What's New in:

Cervical Spine Surgery

Nitin N. Bhatia, M.D.
Chief, Spine Service
Residency Program Director
Orthopaedic Surgery
University of California, Irvine

Disclosures

- Detailed disclosure in the Final Program Book

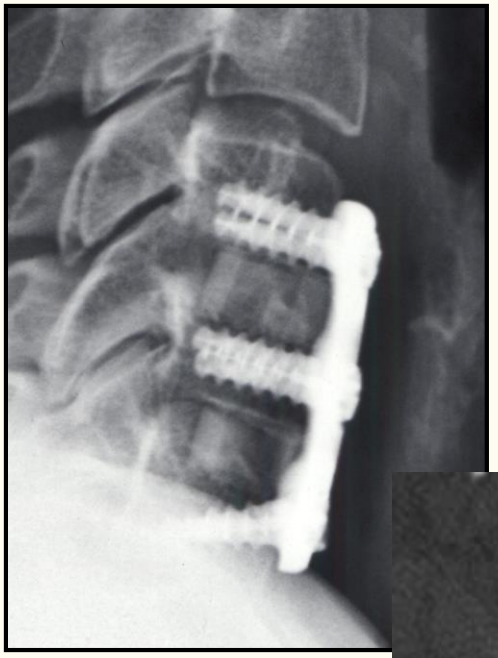
- I have a potential conflict with this presentation due to:
  - (a) None related directly to this talk
  - (b) Consulting/Royalty/Speaker's Bureau payments for unrelated products from: Alphatec, Biomet, DiFusion, Seaspine, Spineart, Stryker, Zimmer

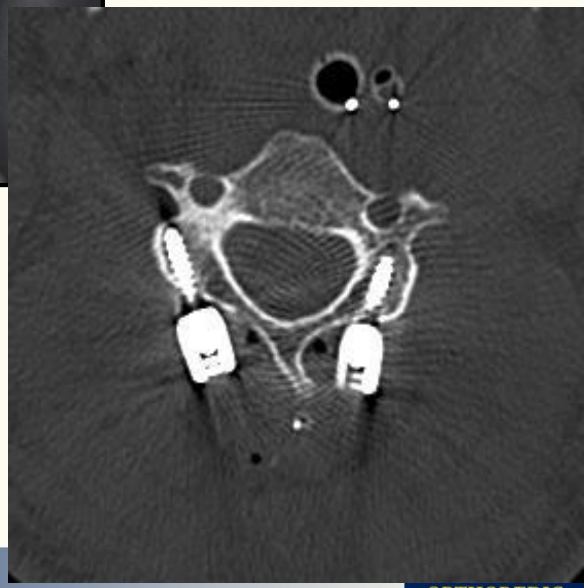
What's New in Cervical Surgery

- Various changes over the past several years
  - Total Disc Arthroplasty
  - Cervical Deformity Surgery
  - Minimally Invasive Surgery

Do We “Need” Cervical MIS?

- Maybe NOT
  - Classic procedures have good outcomes
  - “Open” cervical, especially anterior, carries low risk and fast recovery
  - MIS may take longer and be harder

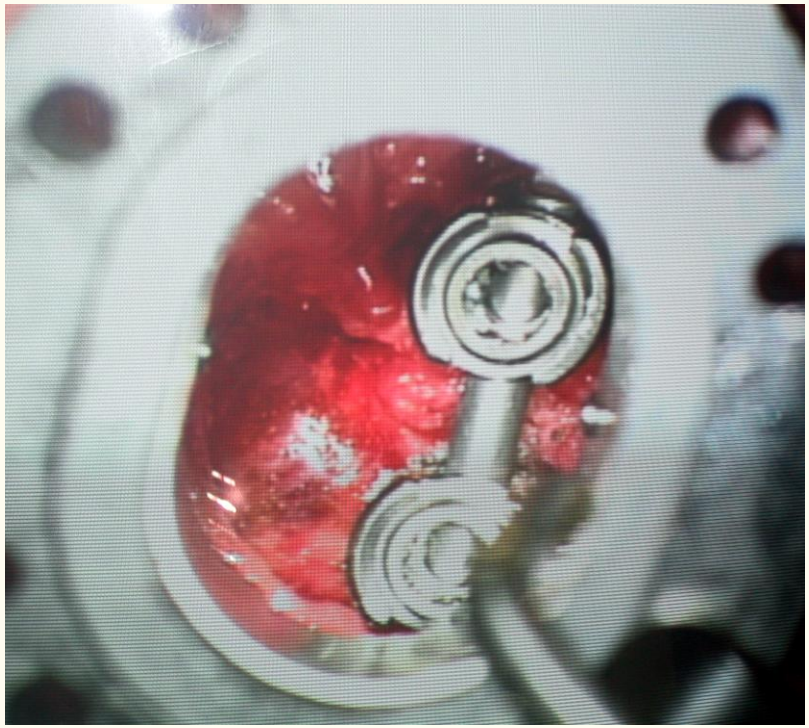




ORTHOPÆDIC SURGERY

Advantages of Less Invasive Surgery

- Smaller incisions which may mean less tissue destruction
- Less blood loss
- Shorter hospital stays



Posterior vs Anterior Cervical

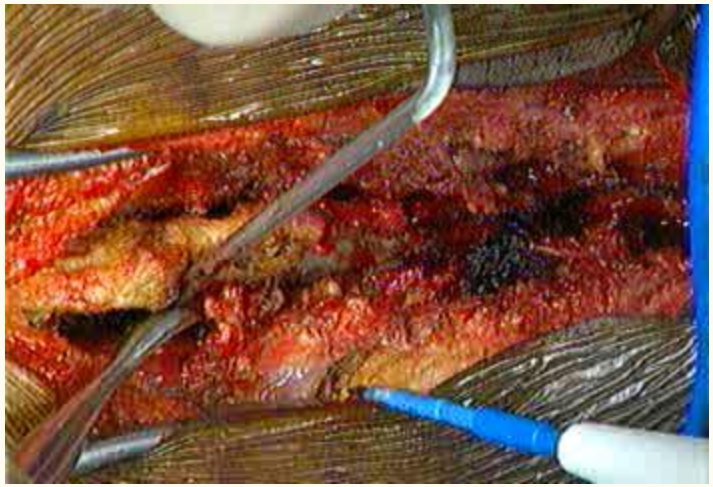
- Advantage of MIS surgery are more significant with posterior cervical surgery
  - Anterior surgery does not have much blood loss, muscle destruction, or extensive hospital stay
- Why consider these posterior surgeries in the first place?

Posterior Cervical Surgery

- Can decompress without fusion
  - Foraminotomy, laminoplasty
- Avoids anterior neck structures
  - Revision surgery (pseudo)
  - Post-radiation
  - Avoids Dysphagia, Esophageal injury, Vessel injury
- Long, multilevel surgery

Improving Posterior Cervical Surgery

- Can we decrease the amount of post-operative pain?
  - Muscle stripping
  - Blood loss
- Reduces the morbidity traditionally associated with the posterior cervical approach



UNIVERSITY OF CALIFORNIA • IRVINE
ORTHOPÆDIC SURGERY

What About Anterior Cervical MIS?

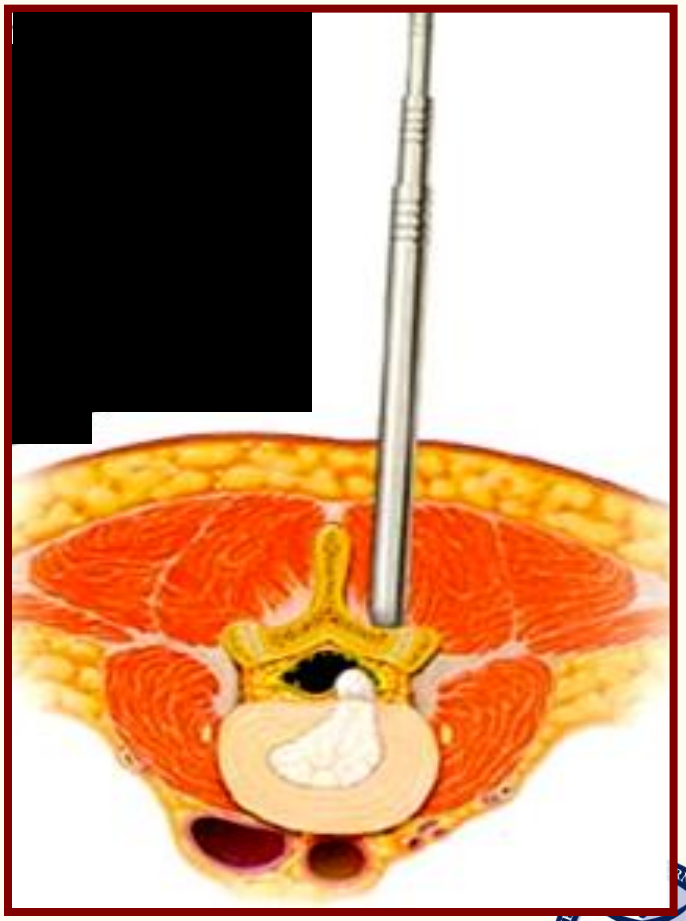
- Some authors have discussed anterior MIS procedures
  - Not widely accepted or performed
  - *Minimally invasive anterior contralateral approach for the treatment of cervical disc herniation*. Surg Neurol 2005
  - *Full-Endoscopic Anterior Decompression Versus Conventional Anterior Decompression and Fusion in Cervical Disc Herniations*. Int Orthop 2008
- The advantages over traditional Anterior surgery are not significant

Candidates for Posterior Cervical MIS?

