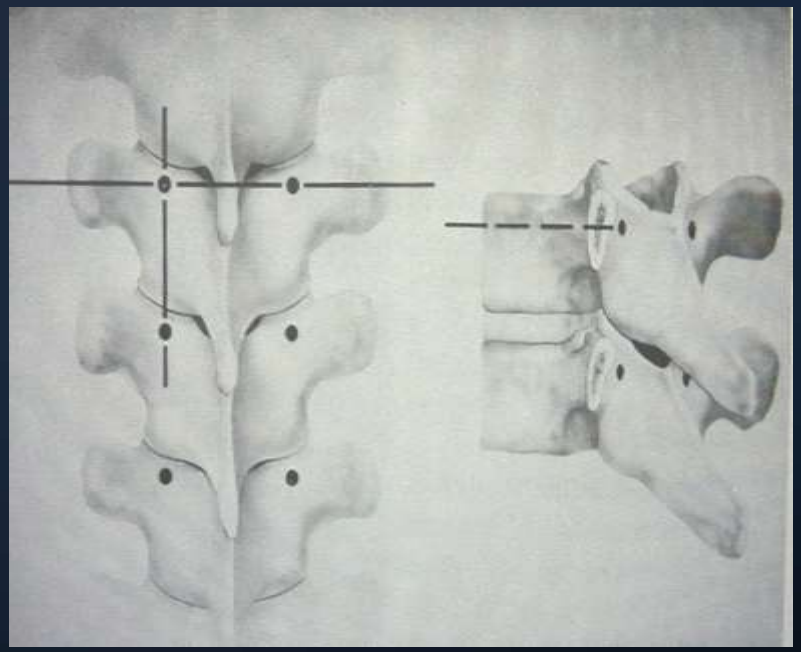
Pedicle screw entry point Lumbar spine

- Straight ahead – Roy Camille
- Inward – Magerl
- Up & In – Levine and Edwards



Pedicle Screw Entry Point Thoracic Spine

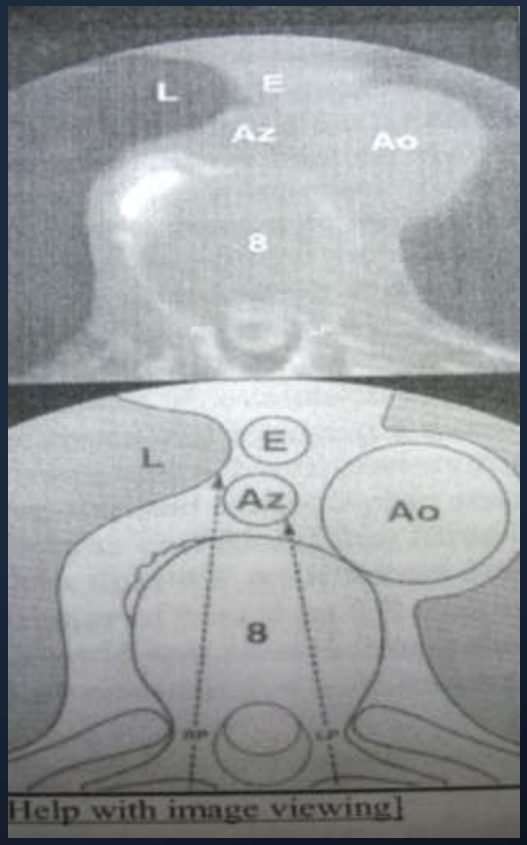
- Roy-Camille
  - Junction between mid inf. Facet and mid-TP
- Vaccaro
  - T4-T9 : superior boarder of TP
  - Caudal to T9: transition to Mid TP



