The MIS Learning Curve:
What is it?
How do we improve it?

Choll W. Kim, MD, PhD
Spine Institute of San Diego
Center for Minimally Invasive Surgery
San Diego, CA

spine institute of SAN DIEGO

Minimally Invasive Spine
CENTERS OF EXCELLENCE

ADVANCED SPINE & JOINT INSTITUTE | ALVARADO HOSPITAL MEDICAL CENTER

DISCLOSURE

CONSULTANT/SPEAKER

- Globus
- Joimax
- K2M
- Allen Hill-Rom
- Safewire
- Nutech
- Mainstay
- Zimmer Biomet
- OR Hub

ROYALTIES

- Globus (Caliber, Intercontinental, MIS Creo)
- Nutech (SI Fix)
- K2M (MIS ACDF System)

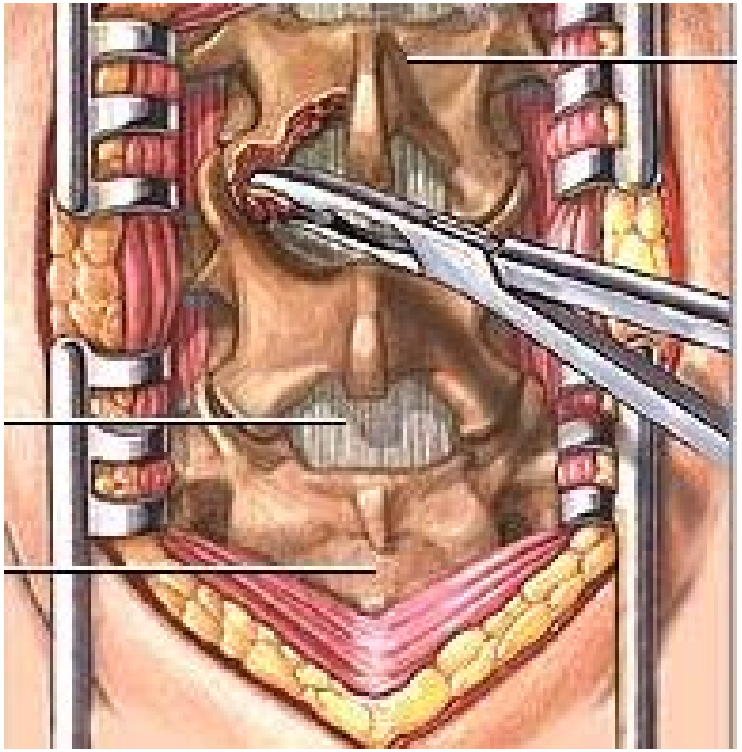
MEDICAL BOARD of DIRECTORS

- Globus Medical

Benefits of MIS

1. Less blood loss
2. Less infections
3. Less post-op pain
4. Shorter hospital stay
5. Strong patient demand
6. Intense technology development
7. Cost effectiveness?
8. Long-term benefits?

Where are we going?



“All surgical techniques evolve to become less invasive”

Why is it taking so long?

SASJournal

MINIMALLY INVASIVE SURGERY

Surgeon Perceptions of Minimally Invasive Spine Surgery

Jonathan Webb,[a] Lionel Gottschalk IV,[a] Yu-Po Lee, MD,[a] Steven Garfin, MD,[a] Choll Kim, MD[a]

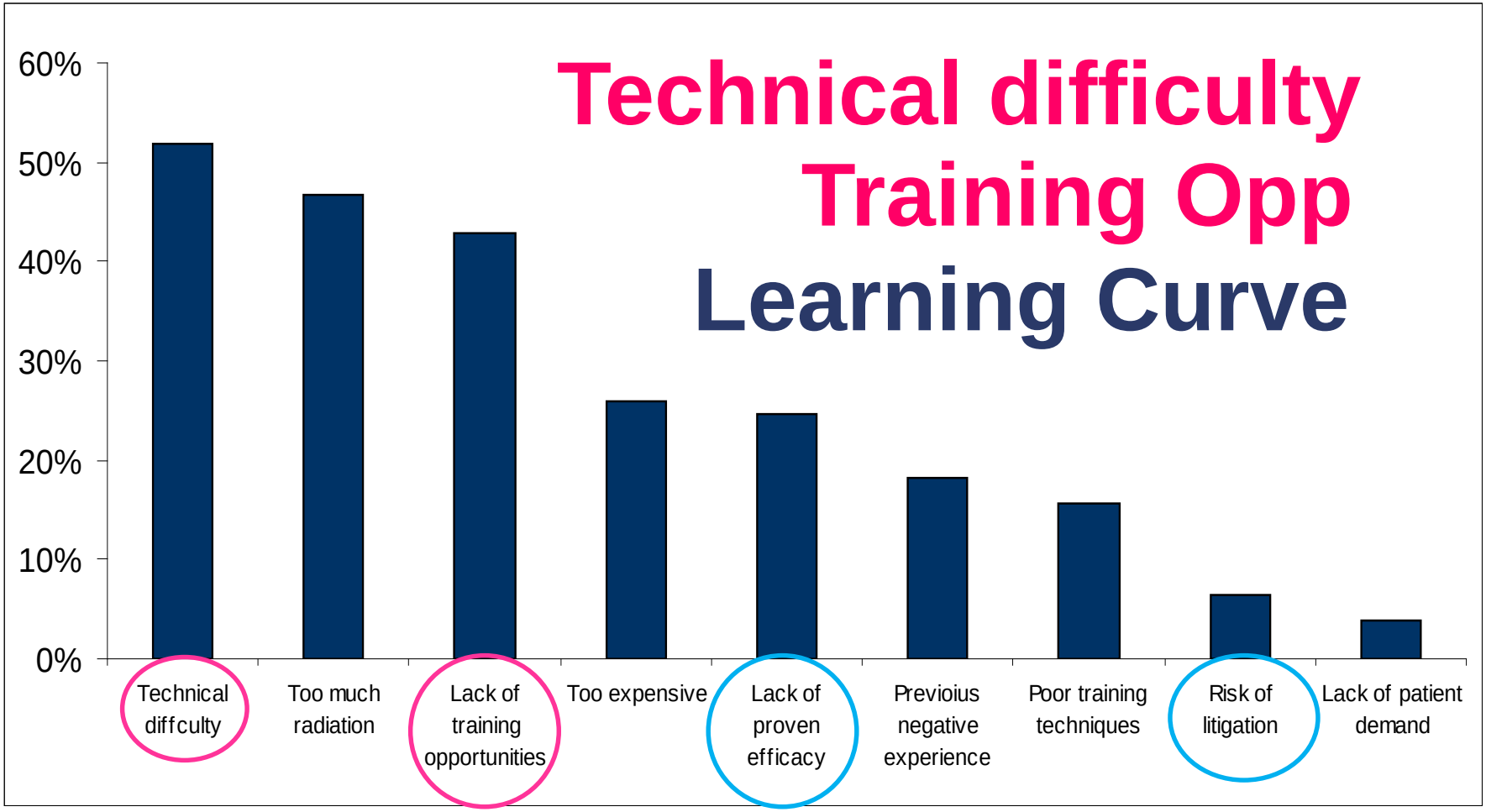
PURPOSE

- Assess surgeon perceptions of MIS
- Better understand poor acceptance

SURGEON SURVEY

- 8 item questionnaire
- Assess perceptions of MIS
  - *Obstacles to adoption*
  - *Perceived benefits*
  - *Desire to adopt MIS*

OBSTACLES TO ADOPTION



n = 87

OBSTACLES TO ADOPTION

NOT…

Lack of RCTs

MAIN BARRIER…

Learning curve

Clin Orthop Relat Res (2014) 472:1711–1717
DOI 10.1007/s11999-014-3495-z

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

SYMPOSIUM: MINIMALLY INVASIVE SPINE SURGERY

Complications Associated With the Initial Learning Curve of Minimally Invasive Spine Surgery

A Systematic Review

Joseph A. Sclafani MD, Choll W. Kim MD, PhD

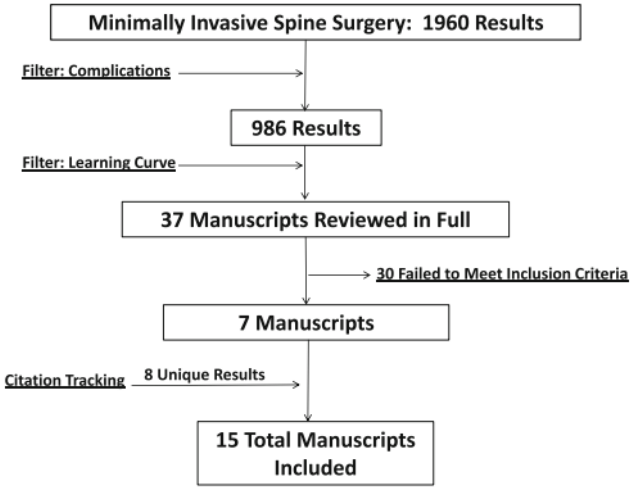


Fig. 1 A flow diagram illustrates the search and selection process.