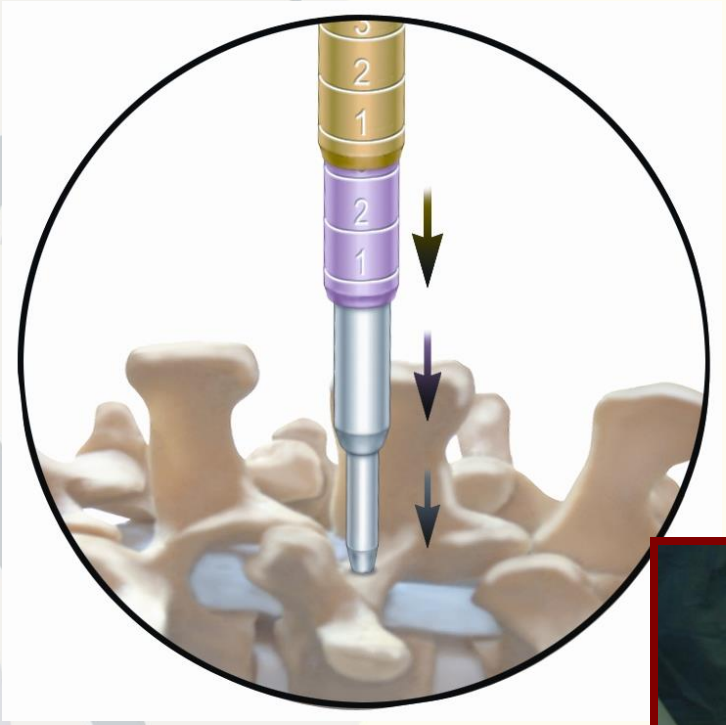
- Patients in whom posterior surgery is a valid option
- Must be able to achieve the goals of surgery (decompression, stabilization)

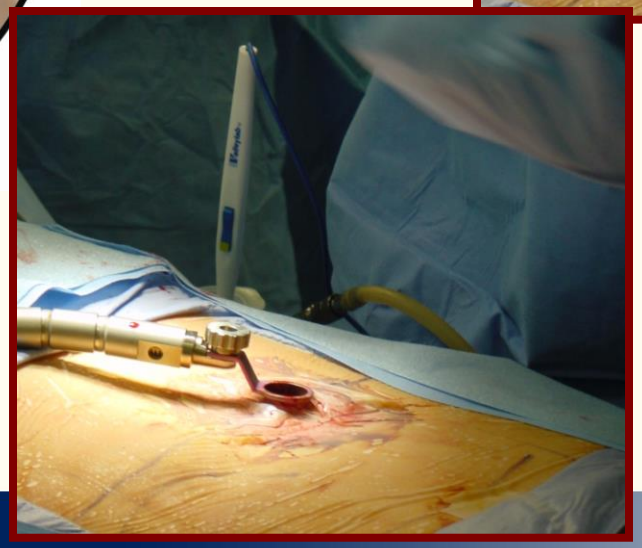
MIS Technique

- Many parallels to lumbar MIS techniques
  - Dilation
  - Visualization
  - Localization
- Based upon dilating the muscle instead of cutting through it

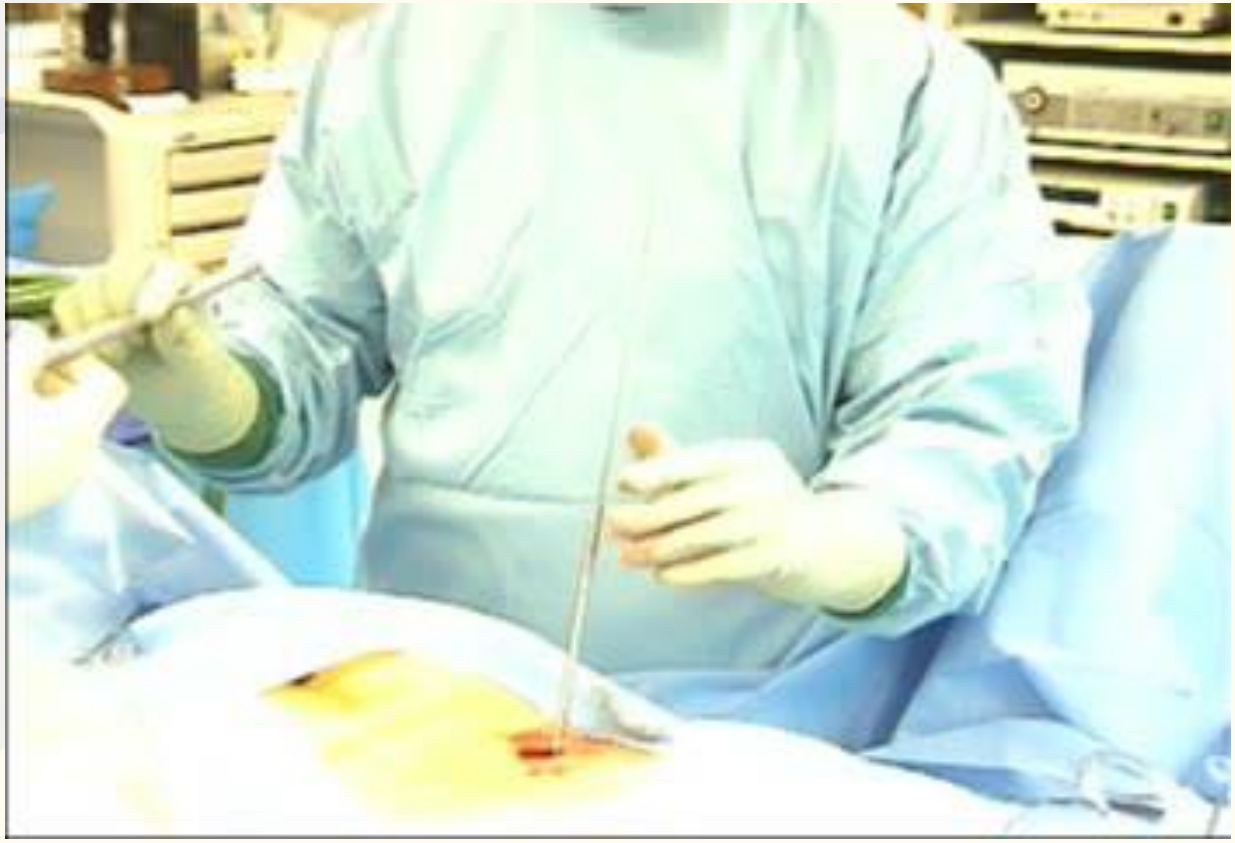


Surgical Technique

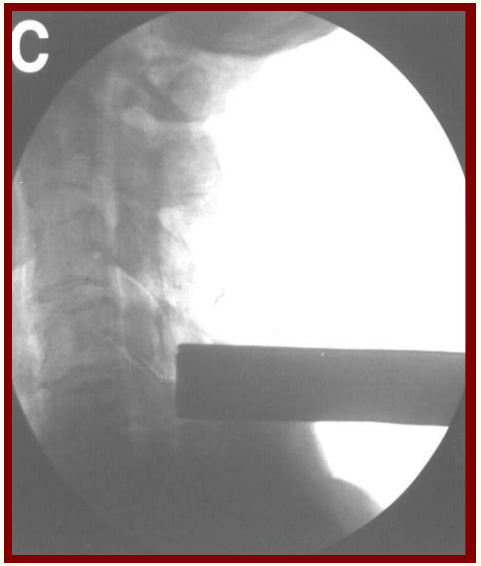




Serial Dilation



Lumbar vs Cervical MIS Dilation



MIS Visualization

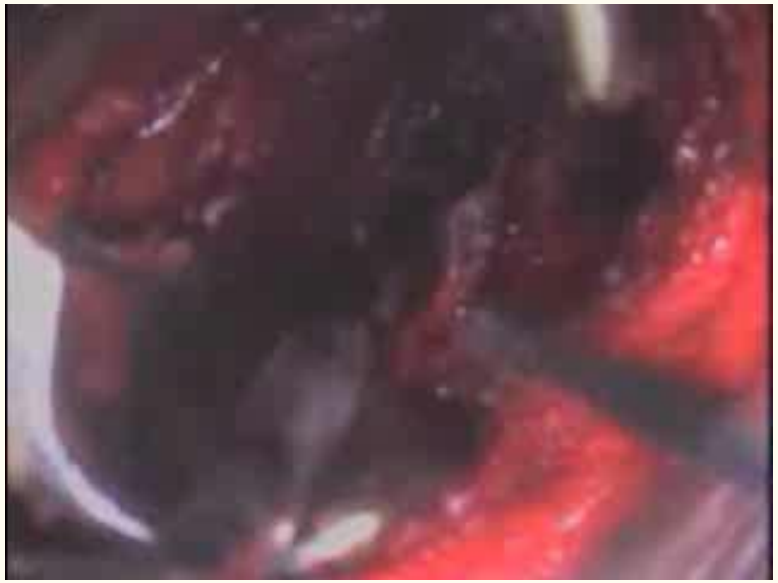
- Need magnification and illumination to safely visualize when using tubular MIS retractors
- Endoscope
- Microscope

Visualization

- Using either endoscope or microscope, visualization can be excellent
- Certain advantages to each technique
  - Microscope: Commonly available, useful for non-MIS surgery, Doesn't fog up
  - Endoscope: 30 degrees viewing angle, less conflict with flouroscopy equipment, Surgeon's hands don't block the view

