

SURGICAL APPROACHES
TO THE
THORACIC SPINE

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FOOTHILLS MEDICAL CENTRE
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OBJECTIVES

- ✻ Indications for Surgical Management
- ✻ Posterior, Lateral, Anterior Approach?
 - Posterior
 - Posterior-Lateral (Costotransversectomy)
 - Antero-Lateral (Retropleurial Thoracotomy)
 - Anterior (Transthoracic Thoracotomy)

INDICATIONS FOR
SURGICAL MANAGEMENT
IN THE THORACIC SPINE

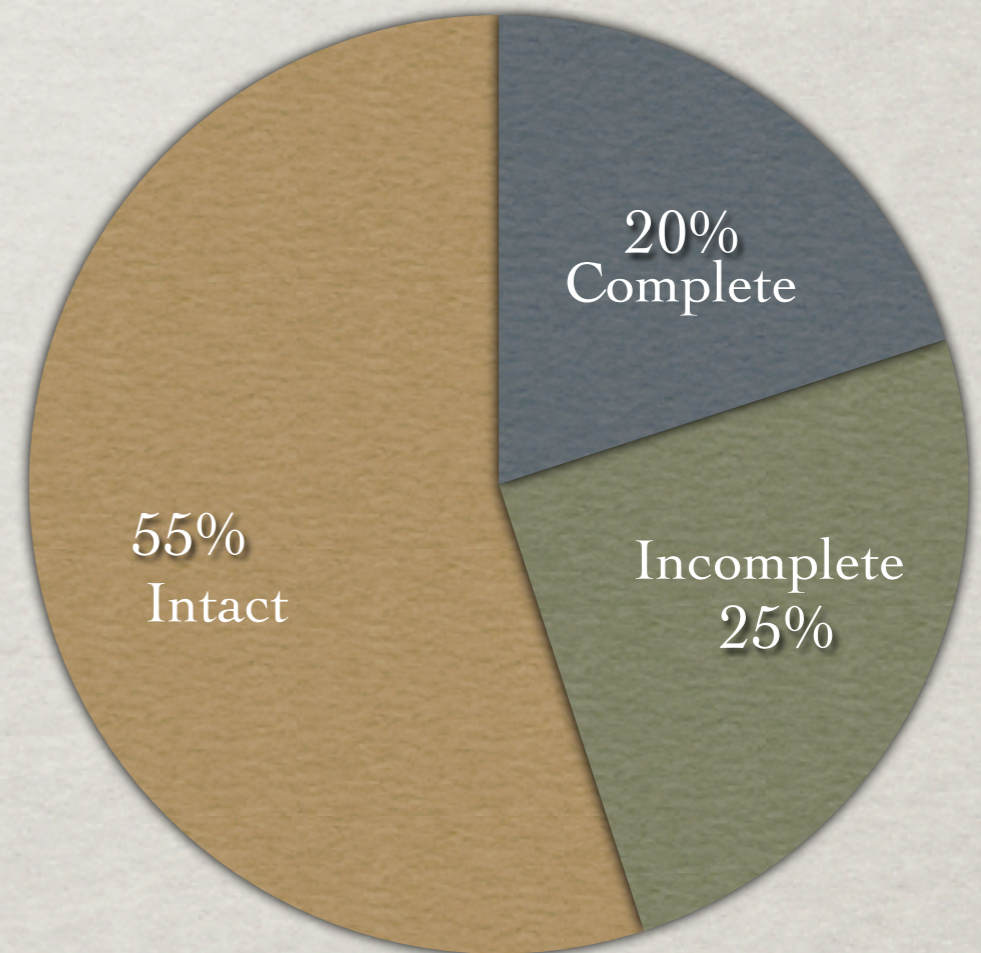
BIOMECHANICS

- ✱ 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 w/complete injuries
- ✿ Injuries below L1 (cauda equina) are associated w/ incomplete injuries

Distribution of Neurologic Injury in T Spine #



GOALS OF SURGICAL MANAGEMENT

- ✻ Many Classification Schemes proposed to guide management

- ✻ General Principle = Prevent further neurologic injury

- ✻ Goals:

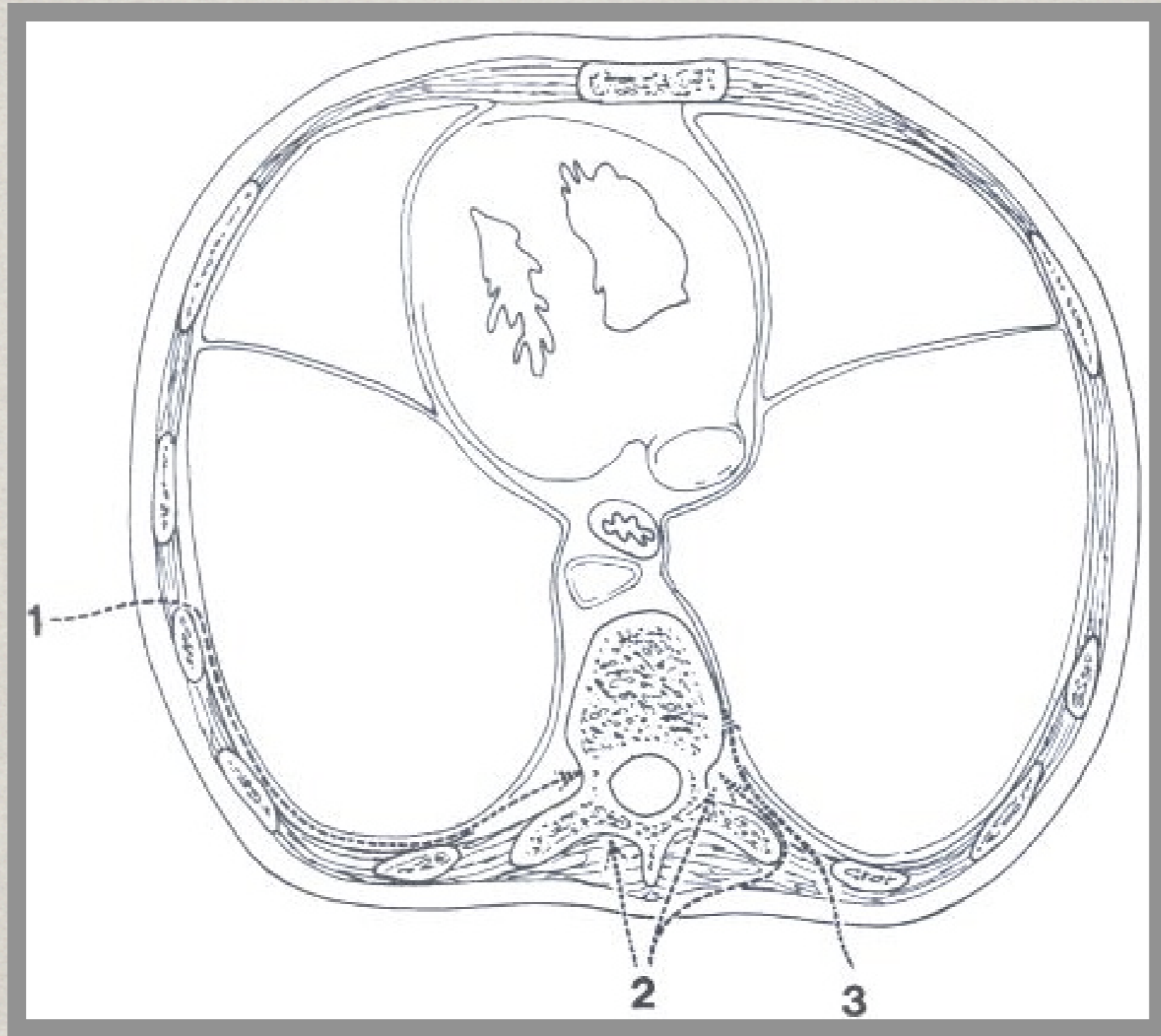
 - Decompression of neural elements in setting of neuro deficit

 - Prevent late injury from an unstable spine

 - Prevent deformity that may lead to chronic pain

 - Promote early mobilization

APPROACHES TO THE THORACIC SPINE



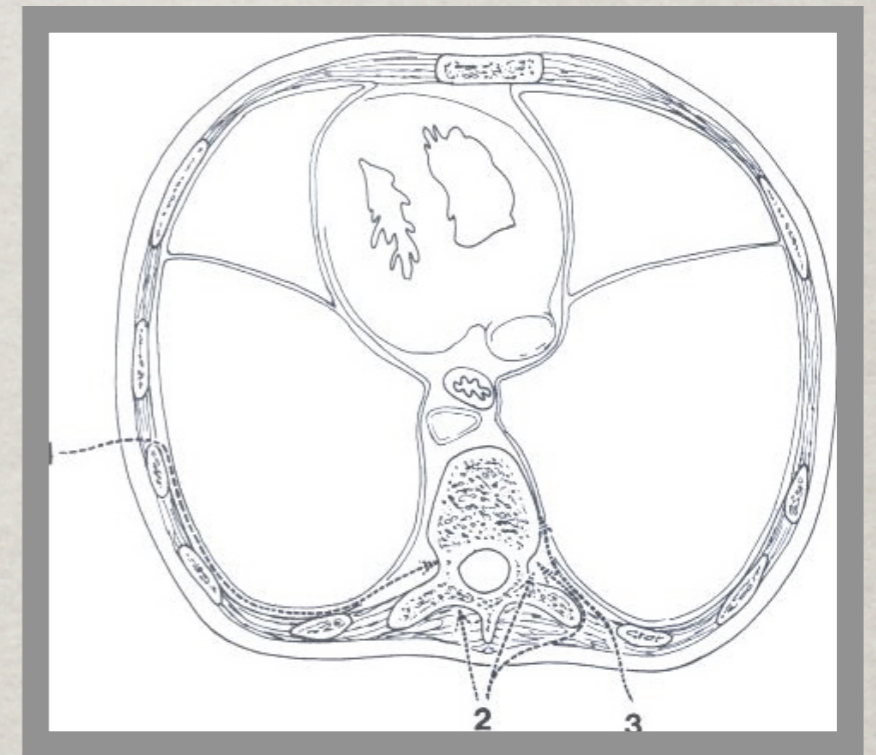
1. Anterior: Trans Thoracic/Retropleural
2. Posterior
3. Postero-Lateral: Costotransversectomy