Results The most common learning curve complication for decompressive procedures was durotomy. For fusion procedures, the most common complications were implant malposition, neural injury, and nonunion. The overall postoperative complication rate was 11% (109 of 966 cases). The learning curve was overcome for operative time and complications as a function of case numbers in 20 to 30 consecutive cases for most techniques discussed within this review.

Conclusions The quantitative assessment of the procedural learning curve for MIS techniques for the spine remains challenging because the MIS techniques have different learning curves and because they have not been assessed in a consistent manner across studies. Complication rates may be underestimated by the studies we identified because surgeons tend to select patients carefully during the early learning curve period. The field of MIS would benefit from a standardization of study design and collected parameters in future learning curve investigations.

Clin Orthop Relat Res (2014) 472:1711–1717
DOI 10.1007/s11999-014-3495-z

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

SYMPOSIUM: MINIMALLY INVASIVE SPINE SURGERY

Complications Associated With the Initial Learning Curve of Minimally Invasive Spine Surgery

A Systematic Review

Joseph A. Sclafani MD, Choll W. Kim MD, PhD

The learning curve varies markedly…

Useful information???

How can we improve the learning curve?

What NOT to do…

- ❑ Crowded lab stations
- ❑ Limited hands-on experience
- ❑ Incomplete procedure
- ❑ Inconsistent techniques

Difficulty with 1st case → **Poor Adoption**

Most MIS Courses…

SKIN

-2-

SKIN

Program

Skin-to-Skin Program

Day 1 (Friday)

- *Case observation*
- *Postop discussion*

Day 2 (Saturday)

- *Round on post-op patients*
- *Cadaver lab (ASC)*
  - 1:1 Surgeon-Cadaver-Fluoro
  - Practice entire procedure
  - Detailed technique guide

S2S MIS TLIF

Technique Guide

Checklists

Step-step instructions

Technique pearls

The Checklist Manifesto

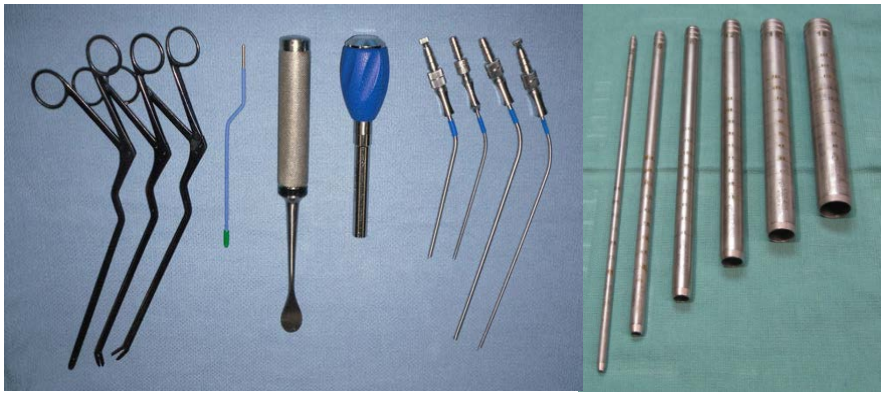
Tasks prior to patient going back to room

[ ] Fluoro from opposite side of TLIF
[ ] Operating microscope on same side of TLIF
[ ] Light Source same side of TLIF
[ ] Table mount placed at hip line (opposite side as TLIF)
[ ] 2.5mm matchstick burr (AM-8)-angled handle
[ ] Globus sets, Custom Sets (see separate checklist)
[ ] Bone Graft (Eg. Infuse, Conduct)
[ ] Powdered Gelfoam + Thrombin
[ ] 1/2 x 1/2 PATTIES
[ ] 1 MIS Neuro Sucker
[ ] 1 Plastic Sucker
[ ] Bayoneted Bovie Tip
[ ] MIS bipolars

MAYO STAND #2

TLIF Exposure

- [ ] 0.5% Marcaine
- [ ] #11 Scalpel
- [ ] Dilators & 3V Frame
- [ ] 3V Light Source
- [ ] Cobb Elevator
- [ ] Bayonetted Bovie
- [ ] Pituitary (Straight, up, down)
- [ ] MARS 3V Wrench (J-Lo)
- [ ] MIS Neuro Suckers

