Not Your Father's Back Surgery: Evolution of Robotic Spine Surgery Techniques

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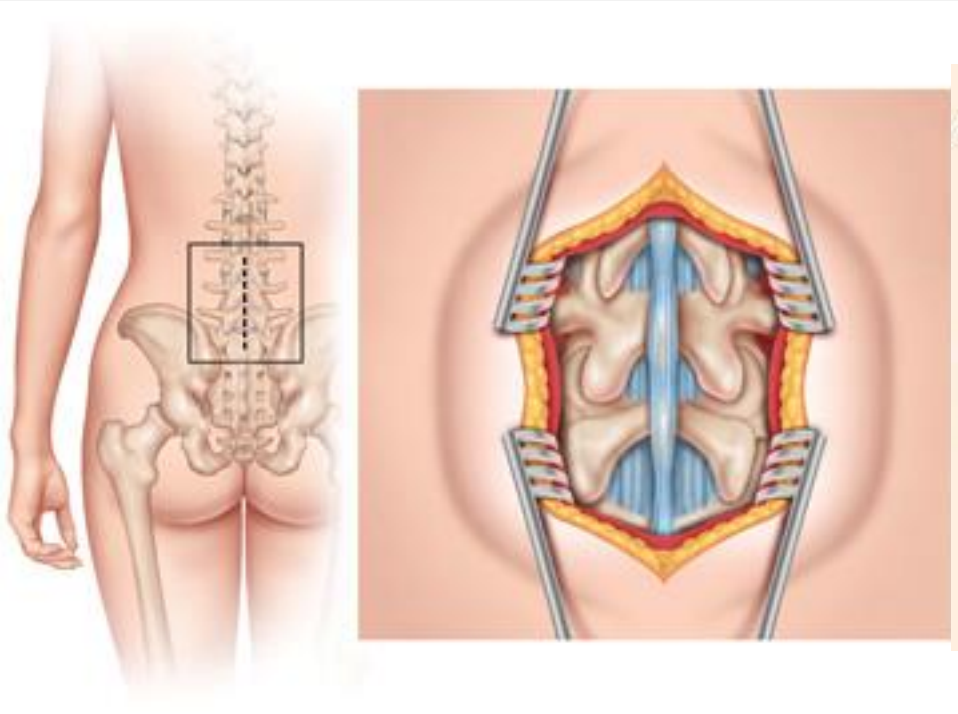
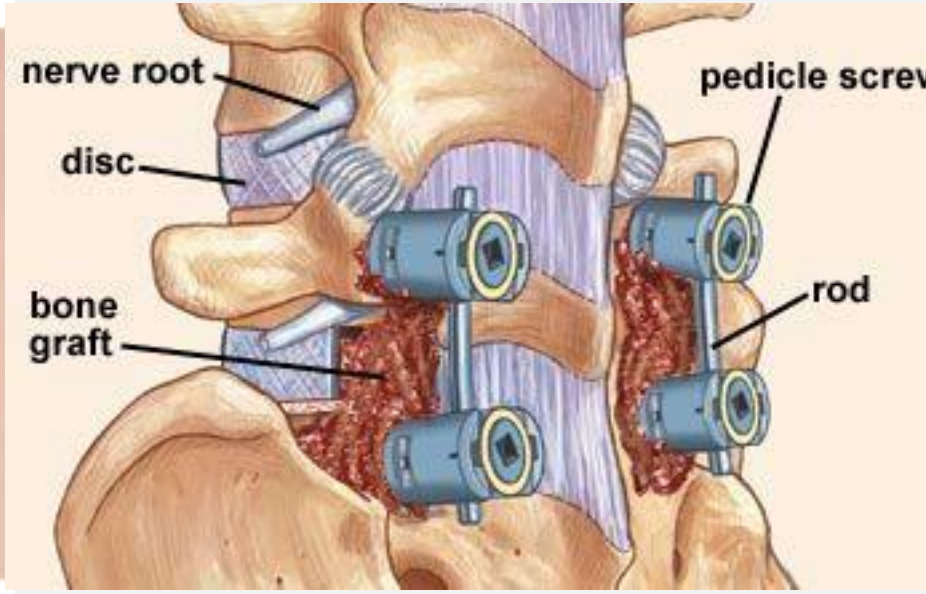
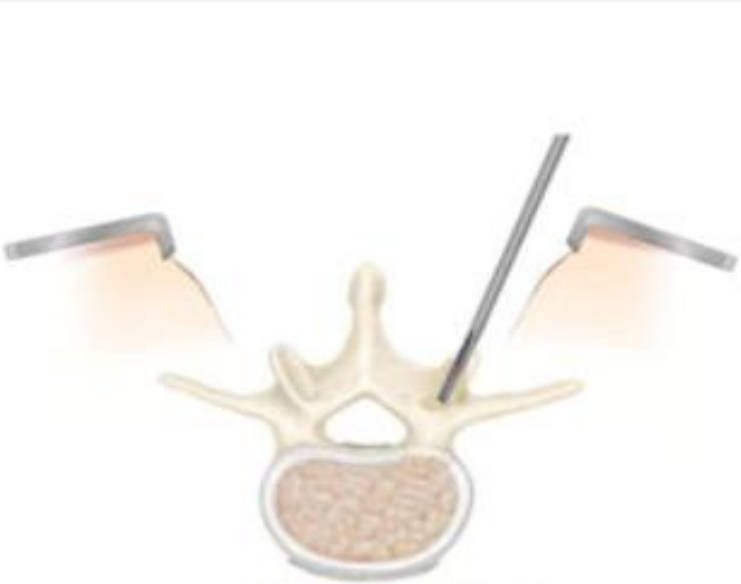
Orange County, CA

