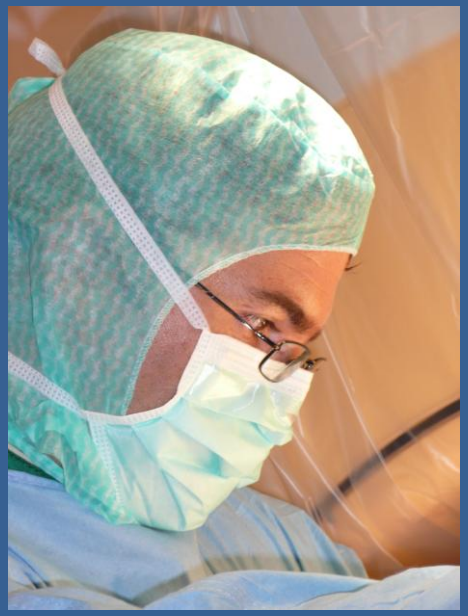
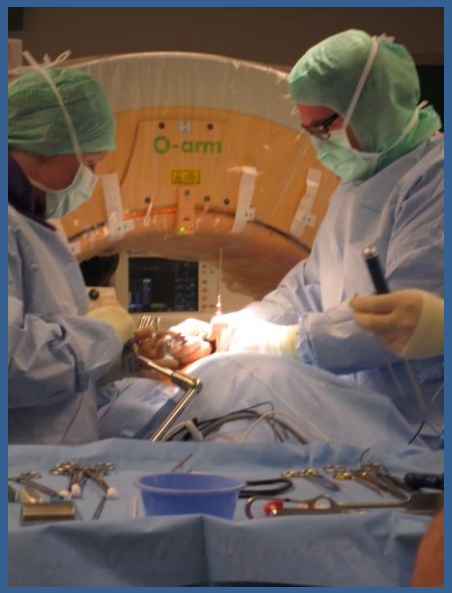
Solutions minimalement invasives en Neurochirurgie: Intérêt de la navigation + O-Arm





Dr Schils Frédéric, Neurochirurgien

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Afiso 26/02/2011

Introduction

- Pourquoi un neurochirurgien?
- Les deux pôles d ’intérêt des neurochirurgiens sont la chirurgie cérébro-médullaire et la chirurgie rachidienne.
- La chirurgie du rachis s ’est considérablement développée au cours des 15 dernières années pour devenir un des pôles de croissance les plus importants de toutes les disciplines chirurgicales

Introduction

- De manière similaire, le nombre de stratégies chirurgicales et la variété de matériel nécessaire pour réaliser ces interventions ont considérablement augmenté.

- Transformation en profondeur de la discipline et axe de développement tout neuf

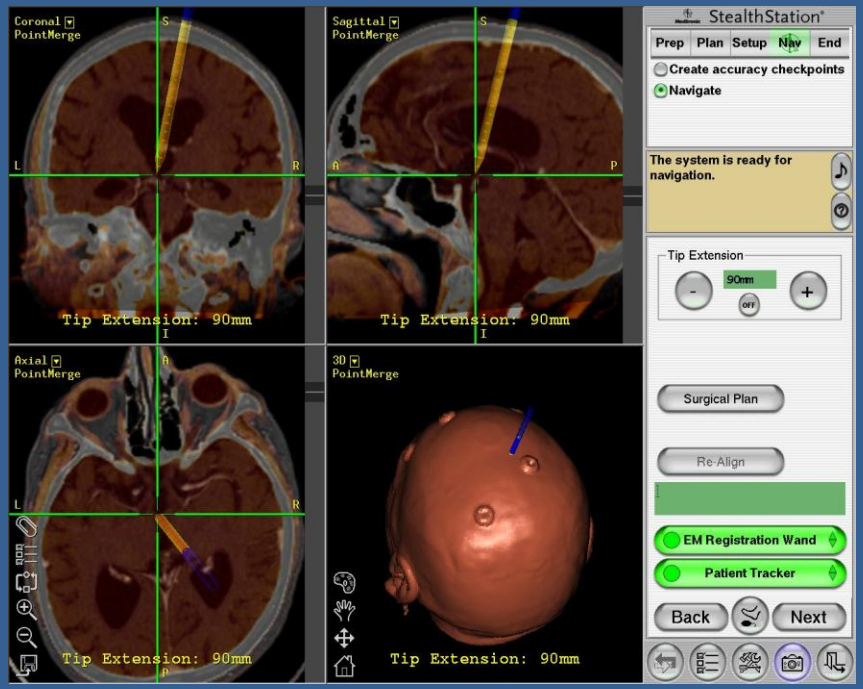
Introduction

- Plus de frontières nettes entre les différentes disciplines (neurochir, ortho, radio)
- Nécessité pour le chirurgien de se poser en acteur global, en développant un intérêt spécifique et en maîtrisant les différentes techniques
- Equipes fortes et intégrées permettent l ’évolution

Is MIS only about spine?

- Kind of philosophy
- Applicable in any field of surgery
- From less invasive « classical procedures » to new concepts
- MIS in neurosurgery…
    - Cranial
    - Spinal

Cranial MIS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StealthStation
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Plan
Setup
Nav
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Create accuracy checkpoints
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The system is ready for navigation.
Tip Extension
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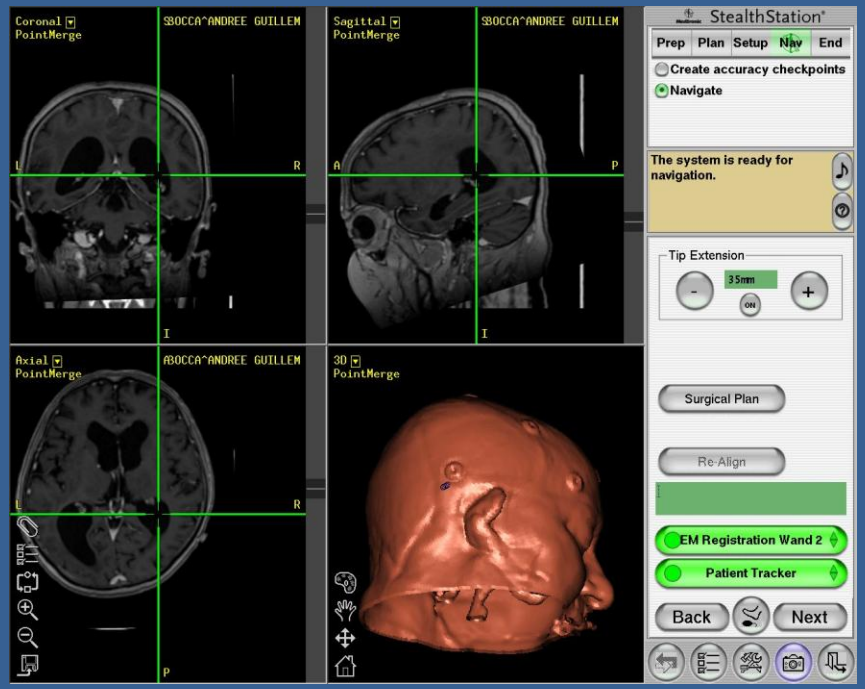
EM Registration Wand
Patient Tracker
Back
Next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Create accuracy checkpoints
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The system is ready for navigation.
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EM Registration Wand 2
Patient Tracker
Back
Next

MIS in spine surgery

Introduction

- Increasing professional, social, and economical consideration prompt surgeon to use new minimally invasive devices/techniques
- Minimally invasive spine surgery is being popularized as a safe and effective alternative to open spine procedures
- It is probably true for experienced spine surgeons but ...

Definition and possible MIS Advantages

- One of the most exciting and dynamic segments of spine surgery
- Fewer incisions
- Less muscle trauma
- Same fusion rates (>90%)
- Reduce stay, blood loss and OR time (learning curve).

Potential indications

Degenerative discopathies

Lumbar stenosis

Minor fractures

Complex fractures

Oncological problems

Infectious problems

Dynamic procedures (ant-post)

Complicated degenerative cases (fusions, deformities)

From simple to more complex

- Discal coblation (C+L)
- Nuleus replacement (C?+L)
- Interspinous systems (L)
- Posterior stabilisation (L)
- Total disc replacement (C+L)
- Anterior and/or posterior fusion (C+D+L)
- Fractures treatment (C+D+L)
- Oncology
- Infection

Percutaneous pulsed radiofrequency in the treatment of cervical and lumbar radicular pain

- Disc bulging
- No neurological deficit
- Borderline cases
- 50% improvement in >50% patients

Nucleus Replacement

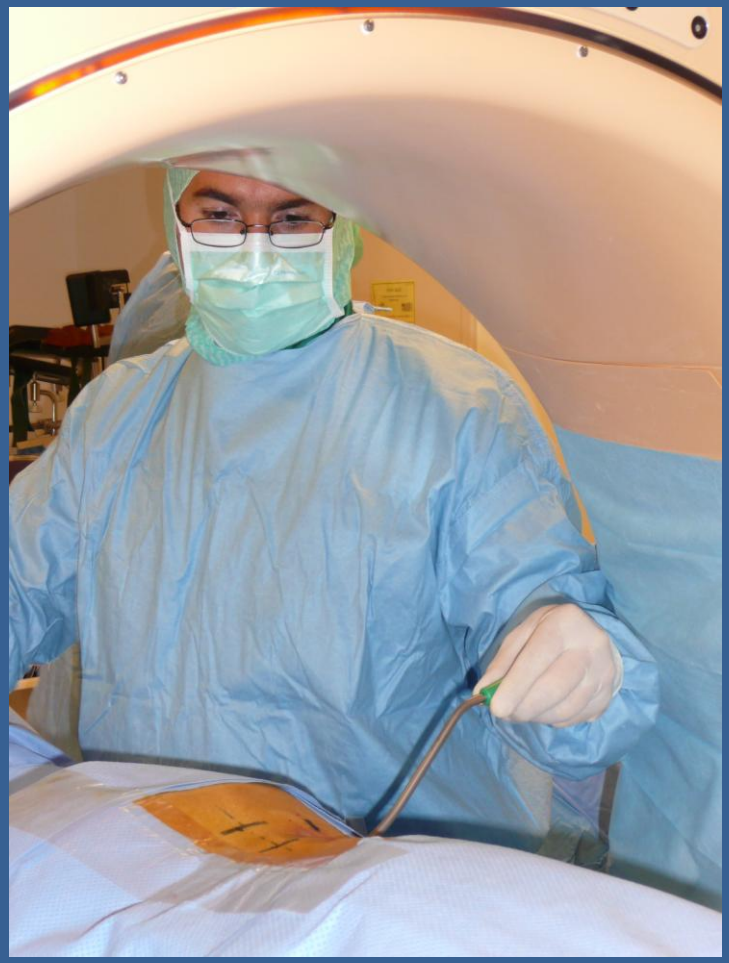
- Less popular
- Anterior experiences and deceptions
- Still a bright future?

Interspinous system

- Indications
- Method
- Results
- Limitations

Percutaneous devices

- Pure percutaneous
- Moderate lumbar stenosis
- Transient surgery?



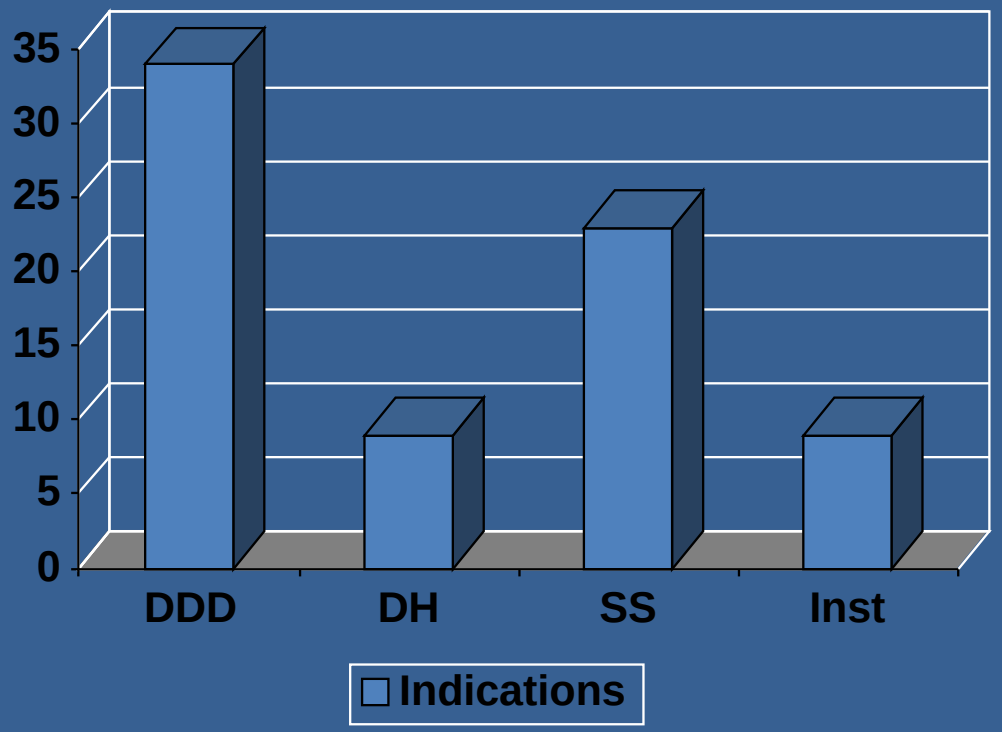
Step by step

Posterior stabilisation

- Concept and philosophy
- Indications
- Technique
- Approach MIS
- Results

Indications

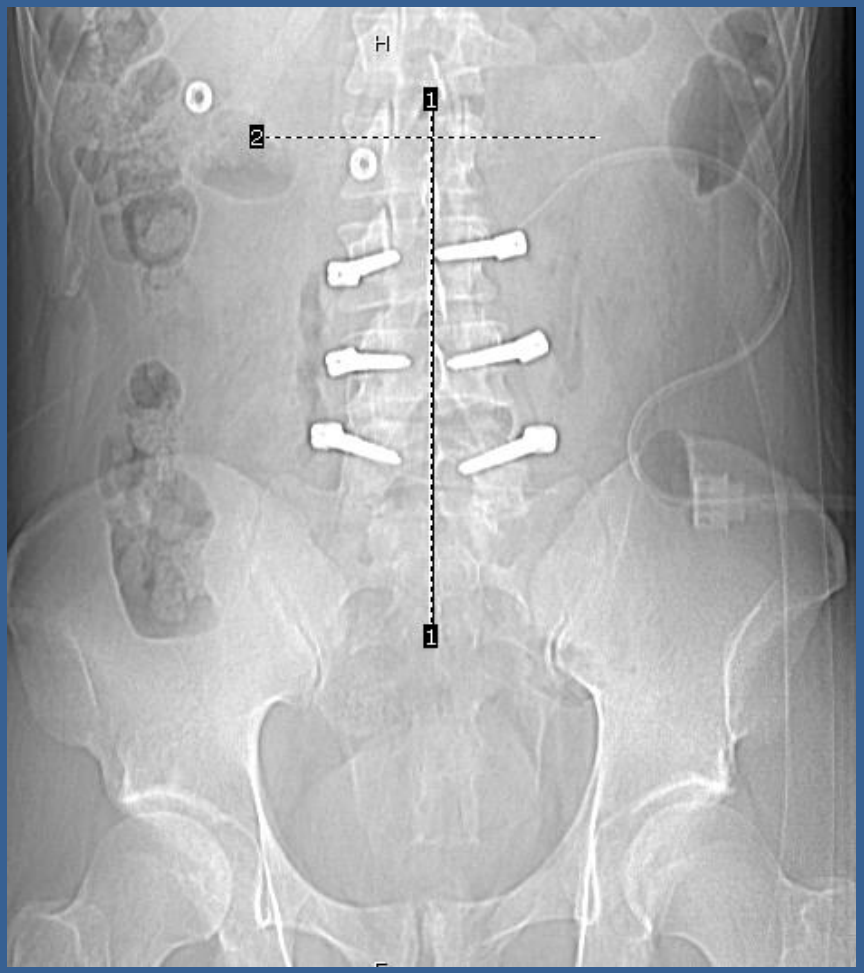
- Mainly the core indications
  - Degenerative discopathy
    34 cases (45%)
  - Disc Herniation
    9 cases (12%)
  - Spinal stenosis
    23 cases (31%)
  - Instability 9 cases (12%)