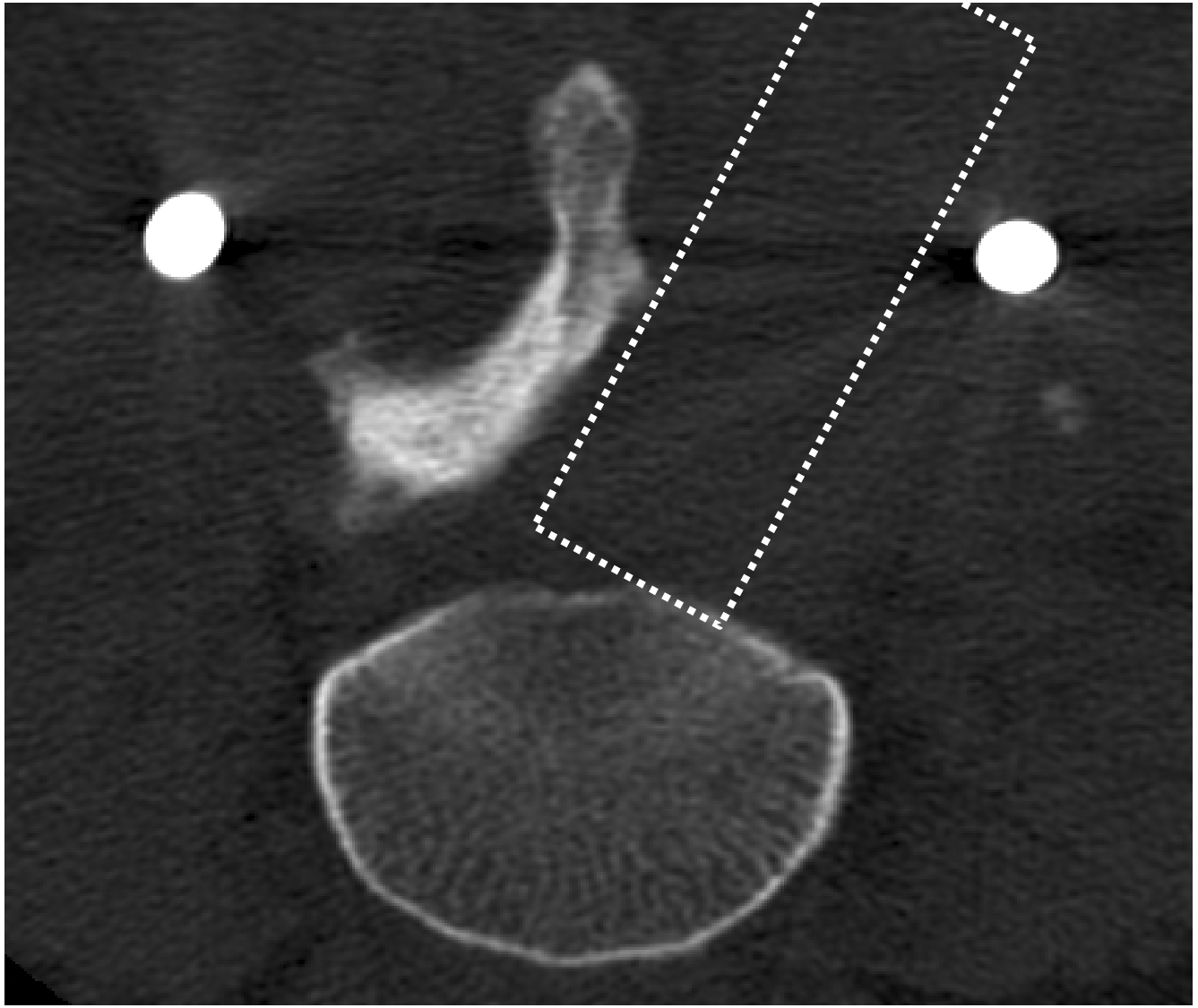


ADDRESS SPECIFIC AREAS OF *CONCERN/CHALLENGE*

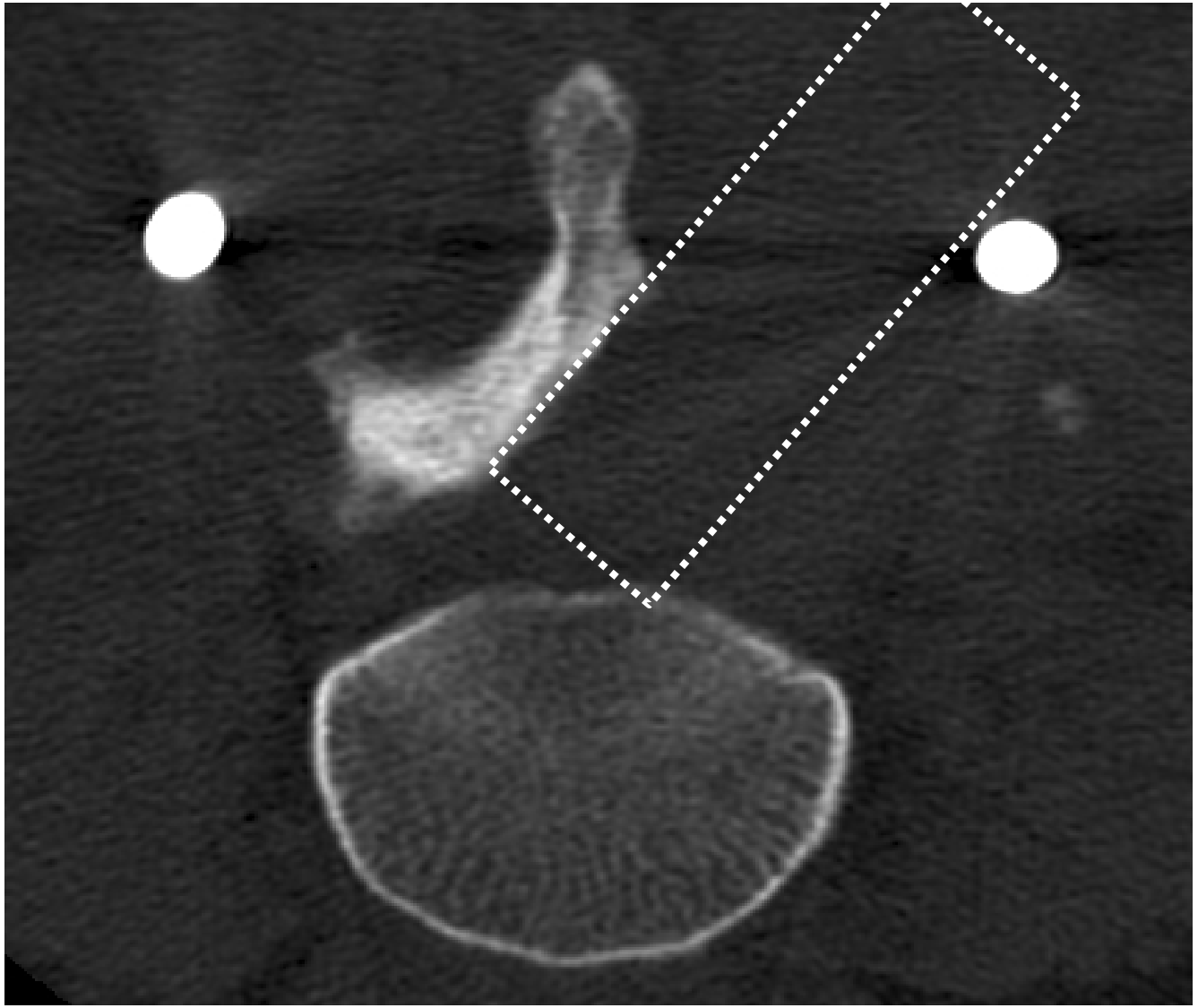
FOR EXAMPLE…

Can you do a good contralateral decompression?