MIS Visualization

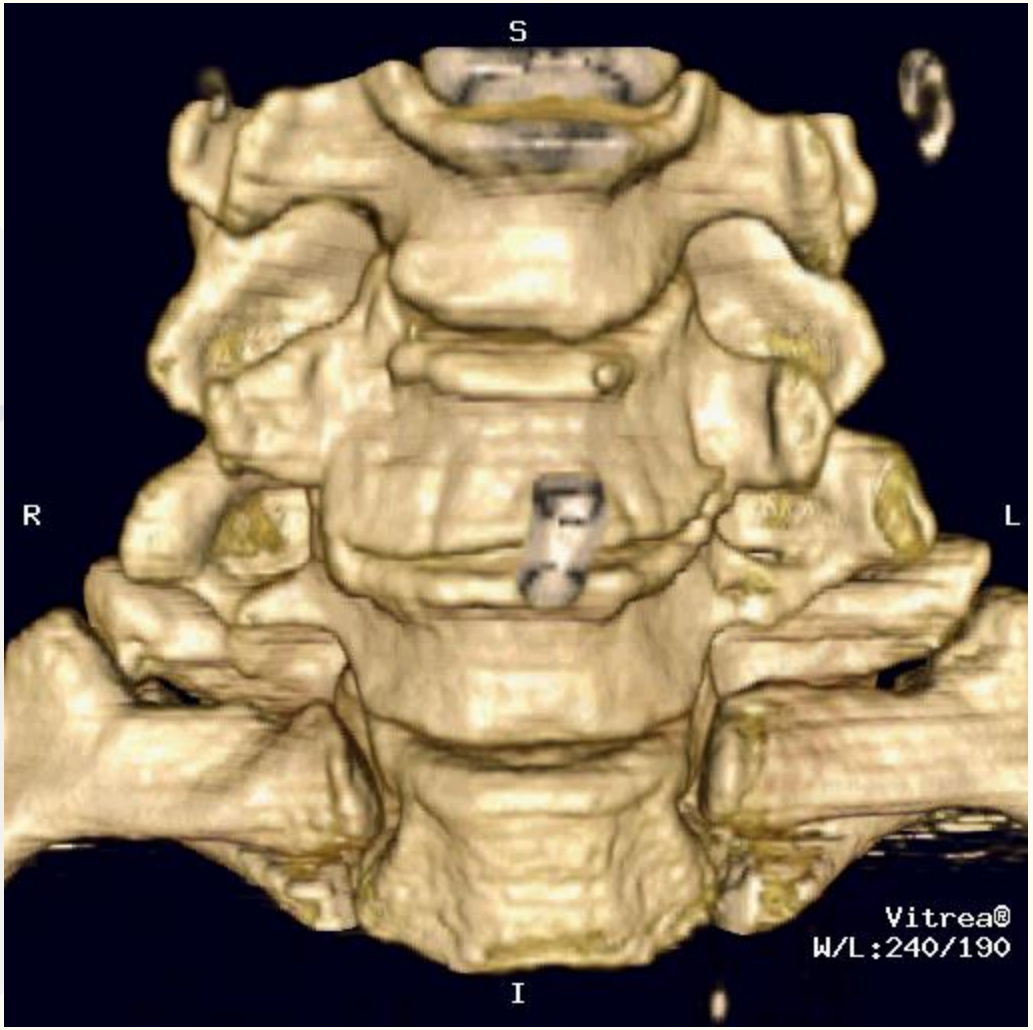
Endoscope



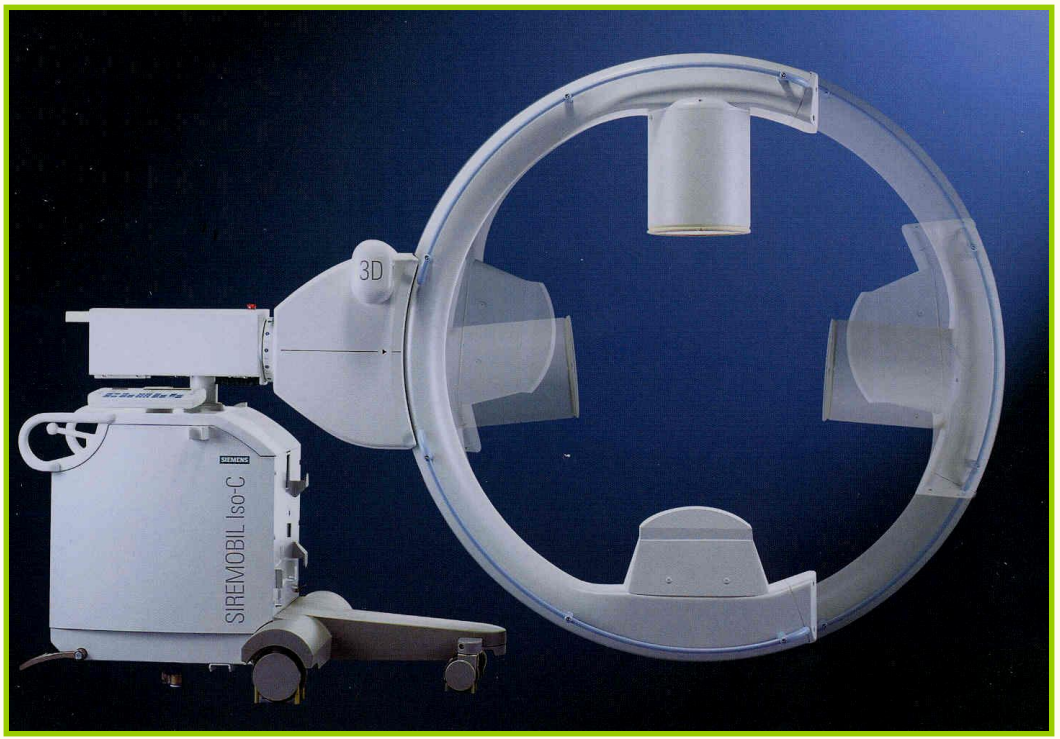
Microscope

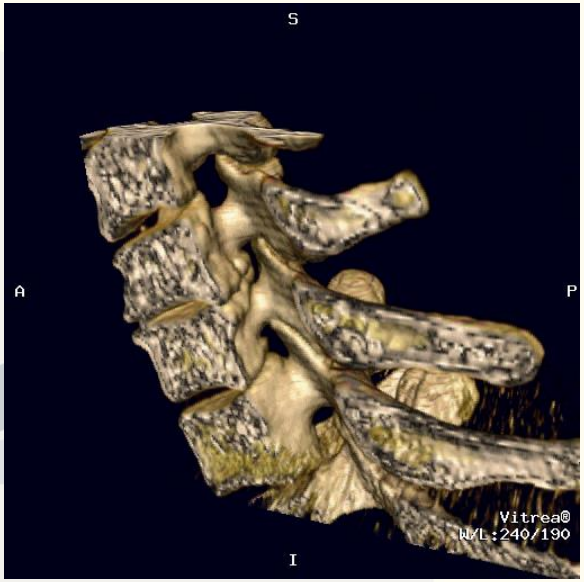
Imaging for MIS Cervical

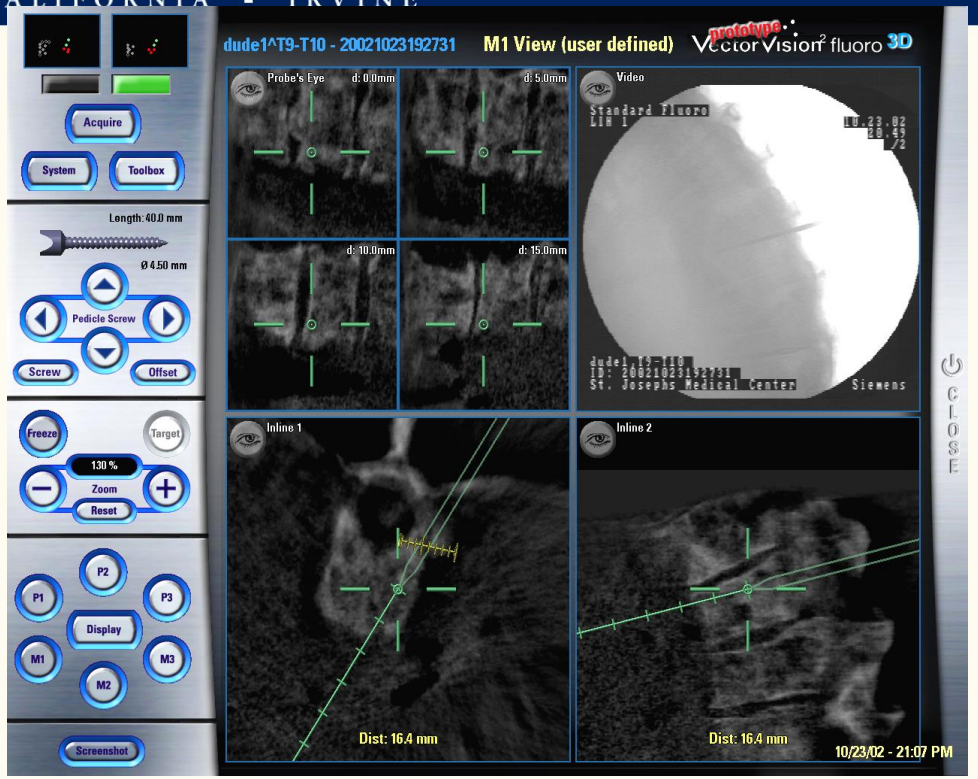
- What do we need to do?
  - Identify location
  - Possibly provide intra-op imaging
- Many imaging systems available
- Simple (x-ray, flouro) to complex



Imaging Options


3D
SIREMOBIL Iso-C





Accurate Navigation

- Immediate 3D reconstruction
  - Real time axial views
  - Multiplanar Guidance
- New Generation detectors

UNIVERSITY OF CALIFORNIA • IRVINE
ORTHOPÆDIC SURGERY

Robotic Guidance

What is Really Needed?

- Intraoperative imaging is required to:
  - Identify levels
  - During or after implants
- For most MIS posterior cervical surgeries, advanced guidance is not necessary
  - We use flouroscopy

Specific Surgeries

- Foraminotomy
  - 1 or 2 levels, ideally unilateral
  - Radicular symptoms
  - Lateral (non-central) compression
- Lateral Mass Fusion
  - Traumatic instability (jumped facets) without ongoing canal compression
  - Anterior pseudarthrosis repair

Foraminotomy

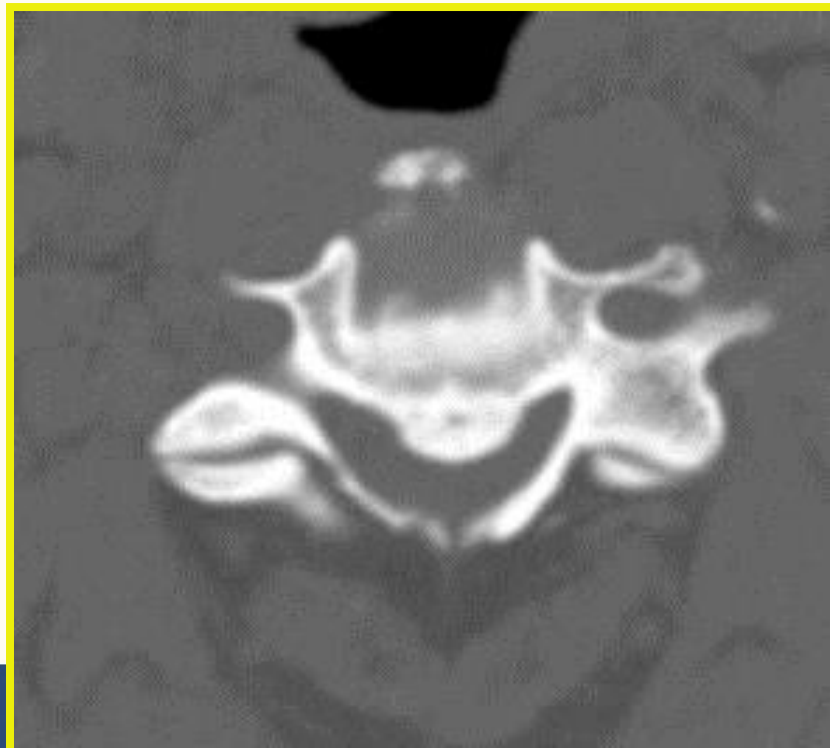
- Advantages of Foraminotomy
  - Preserves motion
    - No fusion related complications
    - Avoids ASD
    - No implants
  - No need for bracing
  - Eliminates anterior-associated complications
    - Dysphonia
    - Dysphagia
    - Esophageal injury