TRADITIONAL TECHNIQUE





OPEN VS MINIMALLY INVASIVE TECHNIQUES



"Open" TLIF

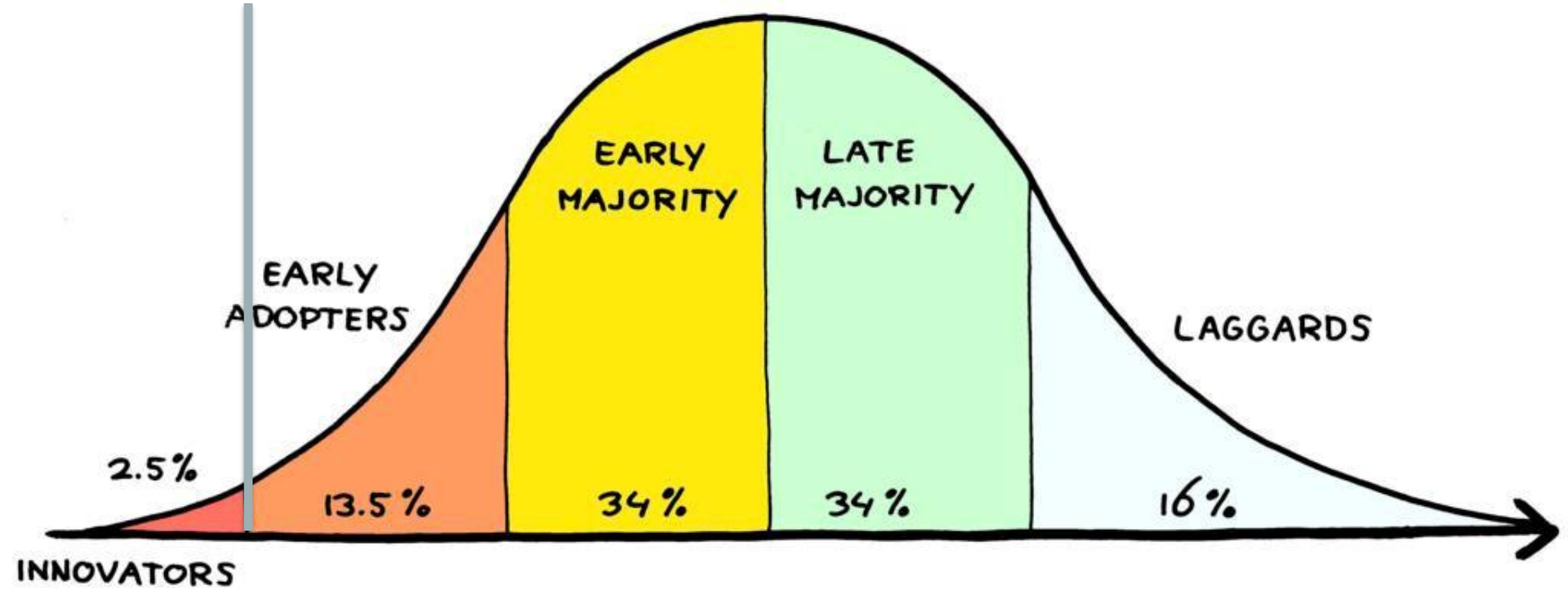
Minimally Invasive TLIF

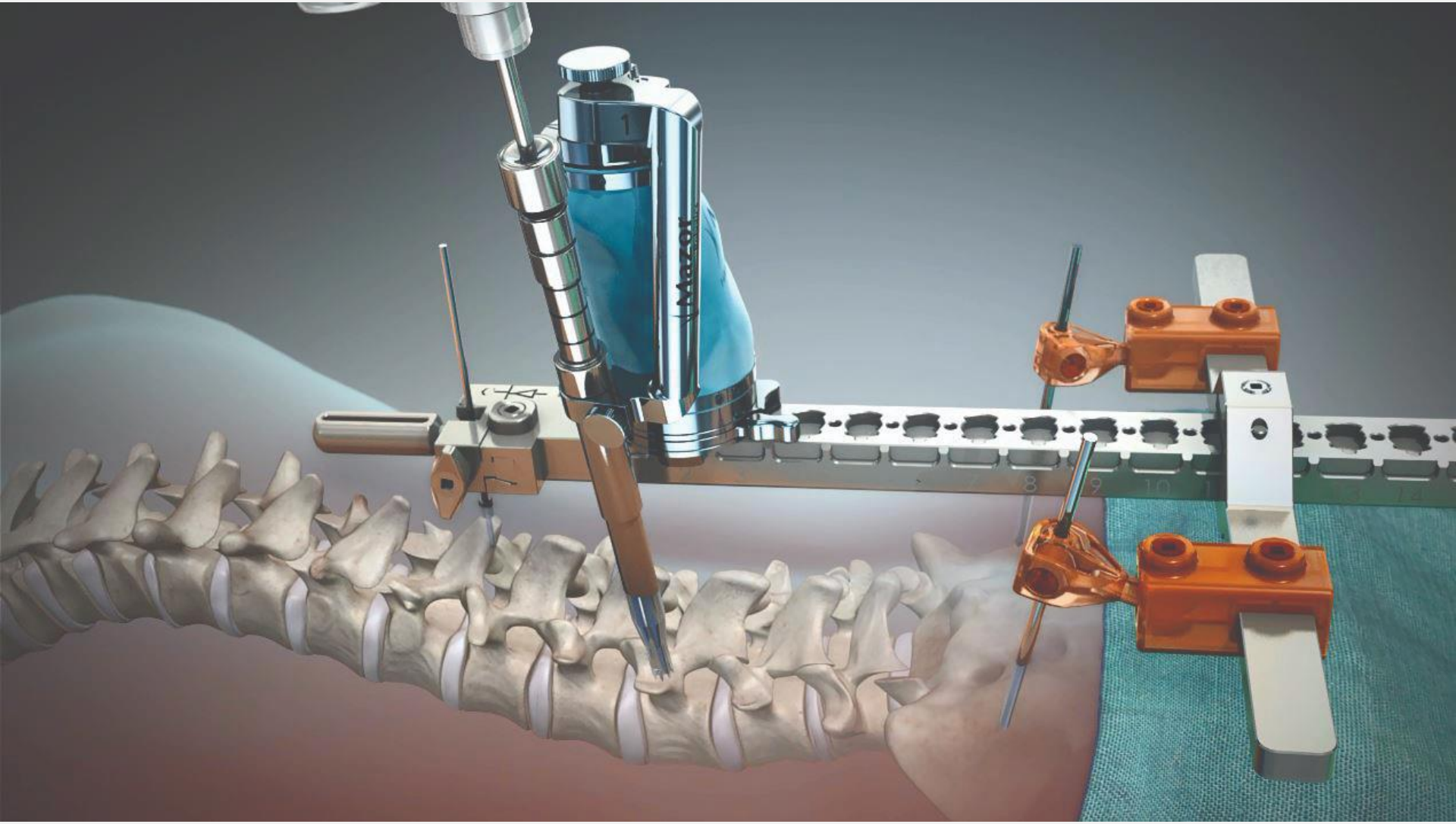

da Vinci S
2
1
3


BRAINLAB

SPINAL NAVIGATION
1996-2017

- CONCLUSIONS: Spine surgeons acknowledge the value of CAS, yet current systems do not meet their expectations in terms of ease of use and integration into the surgical work flow.



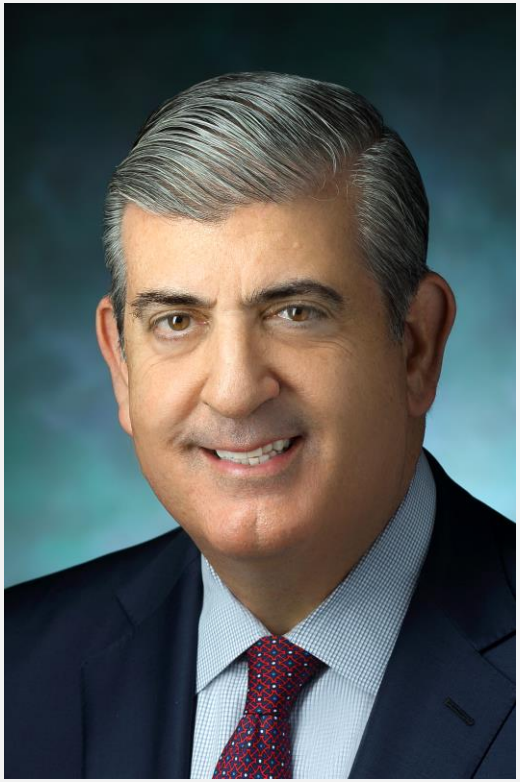


Mazor X and Renaissance

HOW CAN WE DO IT BETTER?

- Create less invasive lumbar spine fusion surgery
- Reduce radiation exposure
- Procedural consistency and safety
- Eliminate K wires to improve work flow
- Integrate real-time image guidance
- End goals
  - Reduce OR time
  - Decrease blood loss
  - Reduce length of hospitalization
  - Discharge more to home instead of rehab
  - Be more cost effective