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

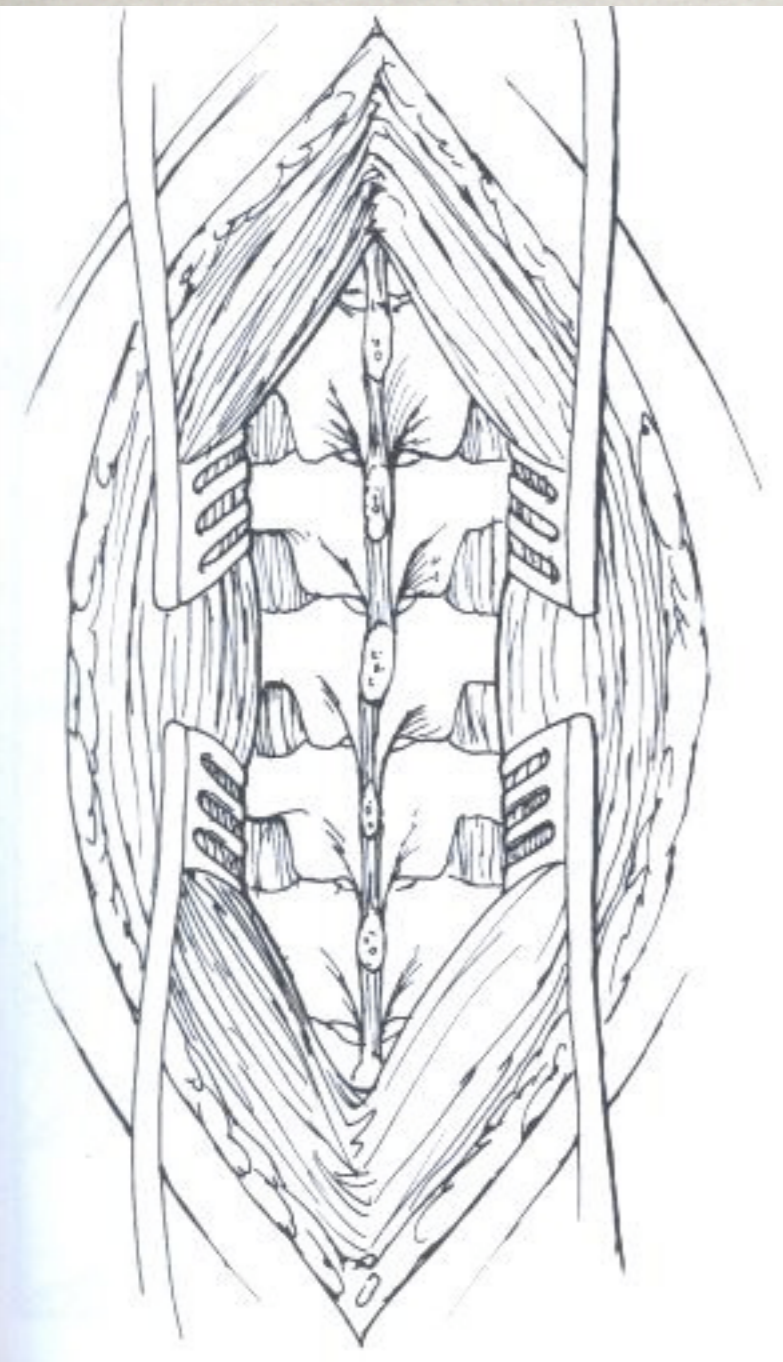
INTRAOPERATIVE

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:

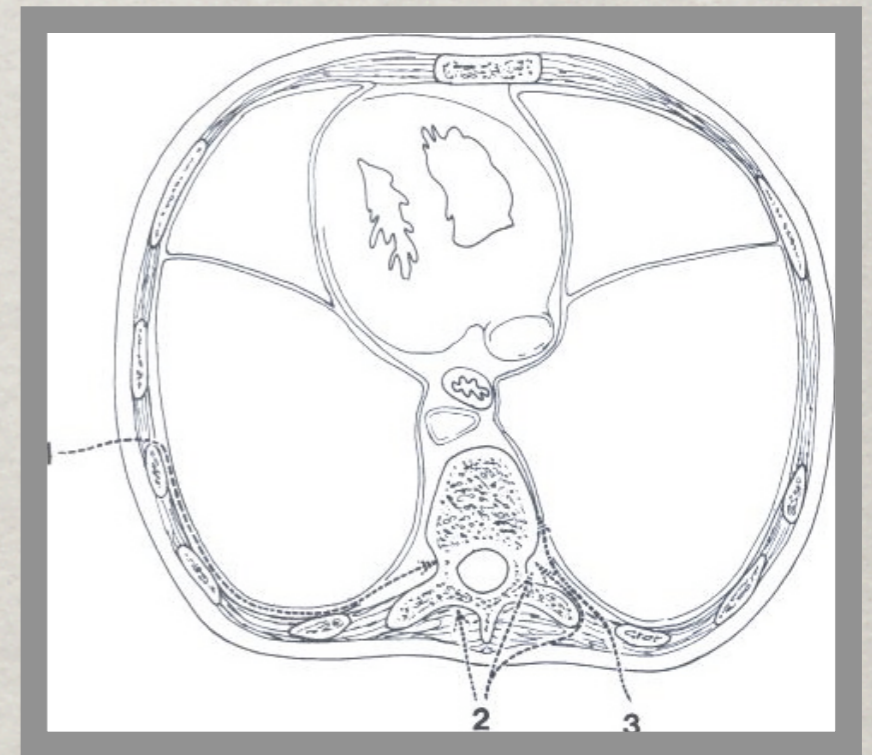
- ☼ Wound infection
- ☼ Motion segment instability
- ☼ Post laminectomy kyphosis

**EXTRA-CAVITARY
COSTOTRANSVERSECTOMY**

INDICATIONS

Postero-lateral approach to the thoracic spine, transverse process, pedicle, and posterolateral vertebral body for:

- ✿ Thoracic discectomy
- ✿ Osteomyelitis/Abscess
- ✿ Vertebral body/ Paraspinal biopsy
- ✿ Palliative decompression