Foraminotomy

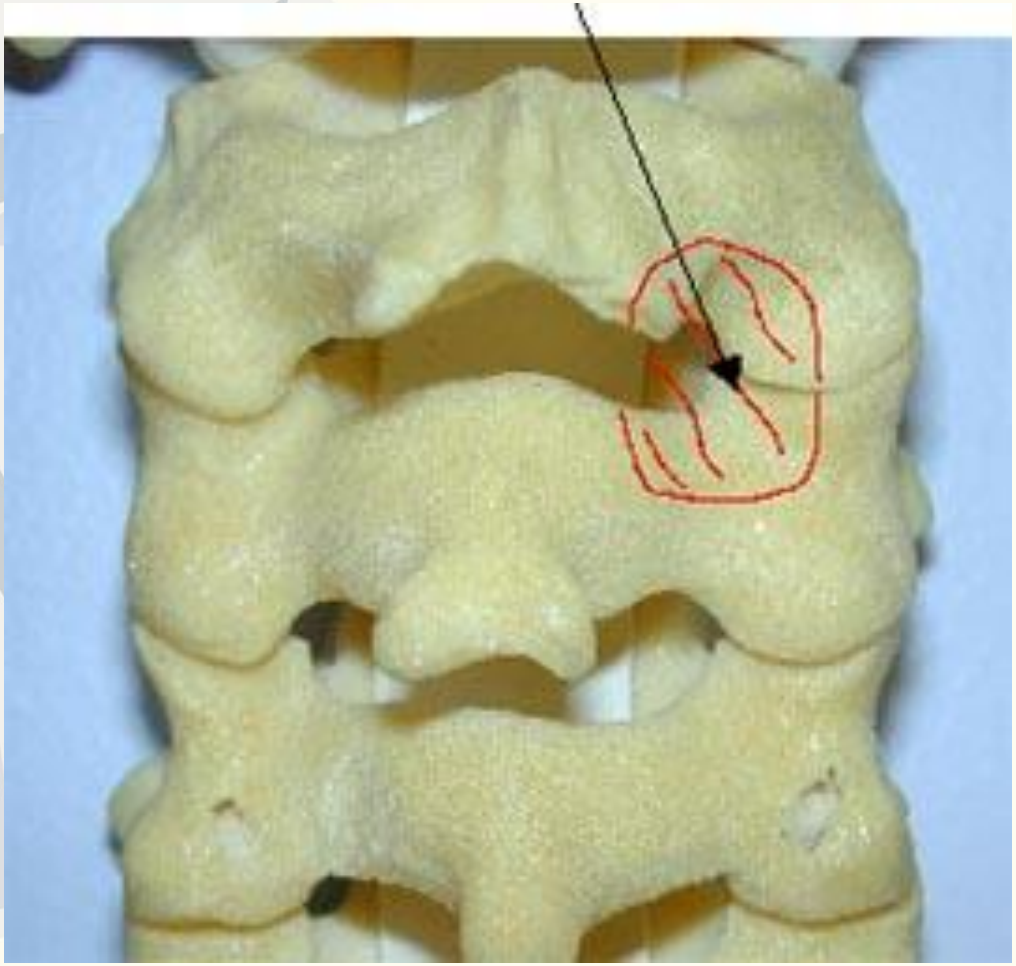
- Disadvantages of Foraminotomy
  - Disruption of the posterior musculoligamentous complex
  - Possible post-op neck pain and spasm
  - Epidural bleeding
  - Cannot decompress the central canal

Contraindications

- Hypermobility on flex/ext
  - May develop instability – even w/ MIS
- Axial neck pain
- Central compression