Degenerative discopathies (45%)

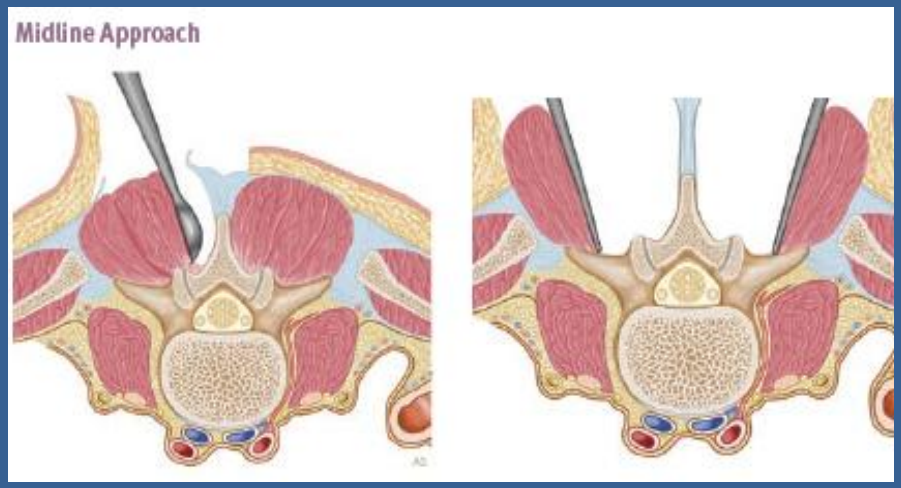
- Young male
- Discographies
  - + L3/L4
  - + L4/L5
  - - L2/L3

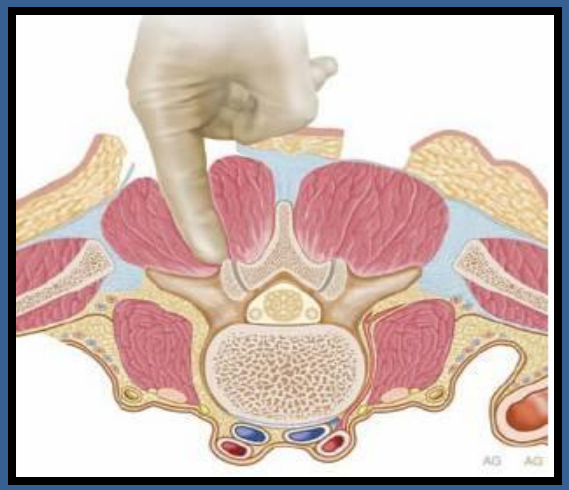
Post-op Wiltse approach



Approach Technique

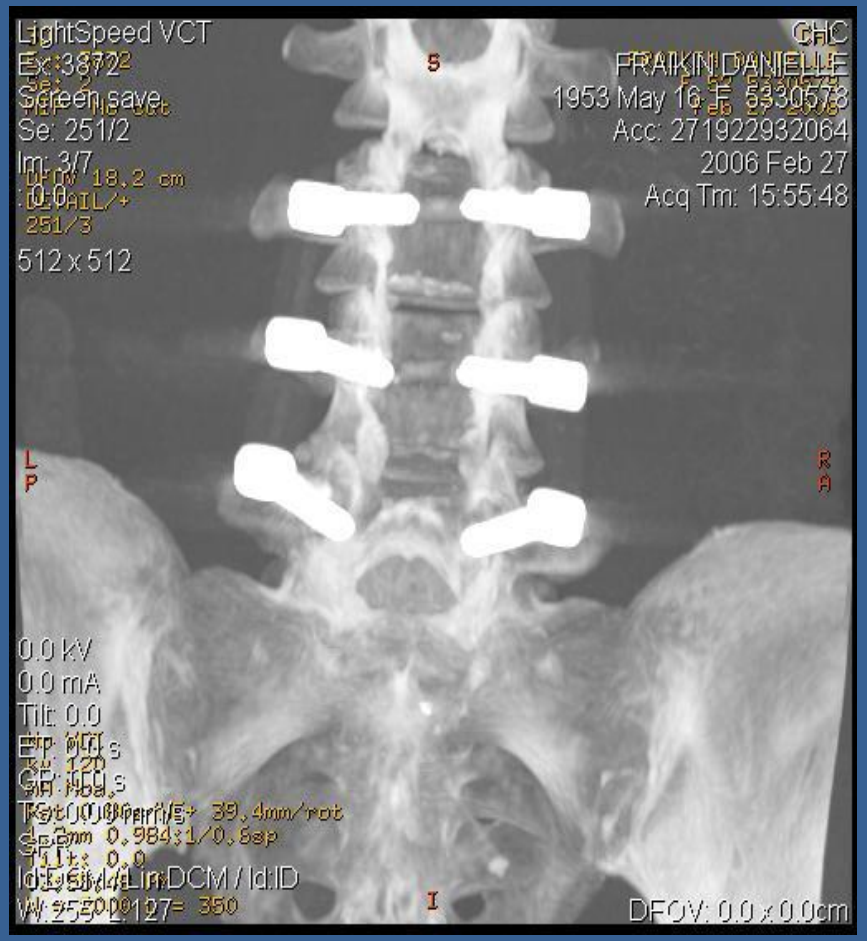
- **47** « classical »
  - 38 with intracanalar job (HD,foraminotomy, laminectomy)
- **28** Intermuscular





Spinal stenosis (31%)

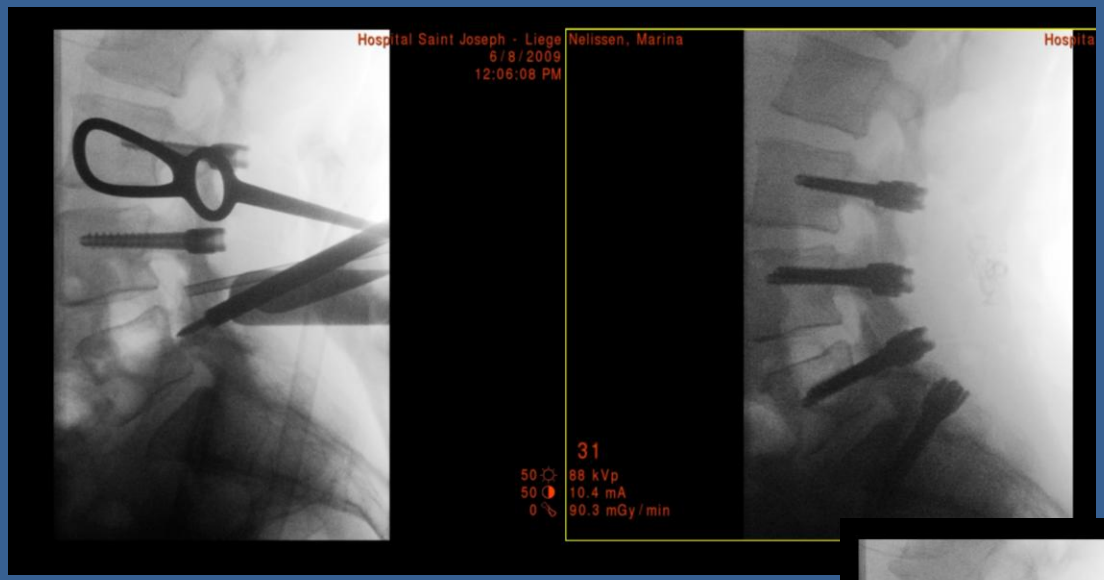
- If back pain present
- Associated with large decompression
- +/- instability



Evolutions

- O-arm use since 1 year, first for immediate post-op screw verification, actually also as a scopy during the procedure

Evolutions


Hospital Saint Joseph - Liege
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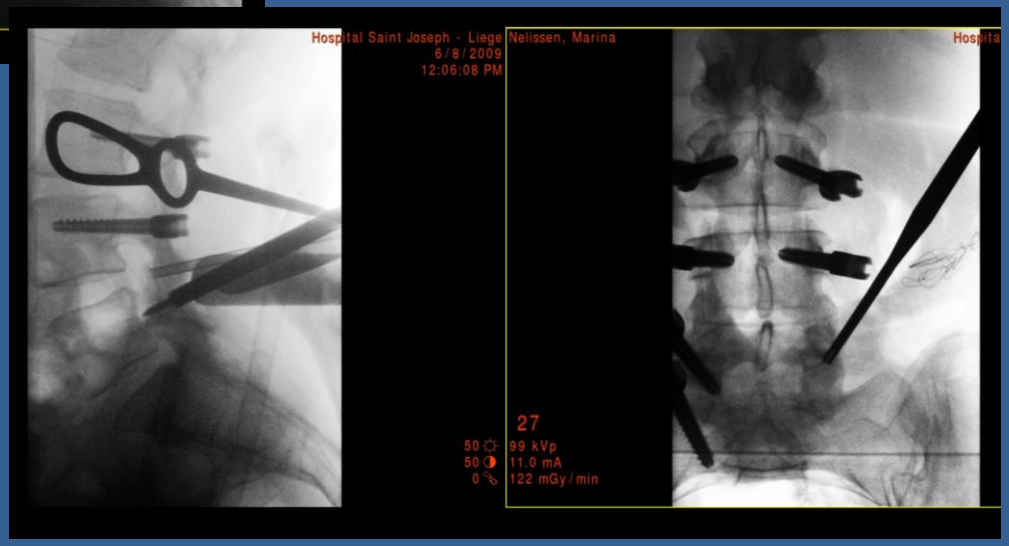
12:06:08 PM
Nelissen, Marina
31
50
50
0
88 kVp
10.4 mA
90.3 mGy/min


Hospital Saint Joseph - Liege
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Nelissen, Marina
27
50
50
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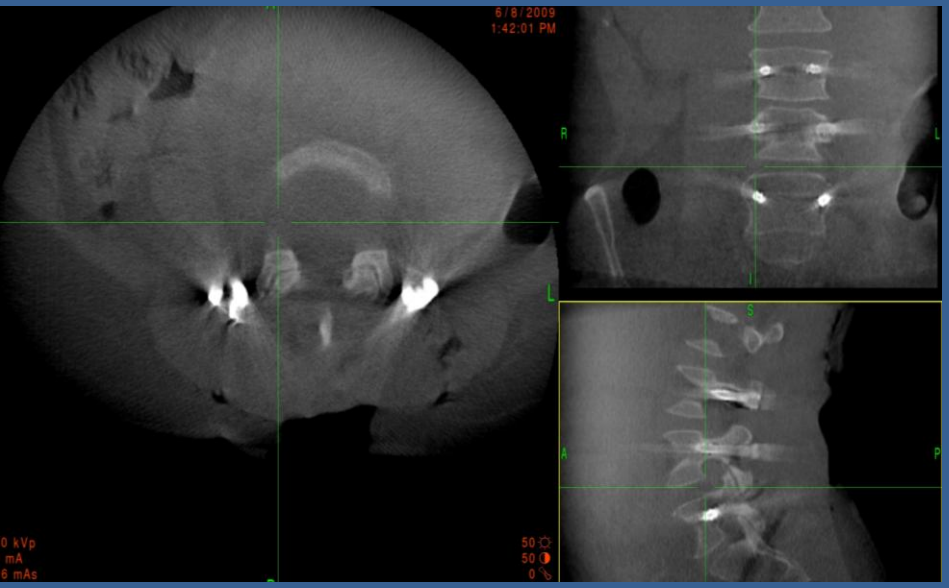
99 kVp
11.0 mA
122 mGy/min

Evolutions

- O-arm to verify screw position during surgery



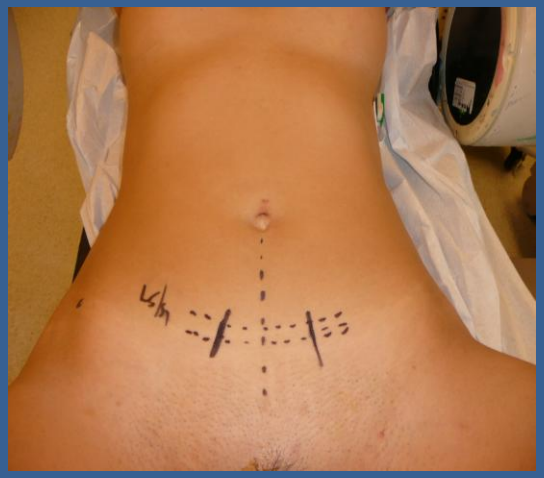
Total disc replacement

- Both cervical and lumbar
- Concept
- Indications
- Technique
- Approach
- Results

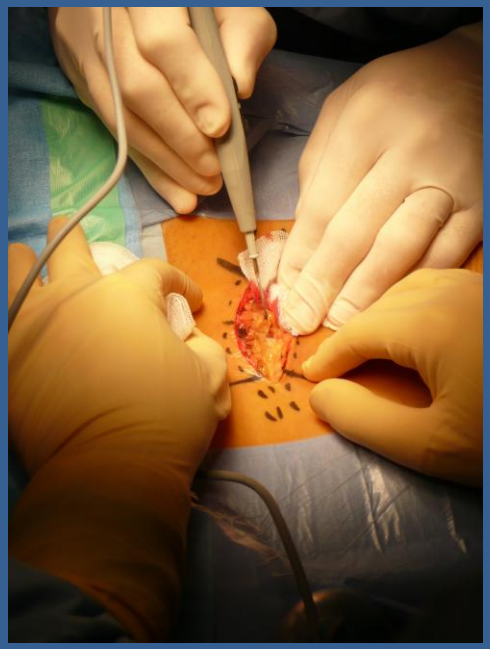
Potential benefits of spine arthroplasty

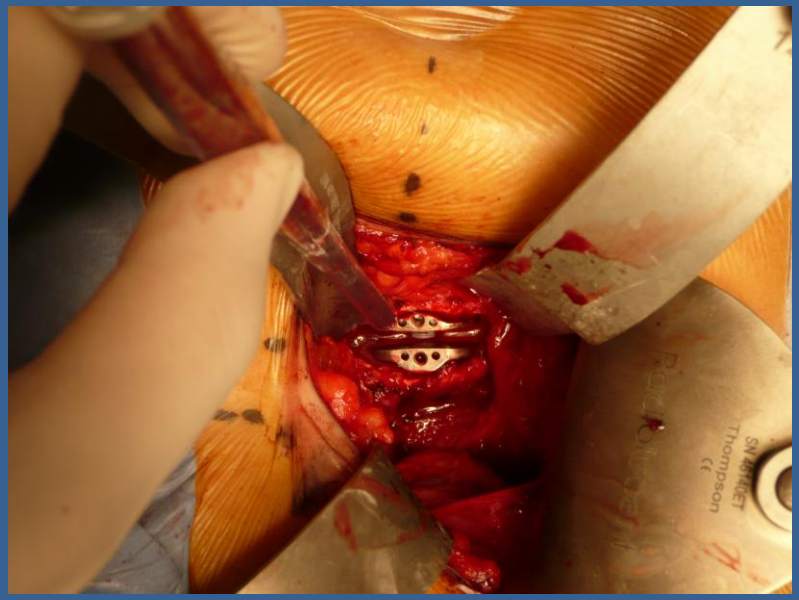
- Remove pain generator (disc)
- Restore disc and foraminal height
- Preserve mobility of the functional spinal unit
- Minimize stress on adjacent level
- Maintain stability
- Eliminate donor site morbidity
- May reduce pain associated with DDD