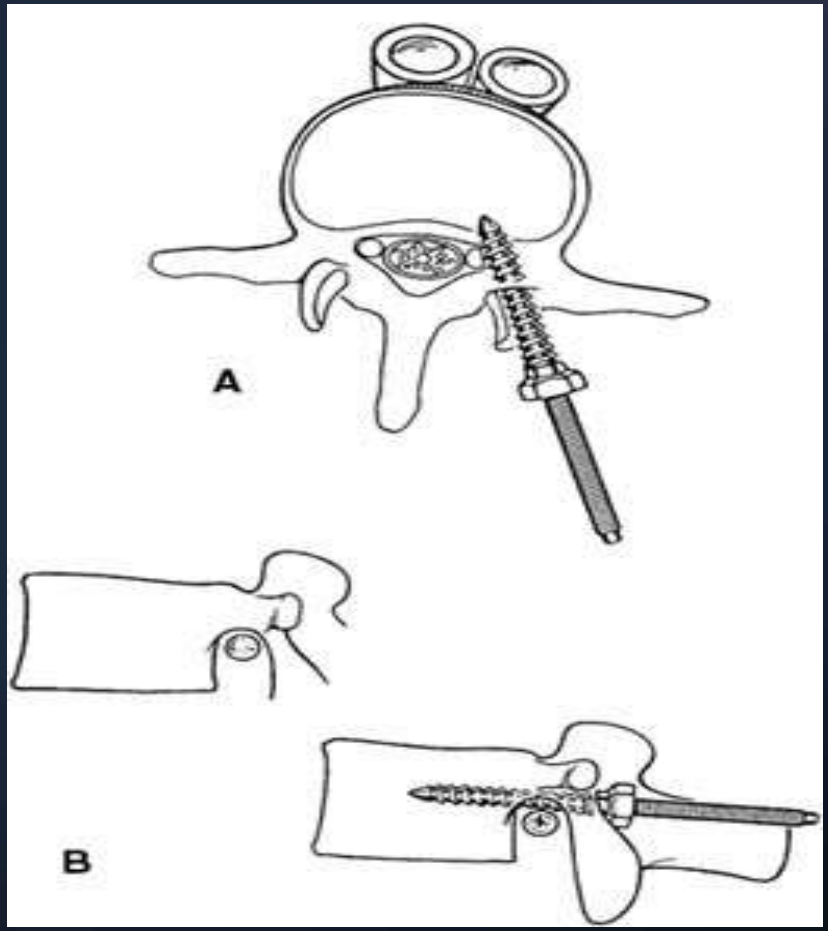
•Roy-Camille, Ortho Clinics of North Am.: Vol. 17-1, Jan86