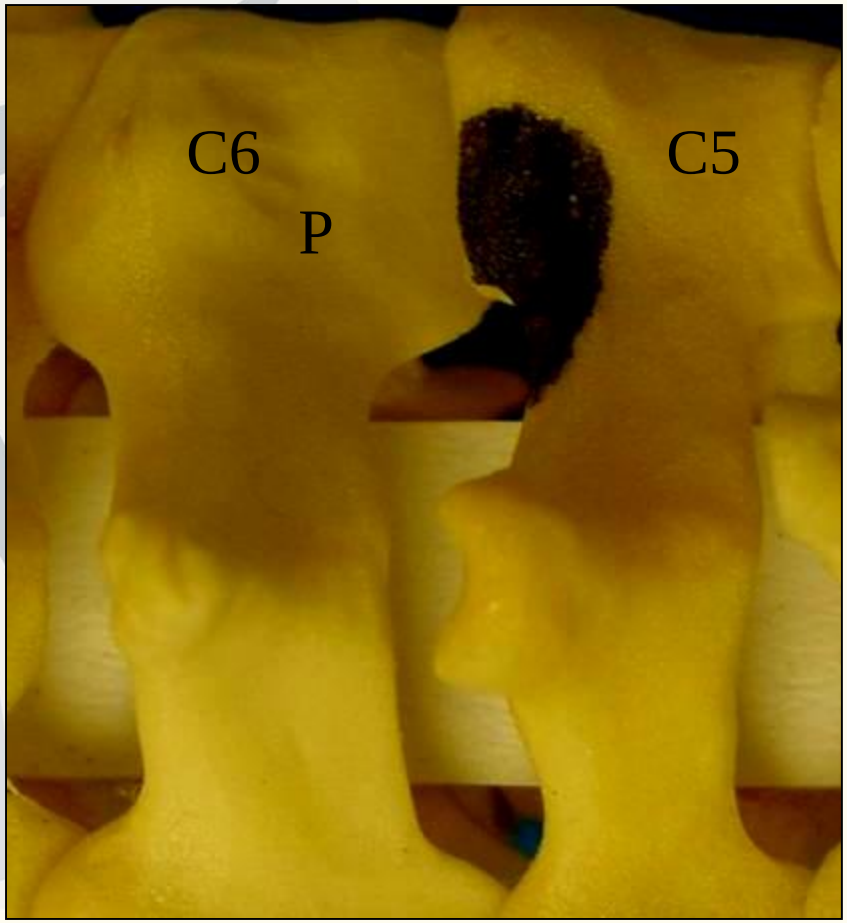
Foraminotomy



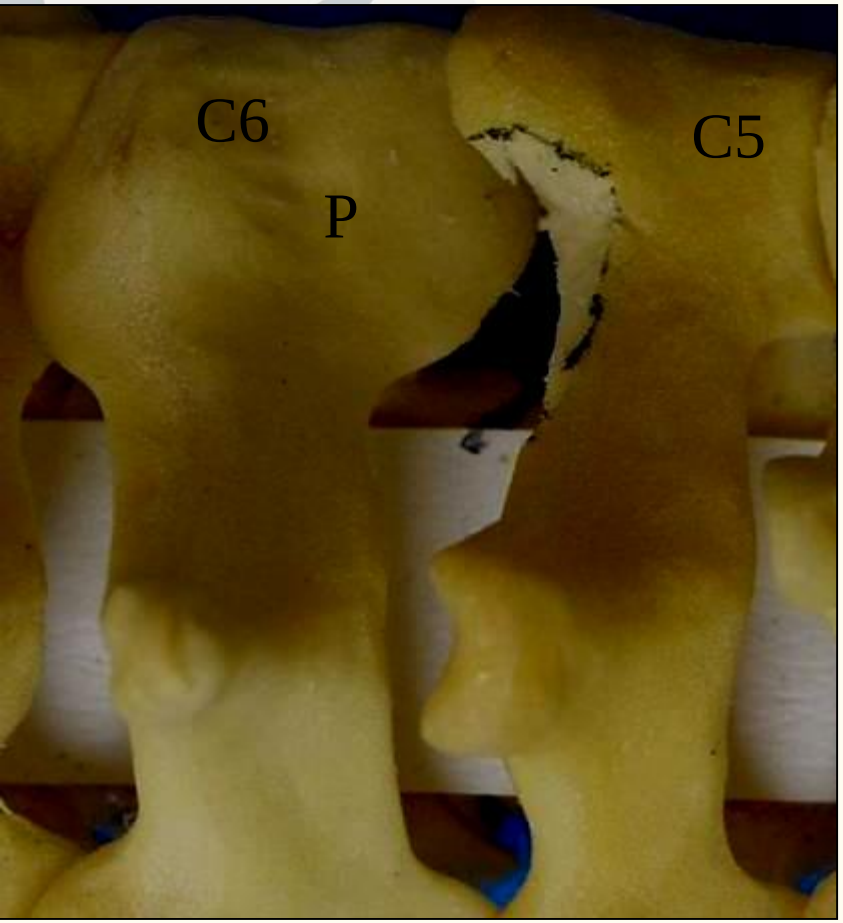
Foraminotomy Technique: Laminotomy

Caudad

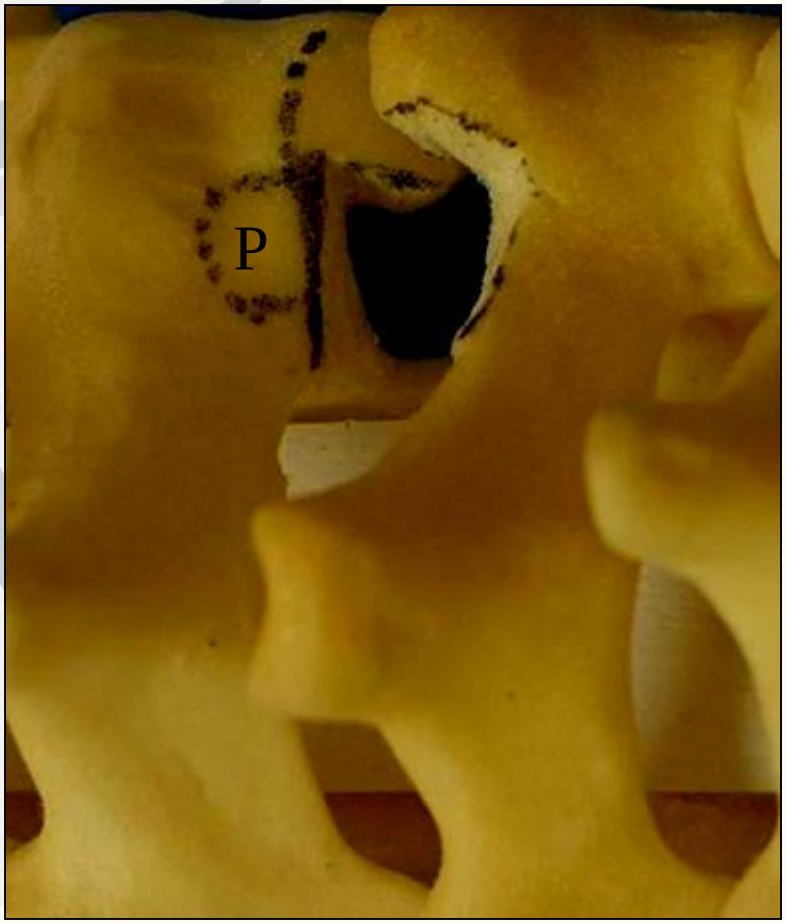
Cephalad

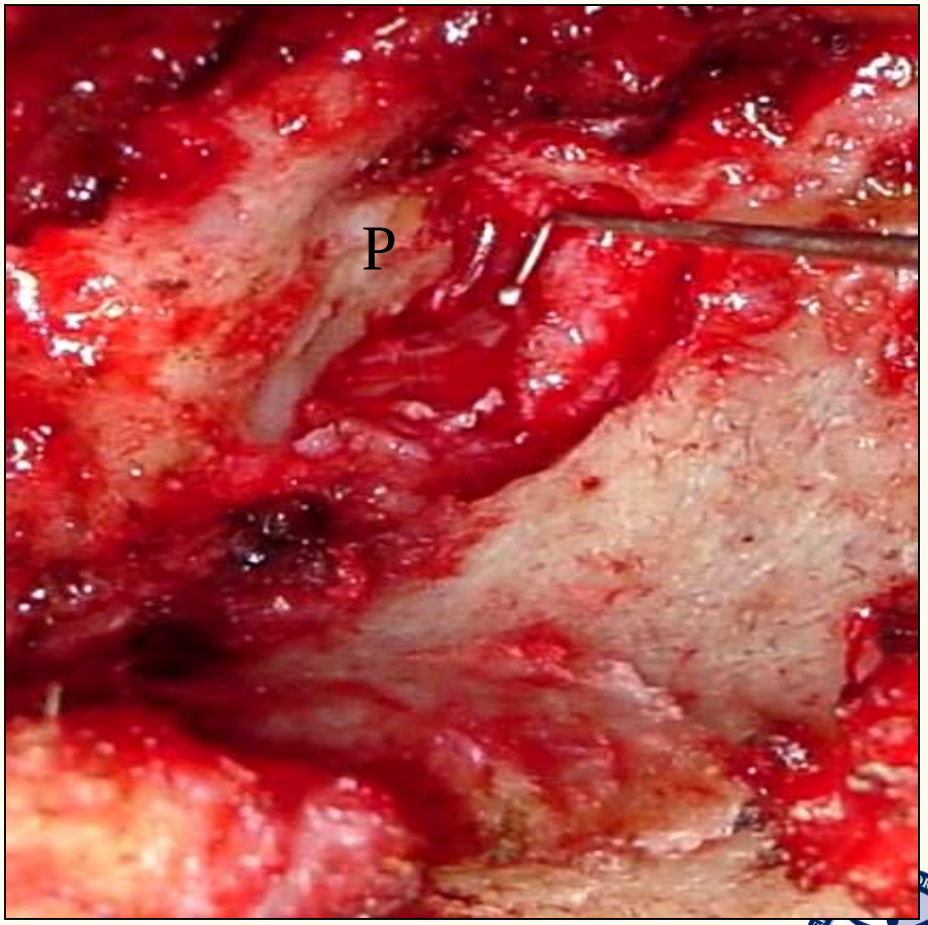


Foraminotomy Technique: Resection of cephalad facet

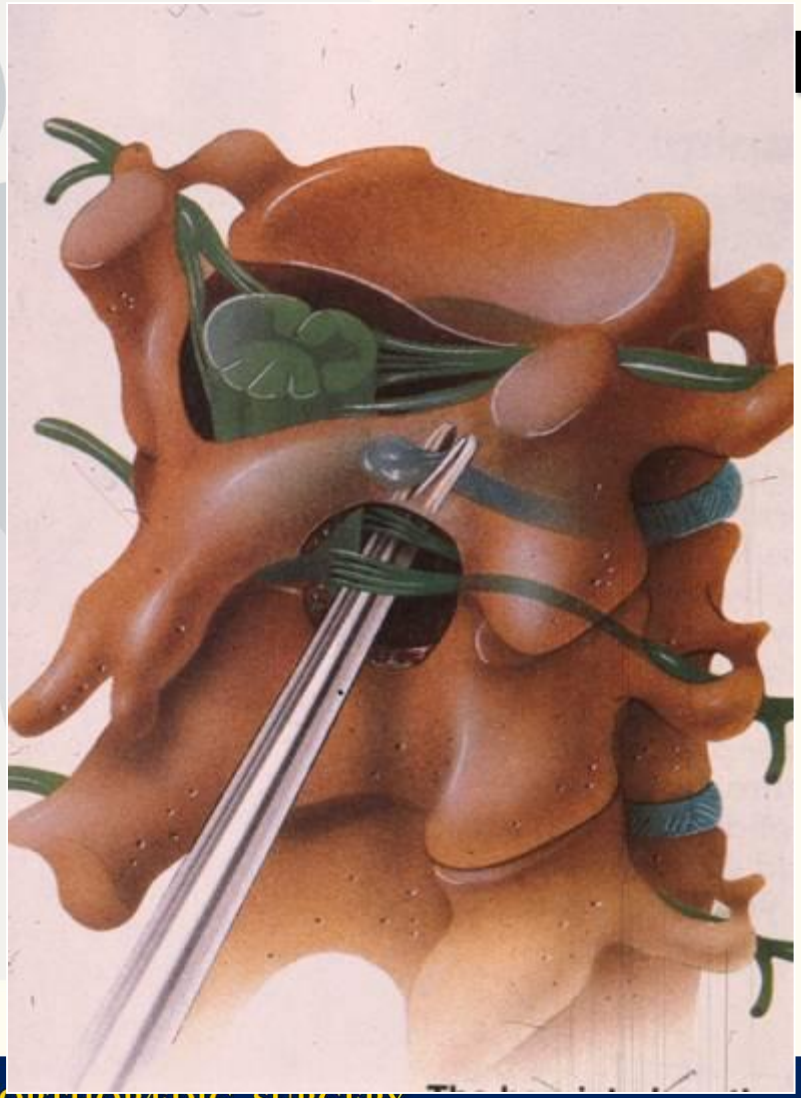


Foraminotomy Technique: Resection of caudad facet

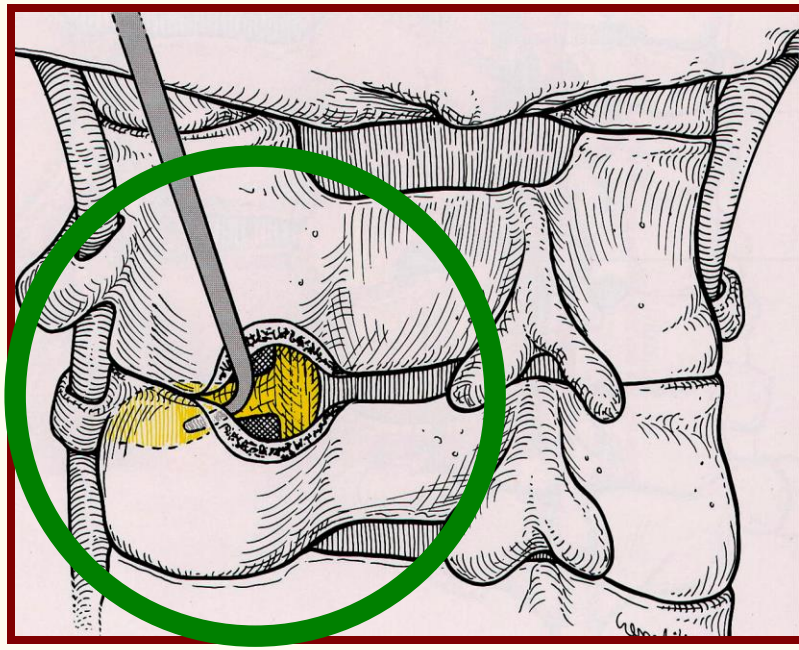




Discectomy and minotomy



Post-operative Imaging

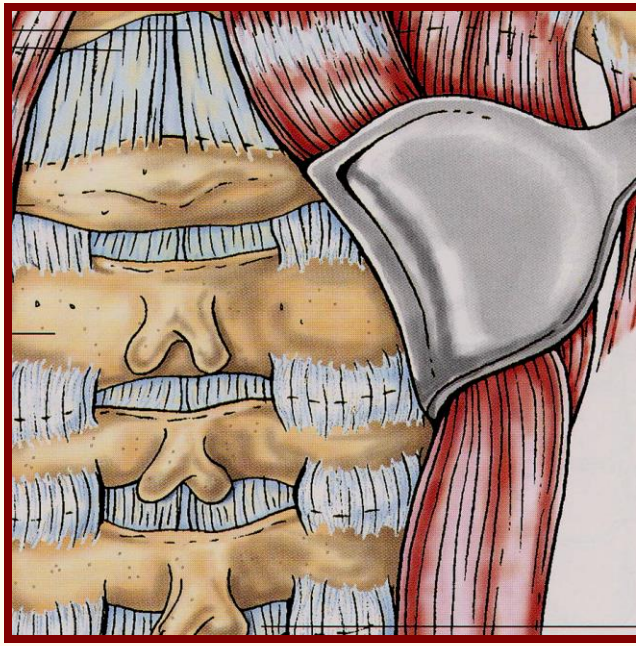


Facet Resection

RESECT <50% OF FACET

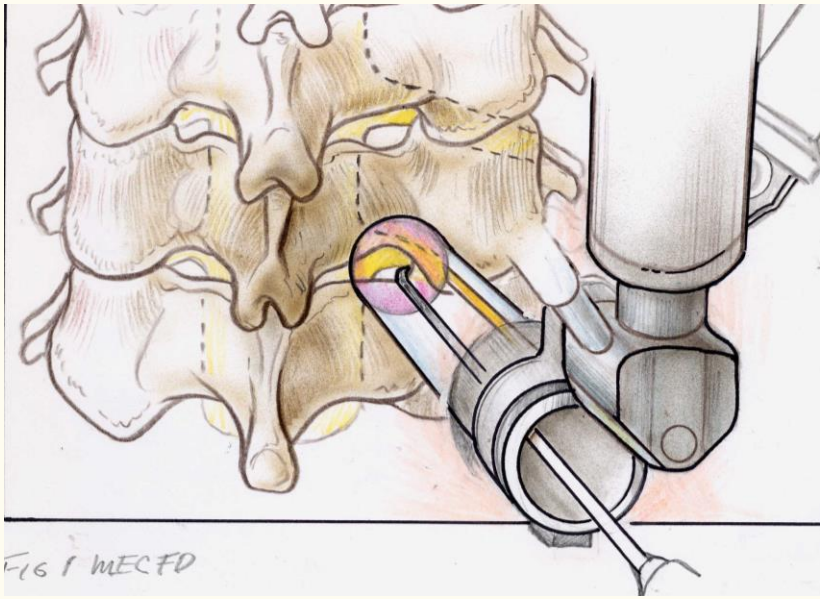
Open Foraminotomy

- Significant muscle stripping and retraction
- Increased:
  - Post-op pain
  - Blood loss
  - Impaired muscle function
  - Magnified in multi-level cases
- High success rate (90-96%)
  - Aldrich, *J Neurosurg 1990*
  - Henderson CM, *Neurosurgery 1983*
  - Woertgen, *Neurosurgery 1989*