The approach



- Retro or transperitoneal approach

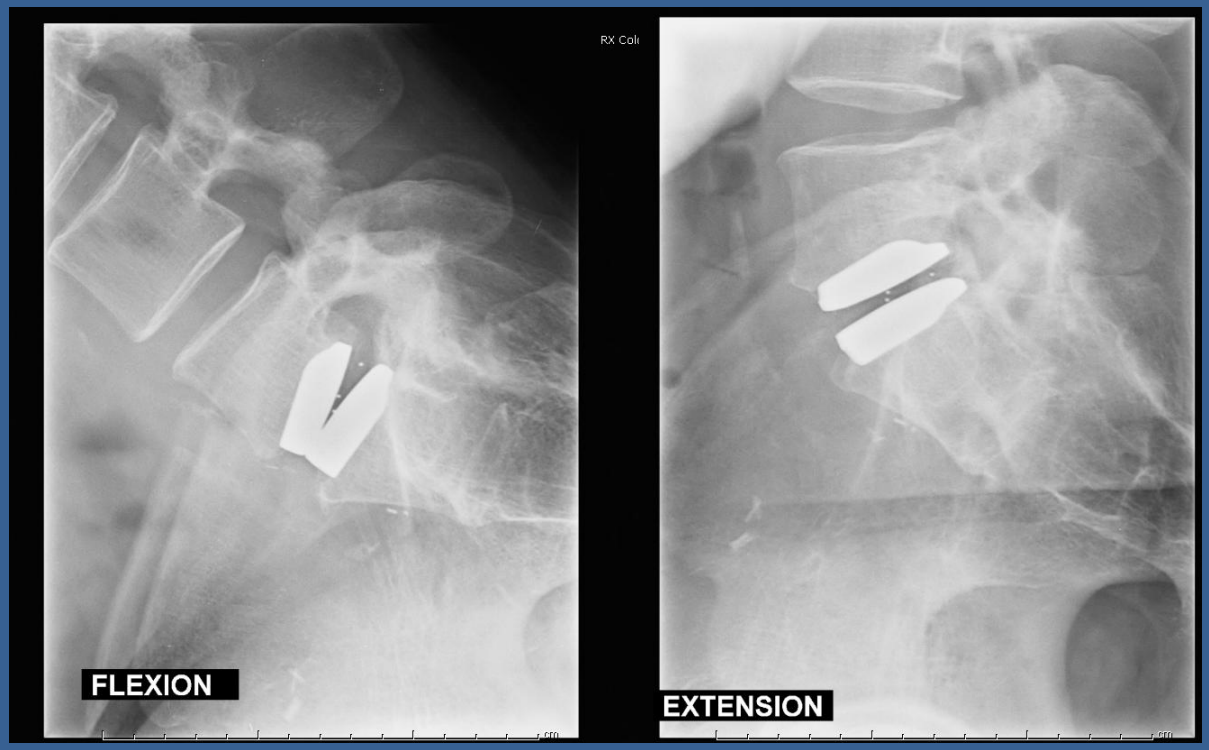




Abords ant.lombaires

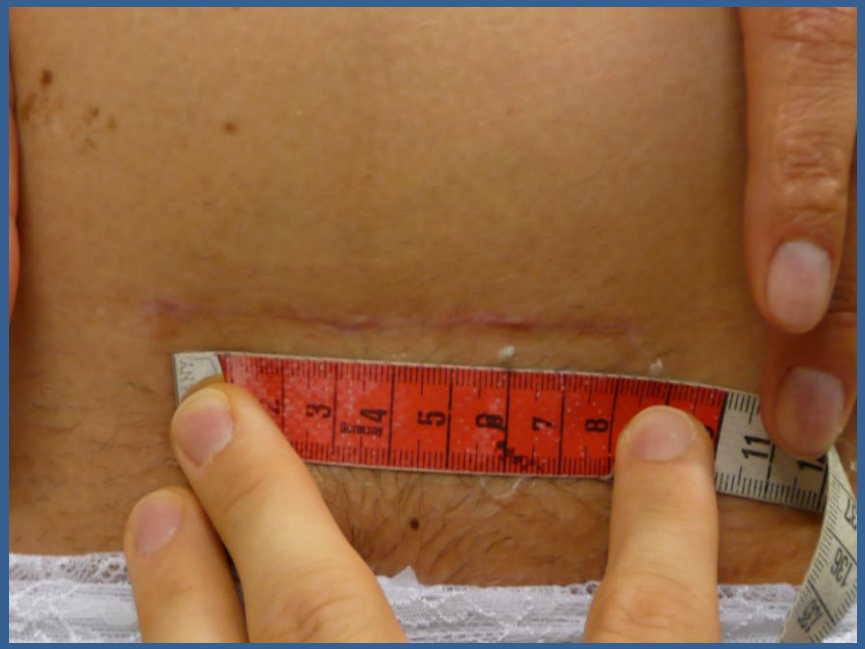
ion de l’acte chirurgical

Radiological result



Anterior MIS

- Postop aspect
- No posterior skin incision
- No muscular damage

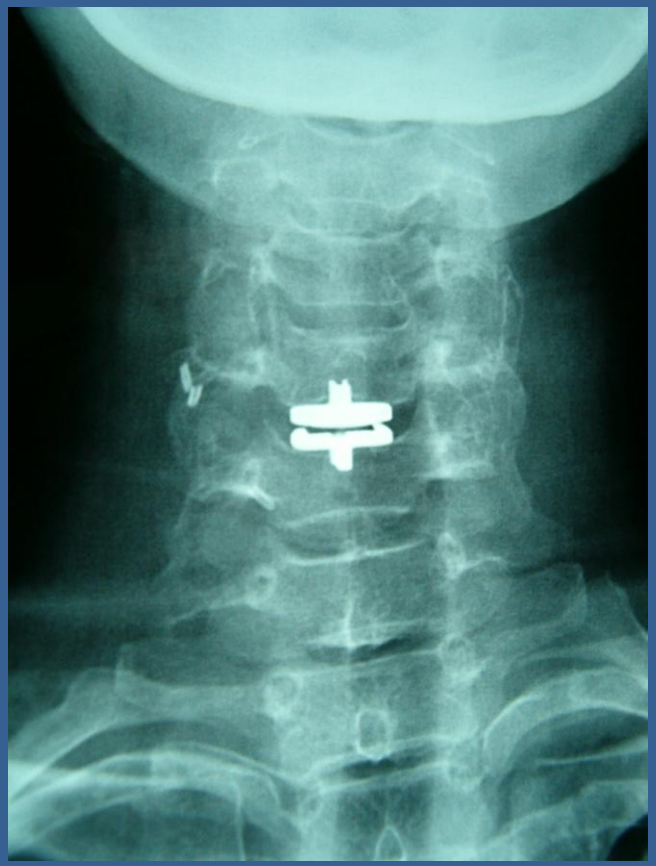


Abords ant. Lombaires

Un travail d'équipe

Rachis cervical

Rigueur chirurgicale



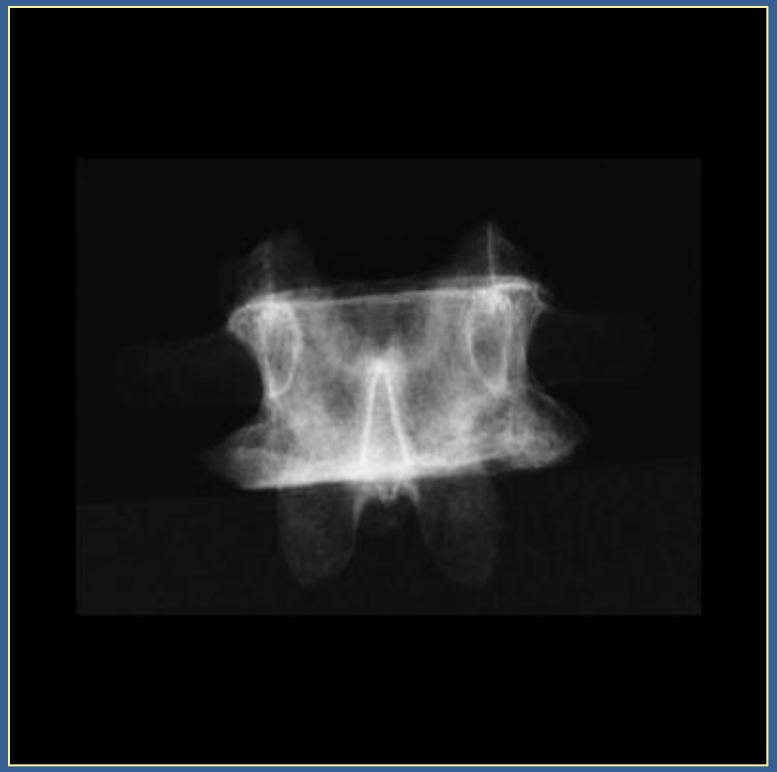
Fusion degenerative

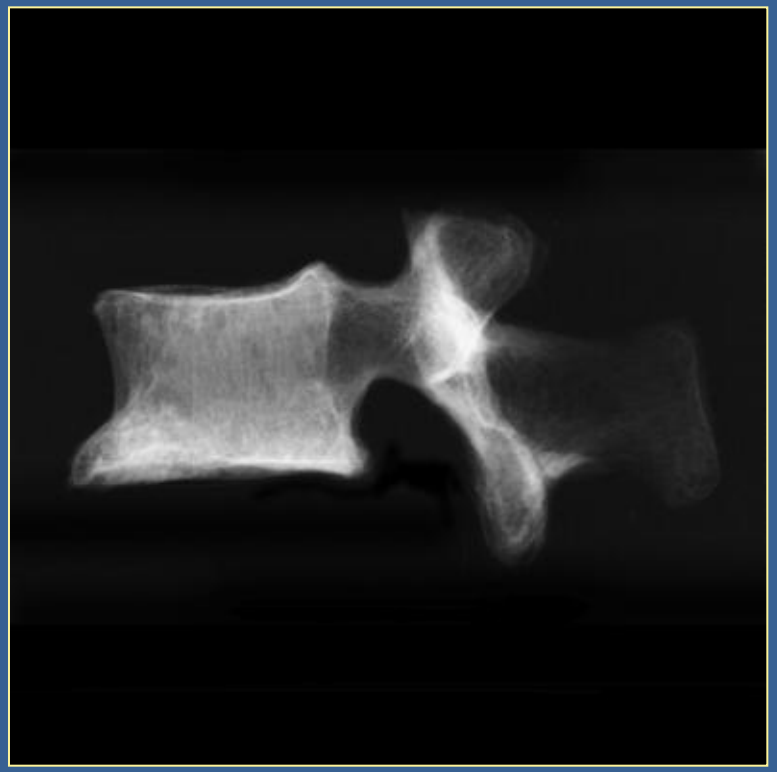
- All spine region
- Open - Hybrid- MIS
- Anterior and/or posterior
- Learning curve
- Diversity of materials

Ideal to perform screw placement:

AXIAL view

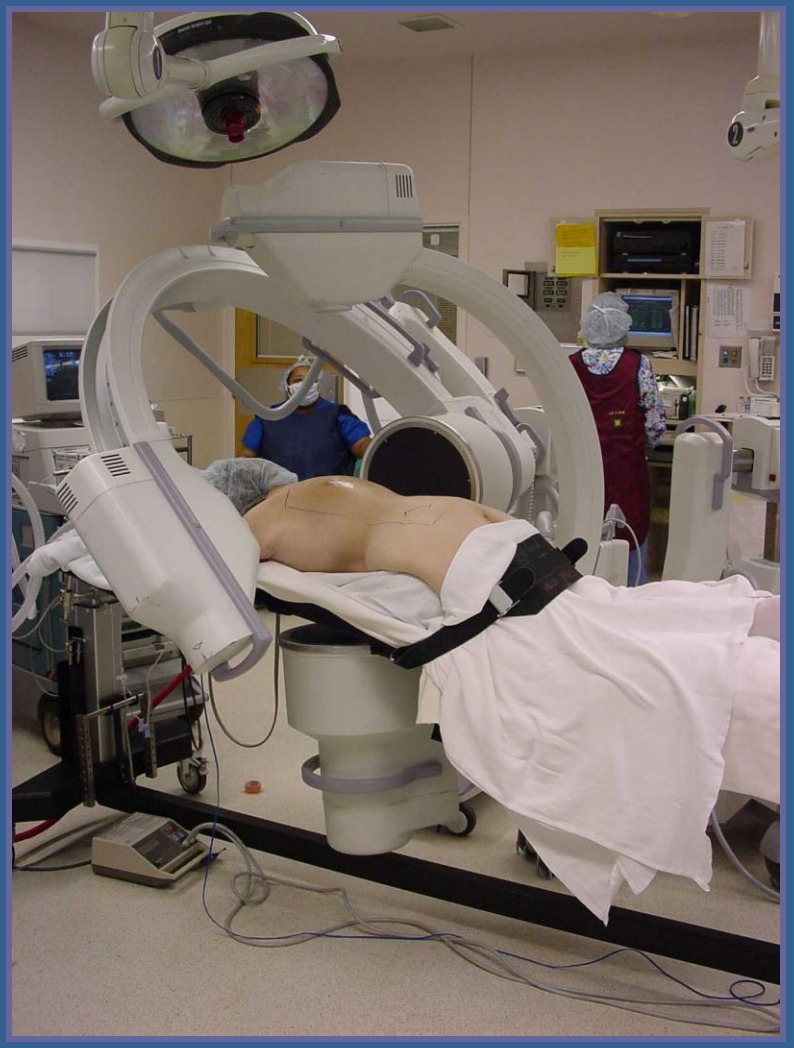
What we have is AP & Lateral:





Must accurately identify radiographic landmarks…

AP and LAT IMAGING



Set-up:

Positioning of the C-arms:

- Use 1 or 2 C-arms for visualization of the fracture.
- The use of 2 C-arms has been found to reduce the procedure time.