CONSIDERTIONS

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

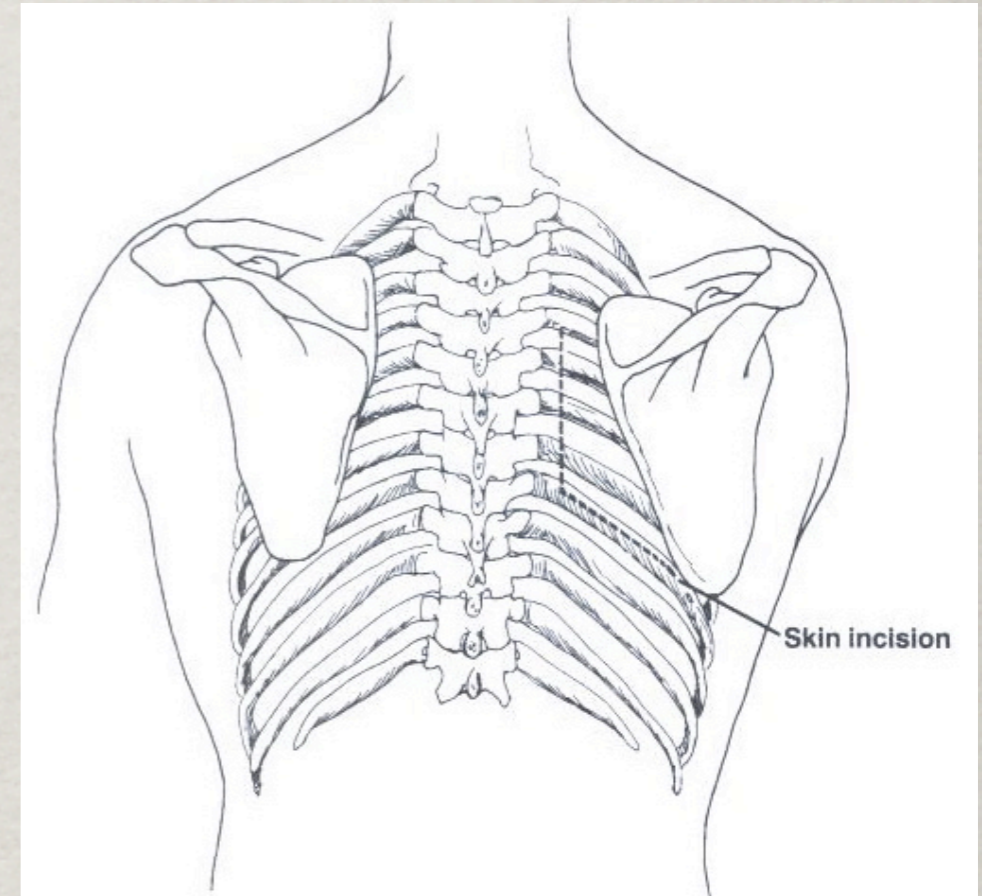
INTRAOPERATIVE

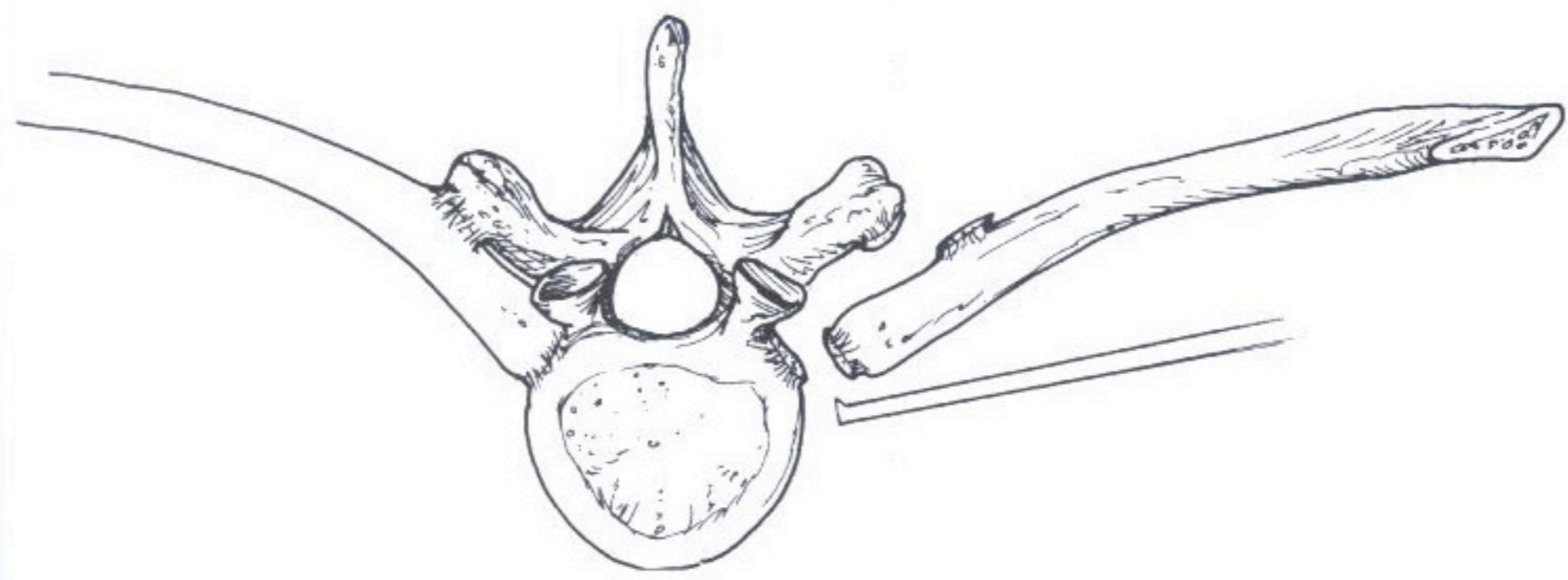
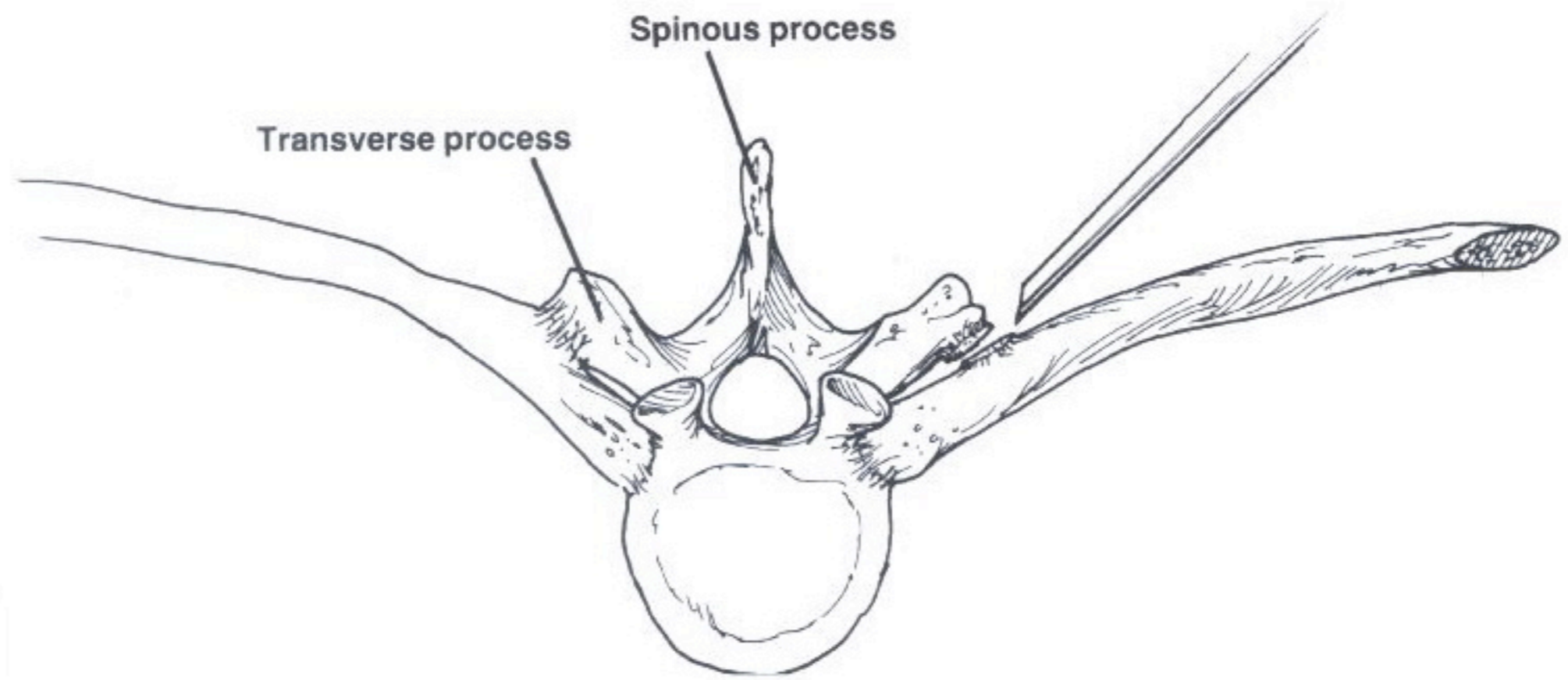
Positioning:

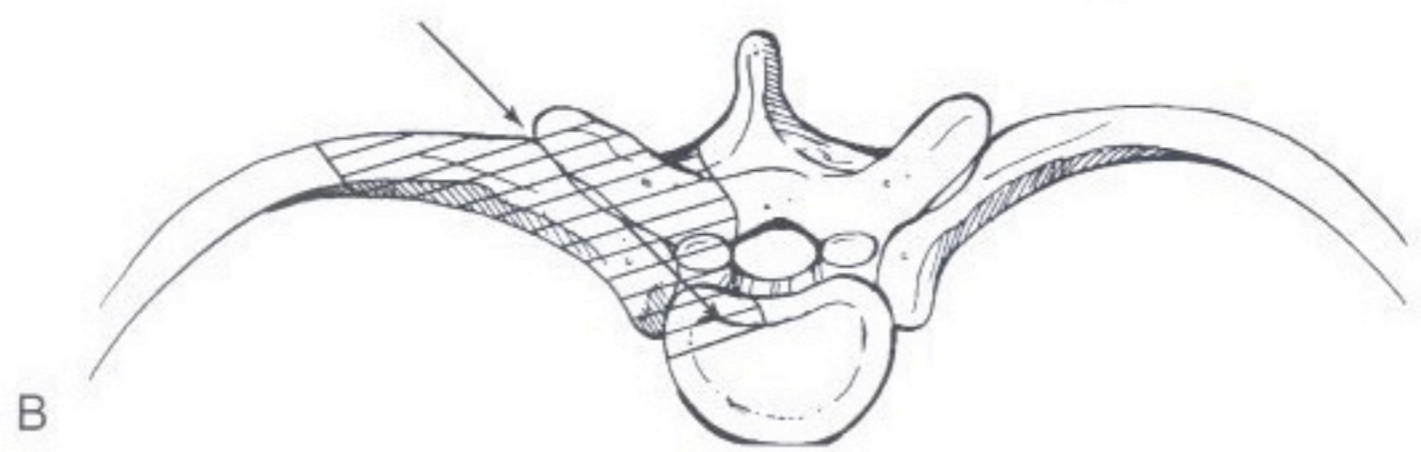
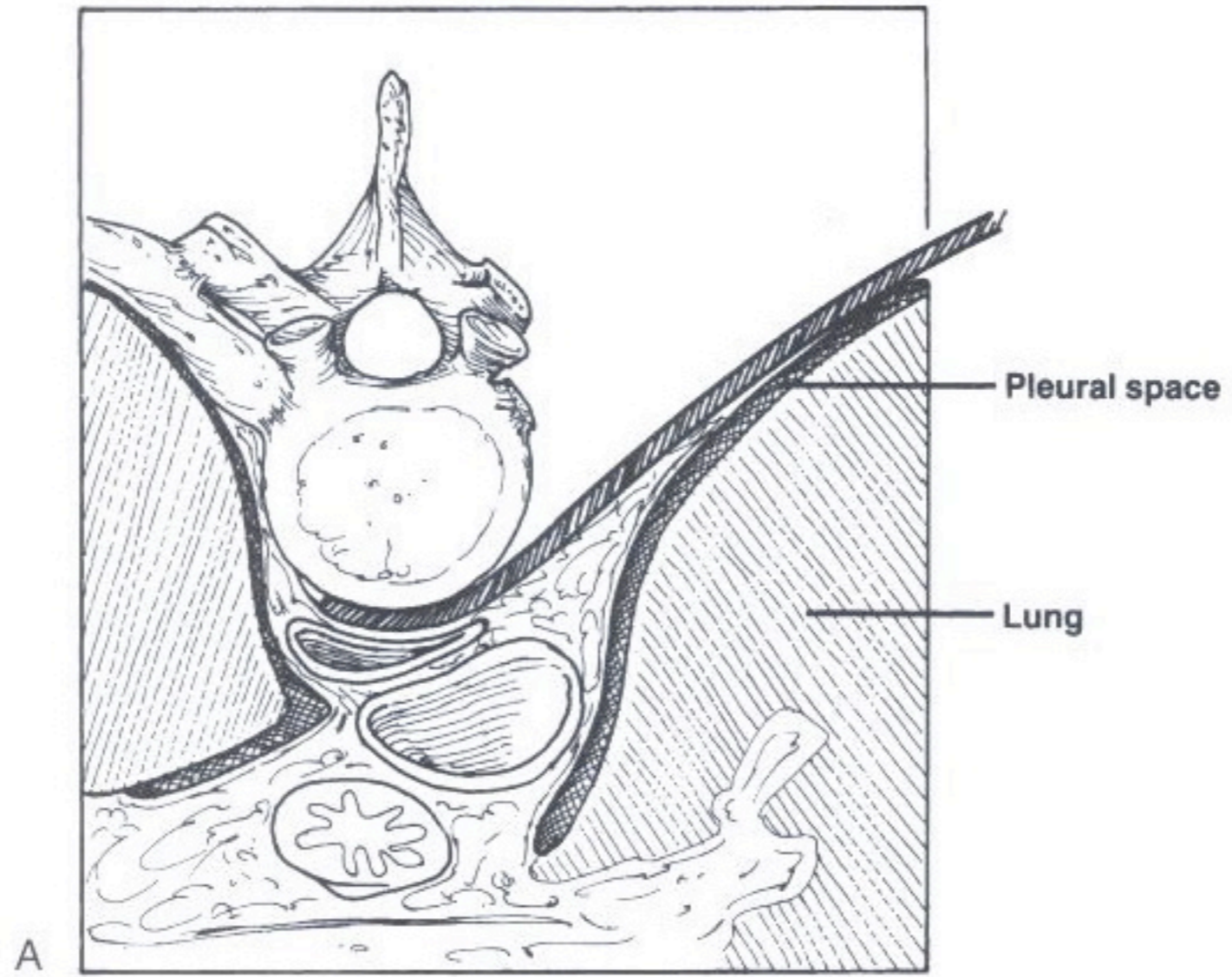
- ✿ Standard prone
- ✿ Semi-prone w/ one side chest elevated 15'
- ✿ Lateral decubitus