Complication

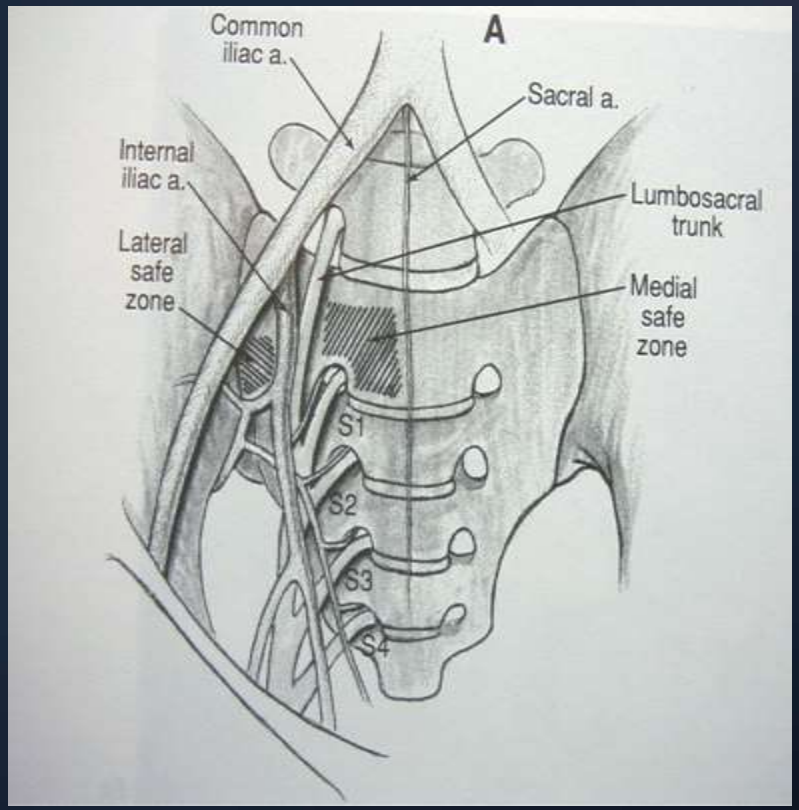
- Anterior penetration



Complication

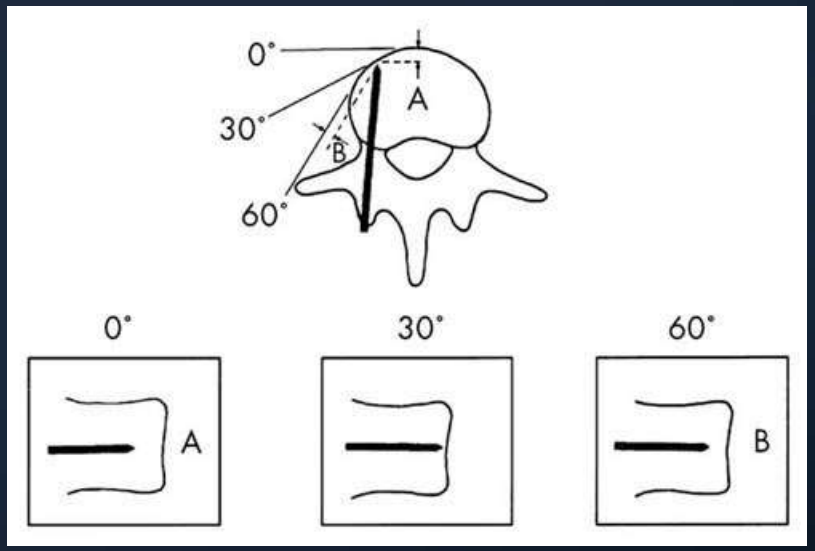


Complication



Near Approach X-ray View

- WhiteCloud
  - Roentgenographic measurement of pedicle screw penetration



•Whitecloud TS, Clin Ortho: 1989;245:57-68

PLIF and TLIF Advantages

- Fusion is induced at the center of segmental motion.
- Vertebral bodies surrounds the graft, provide the graft with consistent nourishing vascular source.
- Uniform distribution of compressive interbody forces prevent graft host collapse.