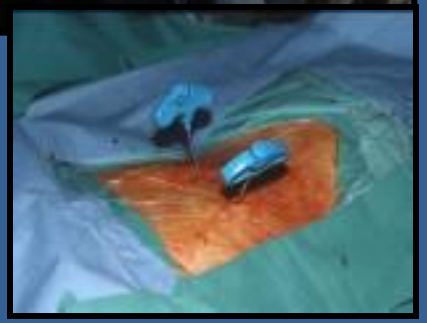
Minimally Invasive Spinal Surgery

Goal: ***target therapy with minimal collateral tissue damage***

Endoscopic

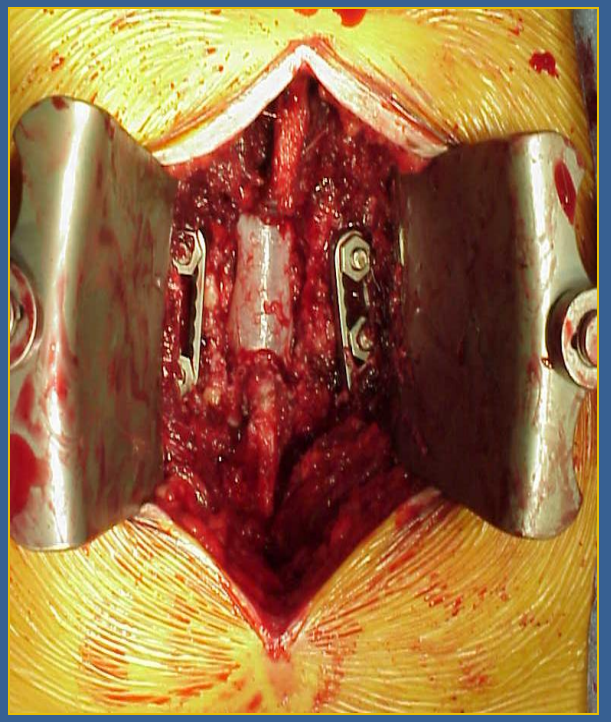
Mini-MiniOpen

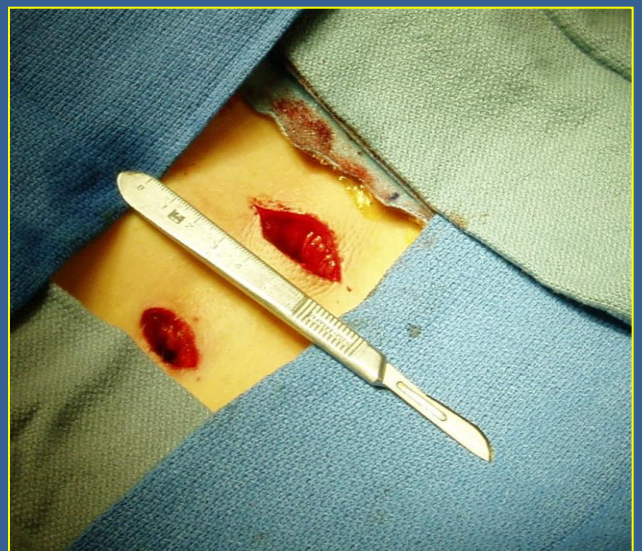
Image Guided Percutaneous



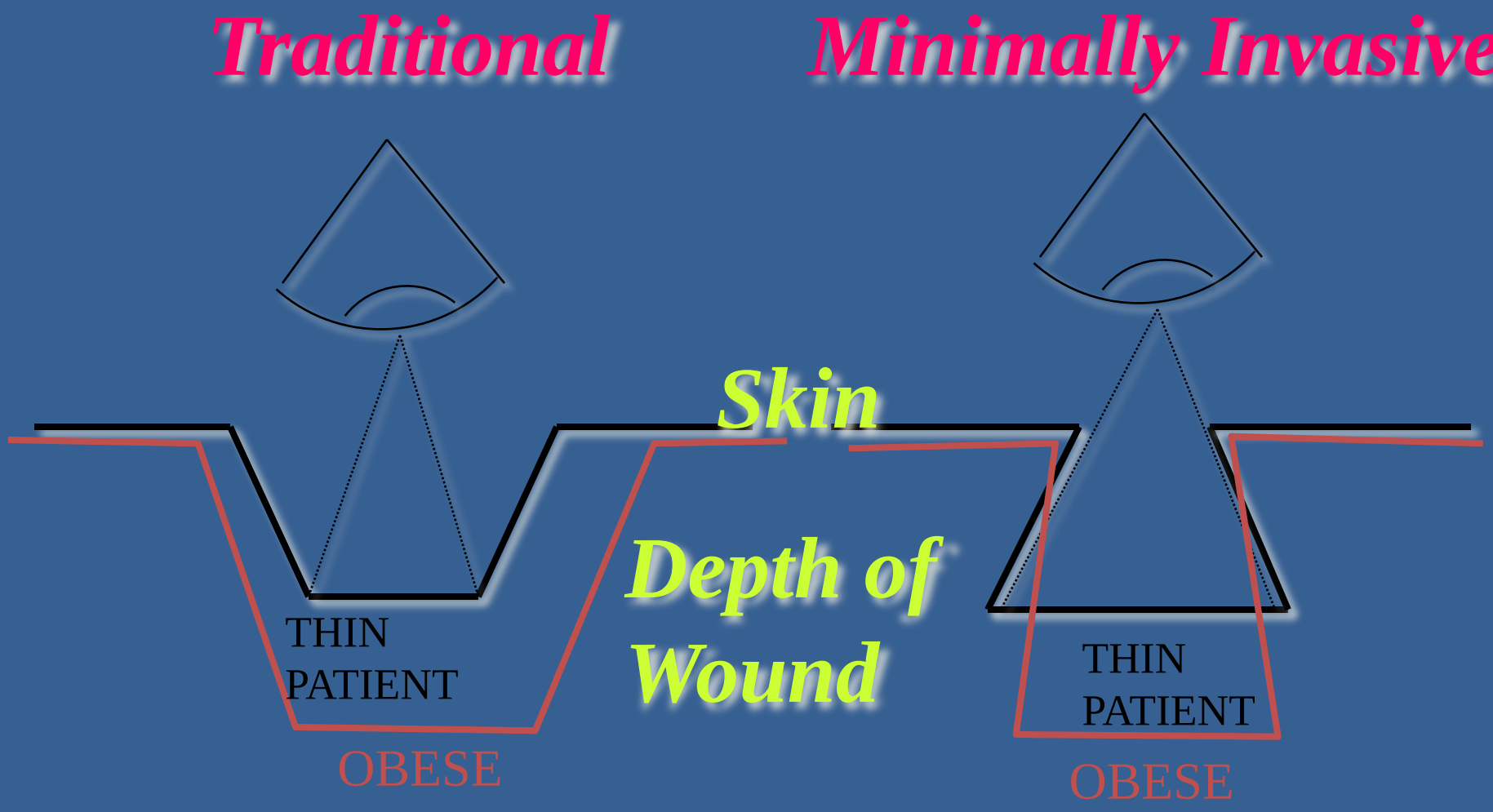
Principles…

- Localize incision
- Tunneled or Inverted V-Shape exposure
- Only expose necessary anatomy
- Split rather than cut muscle fascicles
- Spare tendon/ligament bone attachments
- Spare nerve and blood supply to soft tissues





Inverted V Incision



Possible ways to reduce X-Ray exposure

- Preventive protection measures
  - whole body aprons
  - lead collars
  - protective gloves and eyeglasses
  - standing at appropriate distance from source
  - using imaging sparingly (ALARA principle)

Possible ways to reduce X-Ray exposure

- Use of 2 C-Arm
- Neuro-Navigation (cost, add only on needle positionning)
- Unilateral vertebral filling (unipedicular approach)
- New imaging systems like O-ARM

The O-arm system

- Based on a conventional RX-tube and a Flat Panel Detector (40x30 Varian)
- CE mark in November 2006
- Can be used both in 2D mode, as a conventional fluoroscopic system, and in 3D mode (increase resolution to look for leakages)
- In this last modality, the system offers CT like images

Advantages...

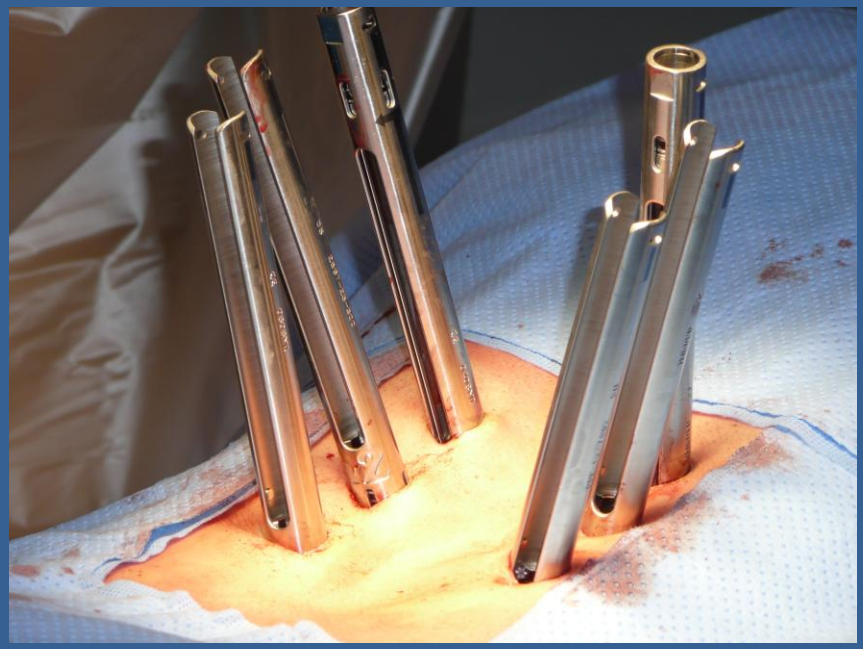
- Robotic movements enables the gantry to move to 4 preset working position (+park)
- 3 megapixel greater spatial resolution for better accuracy (<>fluoroscopy)
- Possible automatic registration for Navigation (StealthStation System)

The Viper system

- Very few instruments needed
- Fantastic screws
- Less incisons

After srews positioning

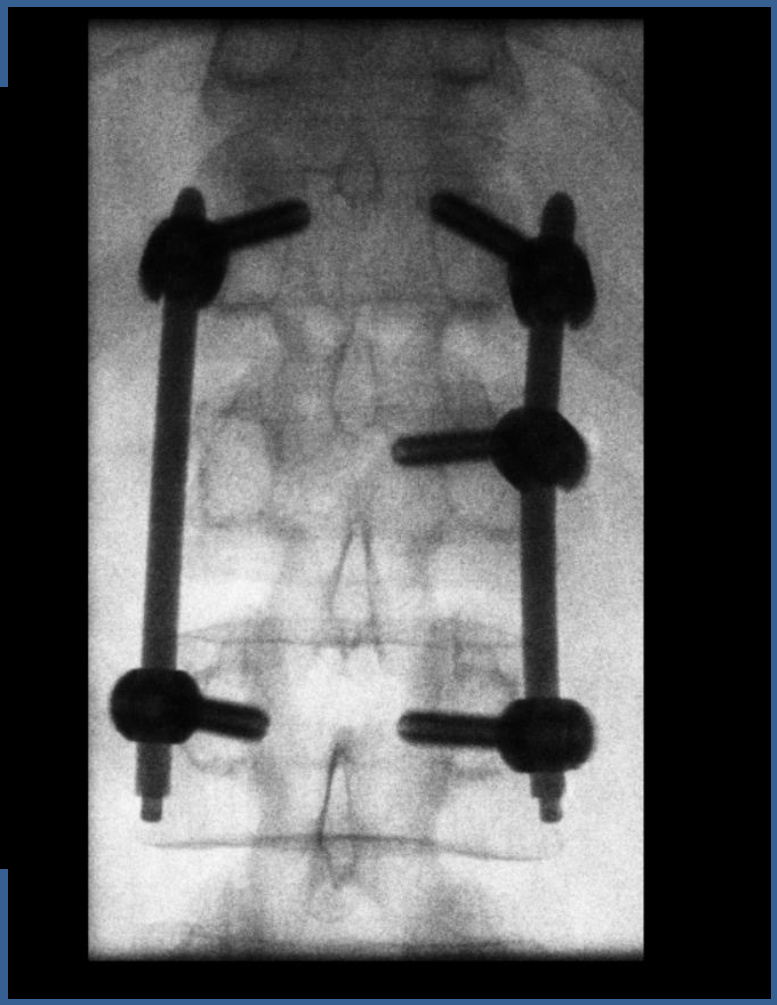
- Technique step by step



Final aspect

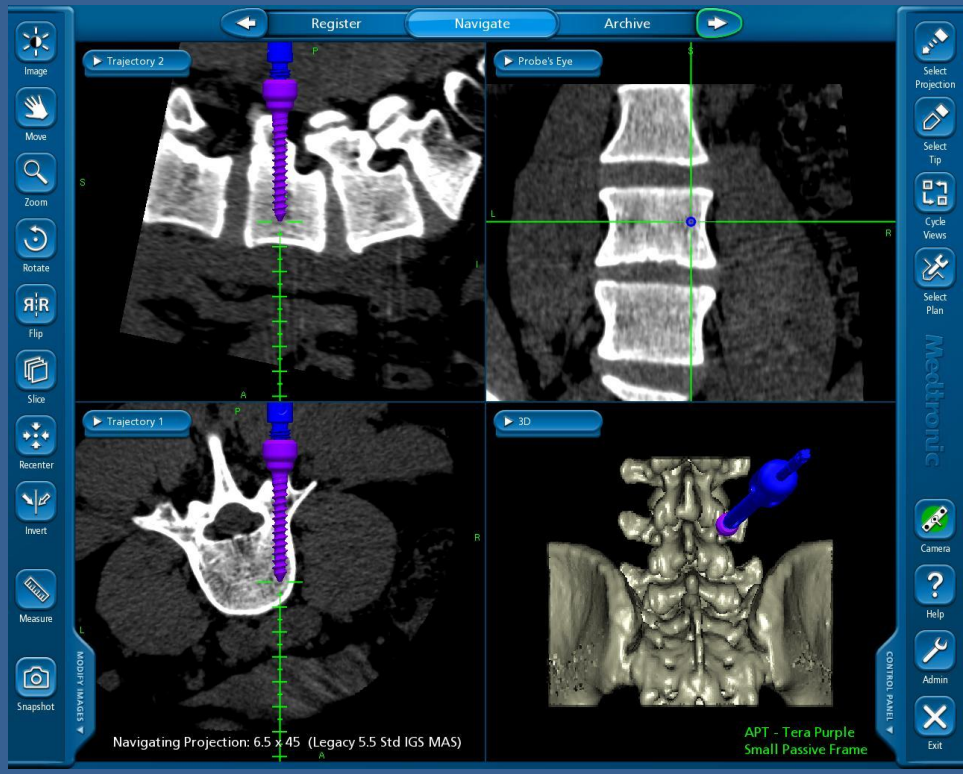
- Only 6 small incisions (15mm) for a three level construct