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:

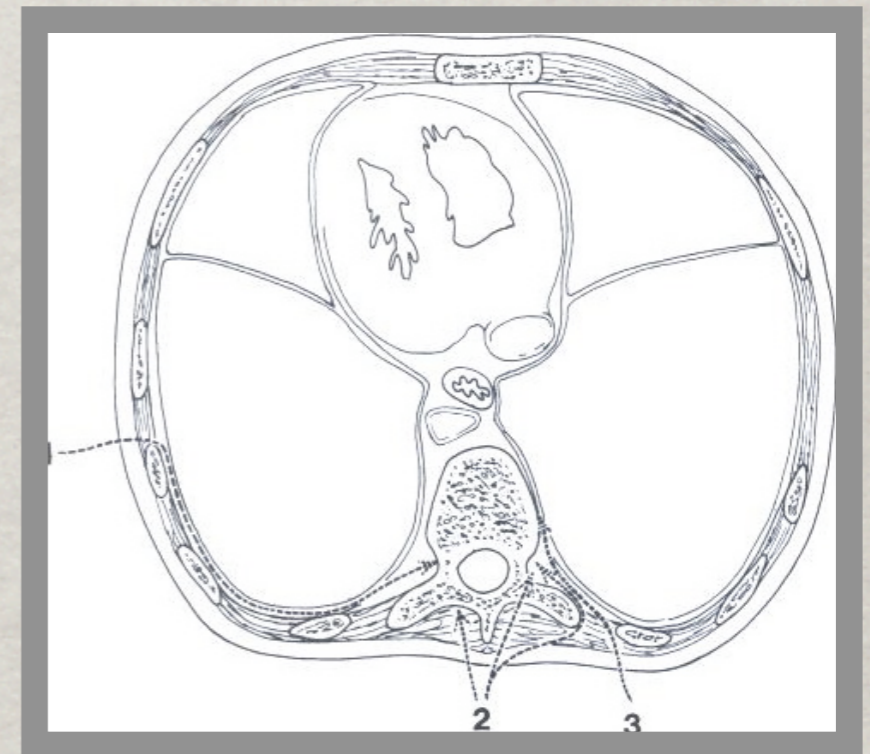
- ☼ Wound infection
- ☼ DVT
- ☼ Construct failures
- ☼ Pseudoarthrosis