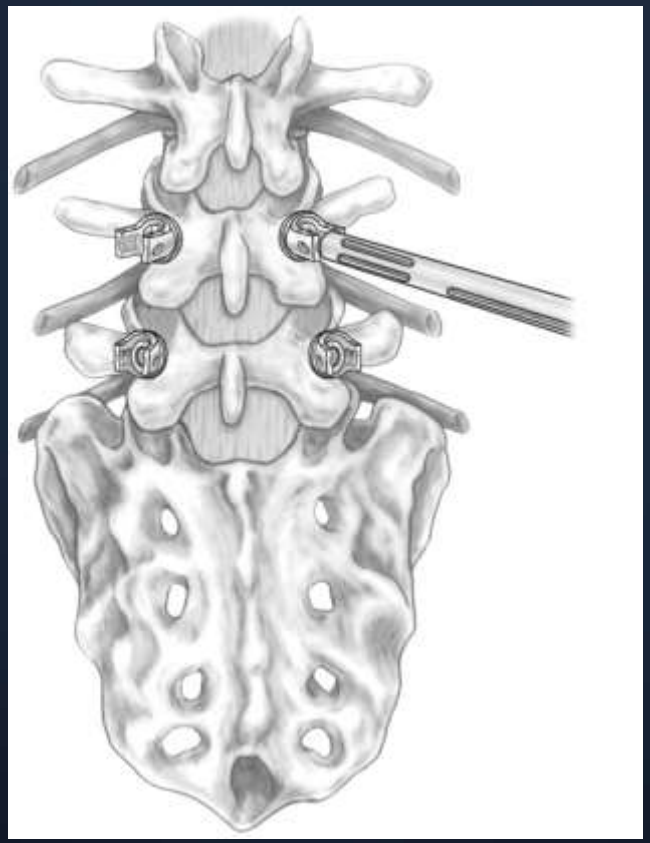
PLIF/TLIF Indications

- ***Not Clear***

- **Ralph Cloward**: The treatment of low back pain with or without sciatica due to lumbar disc disease.

- **Charles Ray**: Intractable, disabling back pain present for at least 6 months in spite of intensive conservative care that arises from degenerated disk spaces.

TLIF



- Midline incision is made in the lumbar spine with subperiosteal dissection carried out to the tips of the transverse processes in the region of the fusion.
- The pedicles are located and opened by means of a pedicle probe.
- The pedicles are tapped and the depth of the screws is determined.
- CD HORIZON® M8 Multi Axial screws are placed with alignment of the screw heads for ease of insertion of the rod.

TLIF

- The rod is cut with care to allow enough length for distraction.
- The lock nut is inserted to loosely fix the rod.

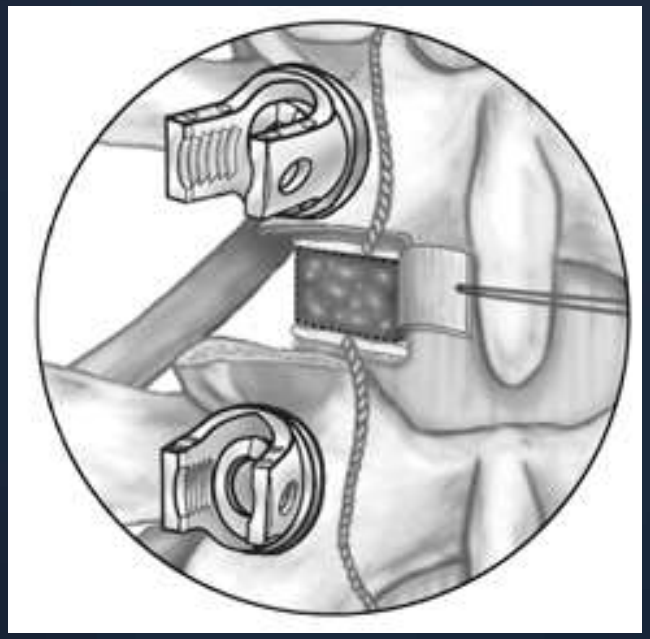
TLIF

- Segmental distraction is applied initially between the screws on the side opposite the surgeon.
- Temporary fixation is achieved by tightening the lock nuts.
- The amount of bony resection for this unilateral TLIF technique is shown.

TLIF

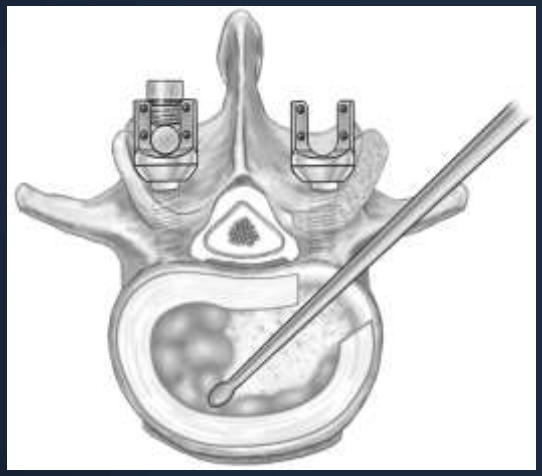
- Unilateral resection and removal of the articular processes of the facet joint is performed.
- First the inferior portion of the superior facet joint is removed.
- Then the superior portion of the facet joint of the caudal vertebrae is removed.
- Now the capsular portion of the ligamentum flavum is removed.