ACKNOWLEDGEMENT



Nicholas Theodore, MD

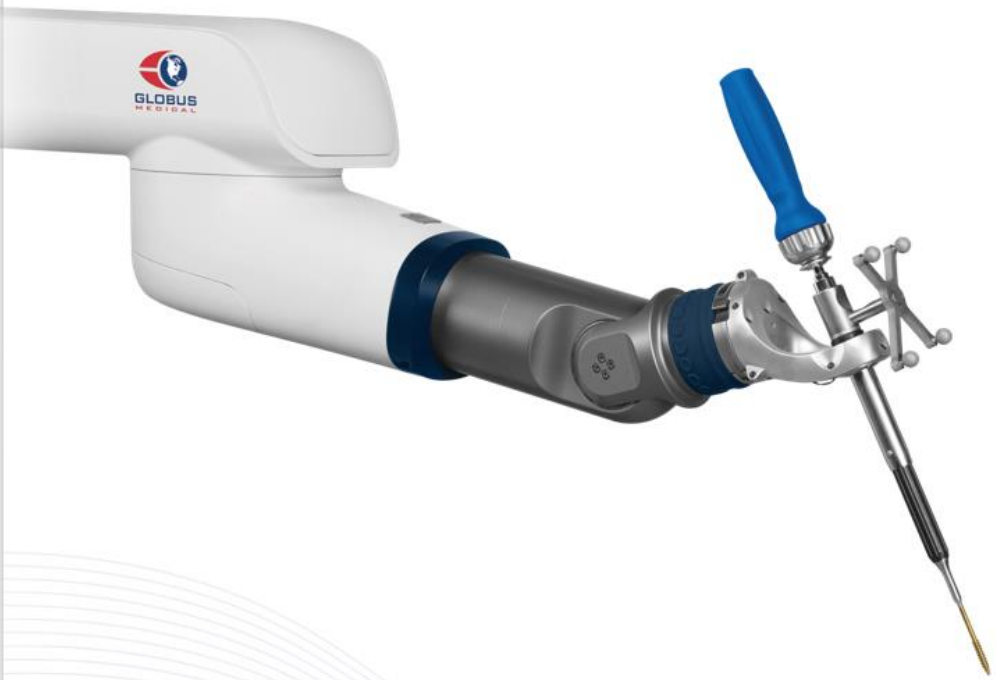
Director, Johns Hopkins Spine Center

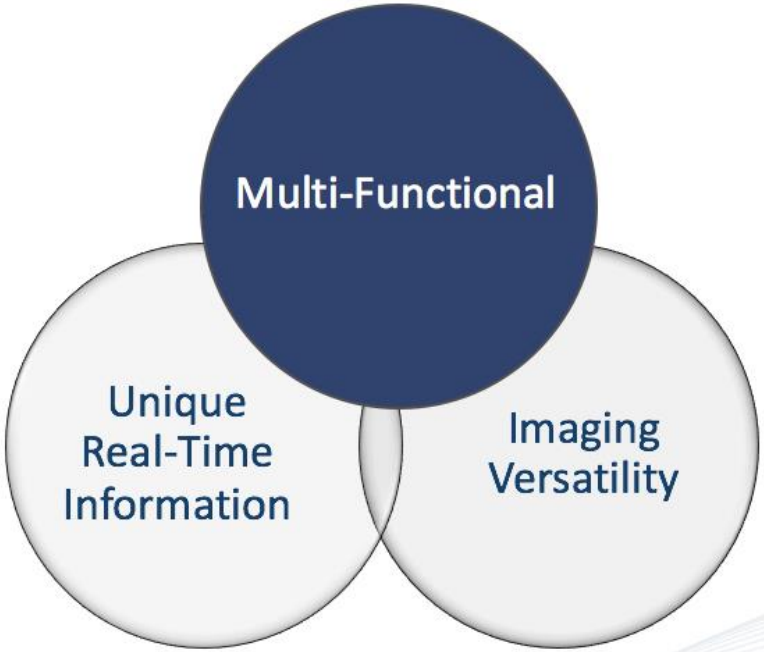
Inventor, Globus ExcelsiusGPS Robot

Providence | St. Joseph and St. Jude Heritage Medical Group

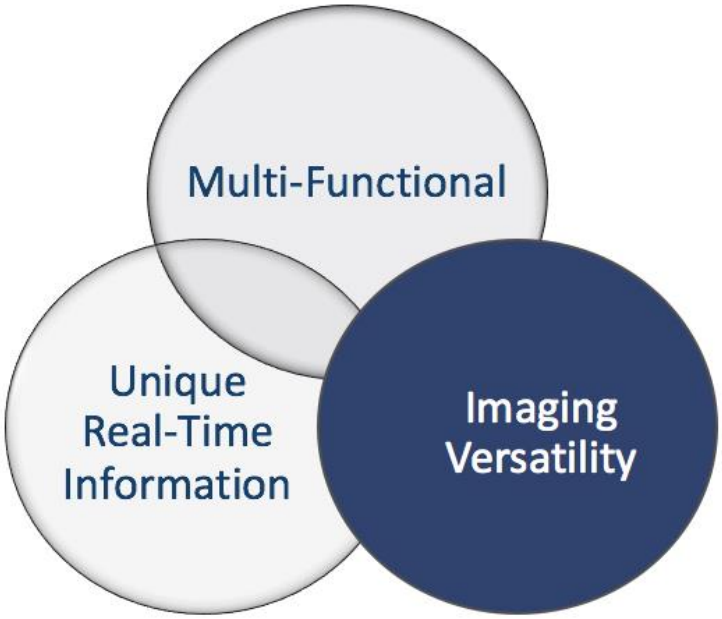
PRIMARY SYSTEM COMPONENTS

SYSTEM SETUP

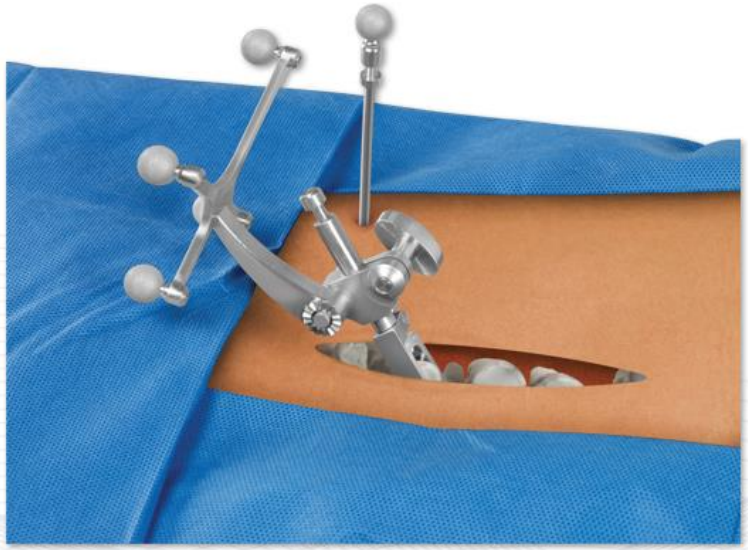


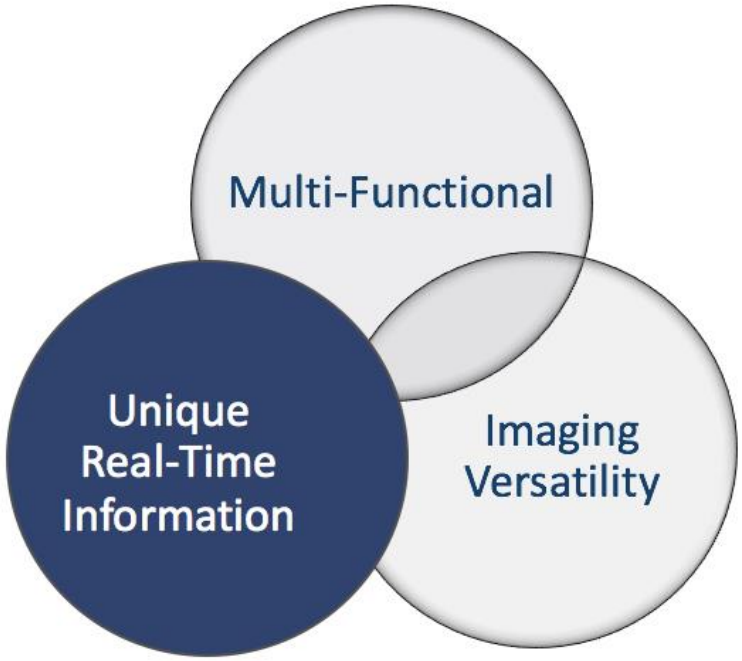


- Robotic + Navigation Guidance
- Active & Adaptable End Effector
- Integrated Instruments

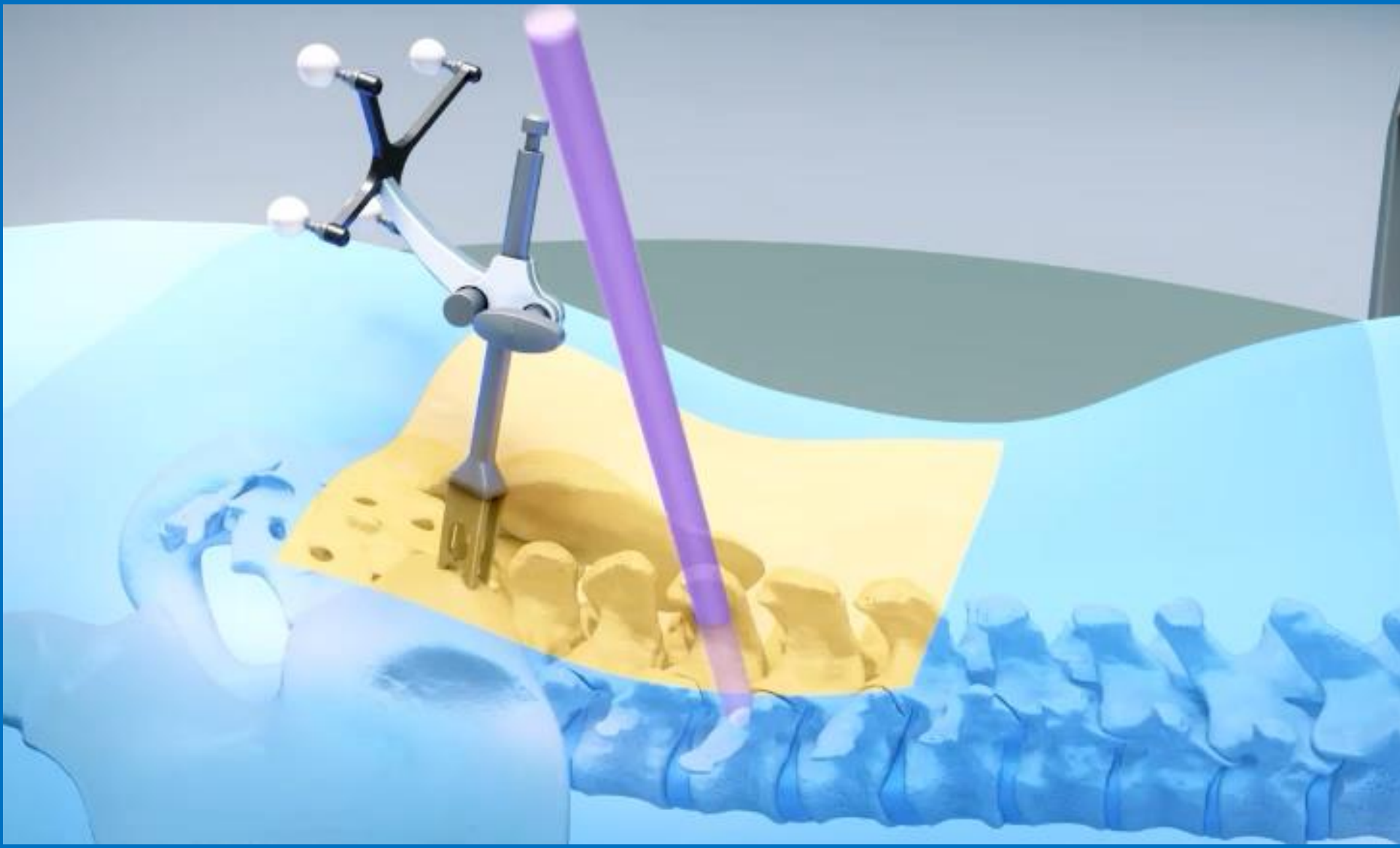


- Intraoperative Fluoroscopy
- Preoperative CT
- Intraoperative CT





- Real-time visualization of instruments
- Active feedback on anatomic reference movement
- Deflection sensing technology



Johns Hopkins Surgeons Perform First Real-Time Image Guided Spine Surgery

Release Date: October 10, 2017

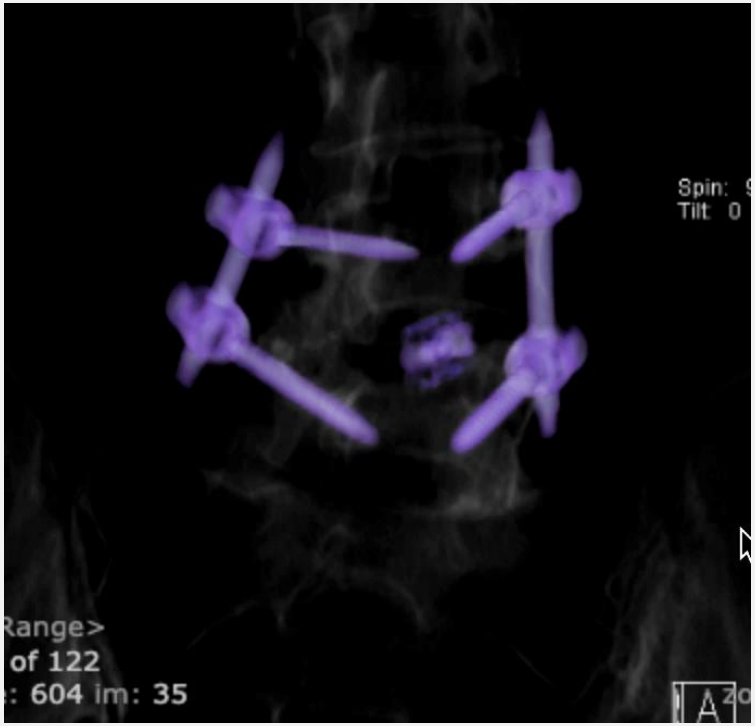
How is ExcelsiusGPS™ Different?