**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

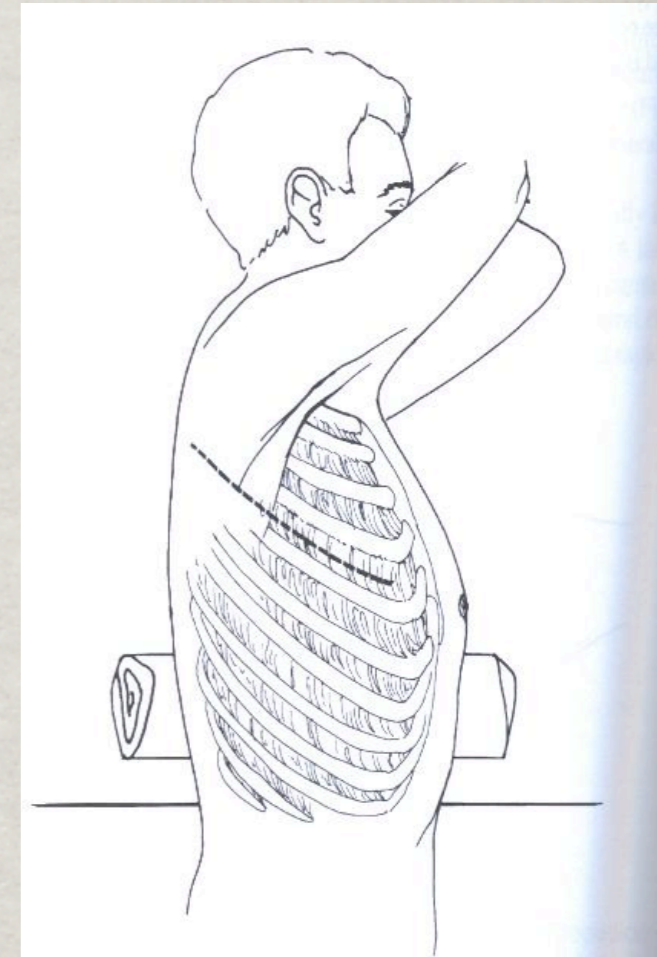
INTRAOPERATIVE

Positioning:

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

Incision/Exposure:

- ✿ Use AP films to confirm location*
- ✿ Incision made ~14cm parallelling rib; medial to ~4cm lateral of midline
- ✿ Dissect thru 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.