MIS Cervical Foraminotomy

- Preserves posterior cervical musculature
  - Important in maintaining spinal alignment and posture
  - Decreased pain
  - Shorter stay
    - *Adamson, J Neurosurg 2001 – 97% sig improvement*
    - *Fessler, Neurosurgery 2002 - 92% sig improvement*
      - *Less blood loss, hosp stay, and post-op narcotic use*

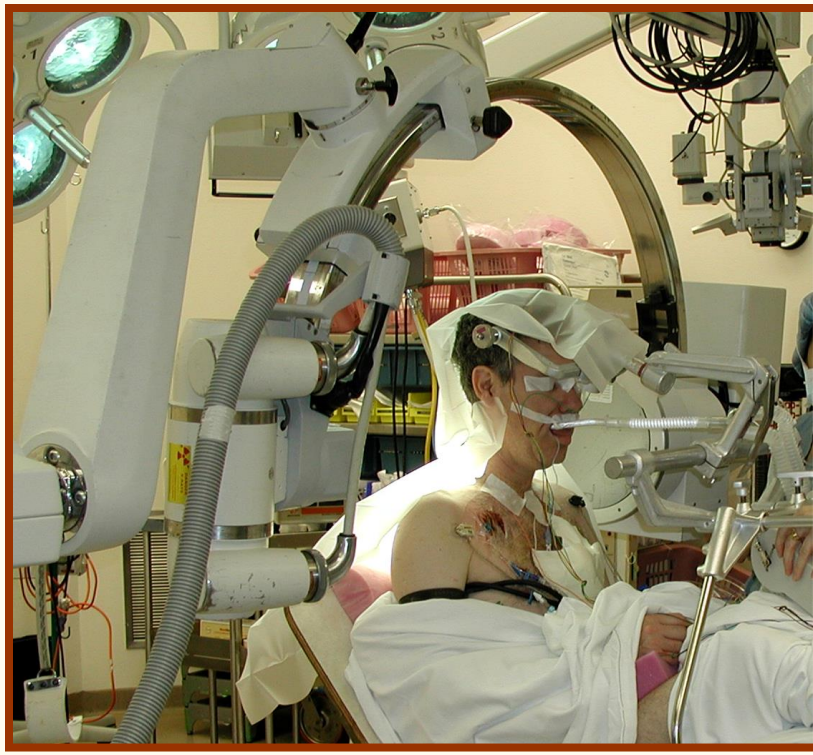


Multilevel MIS Foraminotomy

- High success rate – 90%
  - *J Spinal Disord Tech 2007*
  - 21 consecutive patients
  - Minimally invasive 2-level foraminotomy
    - Same side,radicular pain
    - EBL- 35cc
    - No peri-operative complications
    - Short stay

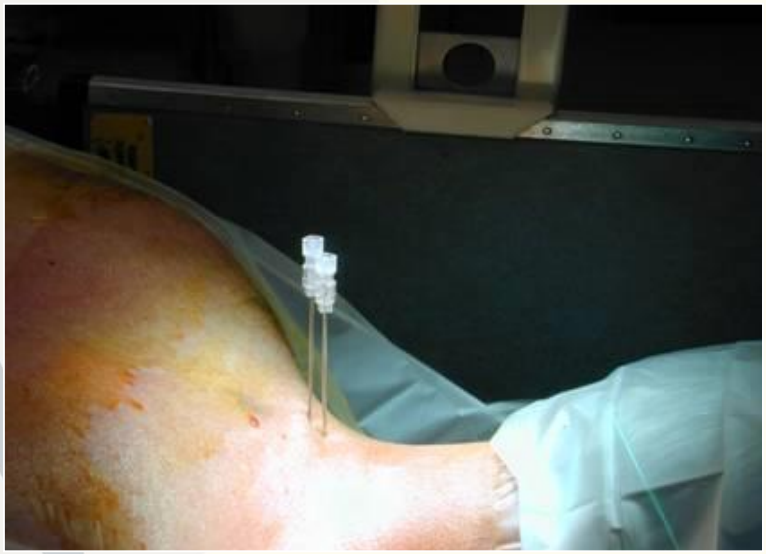
MIS Foraminotomy: Pearls

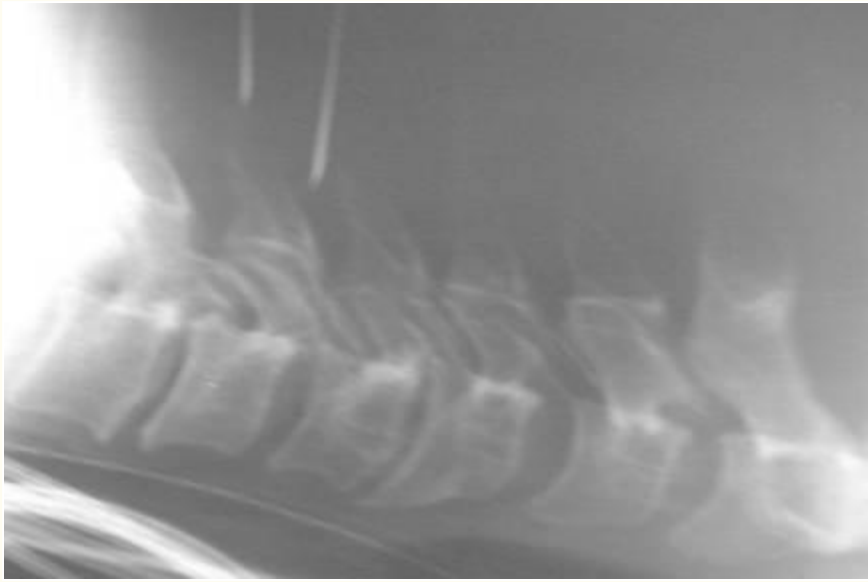
- 2 cm incision
- 1.5 cm off midline
- Can flex the c-spine to open the foramen using Mayfield tongs
- Can be done prone or upright
  - If prone, elevate the HOB to decrease bleeding

