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 & stabilization 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

Morphometry

Transverse Pedicle Isthmus width

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

Morphometry
pedicle length and cord length

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

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

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.
• 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.
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.
• 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.
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.
• 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.
• 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.
• 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.
- 21 screws entered the canal, 16 penetrated the lateral cortex.

Conclusion: Be cautious and know your anatomy.

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Thank you