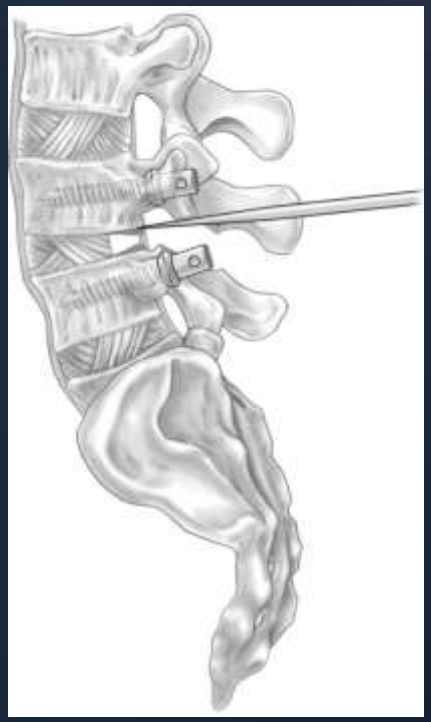
TLIF

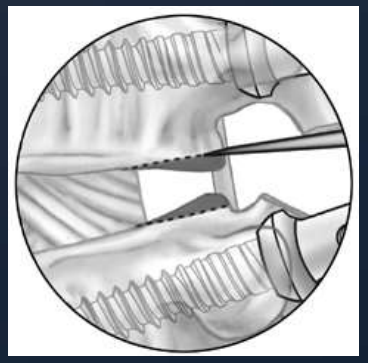


- The dural sac is carefully protected and mobilized medially to expose the anulus fibrosus.
- An anular flap is developed and retracted medially to protect the dural sac.