System	Navigation	Robotic Guidance	Workflow
Excelsius GPS	• **Navigated instruments**	• **Floor mounted** • **Extremely rigid frameless arm** • **Navigated End Effector**	• **Direct screw placement** • **Intra-Op CT, Pre-Op CT and Fluoroscopy** • **Streamlined workflow**
Mazor X	• No navigated instruments	• Bed mounted arm	• Only places K-wires • Pre-Op CT and Intra-Op CT only
Mazor Renaissance	• No navigated instruments	• Patient mounted device on spine	• Only places K-Wires • Pre-Op CT only

IMPACT ON MY MINIMALLY INVASIVE PRACTICE

- Minimally invasive TLIF
- Single position lateral lumbar interbody fusion with percutaneous posterior fixation (L2-3, L3-4)
- Revision of prior ALIF/posterior percutaneous fixation for adjacent segment disease
- Percutaneous fixation/open reduction of compression/burst fracture
- MIS deformity correction

MIS TLIF

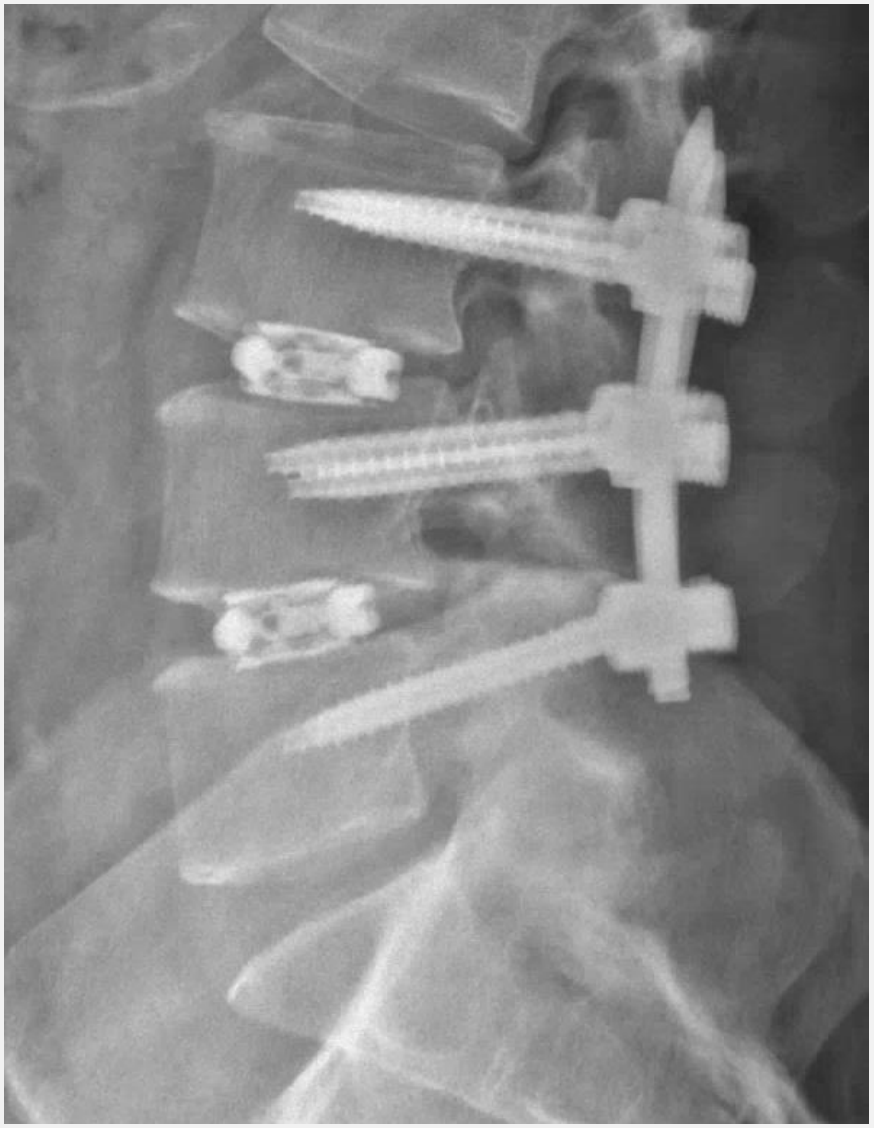


65F with L4-5 DDD

0857	Incision Time
0926	
0941	
1108	Extubation

- OR time about 2 hours
- Estimated Blood Loss 50 cc
- Discharge to home the next day

57M with L3-4, L4-5 DDD



St. Joseph Health SM

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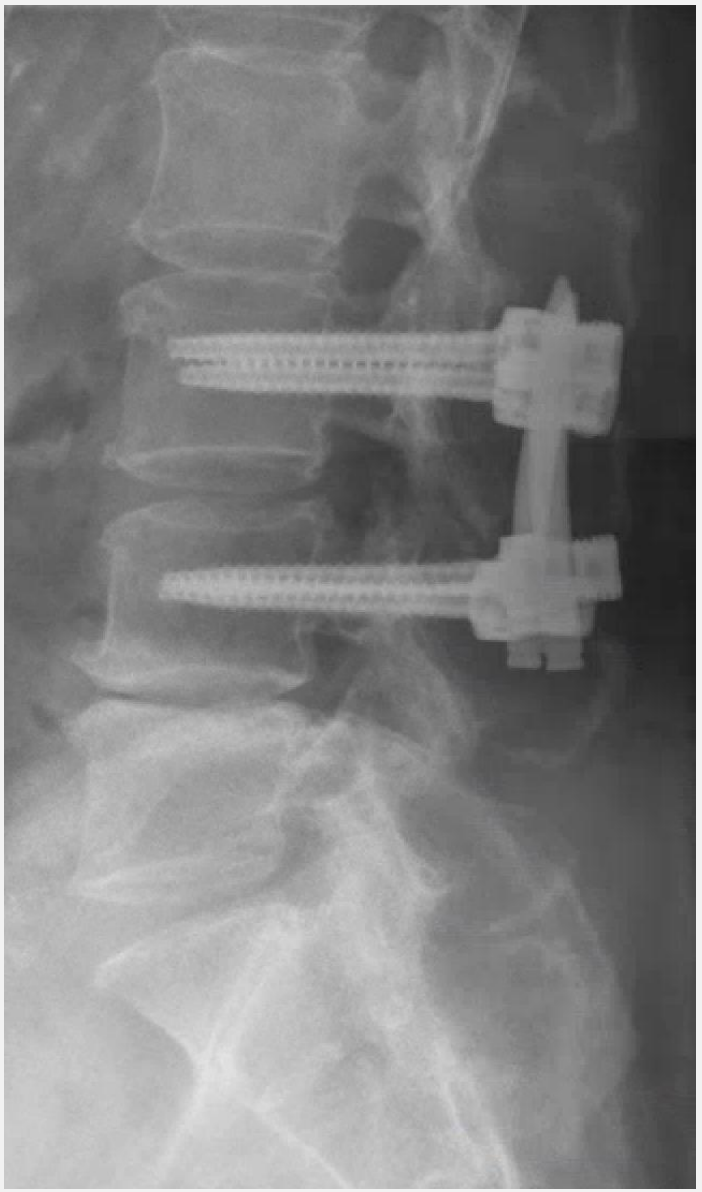
Globus Medical Excelsius GPS: Robotic Spine Navigation Video Clips

84F with L3-4 DDD, grade I spondylolisthesis

Preop

Post op



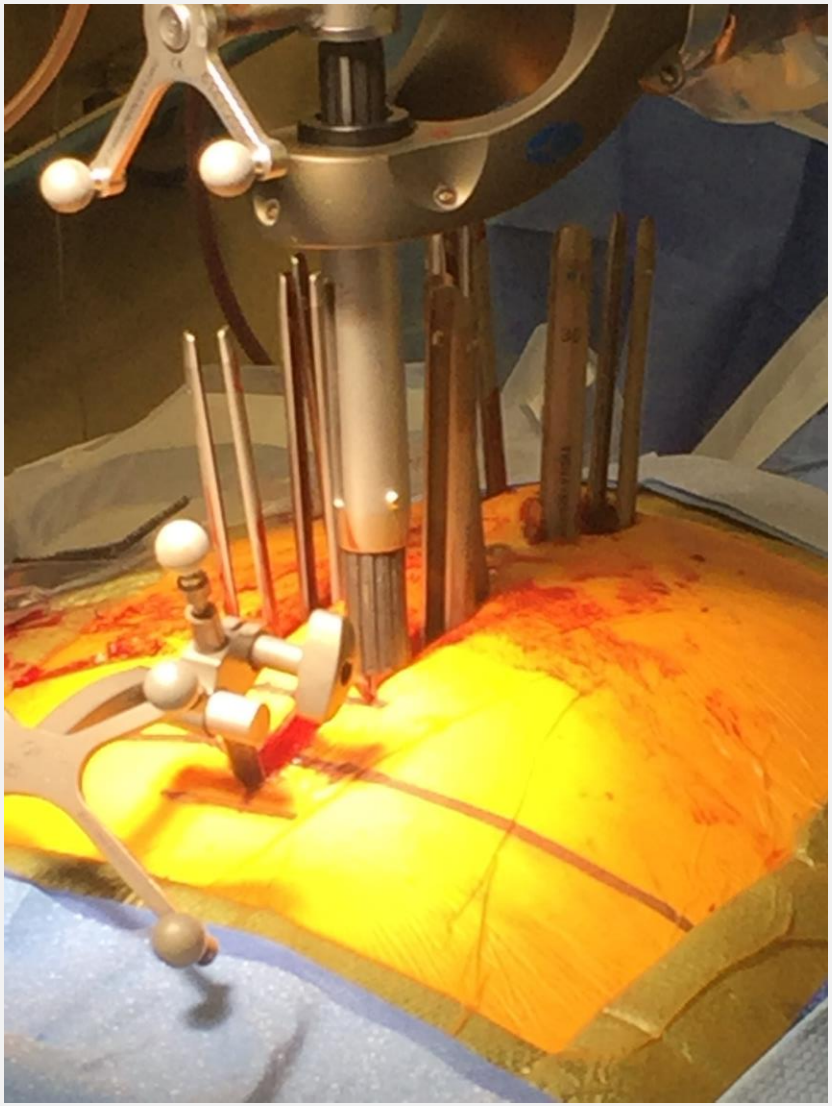
84F with L3-4 DDD, grade 1 spondylolisthesis