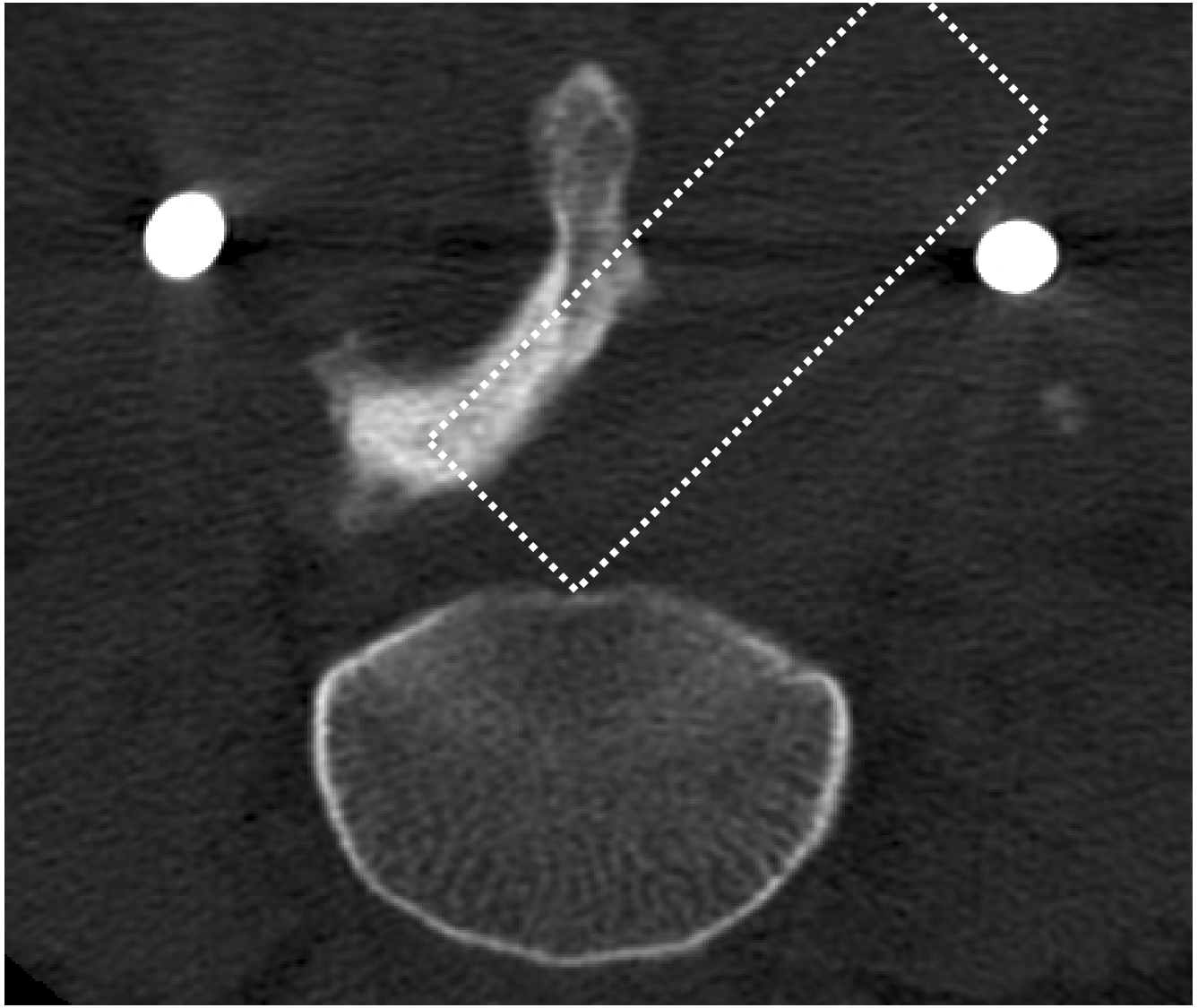
CONTRALATERAL DECOMPRESSION



CONTRALATERAL DECOMPRESSION



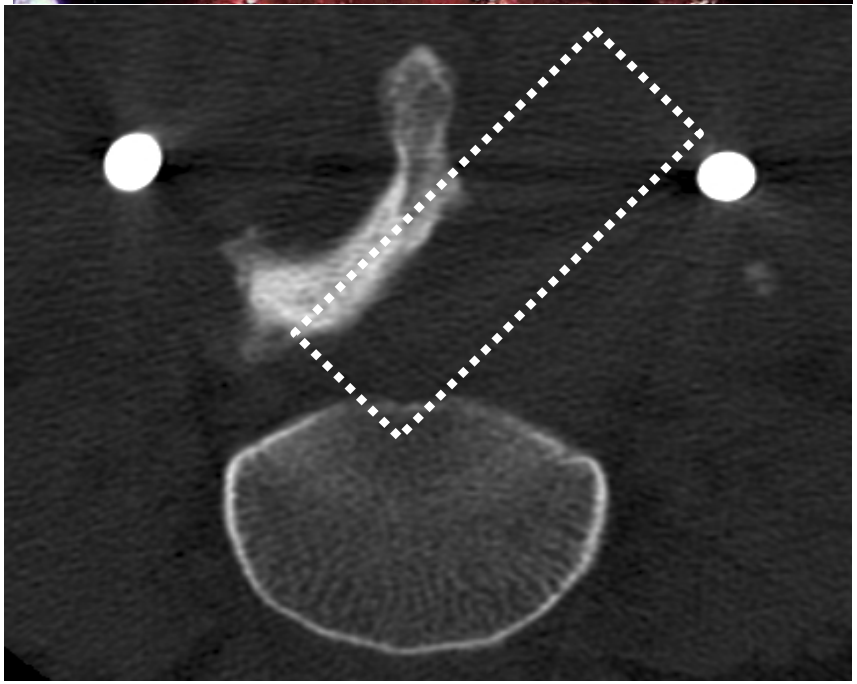
CONTRALATERAL DECOMPRESSION



CONTRALATERAL DECOMPRESSION

RETRACTOR POSITION

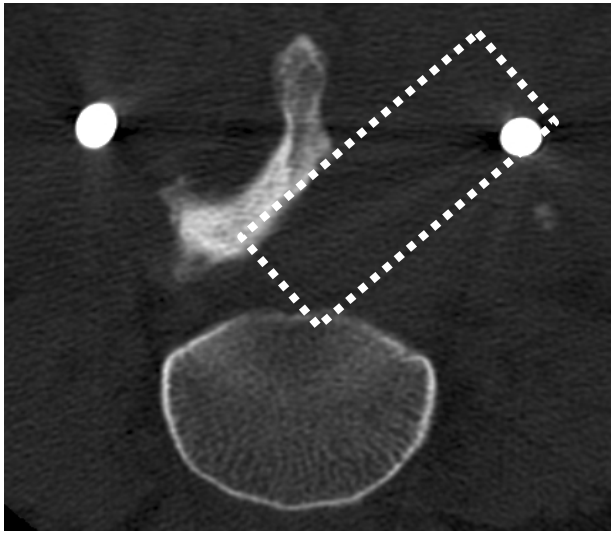
Geometry…

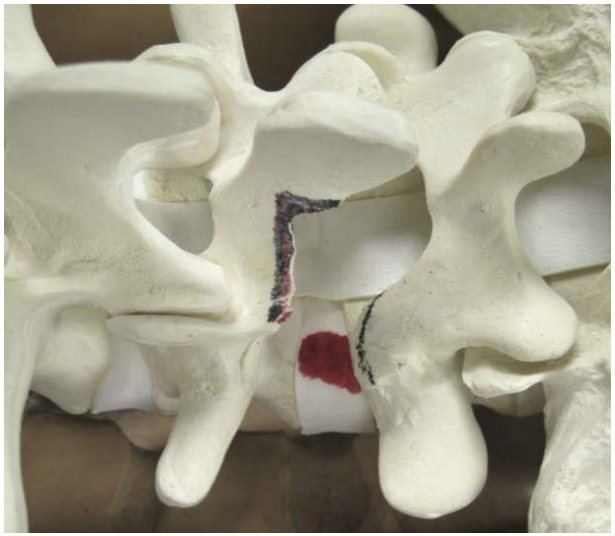


Can you do a good interbody reconstruction and fusion?

FACETECTOMY & DECOMPRESSION

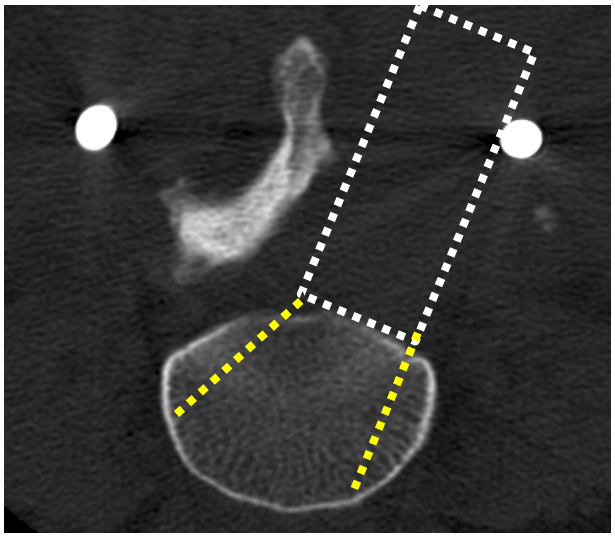
- Redirect exposure laterally to find disc