Stabilisation with no fusion



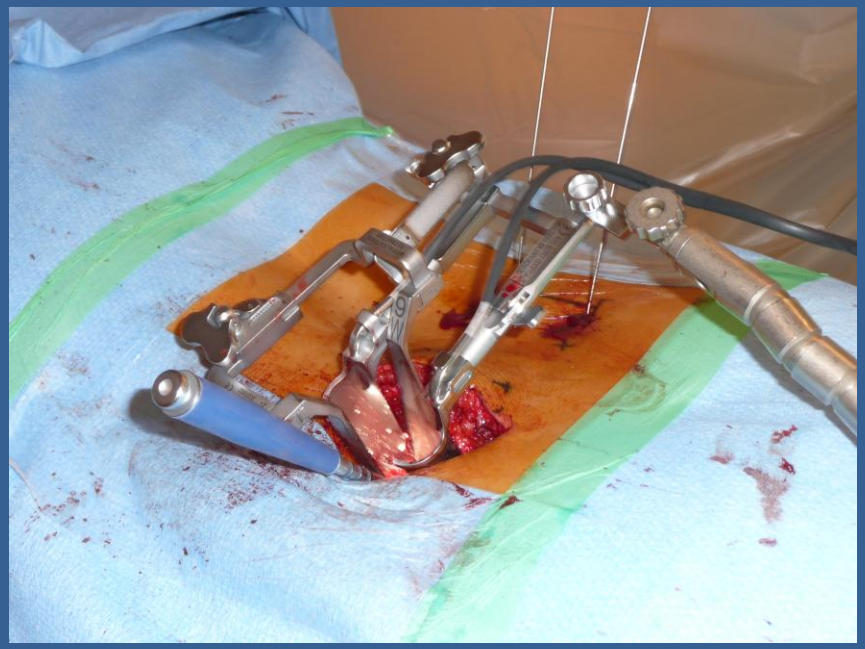
Neuronavigation

- Less fluroscopy
- Better anticipation
- Revision cases



Mast technologies

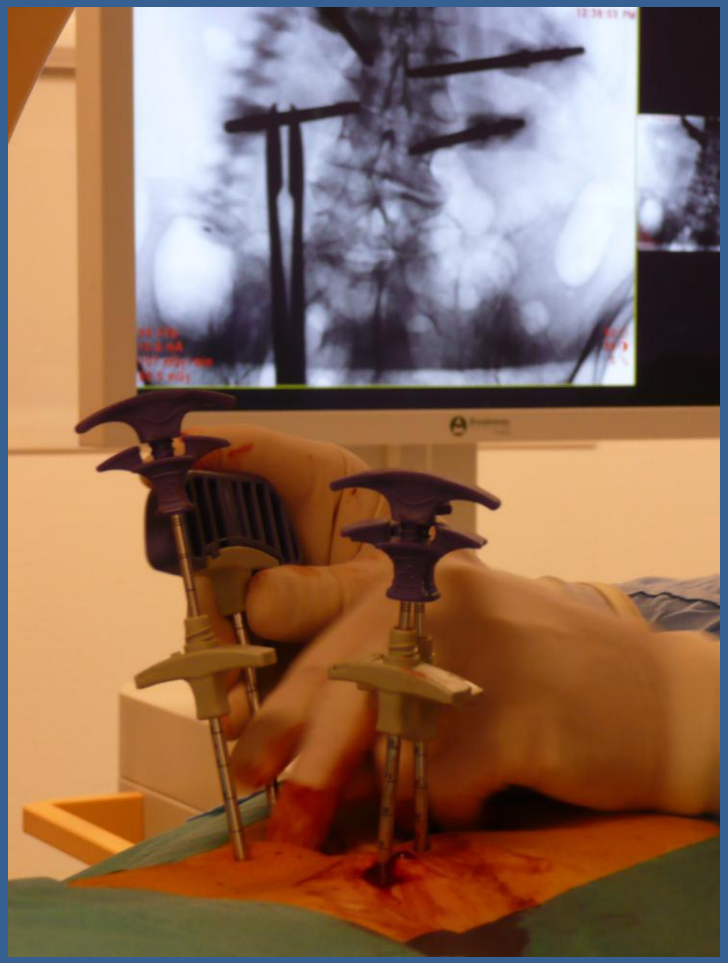
- Percutaneous on one side
- TLIF on the other side



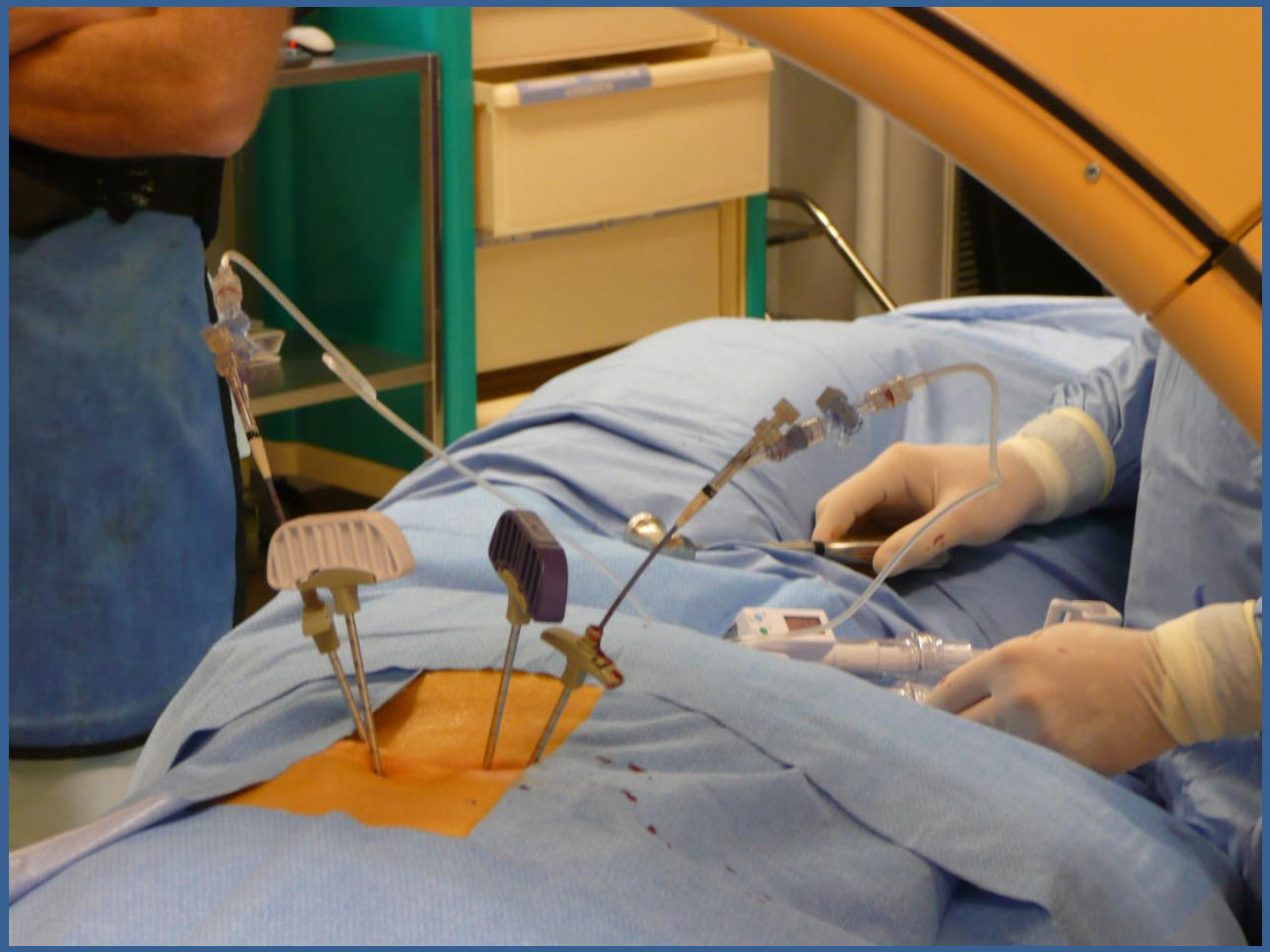
Trauma and osteoporosis

- Cimentoplasty and kyphoplasty
- Percutaneous instrumentation
- Hybrid techniques