TLIF

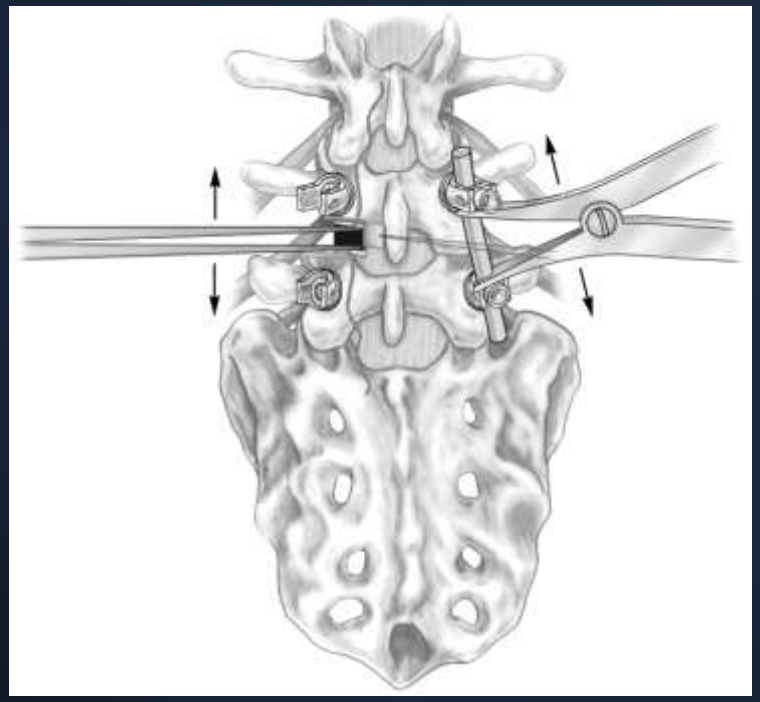






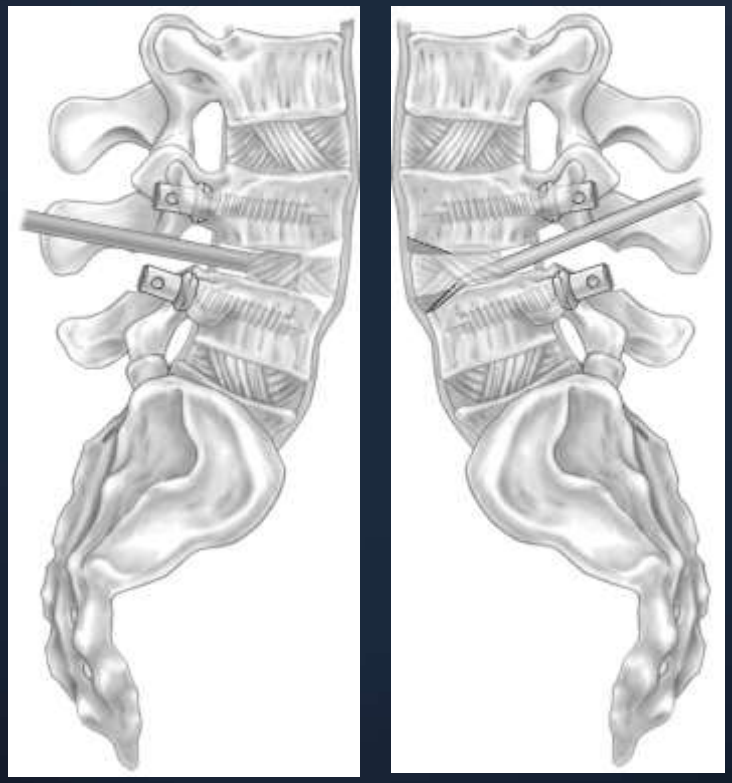
- Intervertebral disc material is removed utilizing pituitary rongeurs and ring curettes.
- Toothy curettes are utilized to remove the cartilaginous end plates while preserving the bony end plates.
- Marginal resection of the vertebral bodies is done to establish a parallel plane for placement of the biological spacer.

TLIF



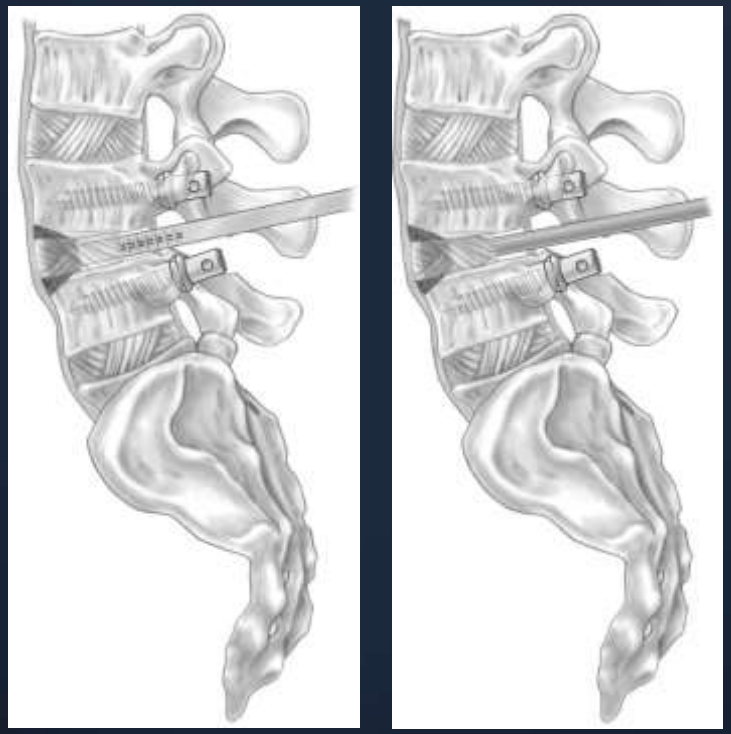
- Distraction is again performed utilizing laminar spreaders between the end plates of the vertebral bodies along with distraction on the lateral rod.
- This allows maximum distraction of the disc space prior to insertion of the biological spacer.