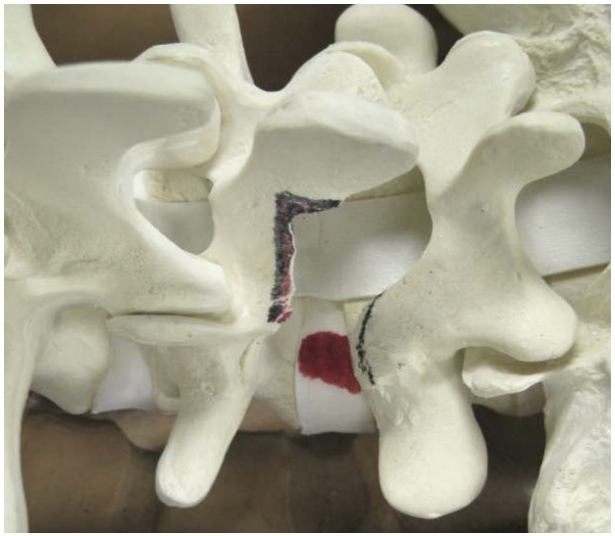




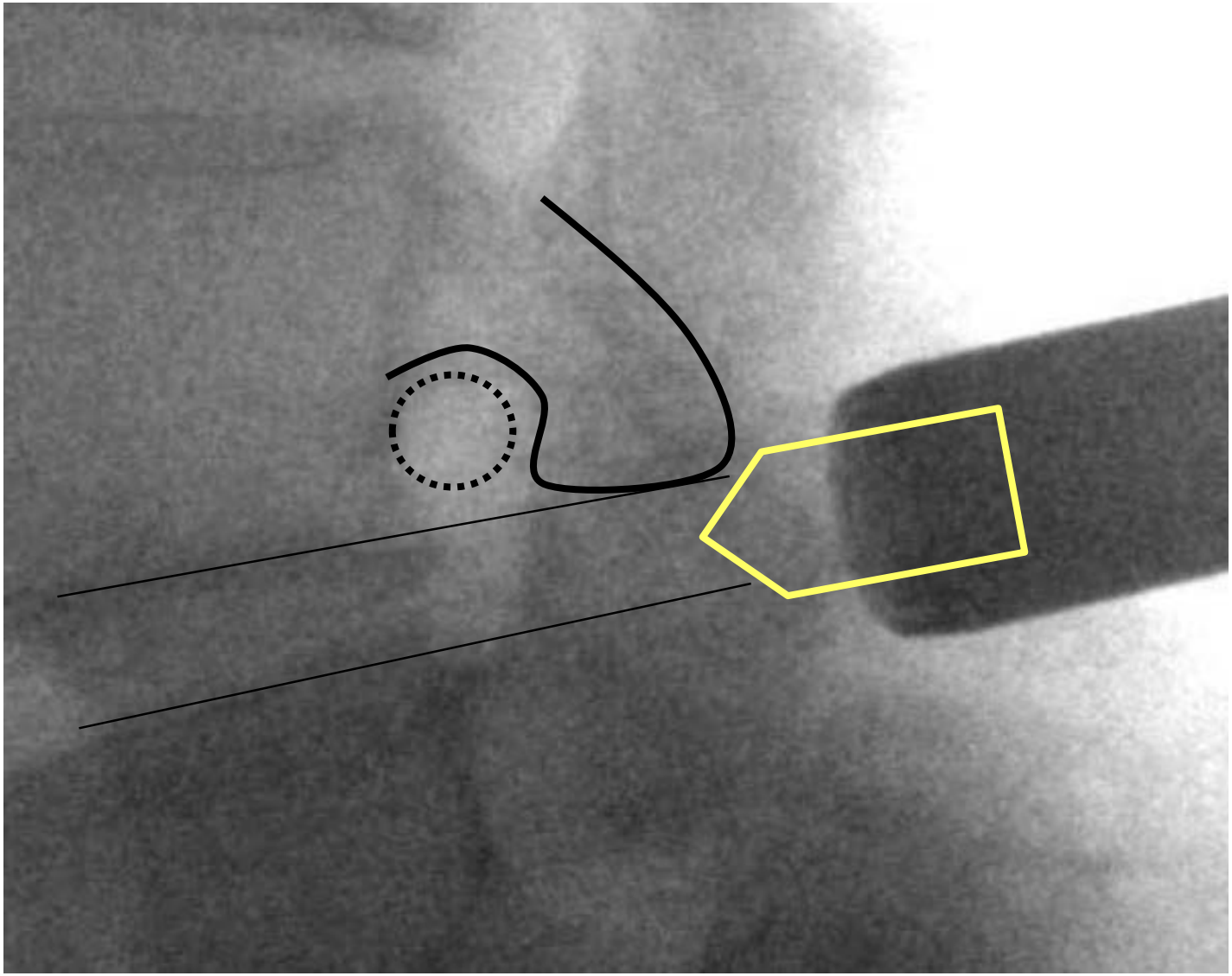
FACETECTOMY & DECOMPRESSION

- Redirect exposure laterally to find disc
- Perform a thorough discectomy
- Keep pars to protect exiting nerve root