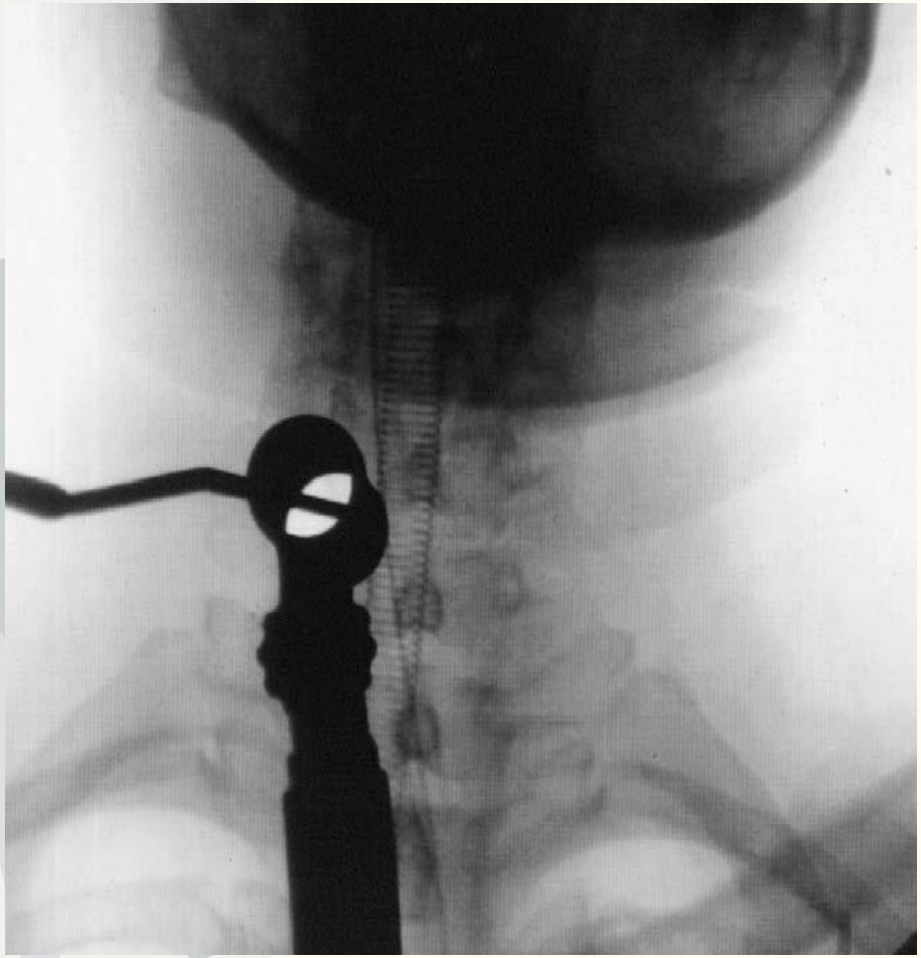


UNIVERSITY OF CALIFORNIA • IRVINE
ORTHOPÆDIC SURGERY

Cervical MIS Foraminotomy





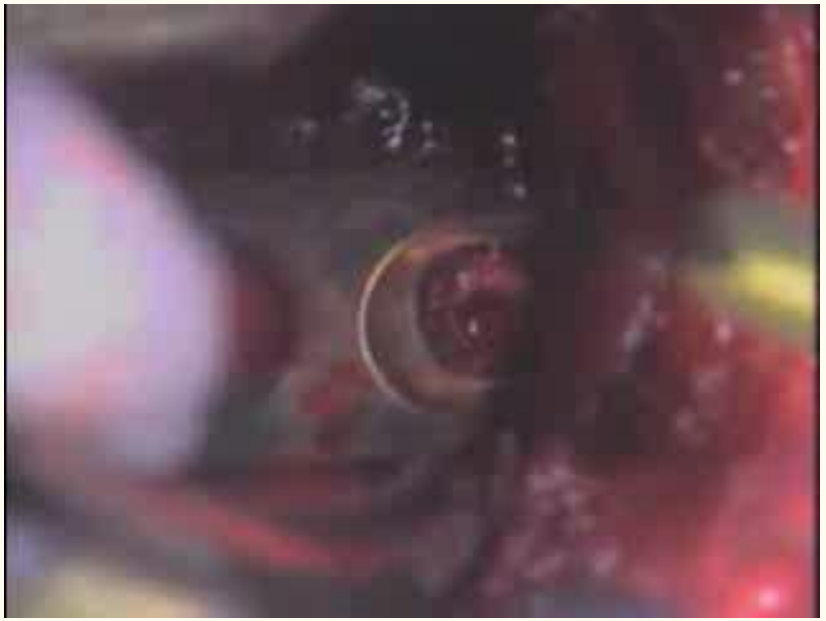



A

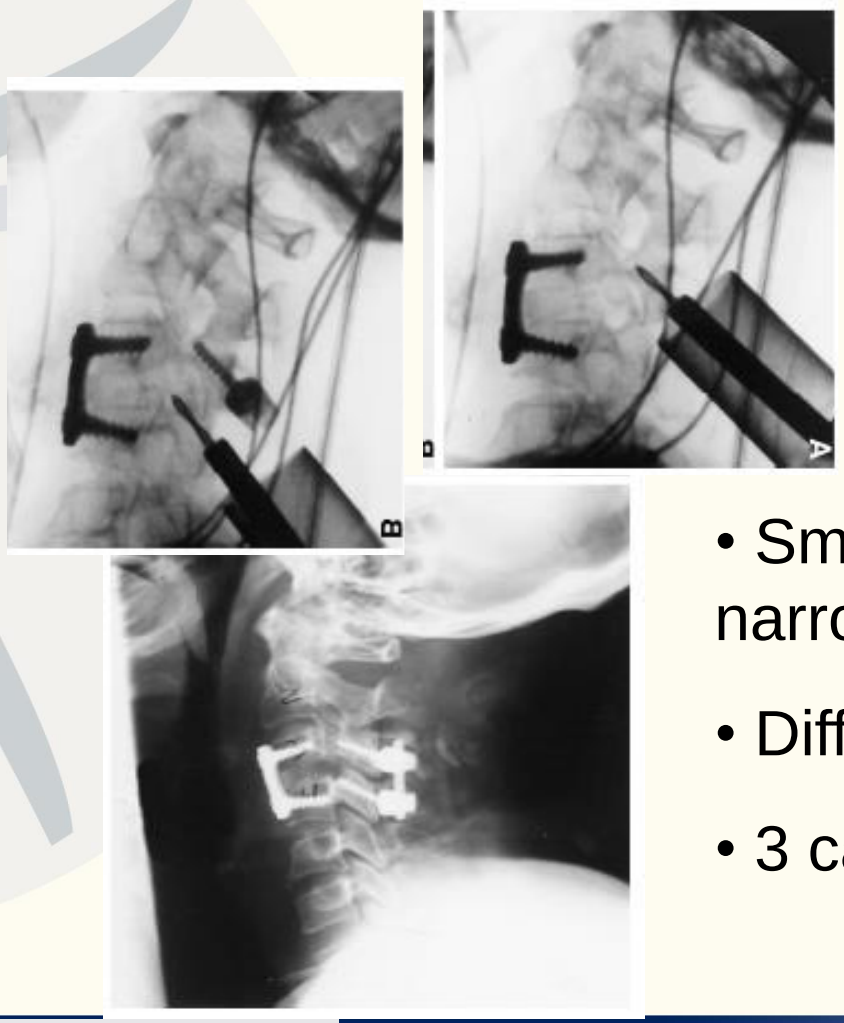

B

Posterior Cervical MIS Fusion

- Repair of anterior pseudarthrosis
- To “back up” longer anterior constructs
- 360 stabilization of cervical trauma



Minimally Invasive Lateral Mass Screws in the Treatment of Cervical Facet Dislocations: Technical Note



- Small diameter of tube – very narrow working corridor (22-40)
- Difficulty with rod placement
- 3 cases with facet dislocation

Neurosurgery 52:444-448, 2003

Minimally Invasive Lateral Mass Plating in the Treatment of Posterior Cervical Trauma

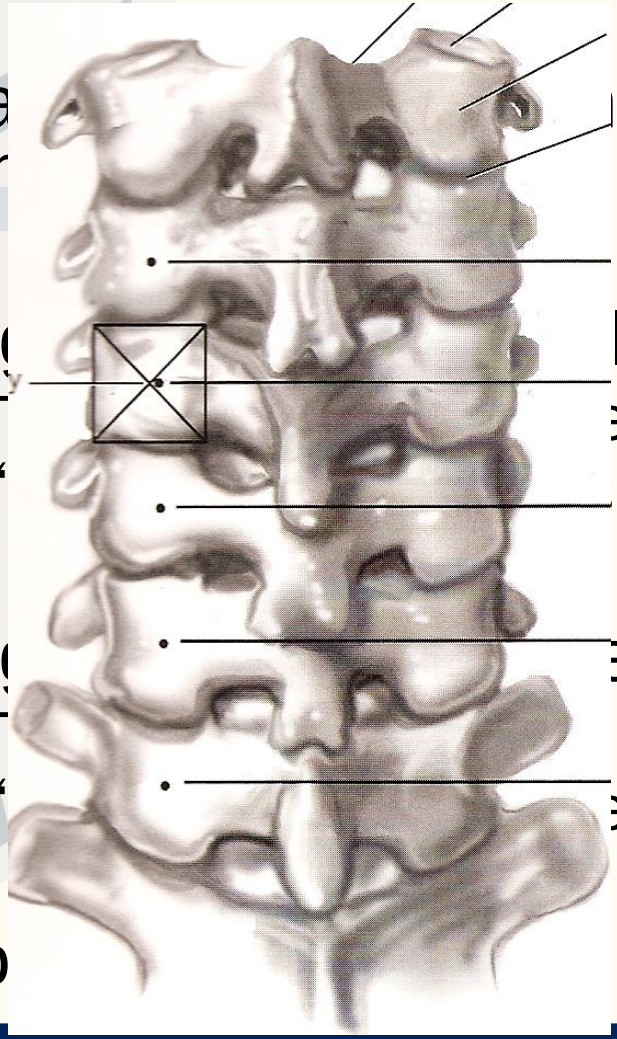
Surgical Technique

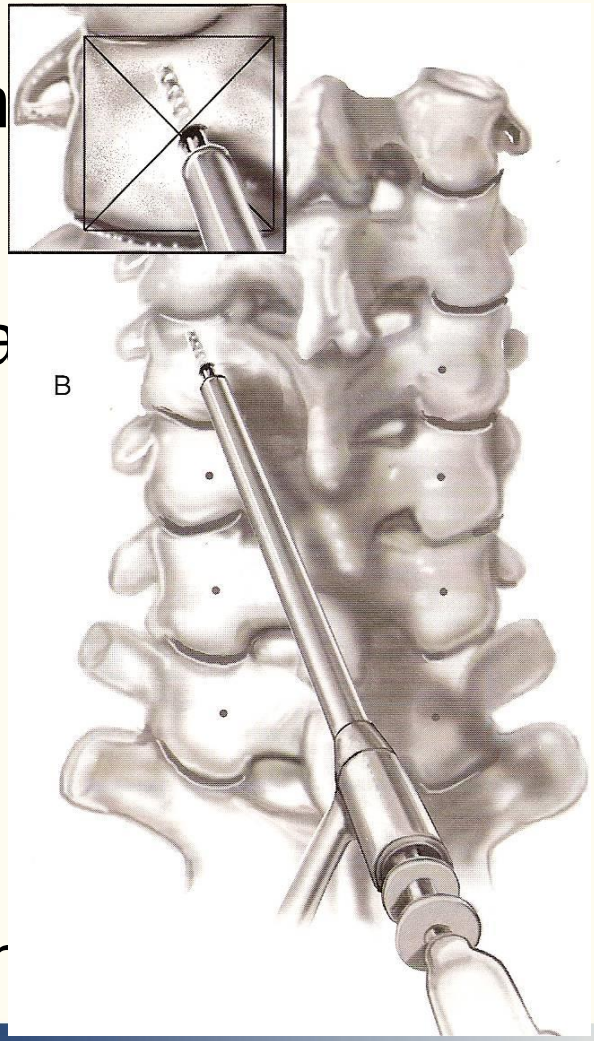
SheeYan Fong, MBBS, MMed, FRCS and Stephen Duplessis, MD, MMed, FRCS†*

J Spinal Disord Tech • Volume 18, Number 3, June 2005

Lateral Mass Screws: Magerl Technique

- Sta… …d ceph… cer… …mass
- An… …lel to fa…
  - –… …e root
  - –“… …ible”
- An… …eral
  - –… … artery
  - –“… …e”
- Mo… …mm lor…