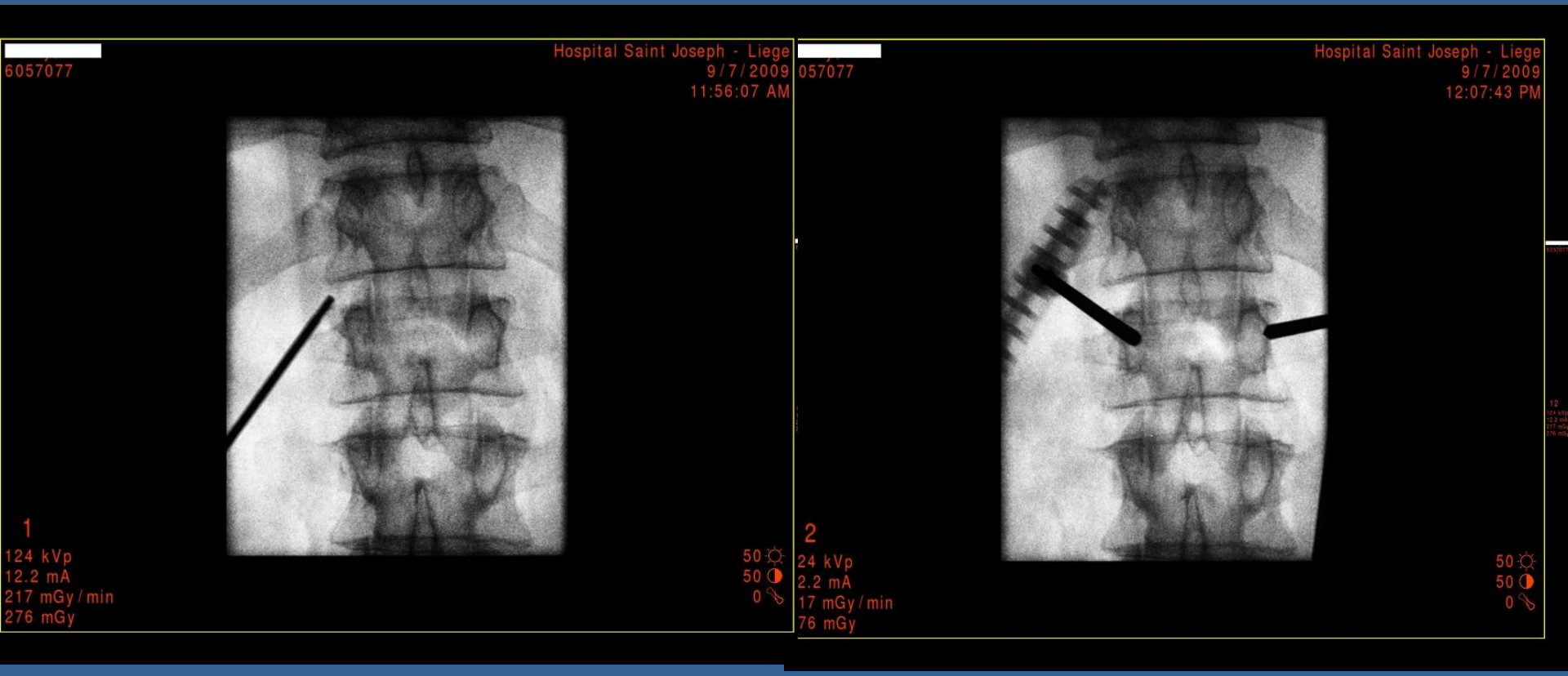
Technique



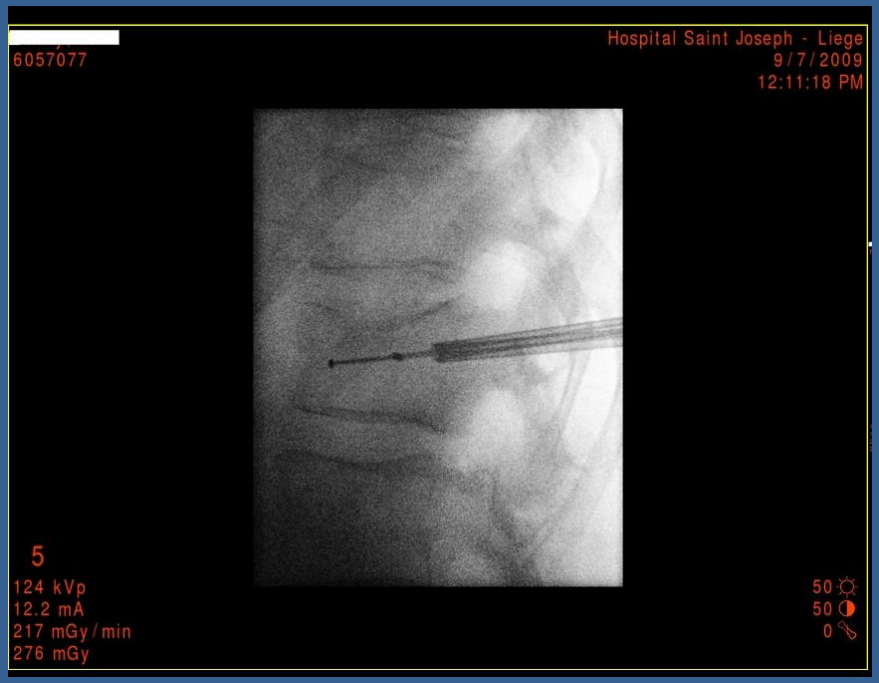
Balloon procedure



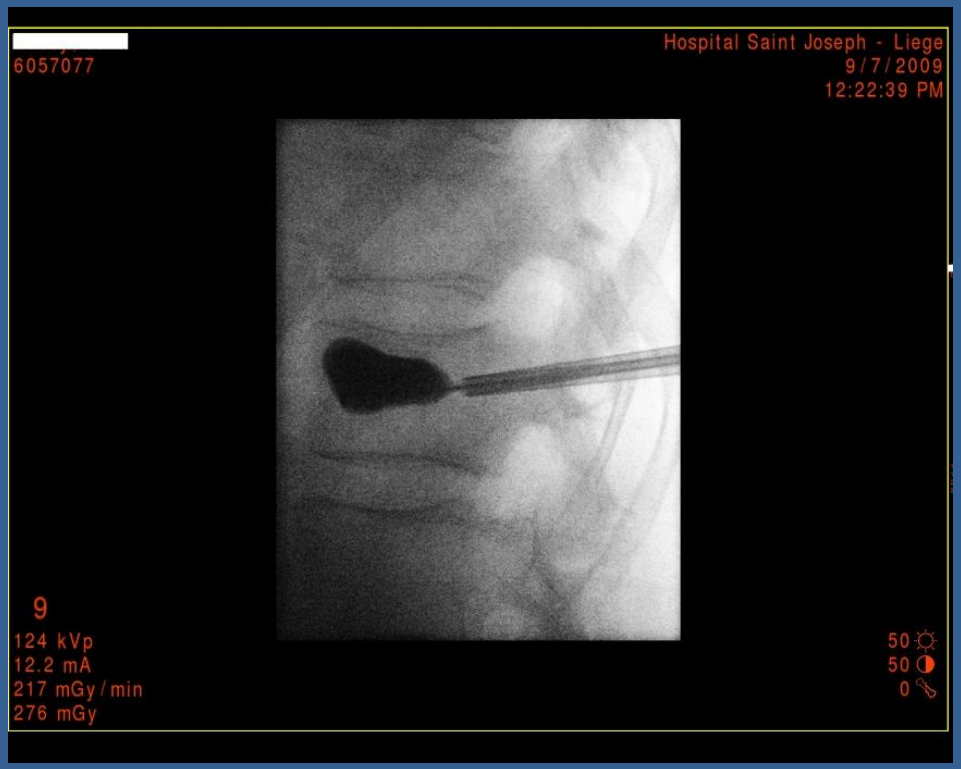
Height Restoration step by step



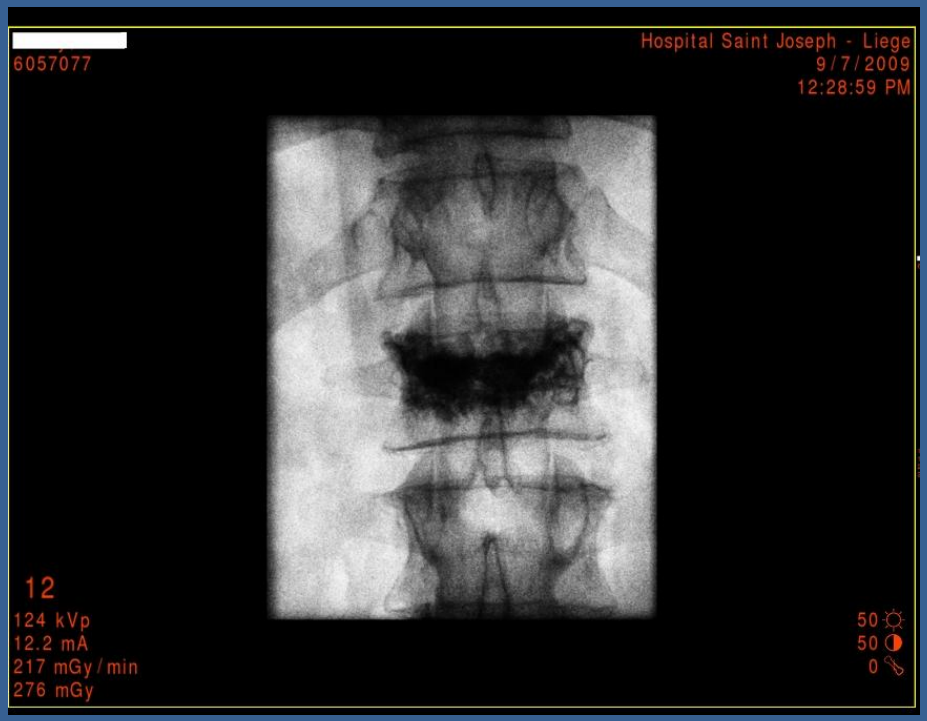
Balloon introduction



Cement injection



Final AP and Lateral

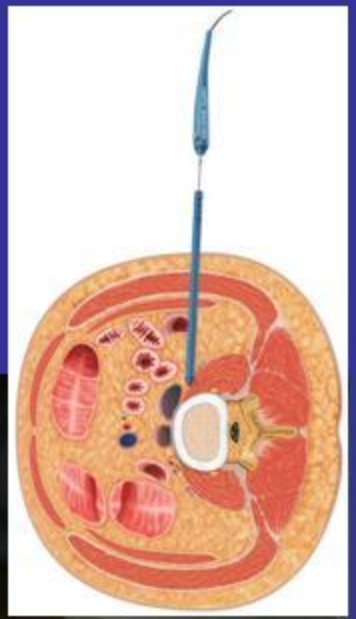


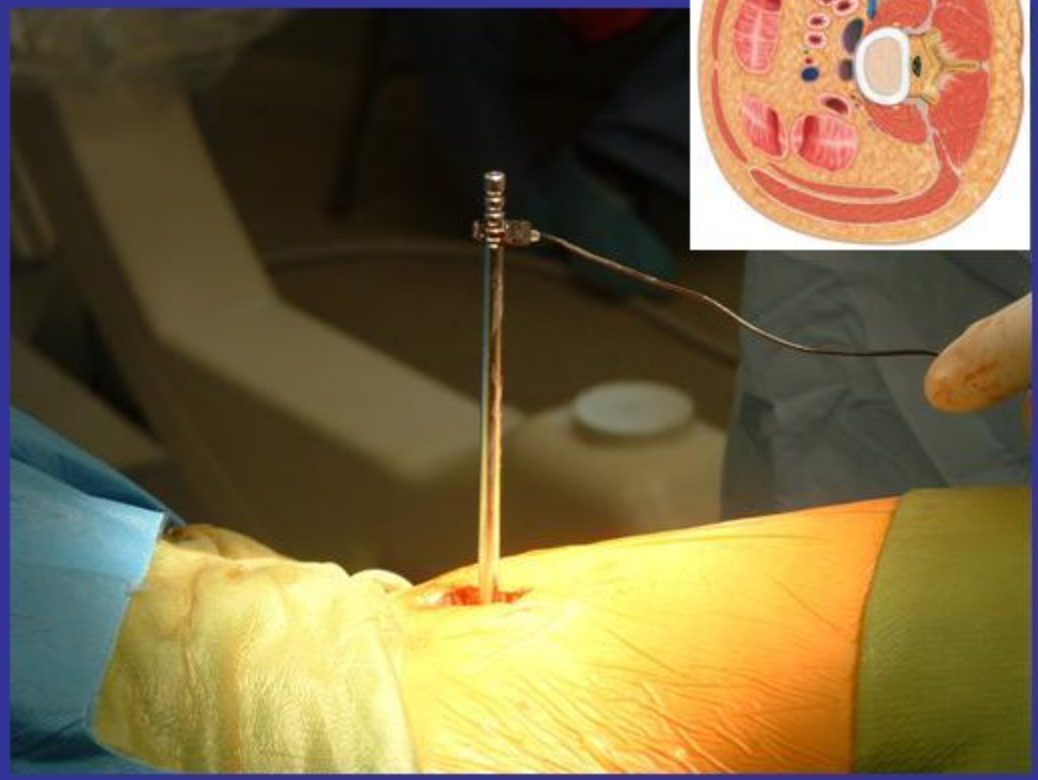
3D Control

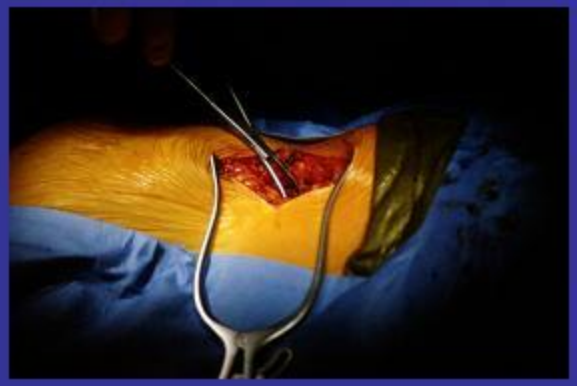
Multiplanar reconstruction

Direct Lateral Technique

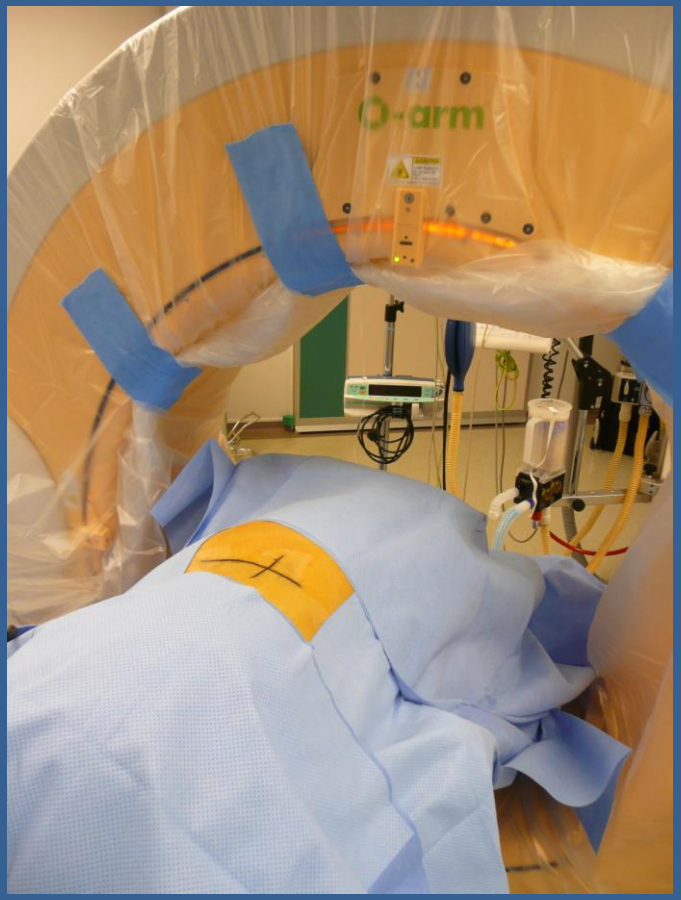
- Localization of target disc
  - Insertion of blunt probe via muscle splitting incision