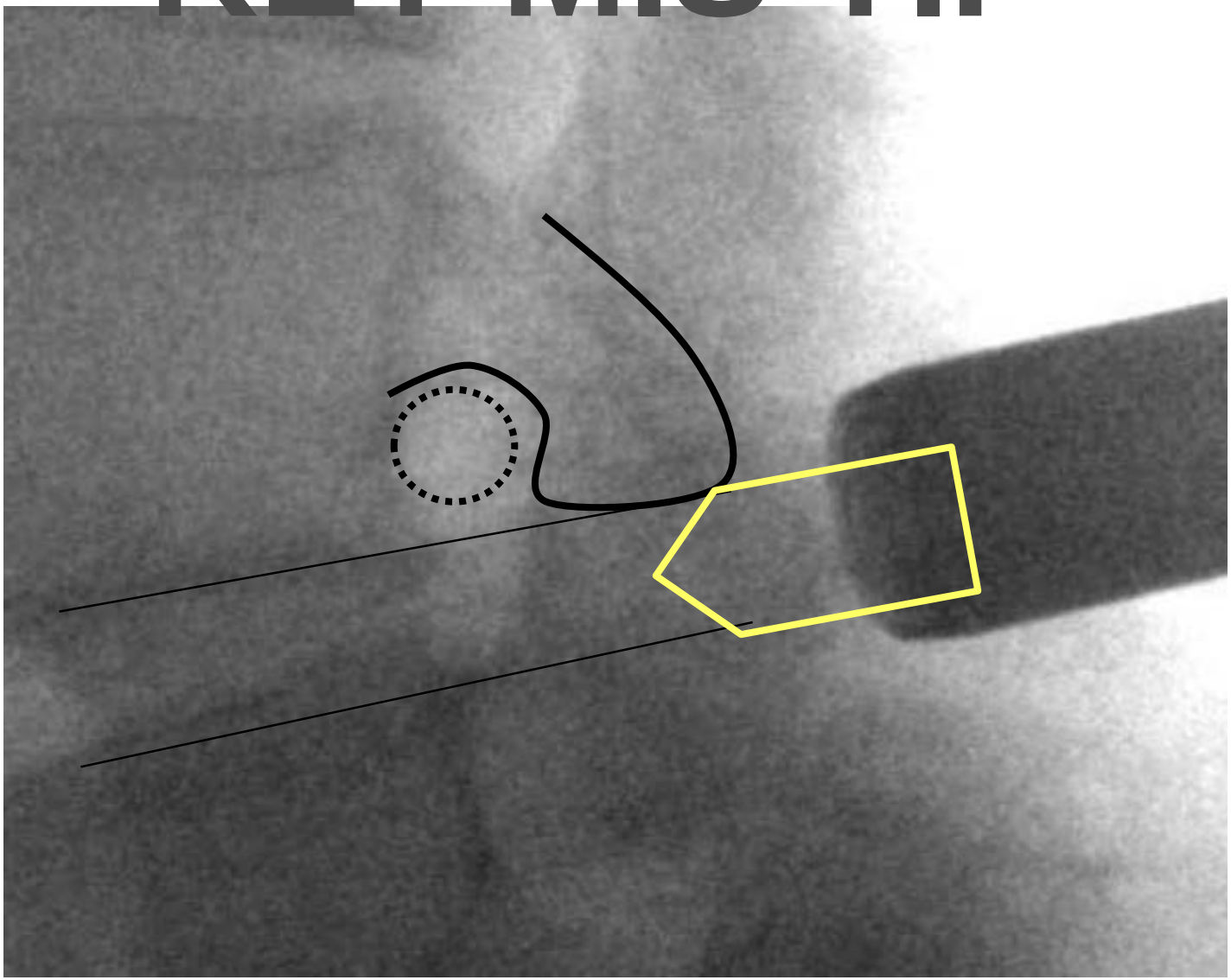




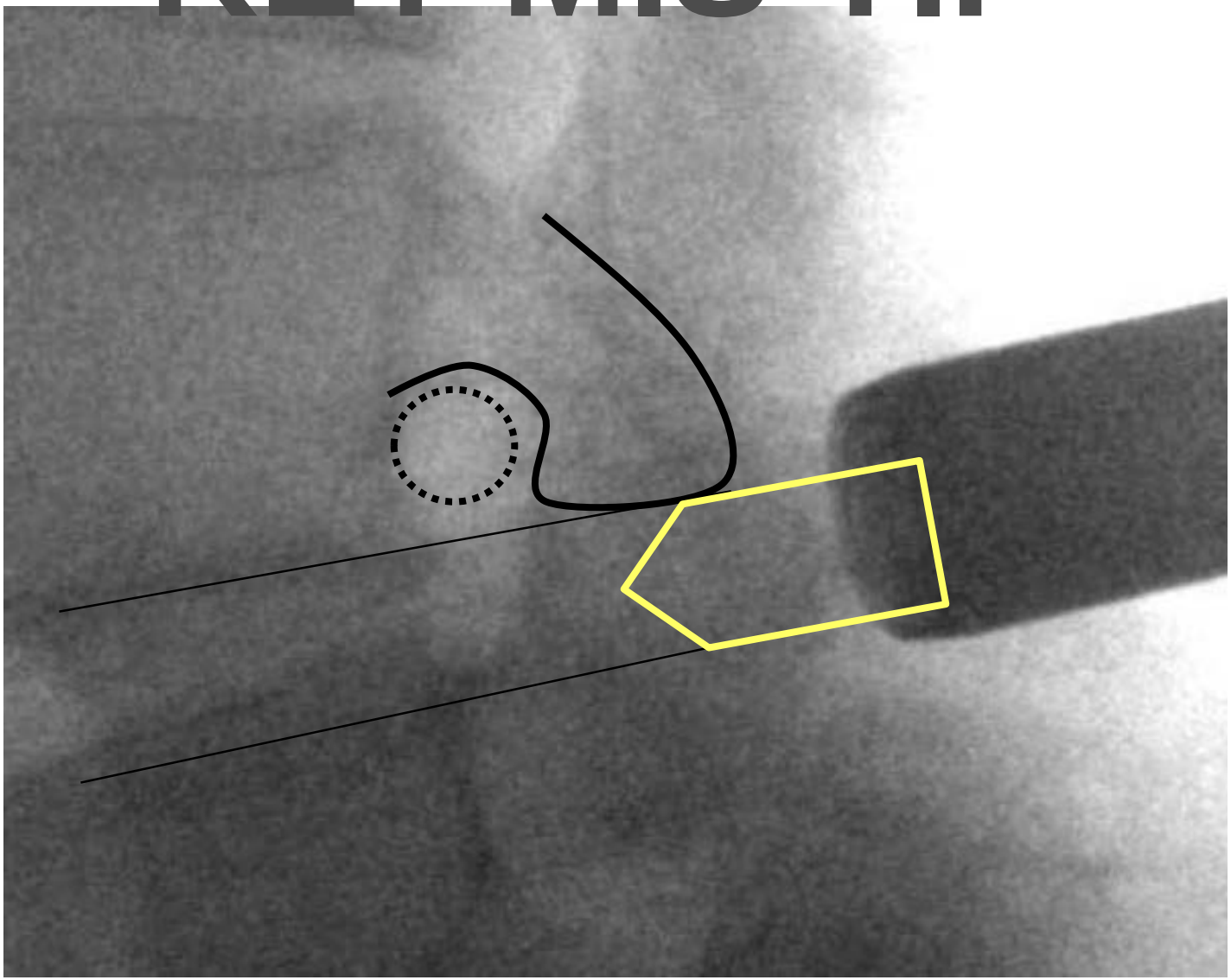
KEY MIS TIP



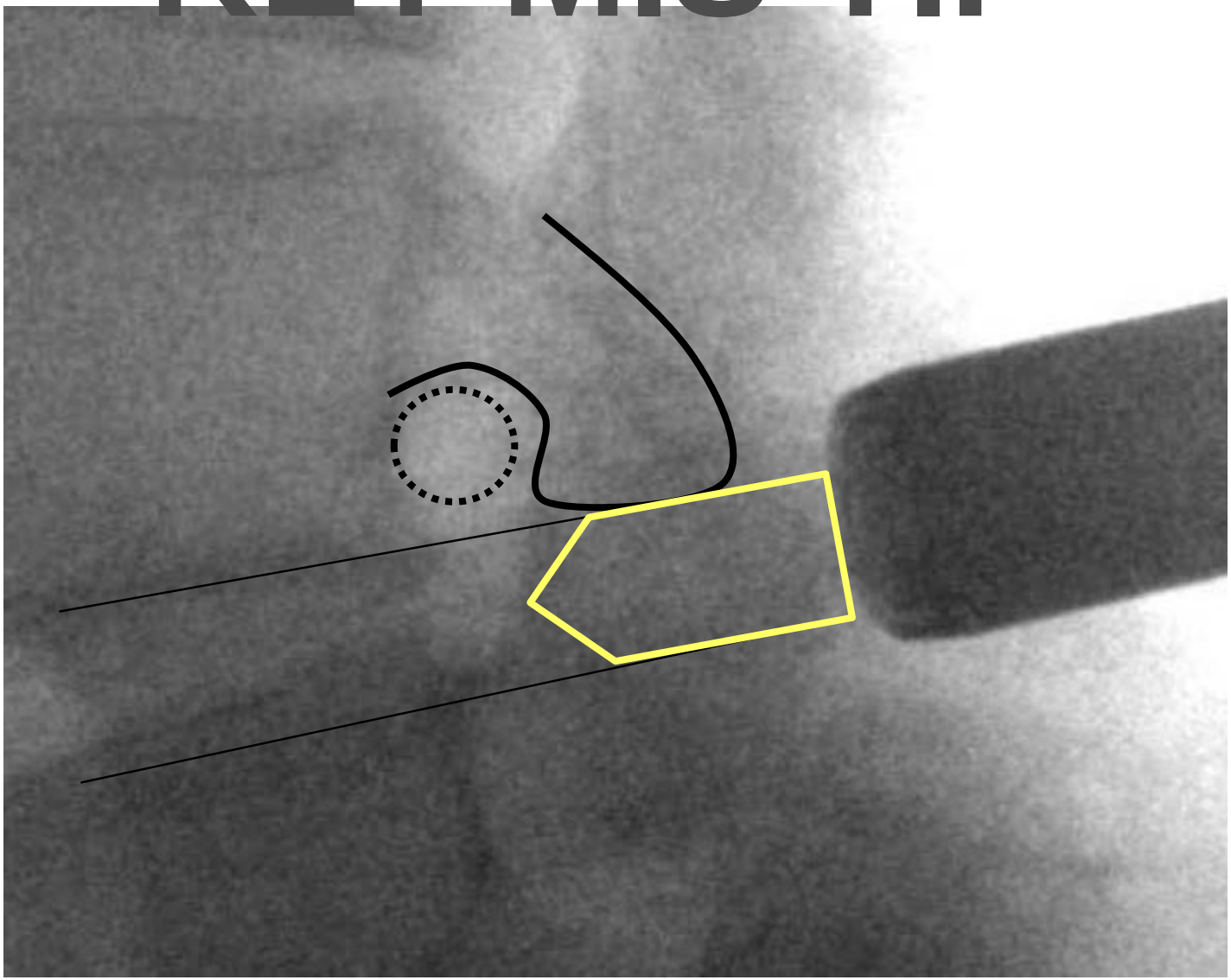
KEY MIS TIP



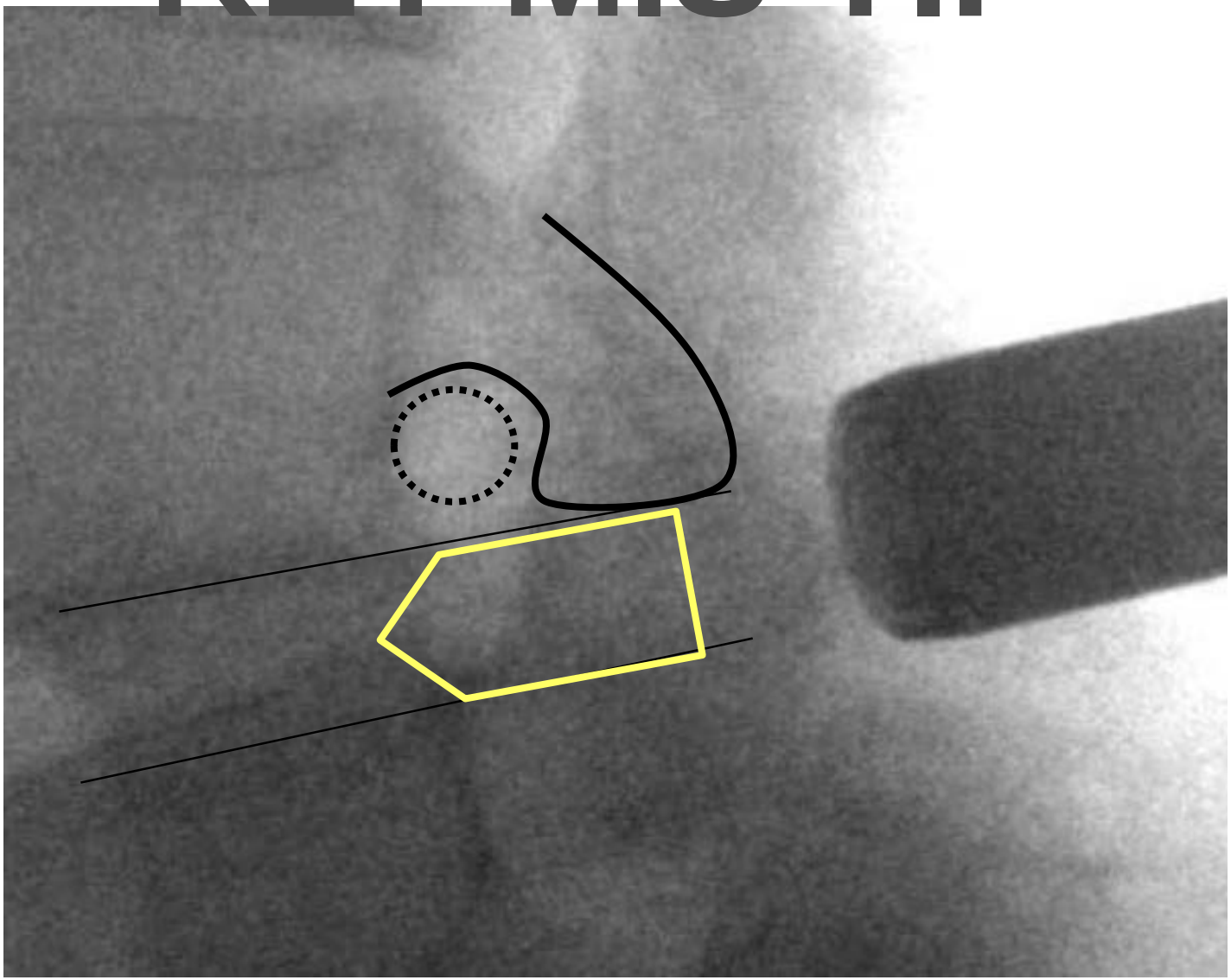
KEY MIS TIP



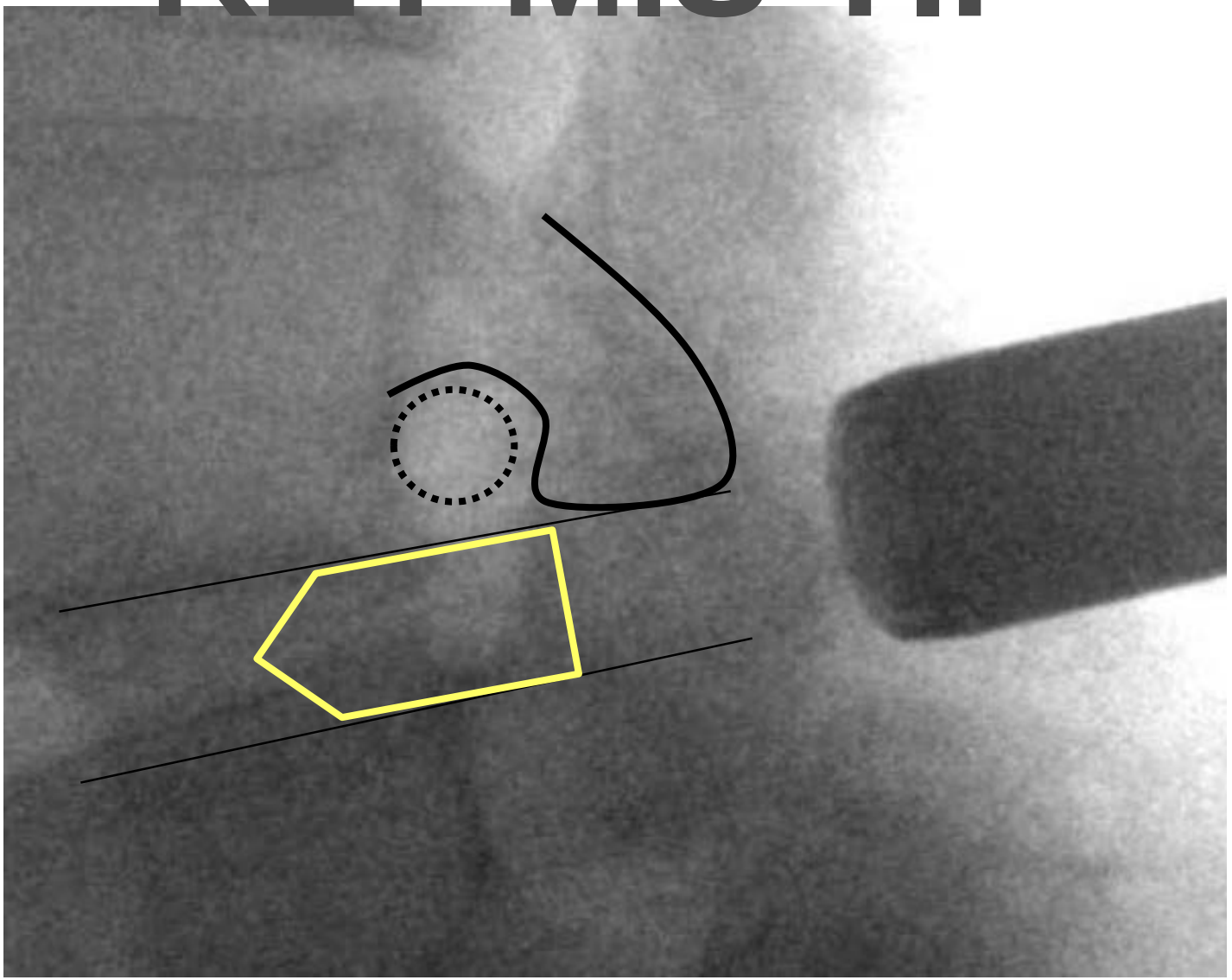