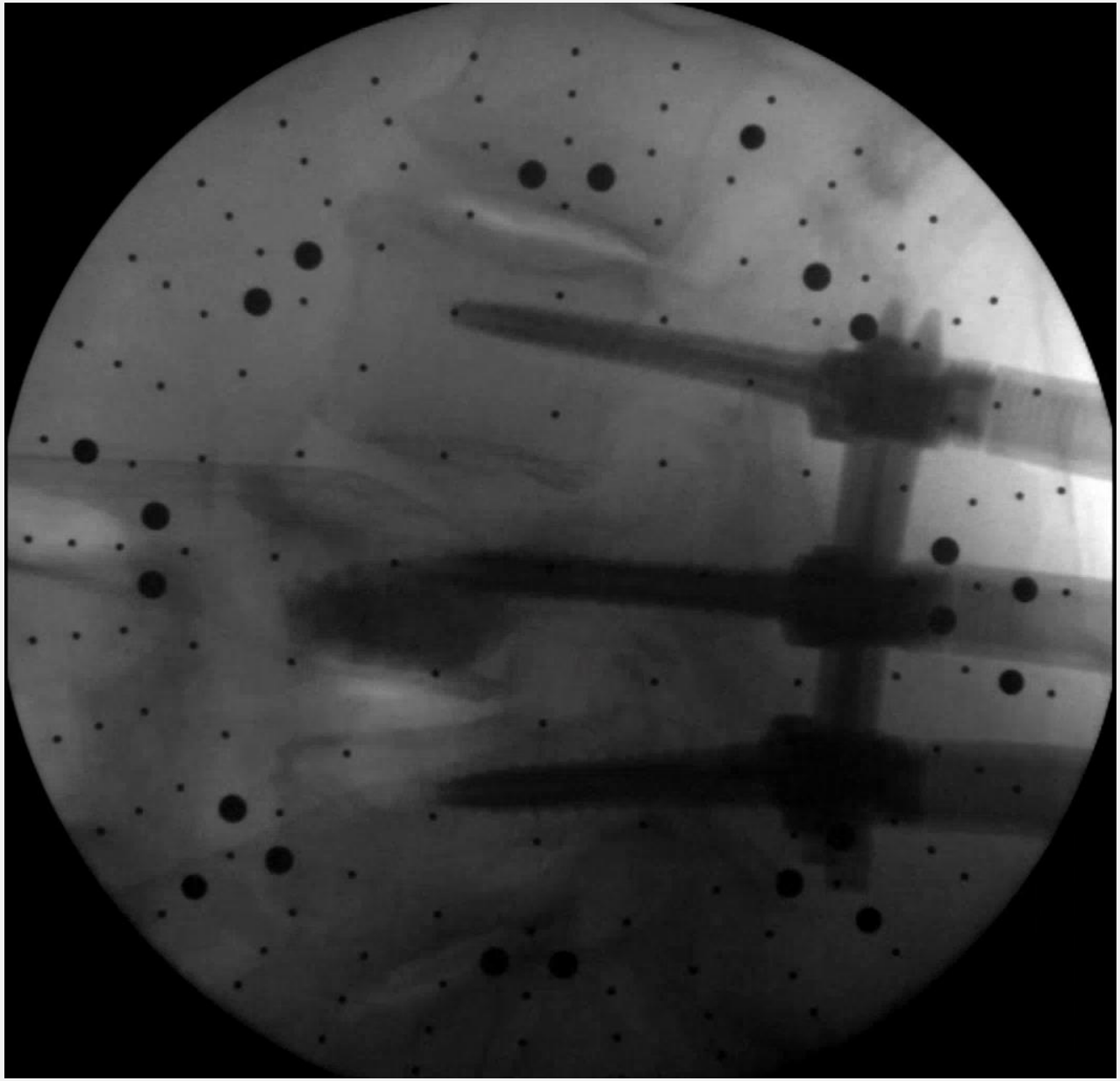
MIS SHORT SEGMENT DEFORMITY

72F with L3-4, L4-5 DDD, flat back syndrome, coronal deformity

MIS TRAUMA

70M BMI 45, unstable thoracic chance fracture

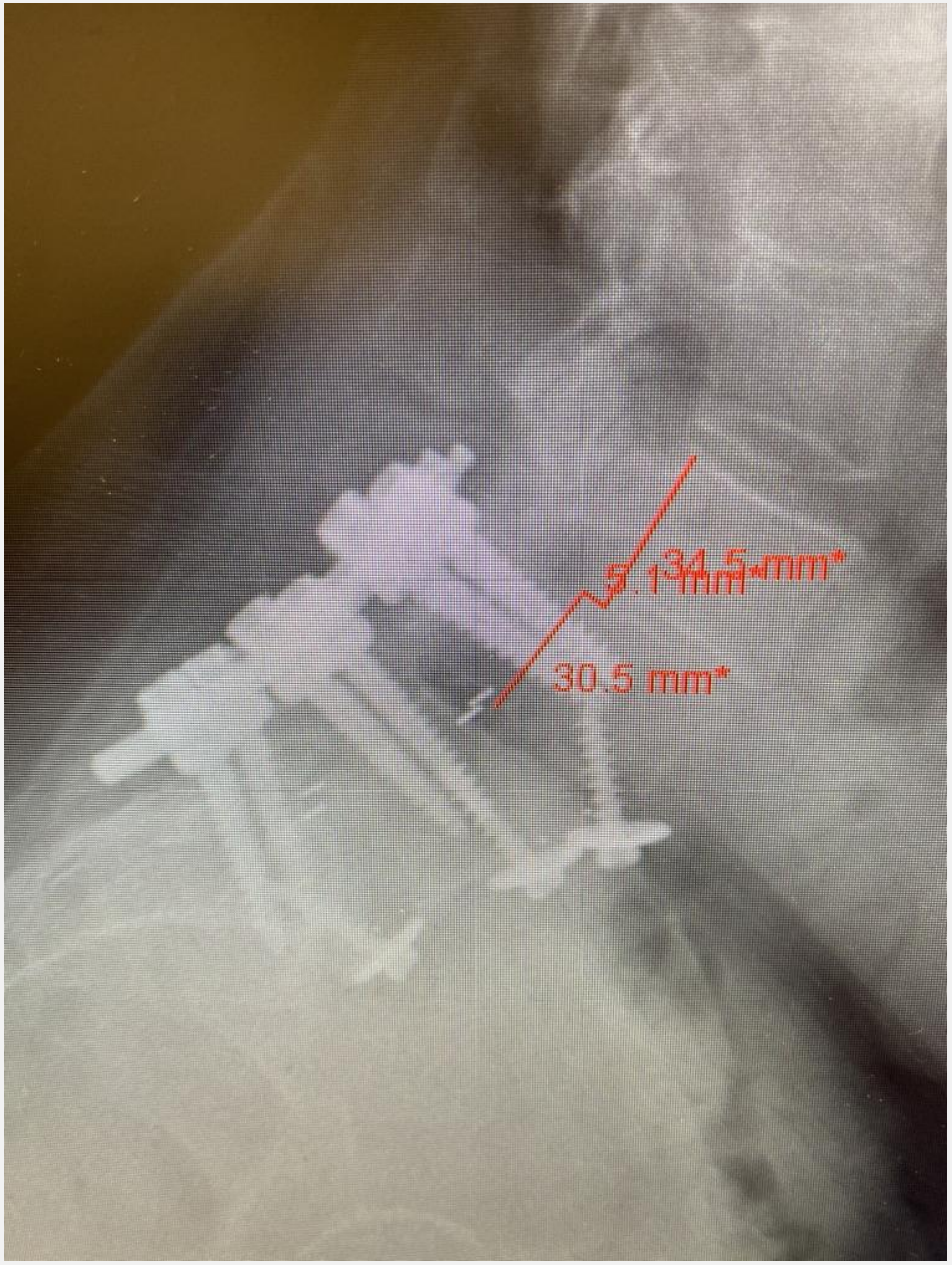


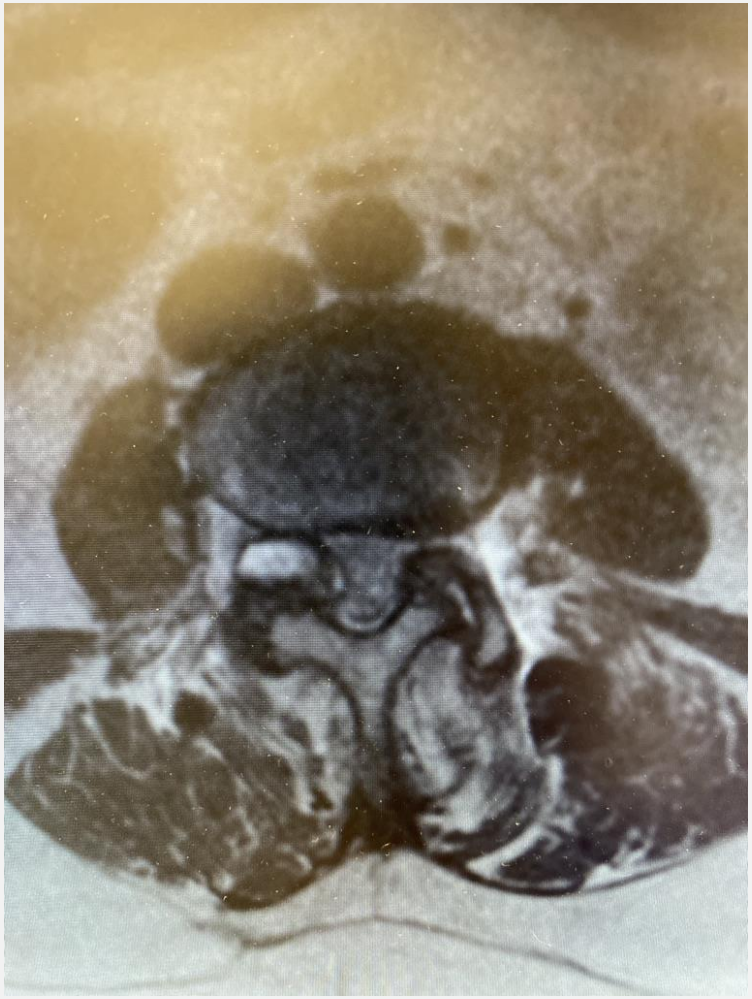


76F failed kyphoplasty for L4 compression fx