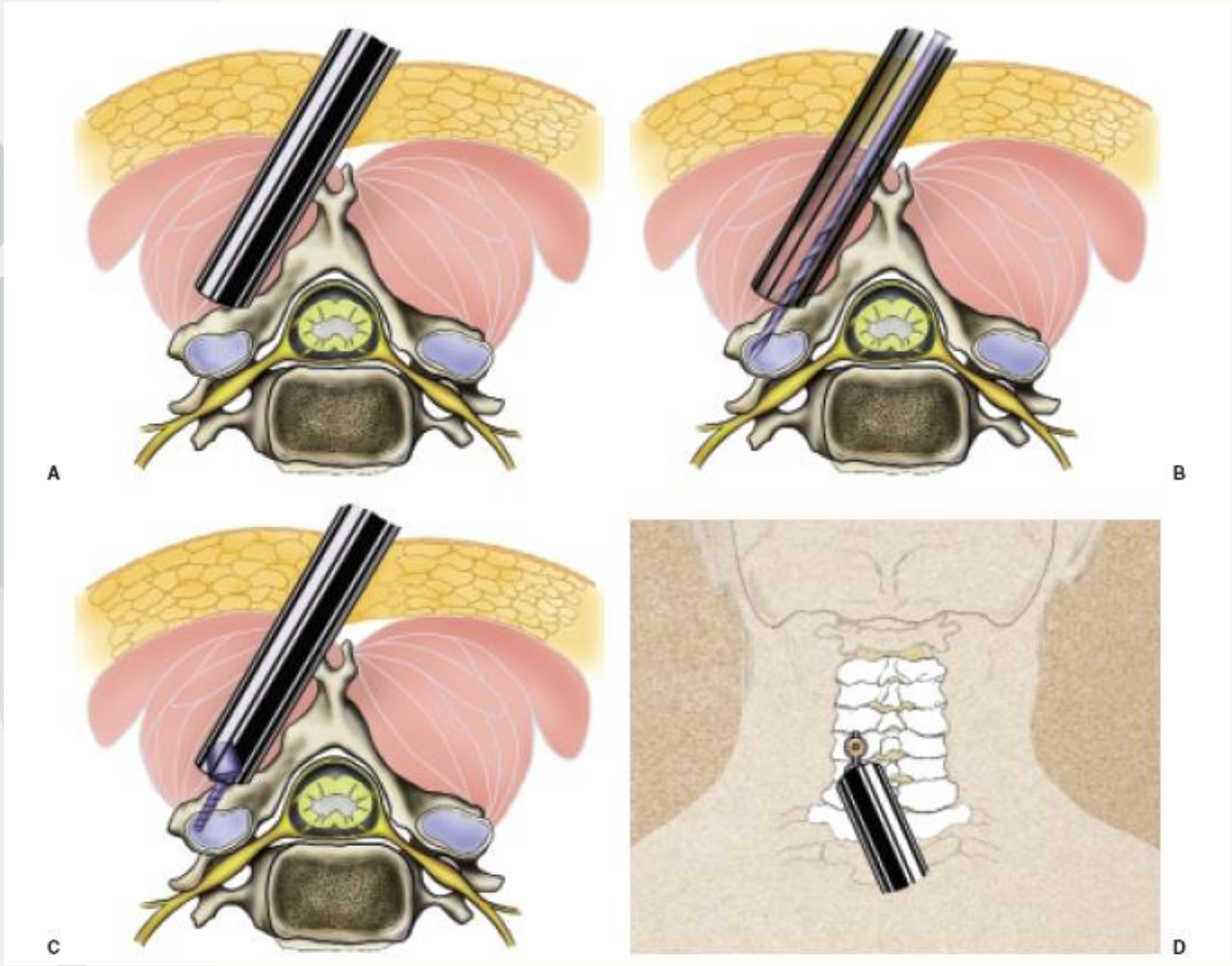


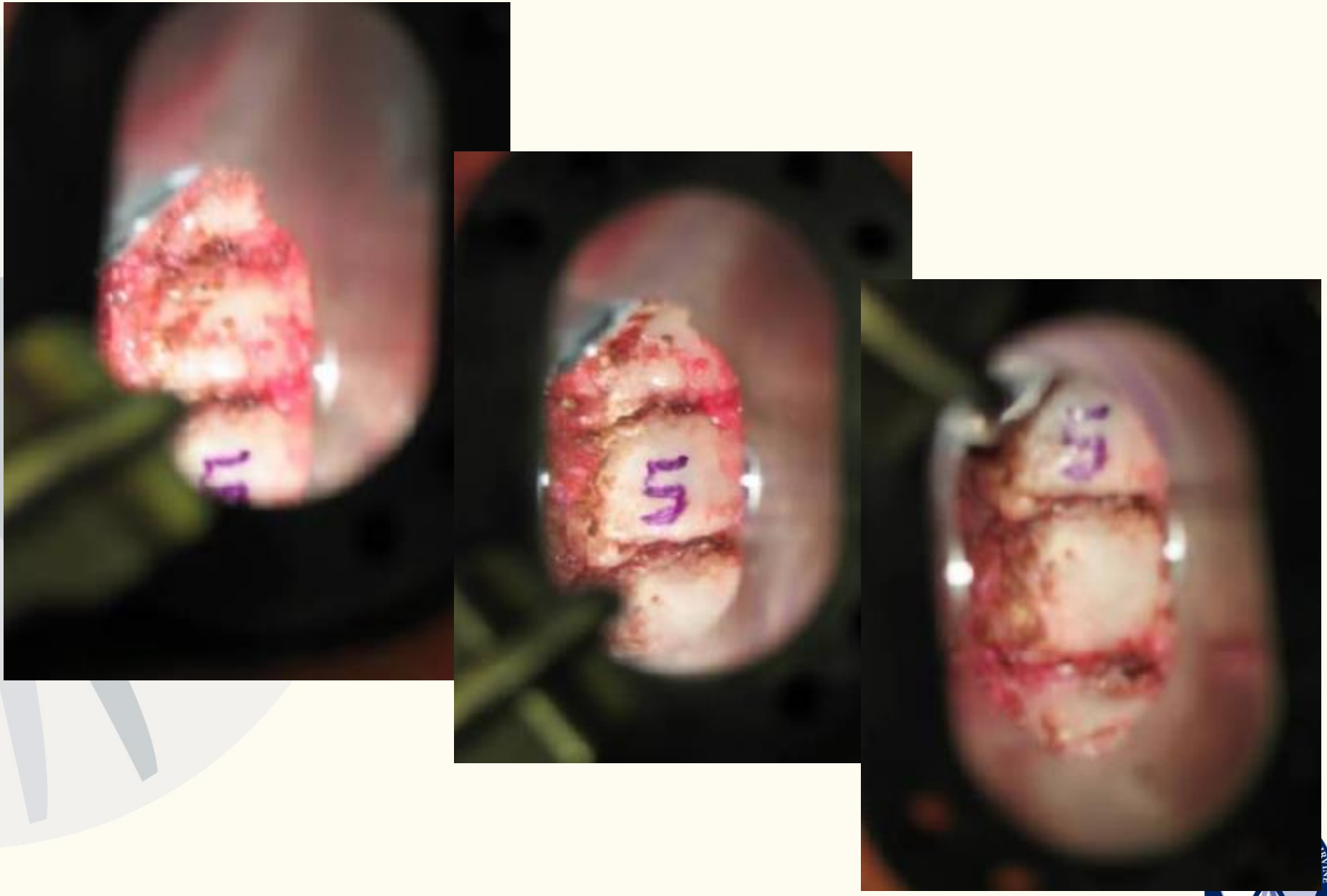


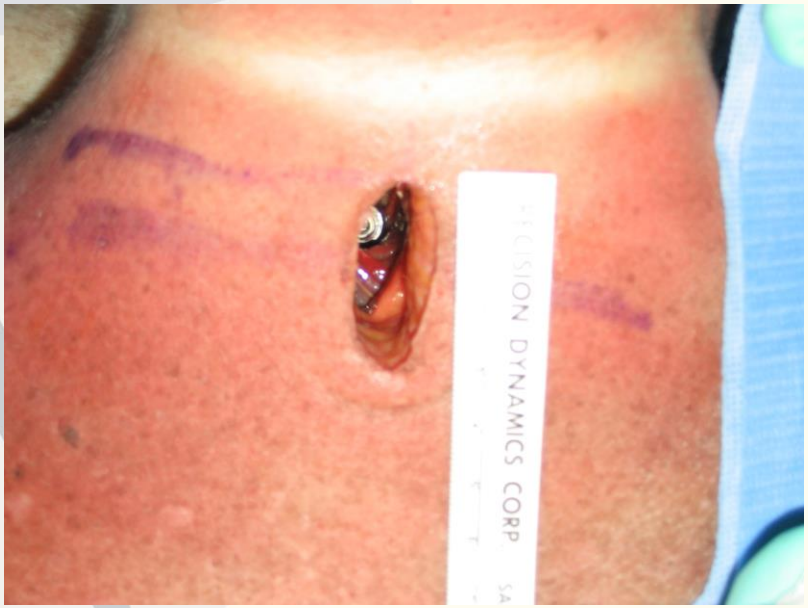
UNIVERSITY OF CALIFORNIA • IRVINE
ORTHOPÆDIC SURGERY

MIS Lateral Mass Fusion: Technique

- Preoperative CT for Planning
- Prone Positioning in Mayfield Headrest
- Fluoroscopy for incision planning
  - Approx 1-2 level below intended rostral target
- 3-4 cm Incision – Midline
- Consider using expandable retractor


A
B
C
D


5
5
5

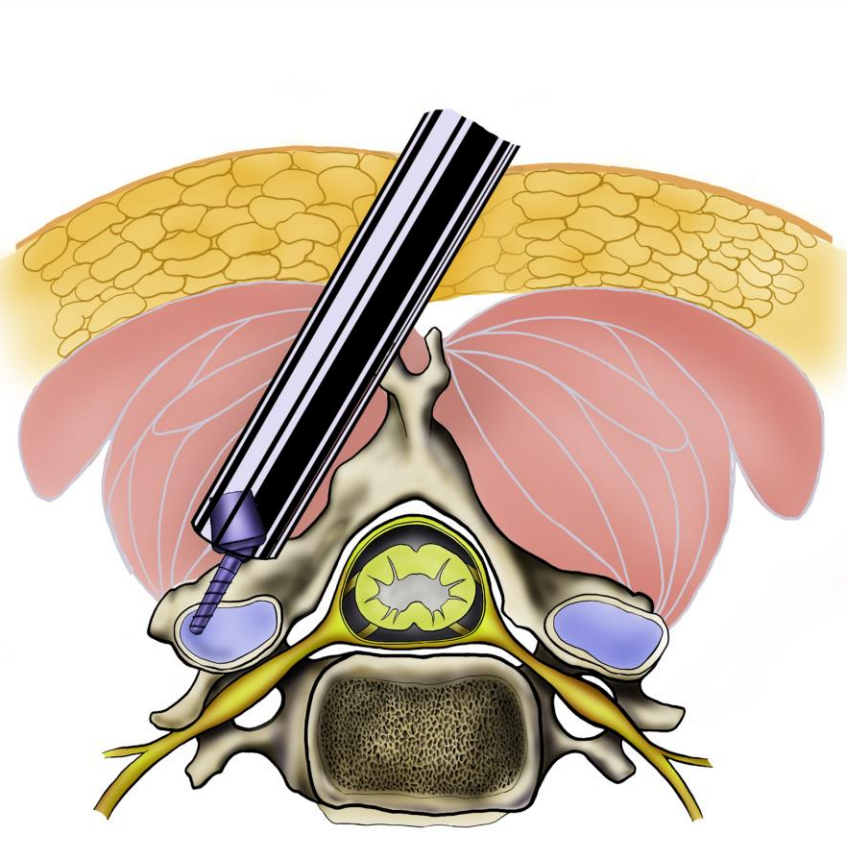


UNIVERSITY OF CALIFORNIA • IRVINE
ORTHOPÆDIC SURGERY

Open vs MIS Cervical

Minimally Invasive Cervical Surgery

- Allows minimally traumatic access for spinal procedures
- Useful in certain conditions
- MUST be able to achieve the goals of spine surgery including decompression and stabilization!!



Thank You!