Surgical Approaches to the Thoracic Spine

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Objectives

Indications for Surgical Management

Posterior, Lateral, Anterior Approach?

- Posterior
- Posterior-Lateral (Costotransversectomy)
- Antero-Lateral (Retropleural Thoracotomy)
- Anterior (Transthoracic Thoracotomy)
Indications for Surgical Management in the Thoracic Spine
Biomechanics

- Thoracic Spine Rigid T1-10
- Fulcrum @ T-L Jxn
- Transfer of Thoracic load to T-L Jxn
- ~75% Spine #’s occur @ T-L Jxn
Risk of Neurologic Injury

- Prevention or minimizing neurologic injury
- 48% of T-L fractures are associated with neurologic injury
- Injuries at or above T12 (above conus) are associated with complete injuries
- Injuries below L1 (cauda equina) are associated with incomplete injuries

Distribution of Neurologic Injury in T Spine #

- 20% Complete
- 25% Incomplete
- 55% Intact
**Goals of Surgical Management**

- Many Classification Schemes proposed to guide management
- General Principle = Prevent further neurologic injury
- Goals:
  - Decompression of neural elements in setting of neuro deficit
  - Prevent late injury from an unstable spine
  - Prevent deformity that may lead to chronic pain
  - Promote early mobilization
Approaches to the Thoracic Spine
1. Anterior: Trans Thoracic/Retropleural
2. Posterior
3. Postero-Lateral: Costotransversectomy
Posterior Thoracic Approach
Indications

Posterior and limited postero-lateral access to the thoracic spine:

- Laminectomy for decompression
- Intradural tumor removal
- Cordotomy
- Arthrodesis
- Instrumentation for stability
- Deformity Correction
Pre-Op Planning

Imaging:

- AP CXR to determine # of ribs
- MRI +/- CT myelogram
- Flexion/Extension if Stability an issue

Anesthetic Issues:

- Pulmonary Fxn must be good enough to tolerate prone position
- IV ABx/Foley
- ?Steroids in decompression
Intraoperative

Positioning:

- Prone w/Mayfield if in Upper T-spine w/arms tucked in
- Prone w/ arms on padded boards if in Mid/Lower T-spine
- Prep and expose hip for possible autograft harvesting

Incision/Exposure:

- Use AP films to confirm location*
- Midline Incision (3-4 levels prox/dist to resection)
- Unilateral subperiosteal dissection over lamina and transverse processes
- Control paraspinal venous plexus bleeding
- Verify level w/intraoperative plain films
- Weitlaner or Adson Retractors placed
- Dissection of soft tissue overlying spine w/ rongeurs/curettes
Complications

Perioperative:

- Nerve root injury
- Spinal cord injury
- Wound hematomas
- CSF leak/Dural tear

Post Operative:

- Wound infection
- Motion segment instability
- Post laminectomy kyphosis
Extra-Cavitary Costotransversectomy
Postero-lateral approach to the thoracic spine, transverse process, pedicle, and posterolateral vertebral body for:

- Thoracic discetomy
- Osteomyelitis/Abscess
- Vertebral body/ Paraspinal biopsy
- Palliative decompression
Considerations

Advantages:

- less extensive than anterior approaches
- adequate exposure for lateral pathology when access beyond midline is not needed

Limitations:

- No anterior access
- Limited access to vertebral body
- difficult to assess across midline
- lot's of muscle dissection
Pre-Op Planning

Imaging:
- AP CXR to determine # of ribs
- Spine CT +/- MRI
- Choose rib to be resected: the rib below leads to interspace above (T8 rib = T7/8 interspace)

Anesthetic Issues:
- Pulmonary Fxn must be good enough to tolerate prone position
- IV ABx/Foley
Positioning:
- Standard prone
- Semi-prone w/ one side chest elevated 15'
- Lateral decubitus

Incision/Exposure:
- Use AP films to confirm location*
- Curvilinear incision start and end in midline w/ apex centered on rib to be resected about 5-7cm from midline
- Dissect thru trapezius, latissimus dorsi, rhomboids down to ribs
- Medial to lateral dissection of erector spinae
- Isolate rib as far medial as possible
- Cut rib at lateral most point exposed, then strip to medial insertion
- Transverse process removed w/rongeur and rib head disarticulated
- Pleura and soft tissue mobilized off vertebral body
Complications

Perioperative:

- Nerve root injury
- Spinal cord injury
- Pleura or lung injury
- Pneumothorax

Post Operative:

- Wound infection
- DVT
- Construct failures
- Pseudoarthrosis
Extra-Cavitary
Retropleural Thoracotomy
Indications

Anterolateral access to the mid-lower thoracic spine and thoracolumbar jxn over 1-3 segments:

- Decompression of thoracic herniated disc
- Burst fracture
- Osteomyelitis
- Vertebral body tumor
- Focal deformity
Pre-Op Planning

Imaging:

- AP CXR to determine # of ribs
- Spine CT +/- MRI
- Choose rib to be resected: the rib below leads to interspace above (T8 rib = T7/8 interspace)

Anesthetic Issues:

- Pulmonary Fxn must be good enough to tolerate prone position
- IV ABx/Foley
Positioning:

- Patient lateral on table/bean bag
- Upper arm on pillow or armrest
- Axillary roll
- Pillow placed between knees, ankles padded, lower leg flexed for stabilization

Incision/Exposure:

- Use AP films to confirm location
- Incision made ~14cm paralleling rib; medial to ~4cm lateral of midline
- Dissect through trapezius, latissimus, rhomboids, id rib, id neurovasc bundle
- Dissect subperiosteal free from endothoracic fascia
- Divide endothoracic fascia, id parietal pleura and dissect away from fascia
- Continue medially to rib heads and spine, ensure a wide dissection to minimize tearing of pleura
- Retract parietal pleura and lung anteriorly
- Identify segmental vessels. Clip and divide if necessary.
FIG. 47. Separation of the parietal pleura begins in the posterior mediastinum.
FIG. 48. The pleura is gradually pushed away.
Postoperative

- TLSO brace post corpectomy or instrumentation
- Abx’s until drains out
- CXR to r/o Pneumo immediate post op and POD#1
- Post Op spine films to chk instrumentation and graft
- D/C when drains out and pain well controlled
Complications

Perioperative:

- Nerve root injury
- Spinal cord injury
- Pneumothorax
- Vascular Injury

Post Operative:

- Wound infection
- Construct failures
- Pseudoarthrosis
- Intercostal neuralgia
Anterior Approach
Transthoracic Thoracotomy
Indications

Anterior approach to thoracic spine:

- Thoracic Discectomy
- Burst fracture
- Osteomyelitis
- Vertebrae body tumor
- Palliative decompression for metastases
Considertions

Advantages:

- good exposure for removal of midline calcified disc herniations
- good access for placement of intervertebral body grafts
- good exposure for multi-level procedures

Limitations:

- Extensive operation w/+ post-op pain
- Pathology may obscure neural tissue
- Post op chest tube required
- Low thoracic exposure may involve diaphragm
Pre-Op Planning

Imaging:

- AP CXR to determine # of ribs
- Spine CT +/- MRI
- Choose rib to be resected: the rib below leads to interspace above (T8 rib = T7/8 interspace)

Anesthetic Issues:

- Pulmonary Fxn must be good enough to tolerate prone position
- Double lumen ETT
- IV ABx/Foley
Intraoperative

Positioning:
- Patient in true lateral position
- Patient in 3/4 prone
- T1-T4 R-sided approach to avoid Aortic arch and heart
- T5-12 L-sided approach to avoid Vena Cava and liver retraction

Incision:
- Use AP films to confirm location*
- T1-4: incision at 4th rib medial and inferior around angle of scapula
- T5-12: posterior midline to anterior axillary line
- Incision centered over rib 2 levels above vertebral level needed for pathology below spinal level T10
- Incision thru skin/submucosa
Exposure:

- Latisimus dorsi muscle transected
- Posteriorly, trapezoids and rhomboids divided
- Anteriorly, serratus muscle divided, locate long thoracic nerve
- Identify rib and dissect sub periosteal, locate neurovascular bundle and protect
- Parietal pleura identified and opened longitudinally --> avoid lung!
- Flanking ribs padded w/mosit packs; apply thoracotomy retractor
- Deflate lung manually
- Localize w/ X-ray
- Incise parietal pleura to vertebral body. Identify segmental vessels and sympathetic chain, ligate as necessary
- Parietal pleura cleared via blunt dissection from lateral to medial
Postoperative

- Chest tubes wean depending on output
- Abx until chest tubes out
- Post-op films to chk instrumentation, graft and alignment
- D/C when drains out, pain controlled, and mobile.
Complications

Perioperative:

- Nerve root injury
- Spinal cord injury
- Pneumothorax
- Pleural or lung injury

Post Operative:

- Wound infection
- DVT
- Construct failures
- Pseudoarthrosis