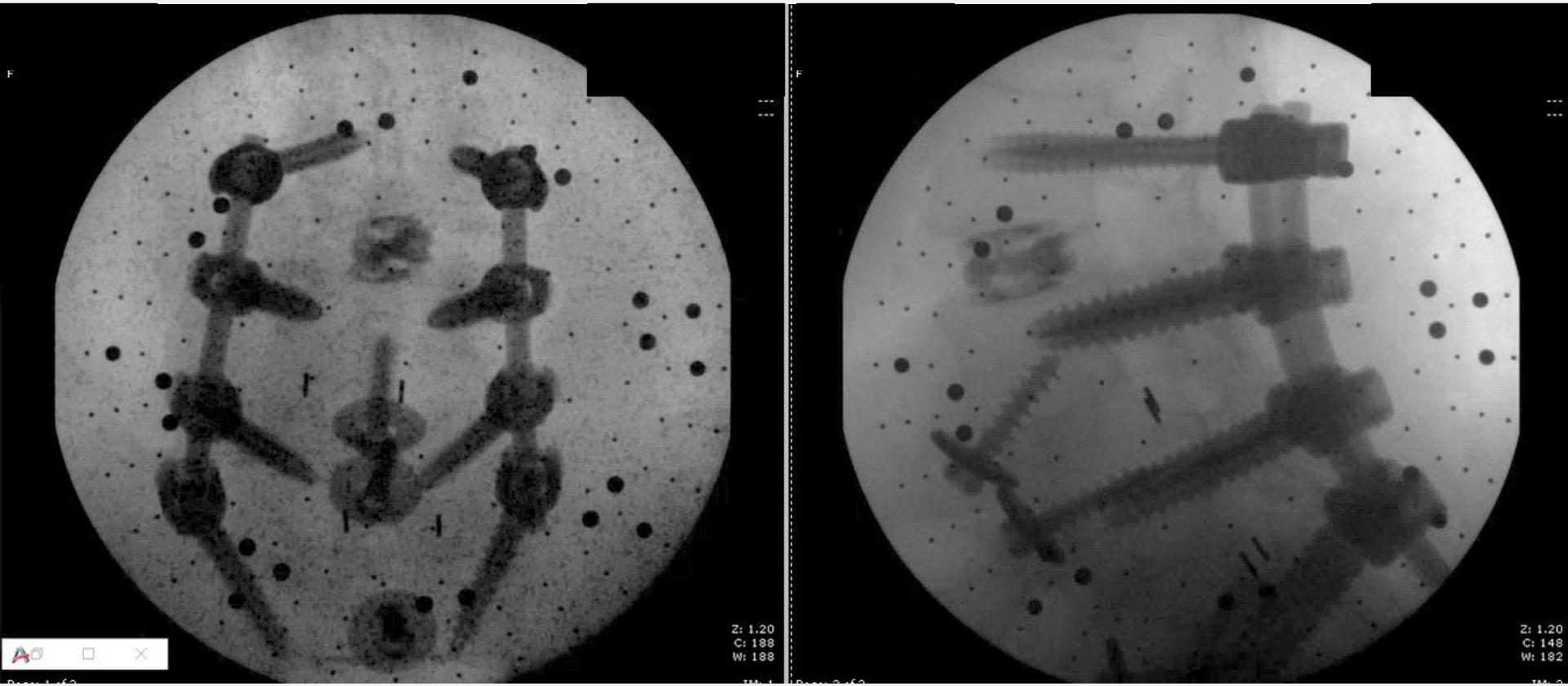
60F with advanced RA, osteoporosis, L1 compression fx with retropulsion

MIS REVISION



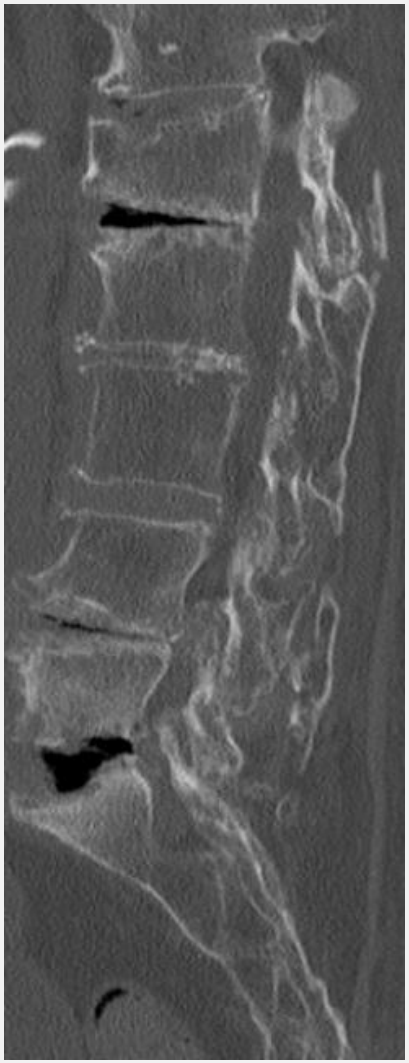


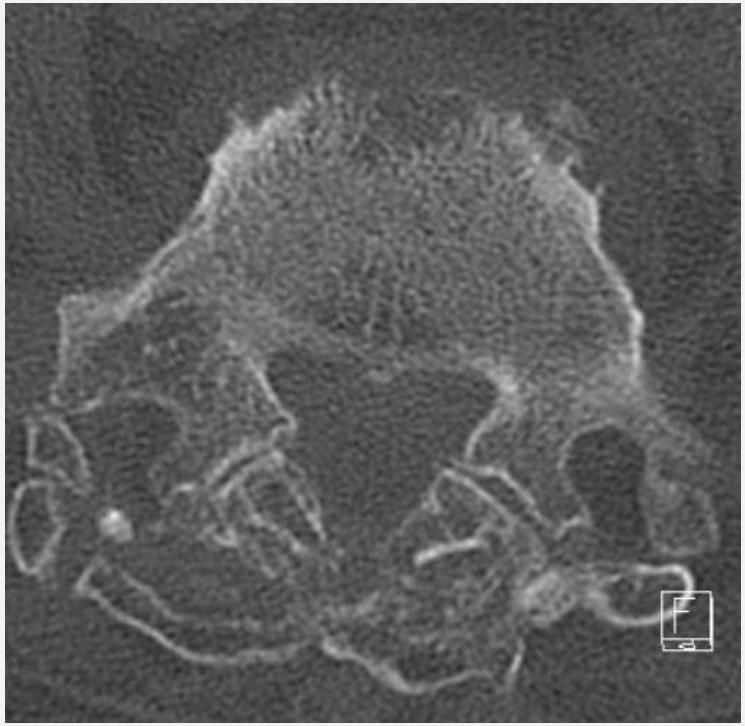
62F with hx of L4-S1 ALIF/perc screws by another surgeon, now with L3-4 DDD