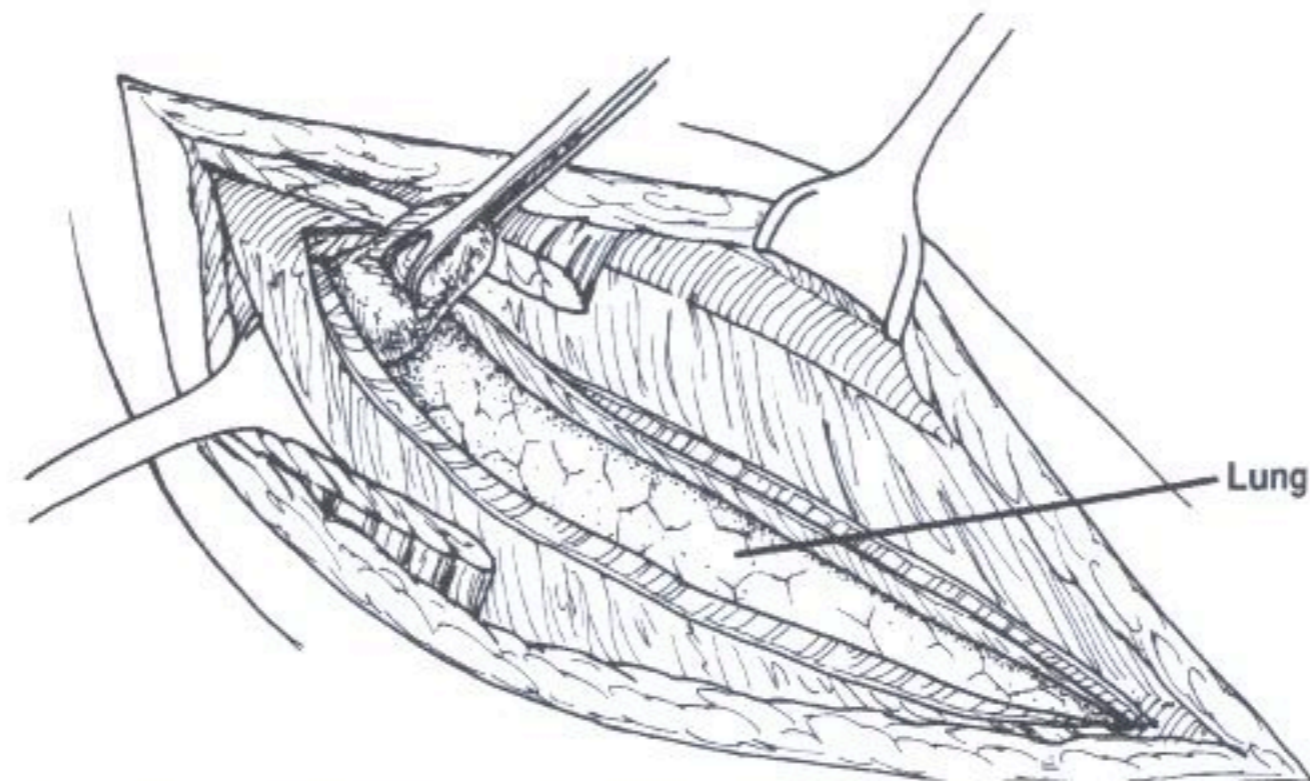
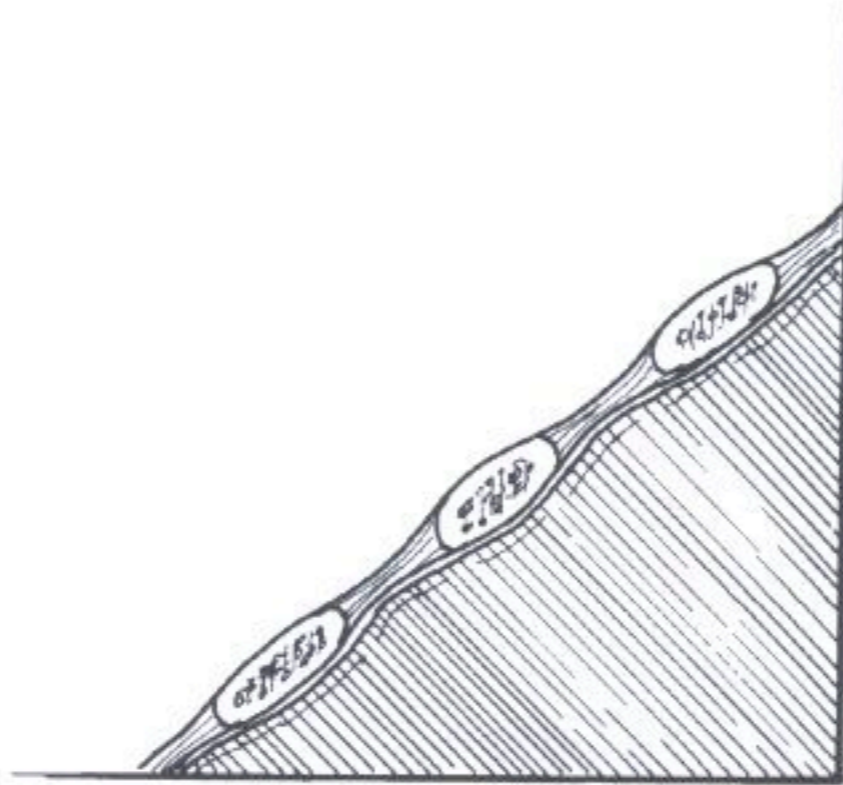
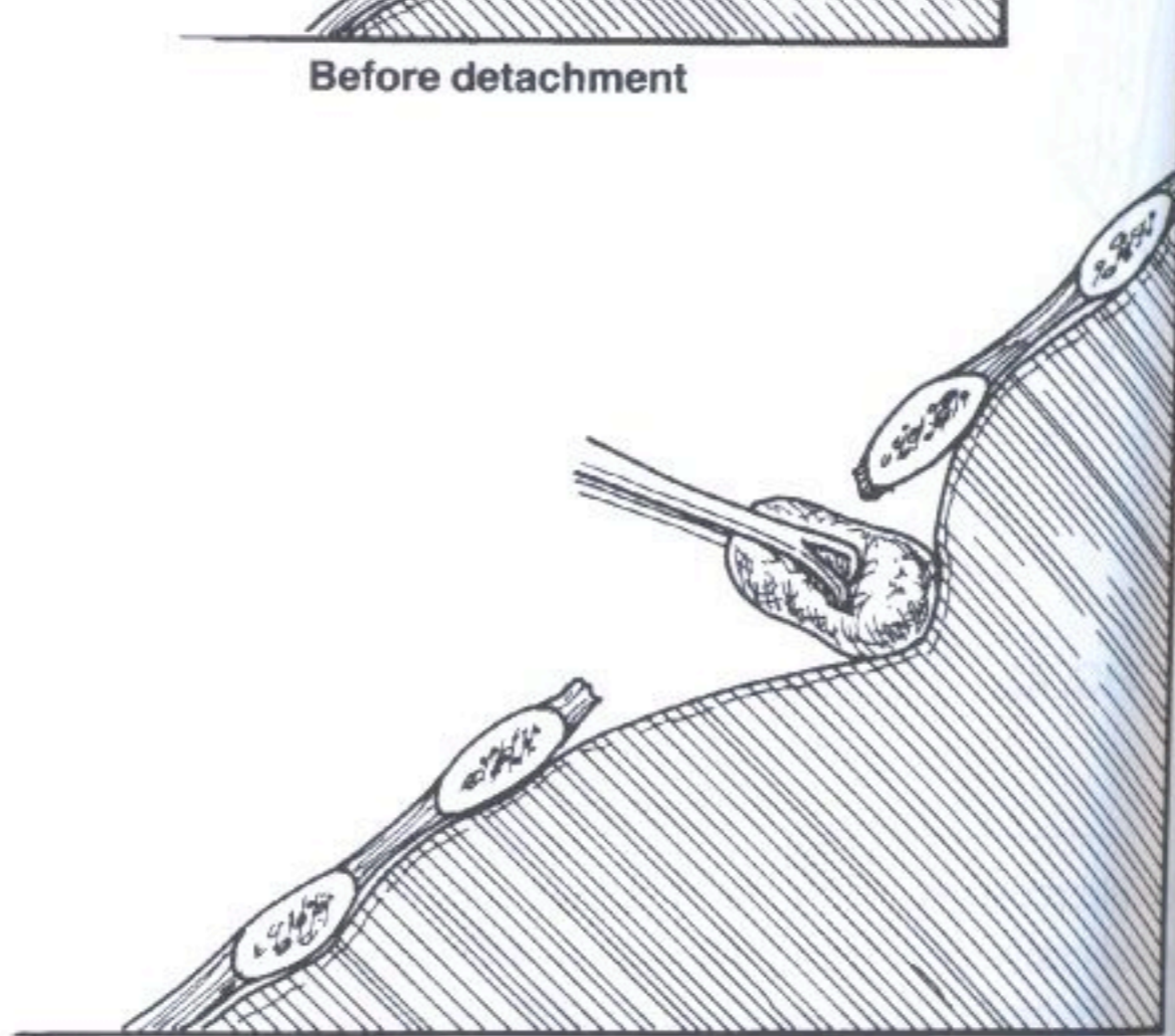


FIG. 47. Separation of the parietal pleura begins in the posterior mediastinum.



Before detachment



Dissection of the pleura

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
- ✻ Vertebral 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

INTRAOPERATIVE

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