KEY MIS TIP



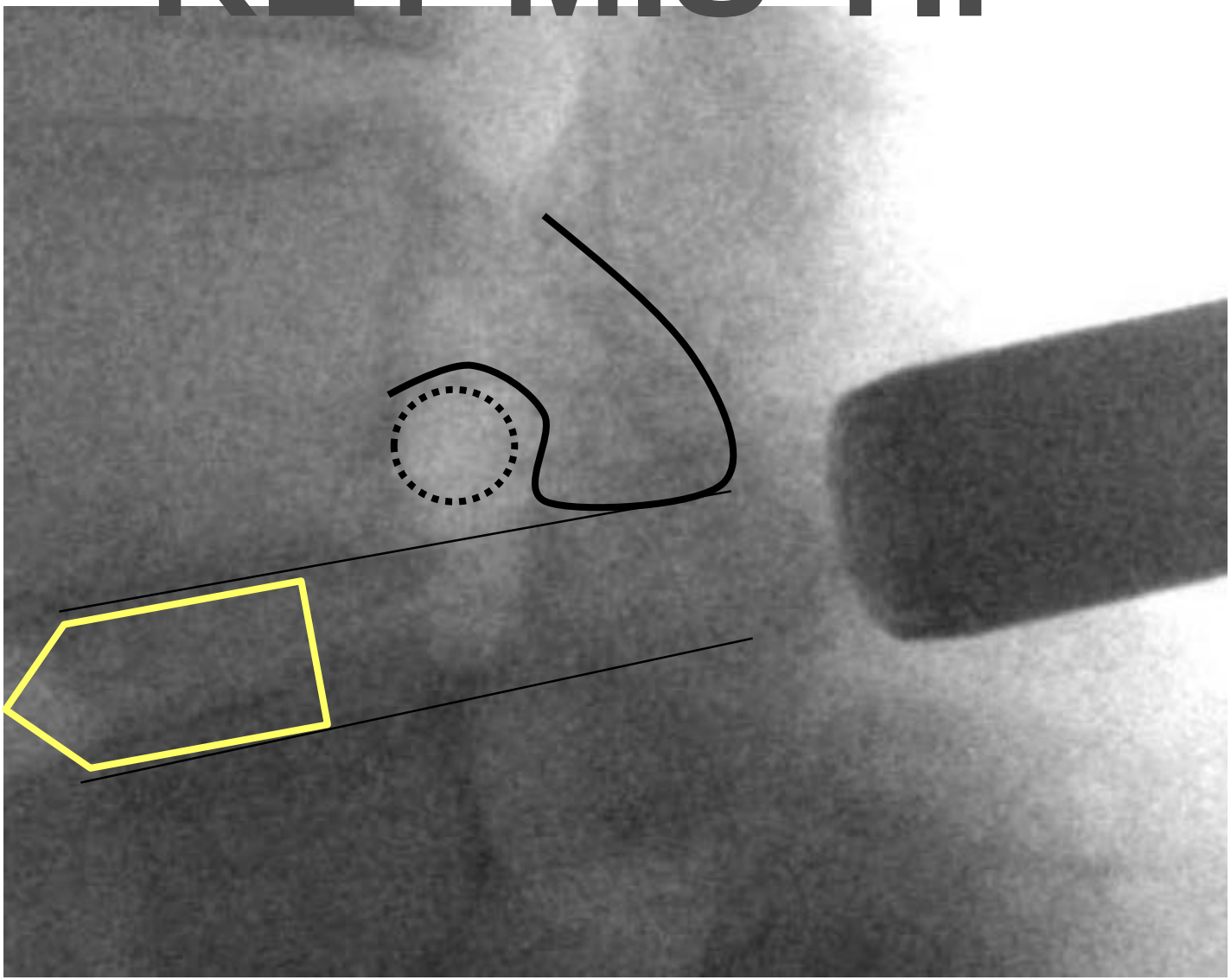
KEY MIS TIP



KEY MIS TIP



KEY MIS TIP



Technique guide is a Navy Seal trail map…

Not a marketing pamphlet!!!

Skin-to-Skin Program

How well is the S2S program working?