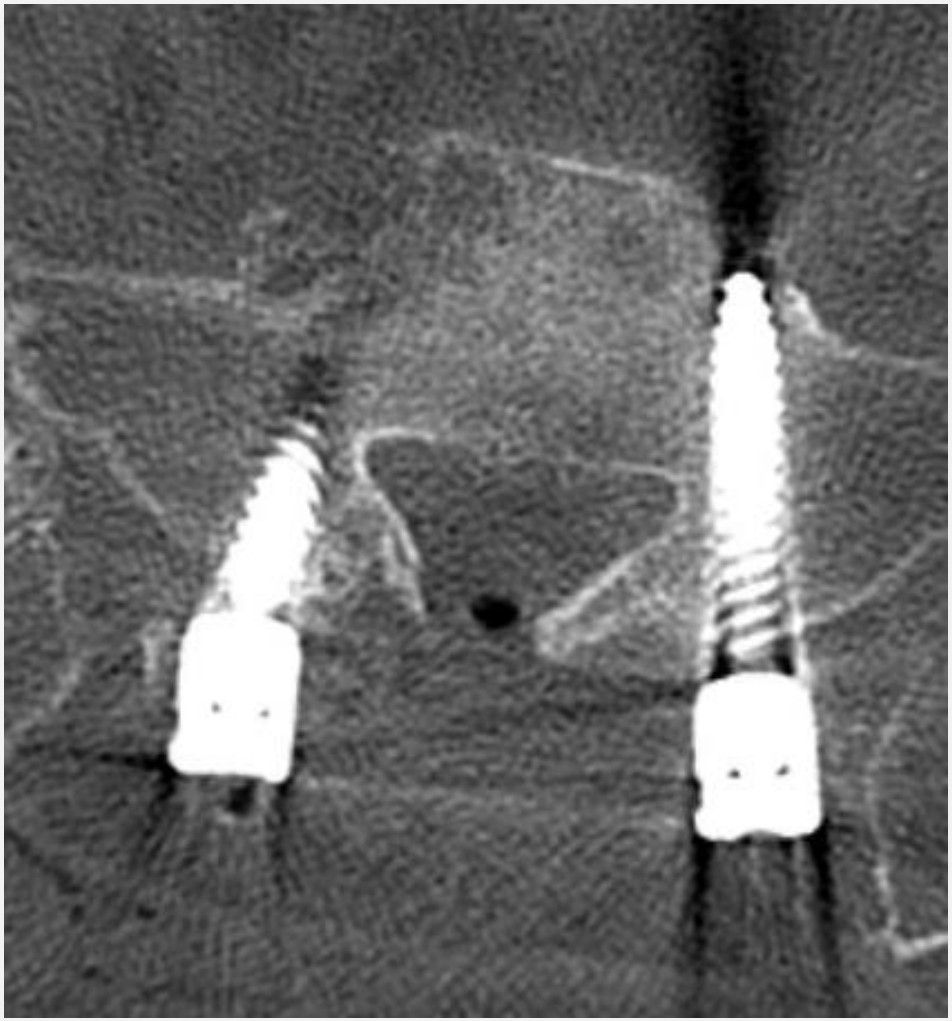


62F with hx of L4-S1
ALIF/perc screws by another surgeon, now with L3-4 DDD

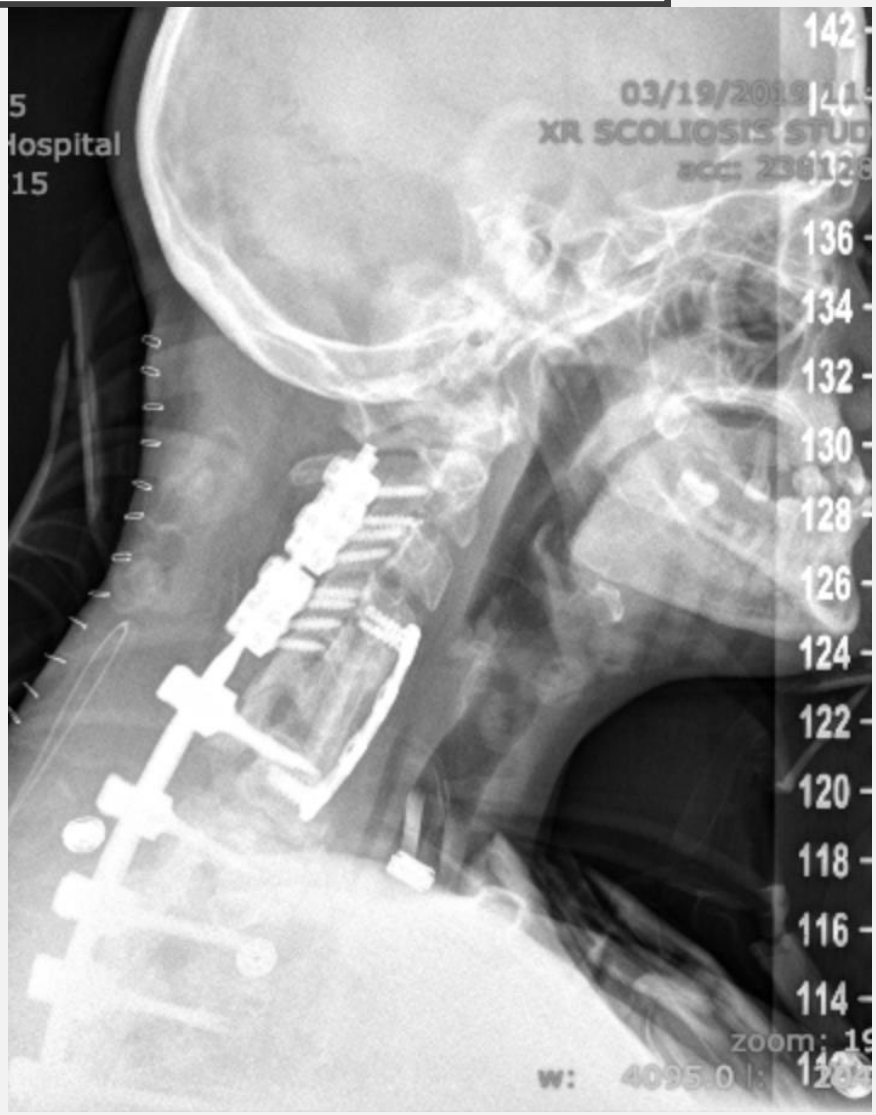
90Y FEMALE WITH ADVANCED SEVERE SPONDYLOTIC CHANGES, BONEY ISLANDS FROM PRIOR NON-INSTRUMENTED FUSION







36F IVDU WITH CERVICOTHORACIC KYPHOTIC DEFORMITY

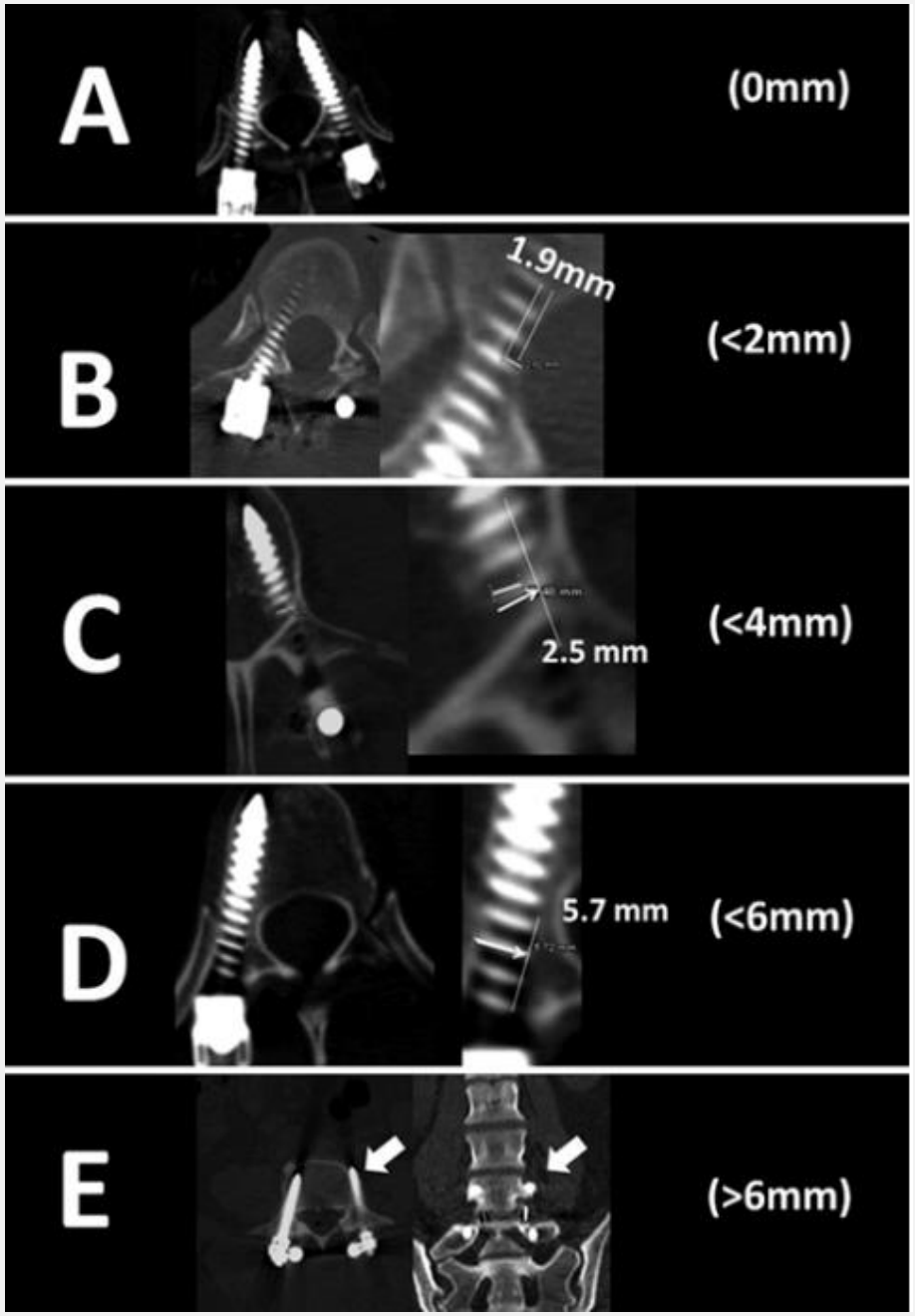



STANDING
L

What does it mean to be "accurate?"