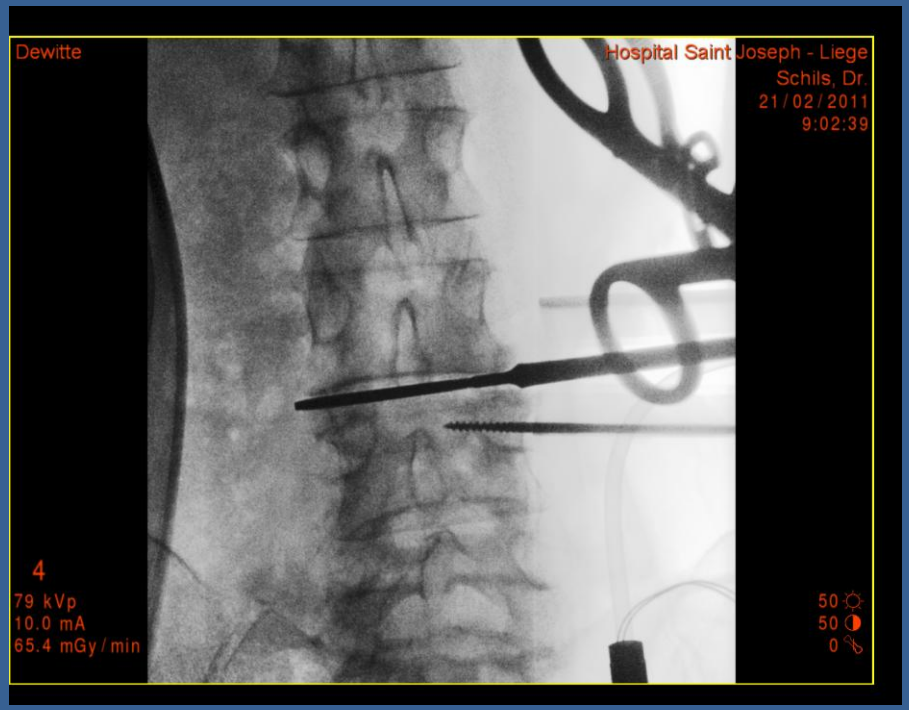


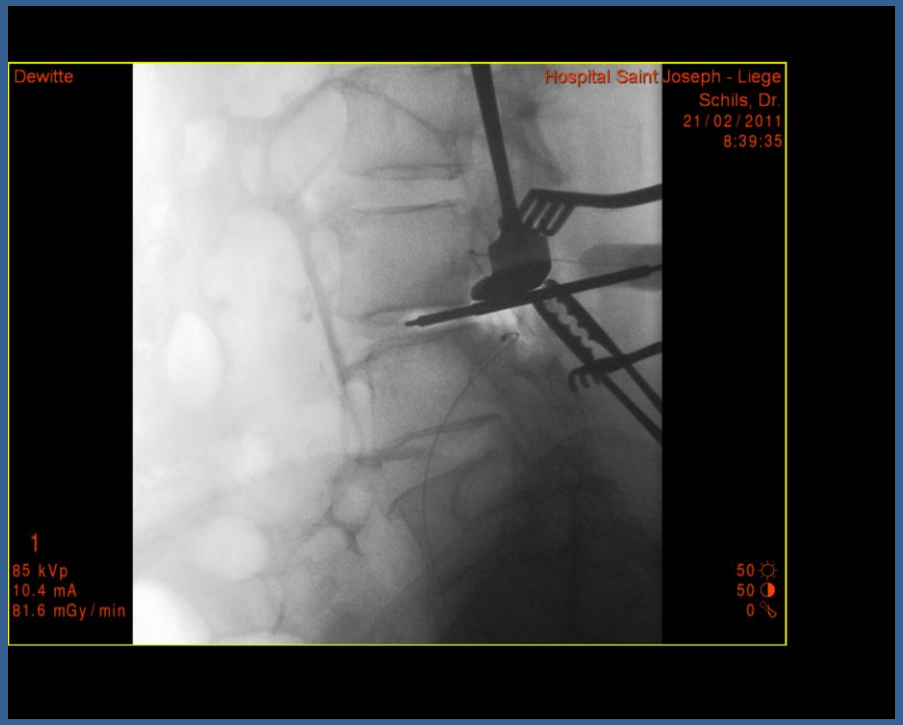


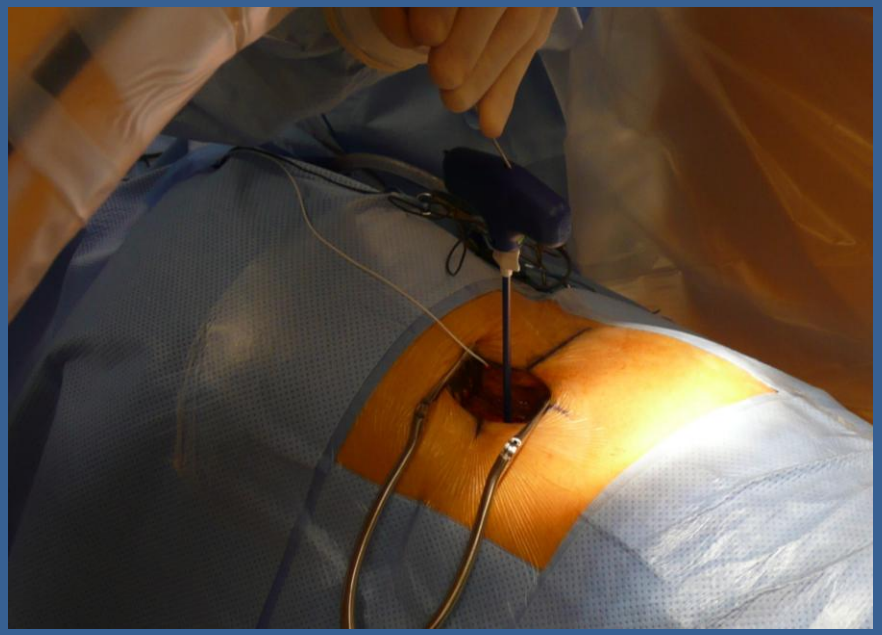

O-arm
O-arm

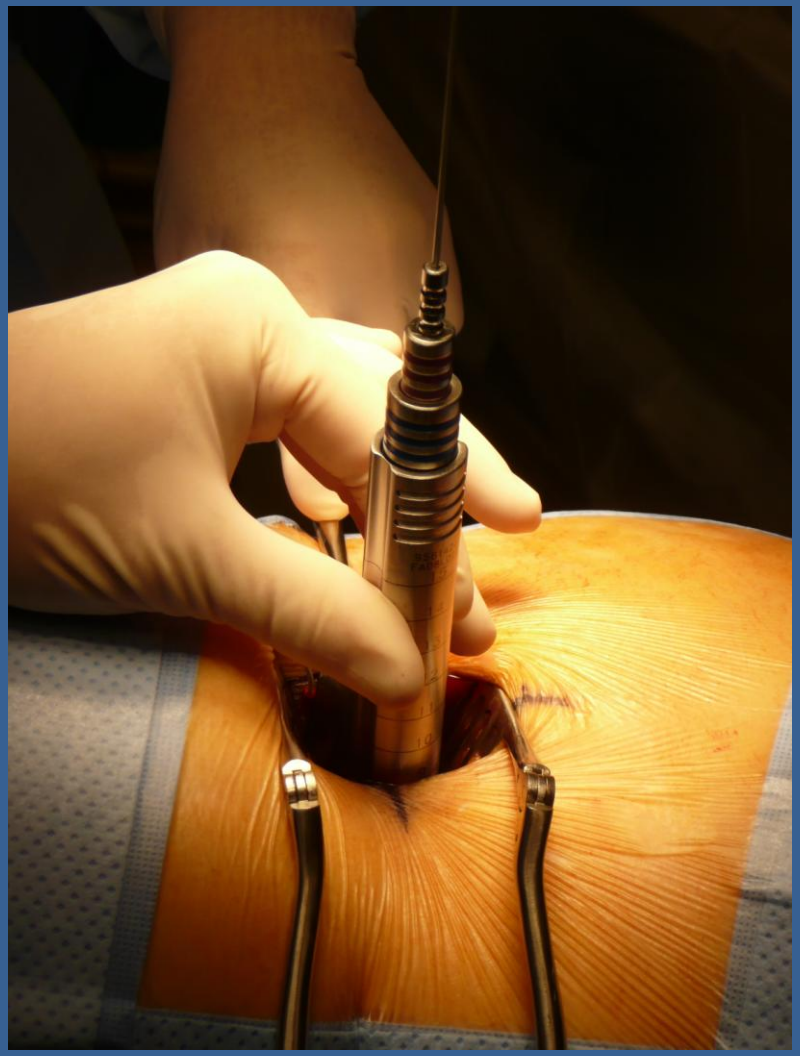

O-arm

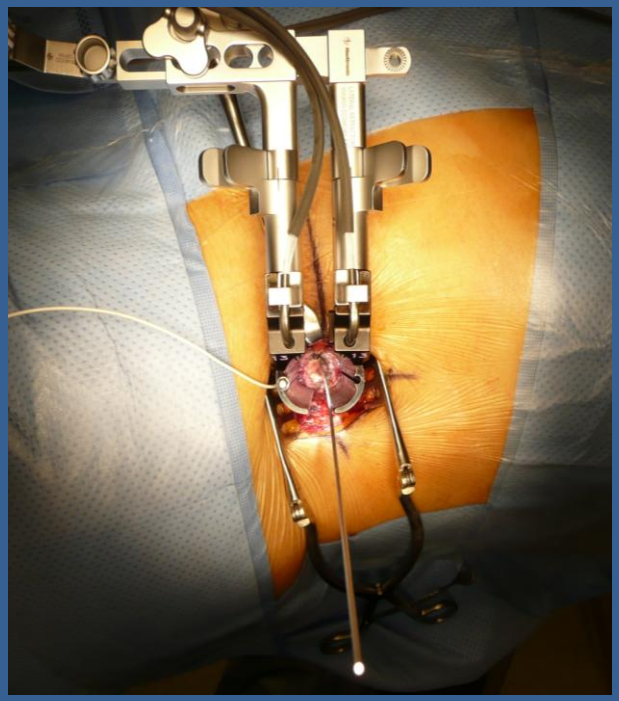
Perop pictures

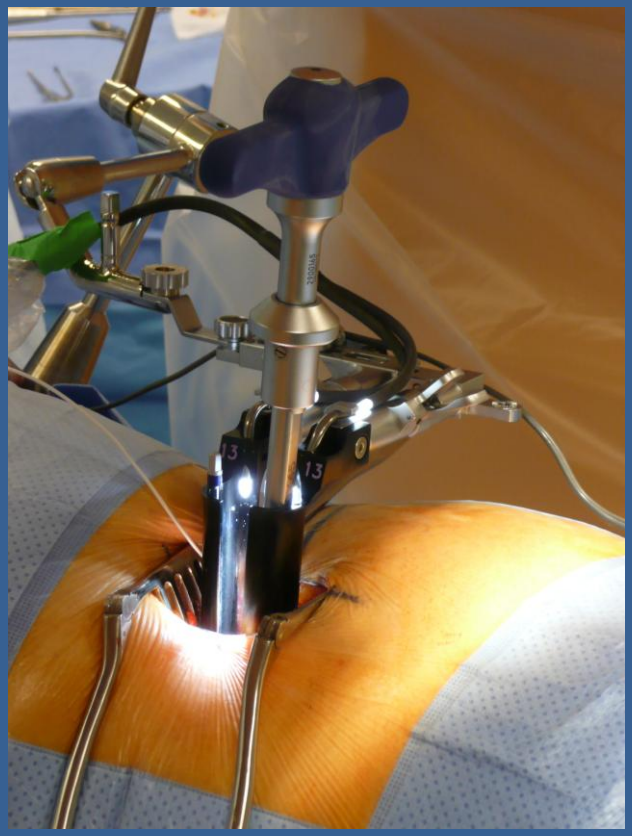




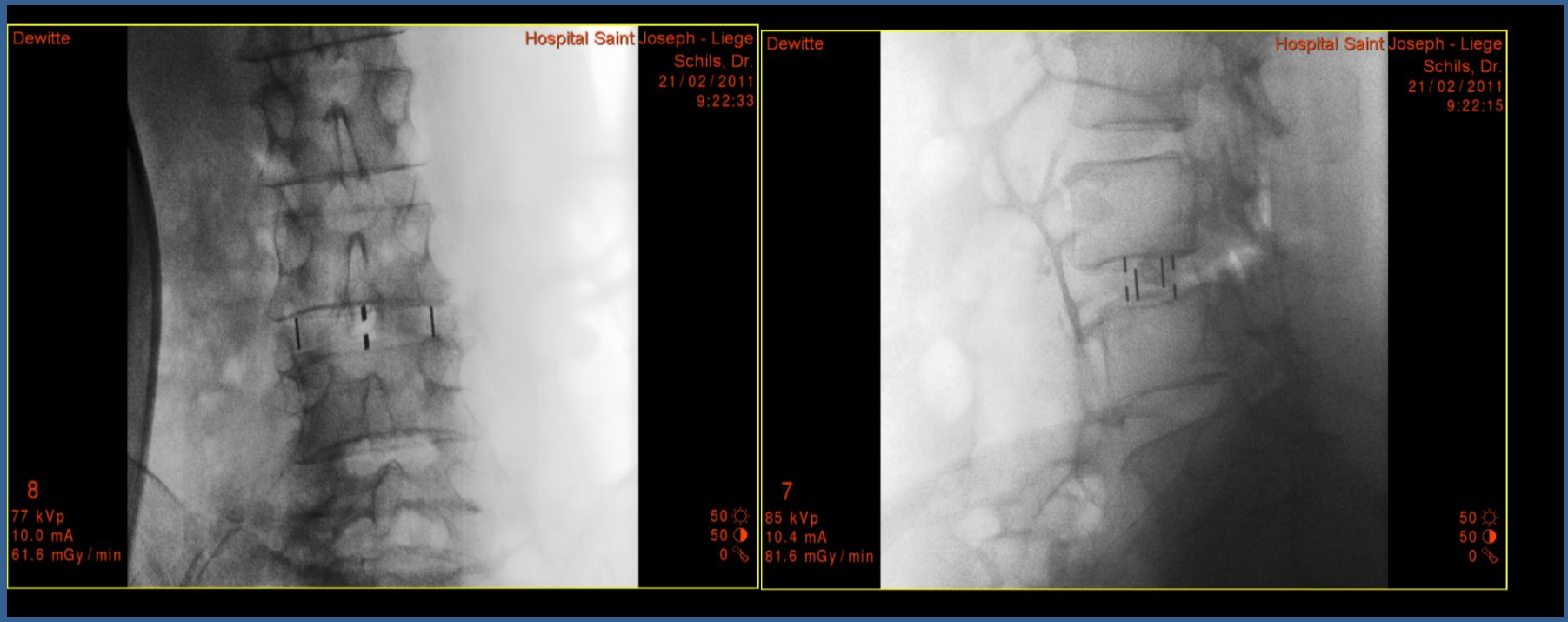






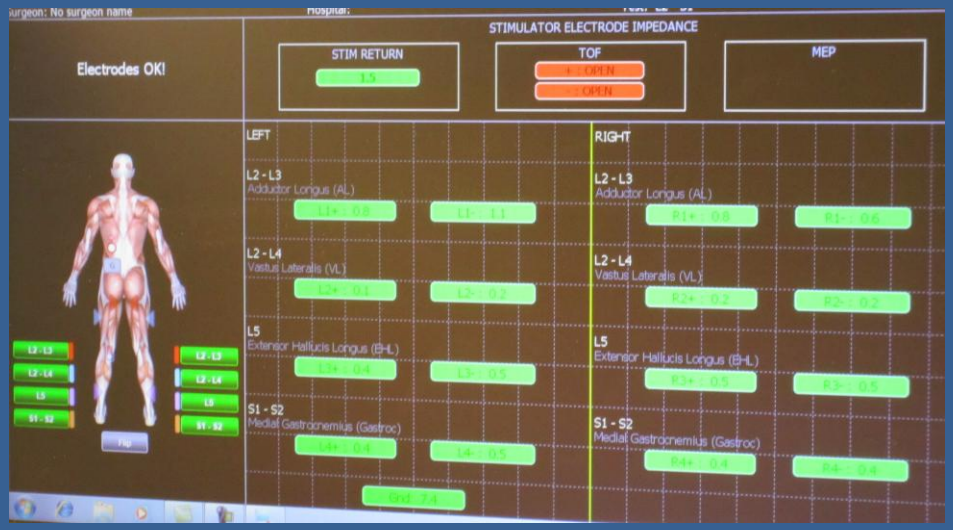


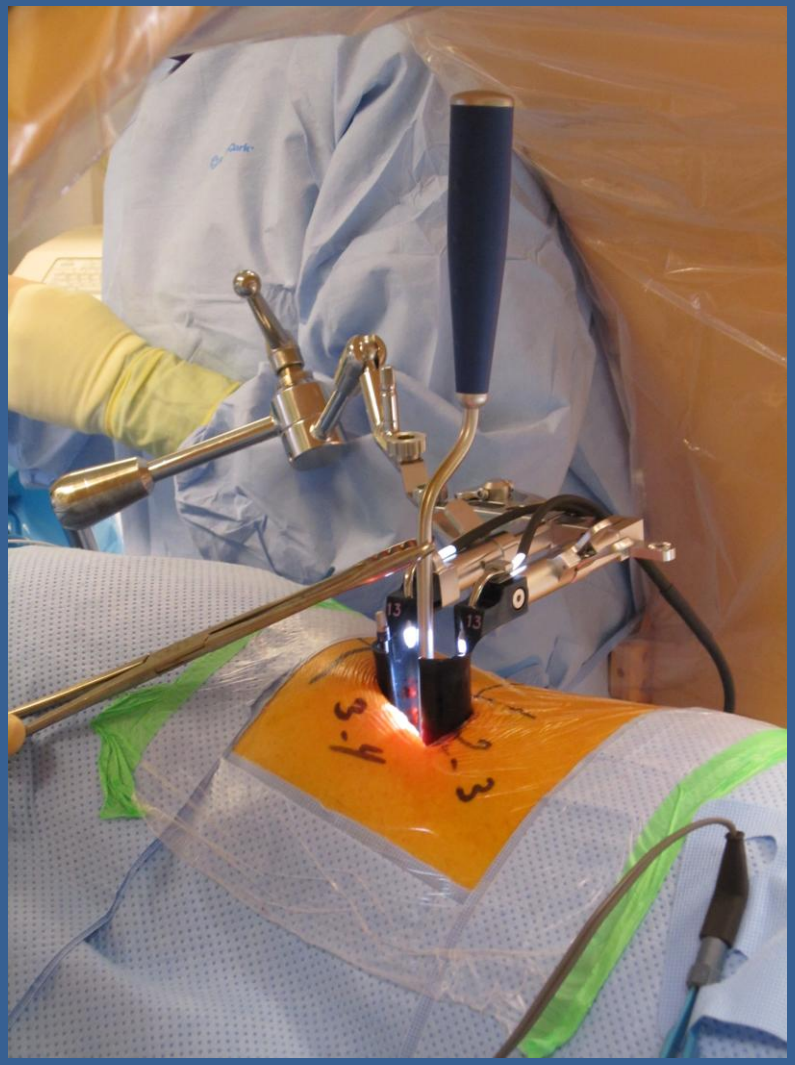
Postop X-Rays

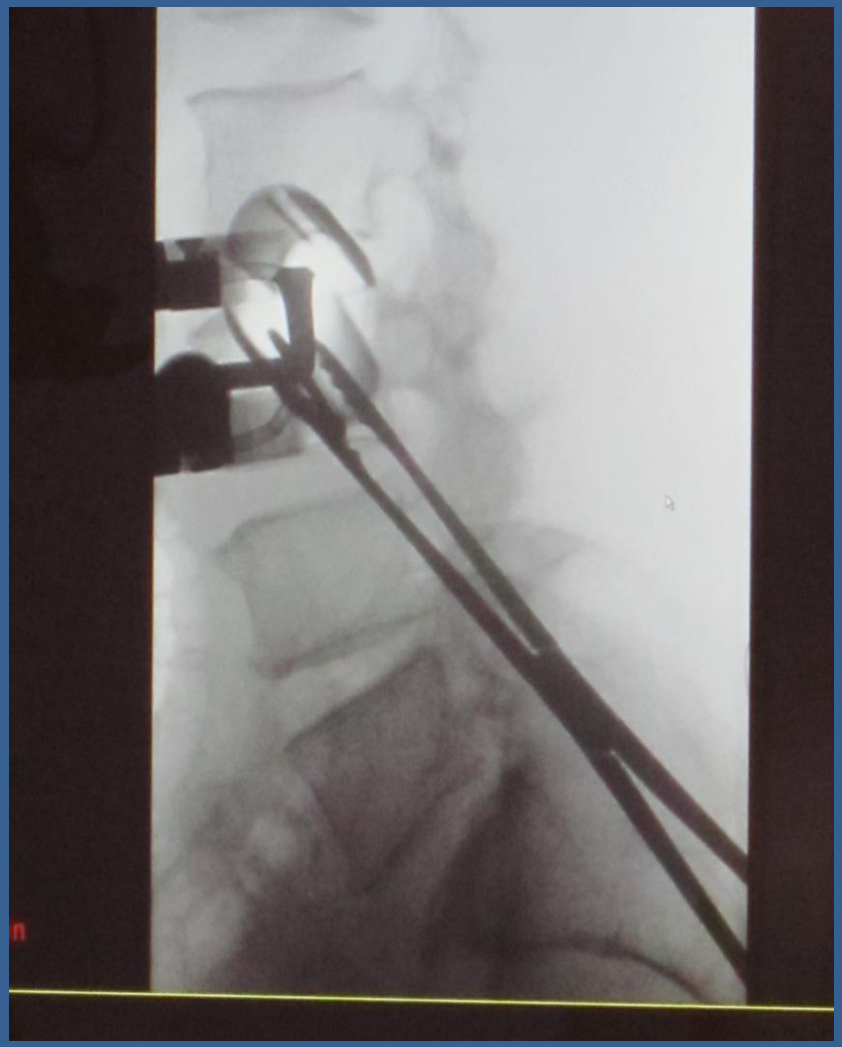


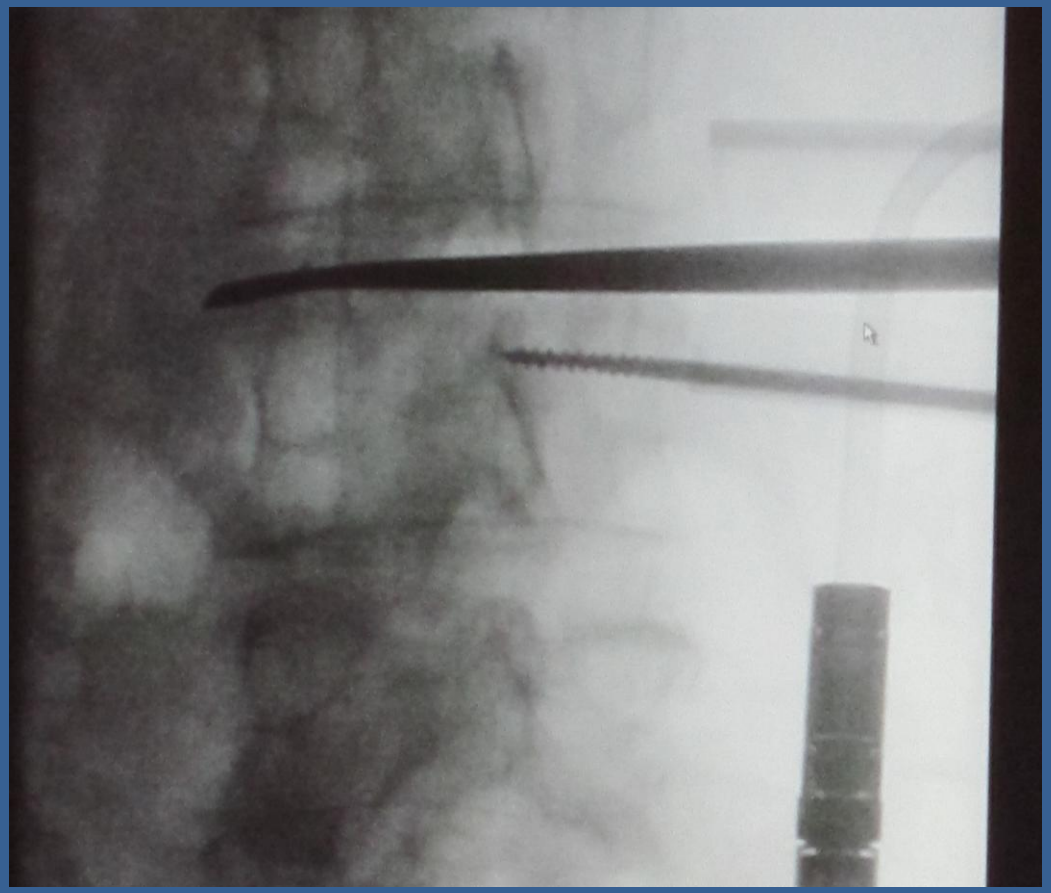
Installation

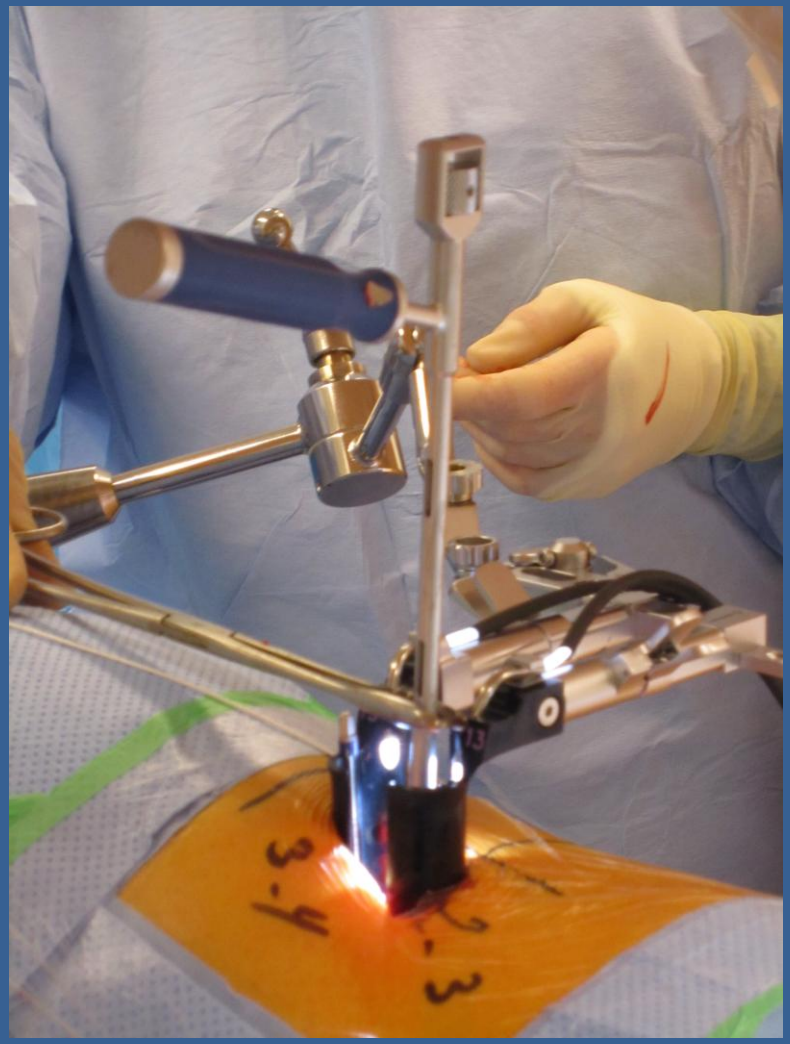
Installation (cntd)

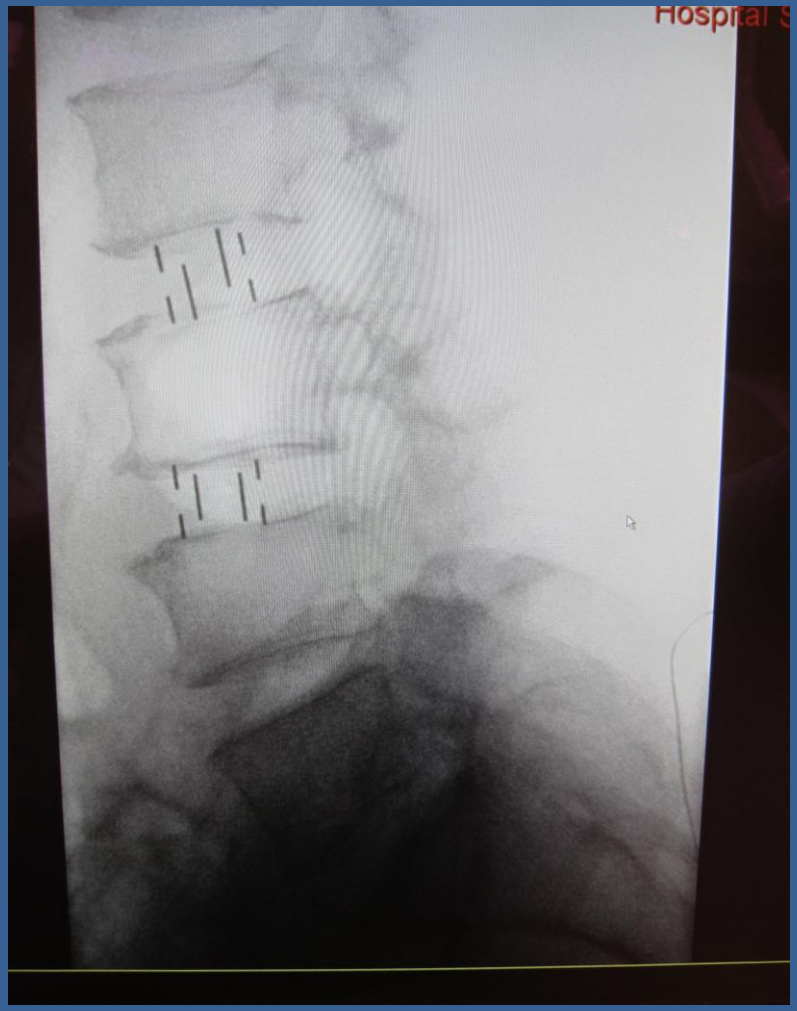


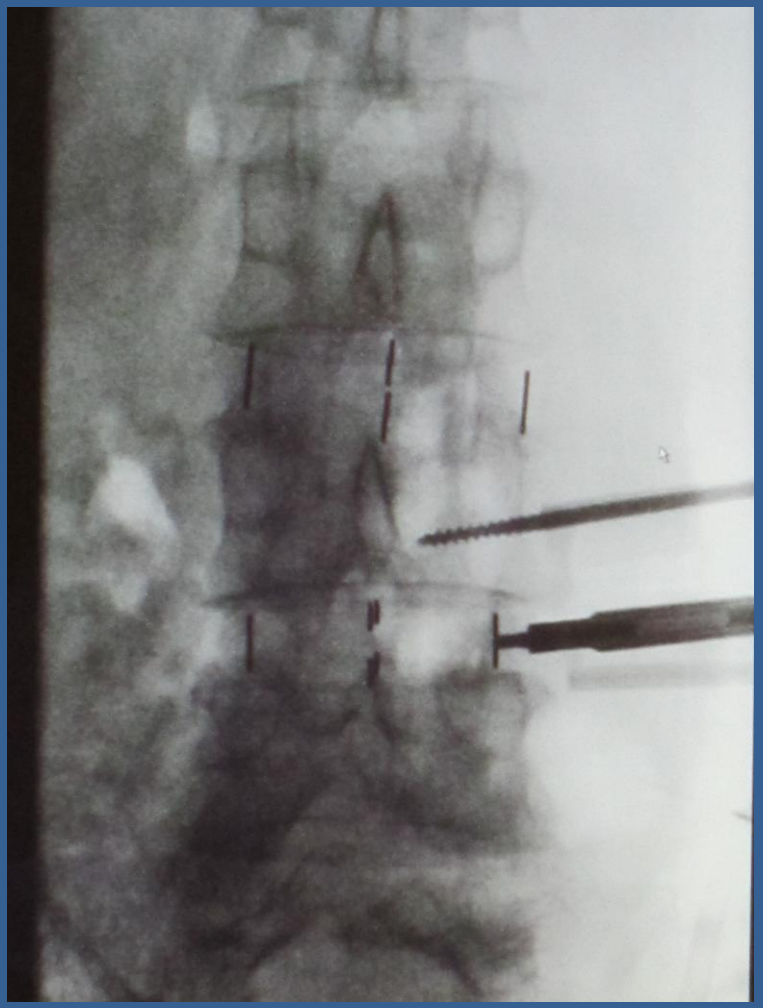




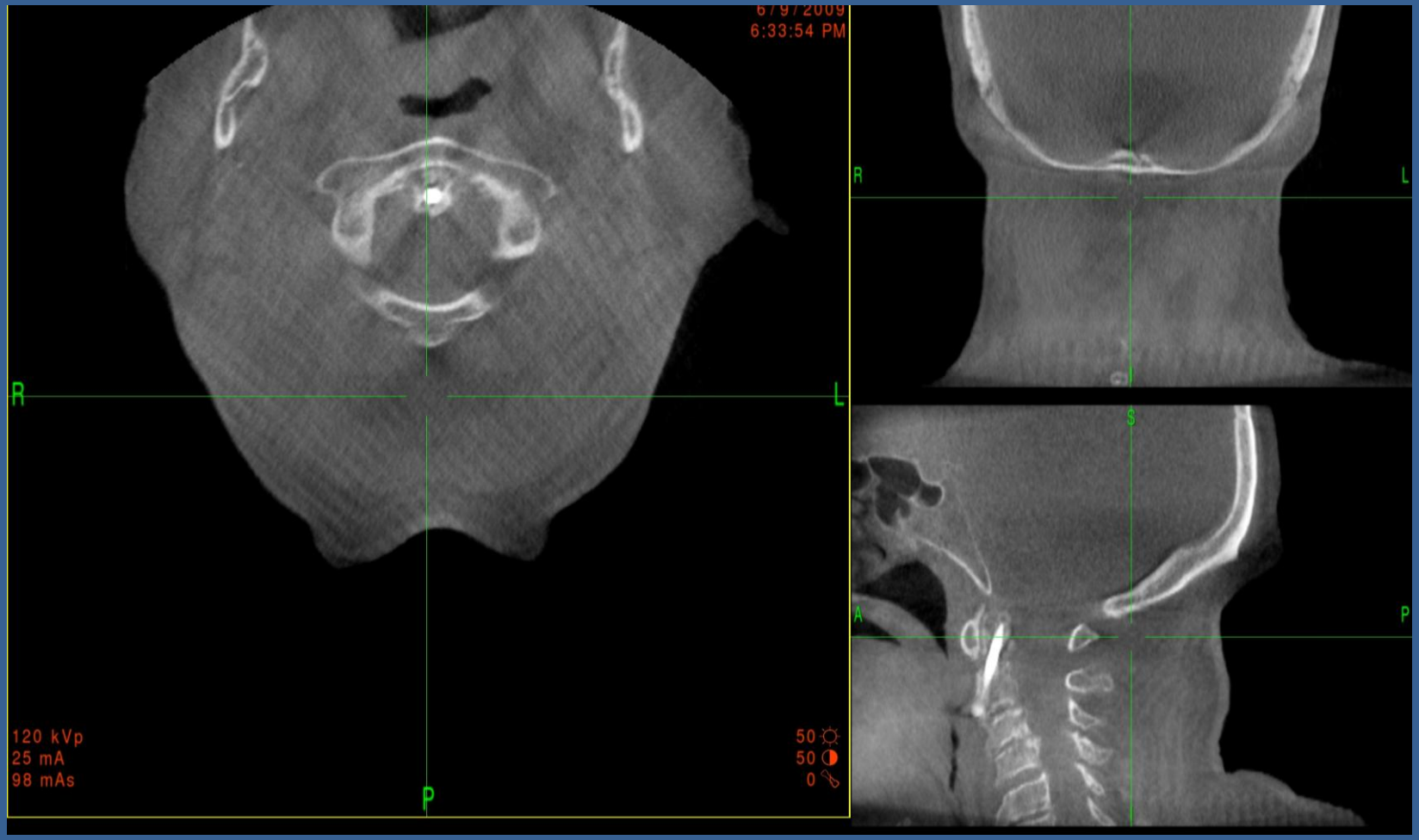




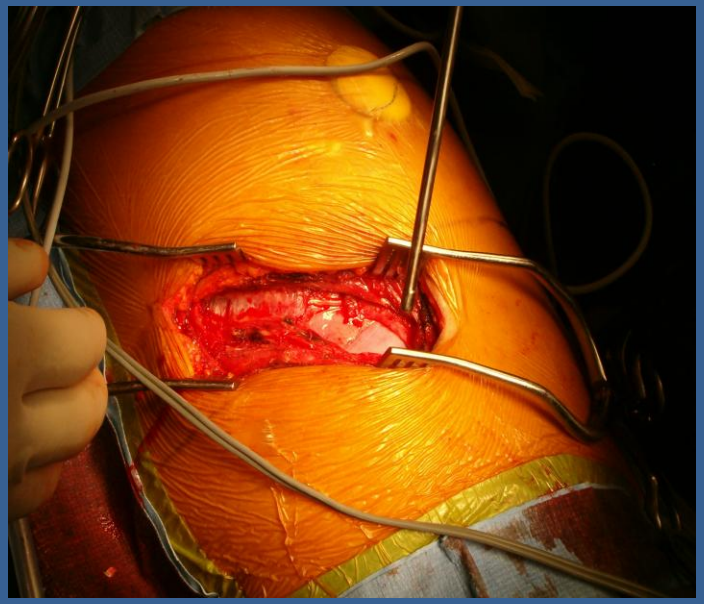


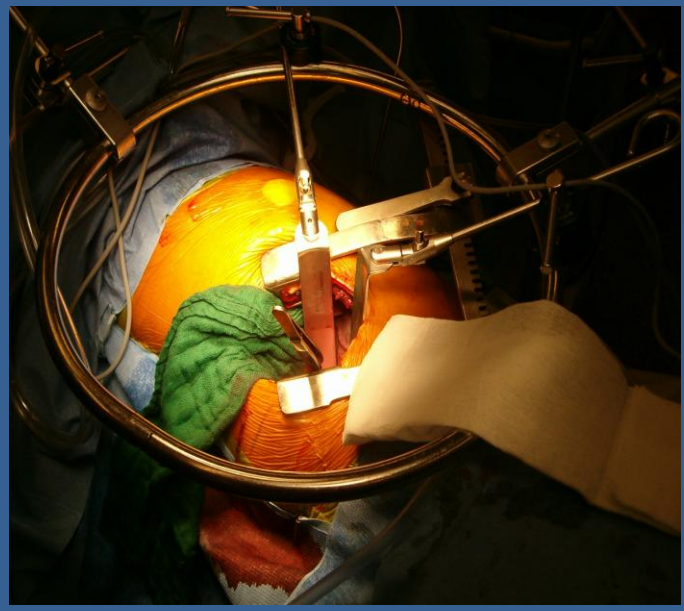


3D reconstruction



Rachis dorso-lombaire





Formation continue

- Training sur cadavre

Team Work

Must do

- As surgeon we do not want to harm patients, colleagues, or ultimately ourselves
- should encourage each other to perform the best, safest, and most effective procedure
- Familiar with the scientific evidence
- Primum non nocere

Conclusions

- L ’évolution constante des techniques et des produits nécessite une adaptation identique des chirurgiens avec un trend minimal invasif évident
- Cette évolution n’est possible qu’au moyen d’ une étroite collaboration entre les médecins et l ’industrie
- Le but principal reste l ’amélioration du patient quelque soit l ’option choisie

Conlcusion

- Only if it can be done safely!!

because bad stuff can happen through small holes