TLIF



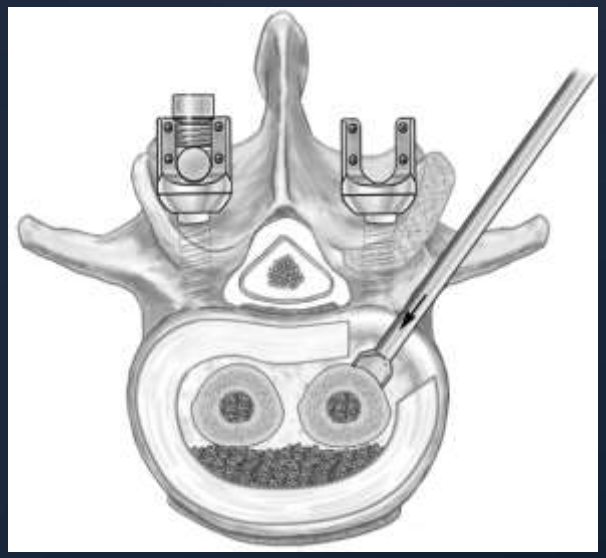
- Assess disc height with the appropriate sized trial.
- The anterior 1/3 of the end plates is now removed with the angled osteotome. Take care to remove only the anterior 1/3 so there is bony end plate available to support the cages.
- The removal of the bony end plates allows rapid incorporation of cancellous bone.

TLIF



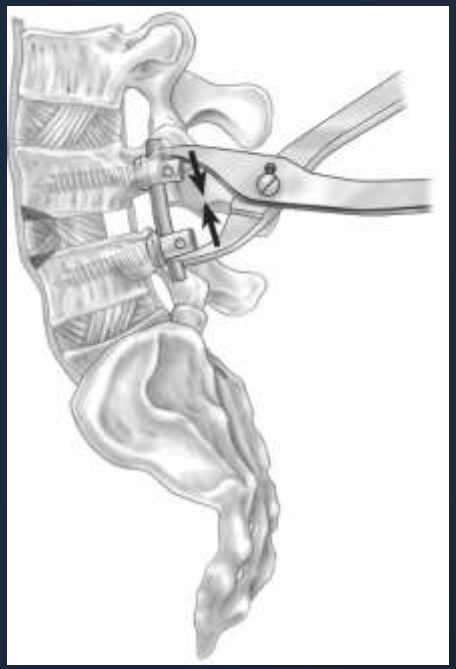
- Cancellous autograft is now packed into the anterior 1/3 of the end plates utilizing the straight and angled tamps.
- Reinsert appropriate trial to reconfirm final placement of constructs. This ensures that the adequate amount of bone graft has been inserted.

TLIF



- Biomechanical spacers of the appropriate height are now inserted.
- The first spacer is placed and brought to the opposite side with angle impactors utilizing a “rolling” motion. The spacers are optimally placed on each side of the midline.

TLIF



- Once the spacers are placed properly, then compression is segmentally performed restoring lumbar stability.
- Posterior lateral fusion is performed on each side.

Placement of Pedicle Screws in the Thoracic Spine

- Vaccaro,Garfin,An, Balderston.
- Five Cadavers, ninety screws between T4-T12 without imaging studies.
- 37 (41%) penetrated cortex.
- 21screws entered the canal, 16 penetrated the lateral cortex.
- Conclusion: Be cautious and know your anatomy.

•JBJS Vol. 77-A(8); Aug 95,1200-1206

Thank you