S2S Impact Score

Cases Performed Within the First Year After Training

0 = No cases

1 = 1 case only

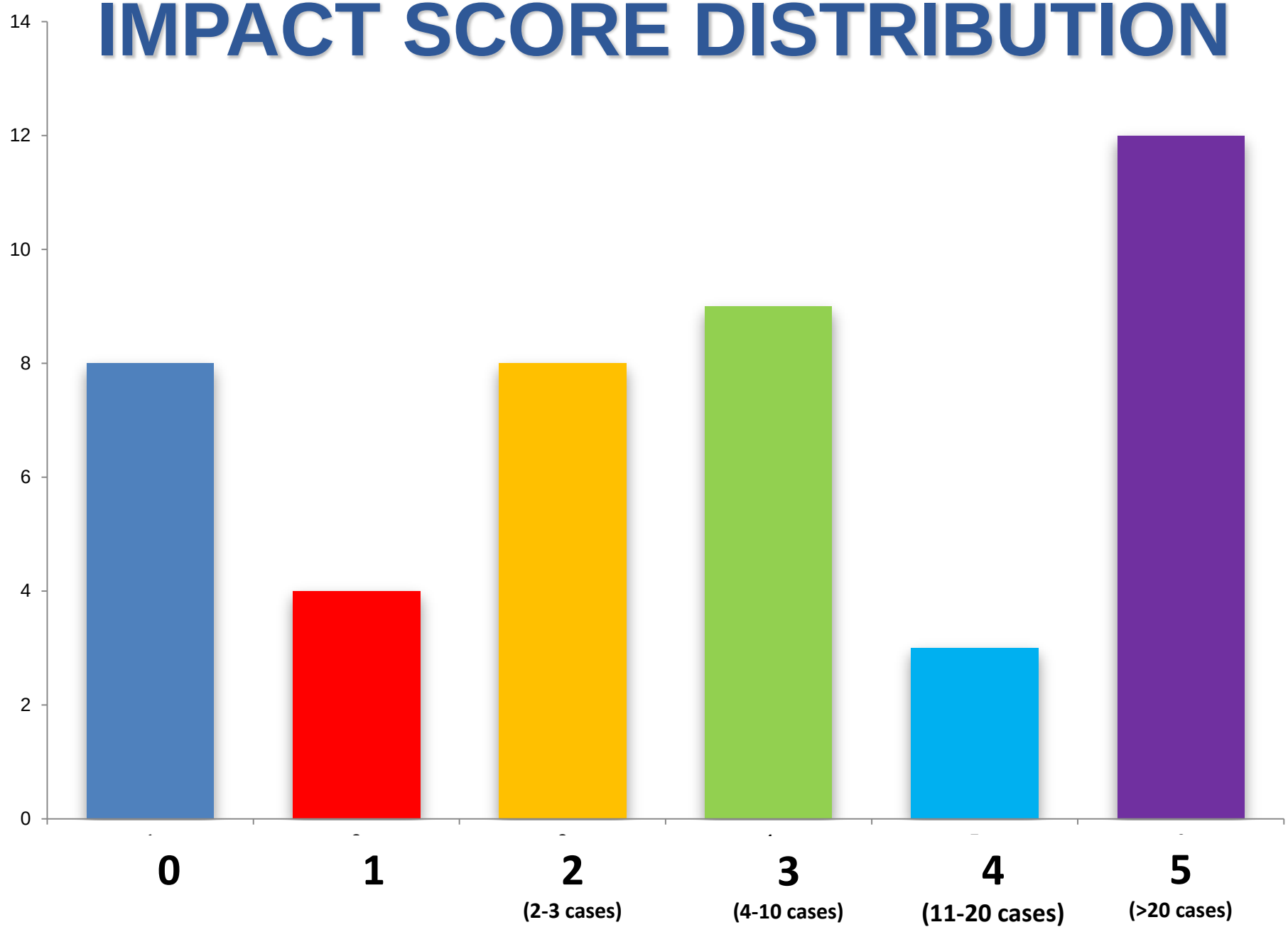
2 = 2-3 cases

3 = 4-10 cases

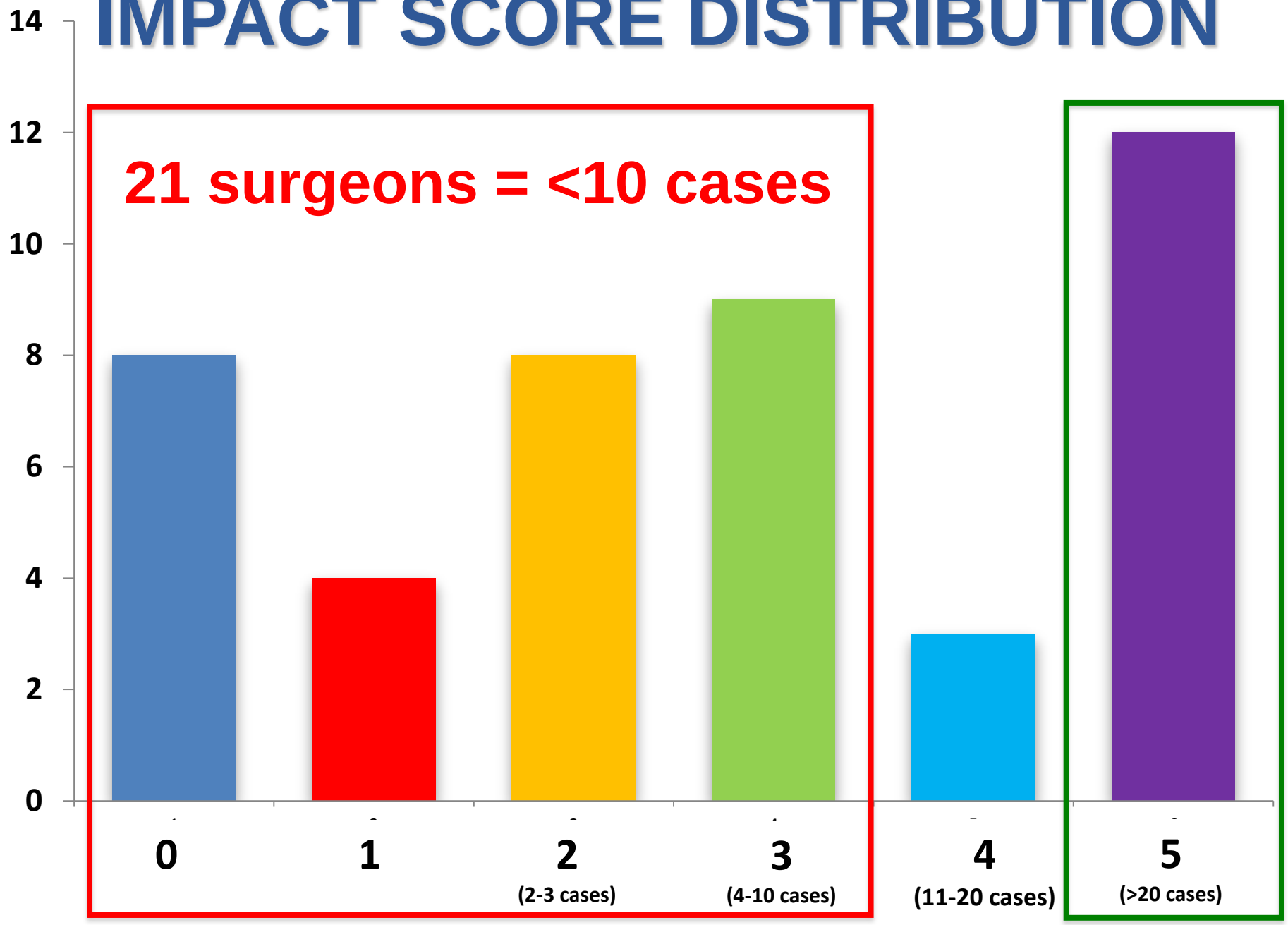
4 = 11-20 cases

5 = >20 cases

IMPACT SCORE DISTRIBUTION



IMPACT SCORE DISTRIBUTION



What is the adoption rate?

True Adoption = >20 cases (Impact Score = 5)

Adoption Rate

PREV. TRAINING

5 Surgeons/Lab

4 Labs/yr for 6 yrs

= 120 Surgeons

Adoption by 5…

= 4.2%

S2S TRAINING

1 Surgeon/Lab

20 Labs/yr

= 43 Surgeons

Adoption by 12…

= 28%

SUMMARY

- S2S Program ~ Prototype
- Primary goal: 1st case must go well
- *Learning curve about 5-6 cases*
- *S2S = High resource demands*
- *Good adoption rate*
- Focus on “bending” the learning curve

Minimally Invasive Spine
CENTERS OF EXCELLENCE