Accuracy of Pedicular Screw Placement *In Vivo*

STANLEY D. GERTZBEIN, MD, FRCS(C),* and STEPHEN E. ROBBINS, MDI

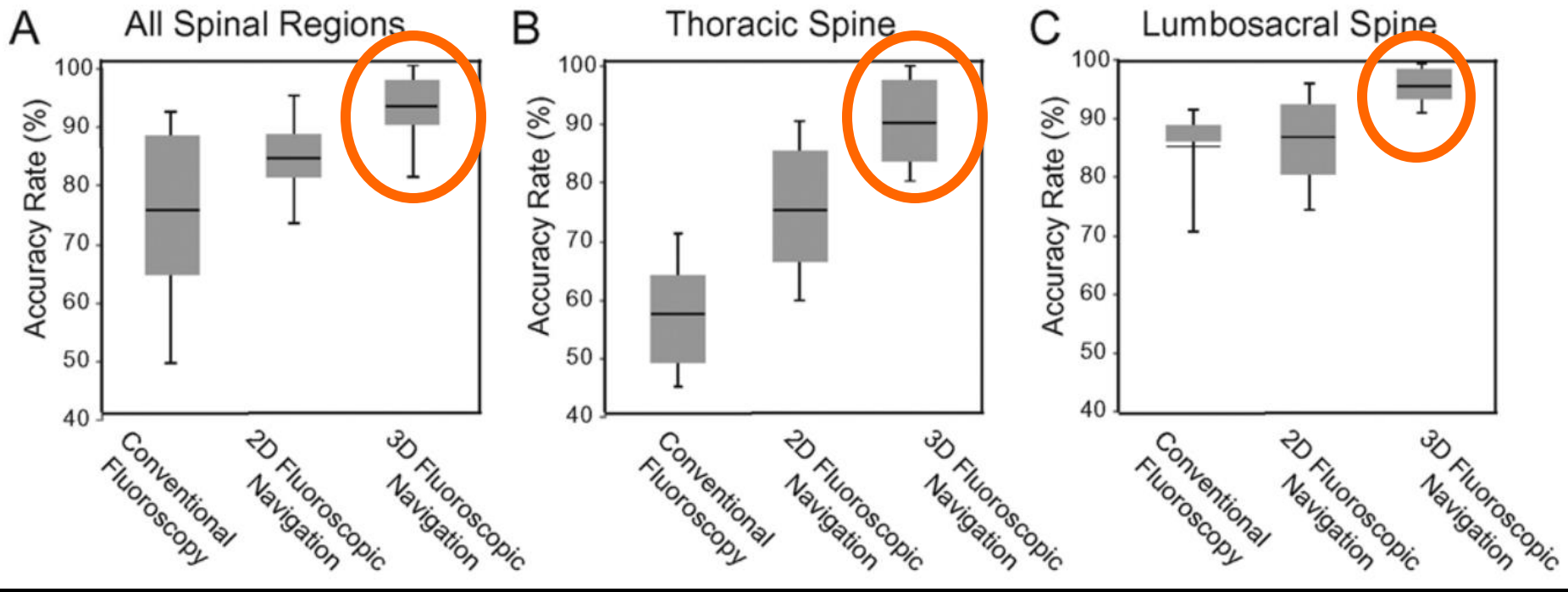


J Neurosurg Spine 20:196–203, 2014

The accuracy of pedicle screw placement using intraoperative image guidance systems

A systematic review

Alexander Mason, M.D.,[1,2] Renee Paulsen, Ph.D.,[1] Jason M. Babuska, B.A.,[1] Sharad Rajpal, M.D.,[2] Sigita Burneikiene, M.D.,[1,2] E. Lee Nelson, M.D.,[1,2] and Alan T. Villavicencio, M.D.[1,2]



JNS SPINE

CLINICAL ARTICLE

Three-dimensional assessment of robot-assisted pedicle screw placement accuracy and instrumentation reliability based on a preplanned trajectory

*Bowen Jiang, MD,[1] Zach Pennington, BS,[1] Alex Zhu, PA-C,[1] Stavros Matsoukas, MD,[2] A. Karim Ahmed, BS,[1] Jeff Ehresman, BS,[1] Smruti Mahapatra, BE,[3] Ethan Cottrill, MS,[1] Hailey Sheppell,[3] Amir Manbachi, PhD,[3] Neil Crawford, PhD,[4] and Nicholas Theodore, MD[1]

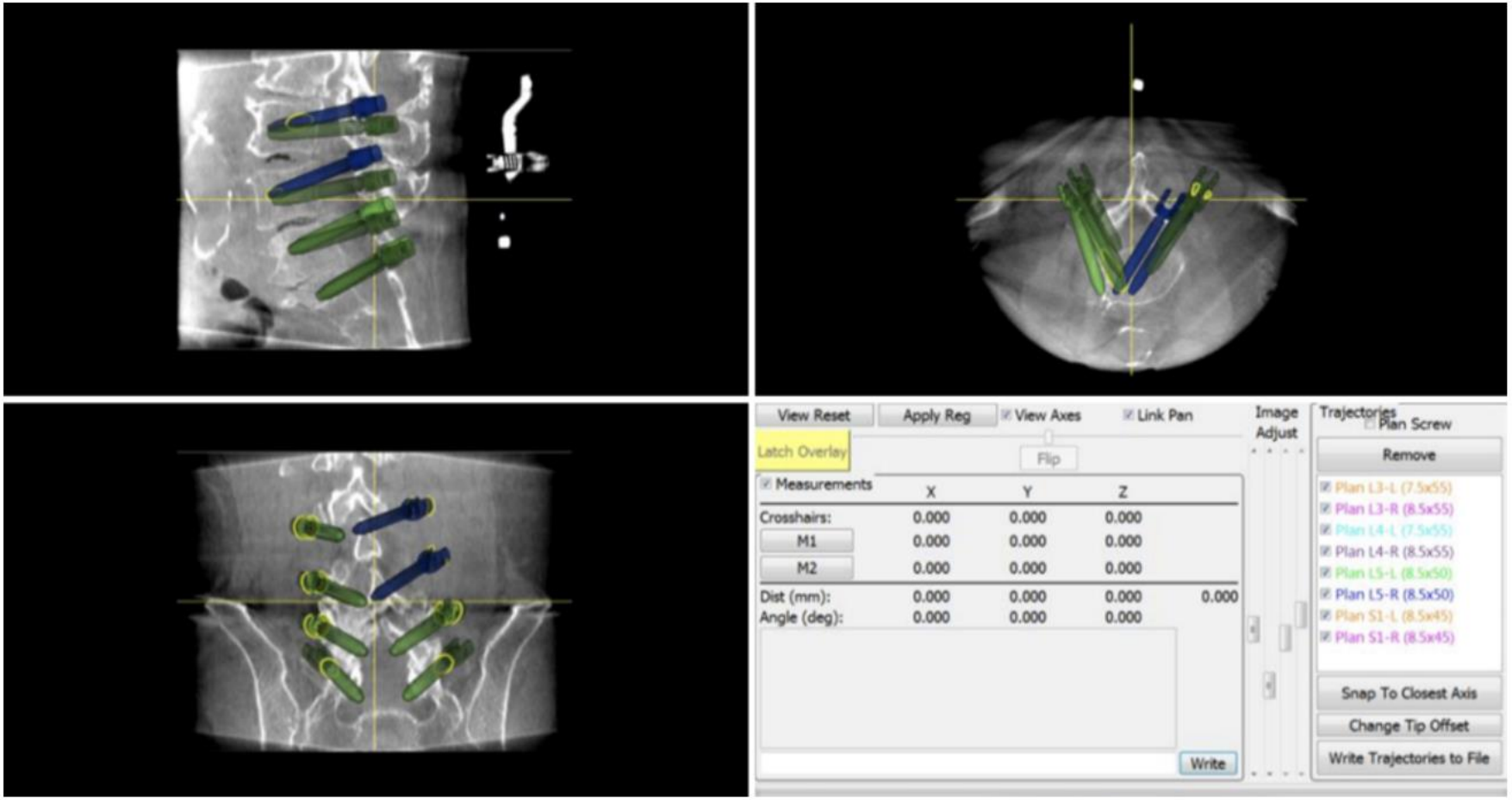
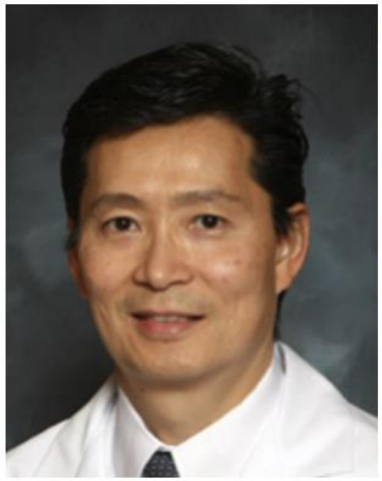


FIG. 1. Example of screw trajectories plotted on a preoperative surgical plan.

Our Neurosurgeons



Hector Ho, MD

Undergraduate:
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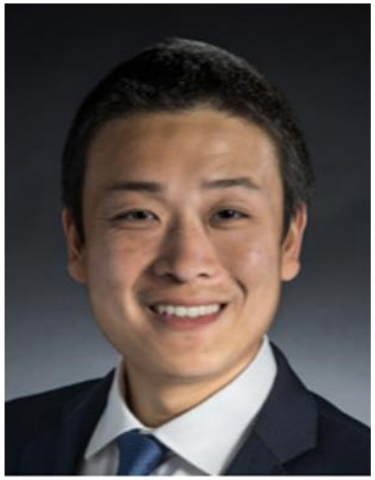
Medical School:
St. Louis University School of Medicine

Internship:
Northwestern University School of Medicine

Residency:
Northwestern University School of Medicine



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Residency:
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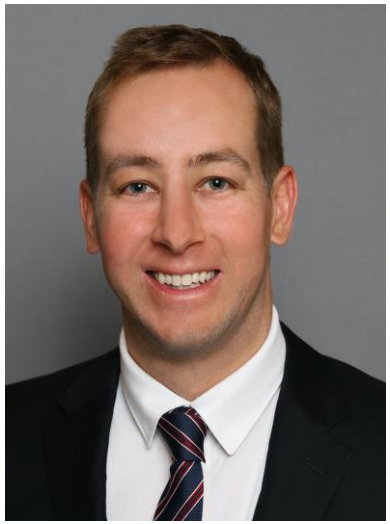

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