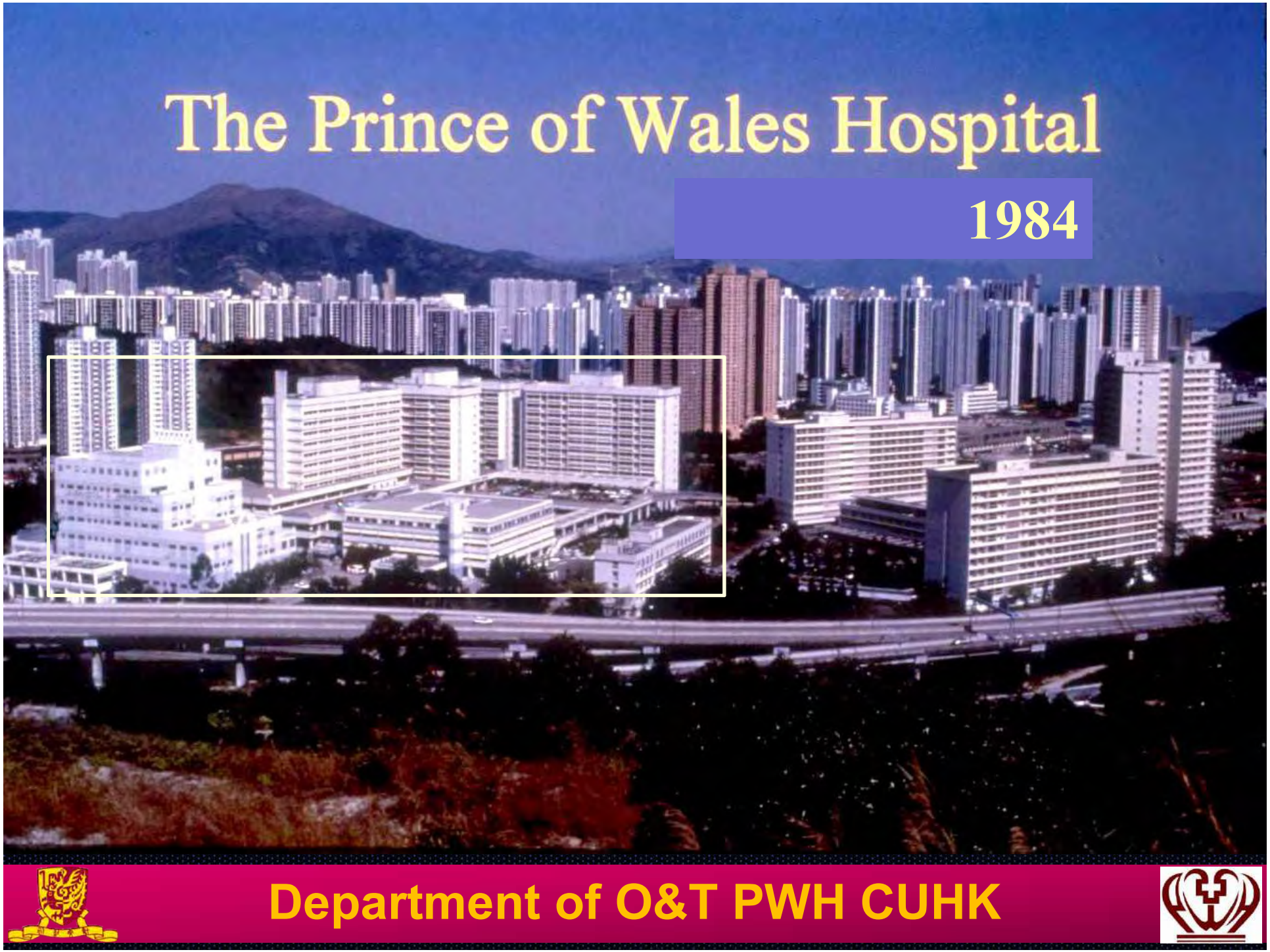
Department of O&T PWH CUHK


The Prince of Wales Hospital
1984
Department of O&T PWH CUHK

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Advances in Paediatric Orthopaedics

Dr Bobby KW NG
Department of Orthopaedics & Traumatology,
Prince of Wales Hospital,
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Shatin, Hong Kong.

Department of O&T PWH CUHK

Outline of Talk

- **1 DDH**: Adolescent hip osteotomy, PAO
- **2 Perthes Disease**: A-Frame, ROWO
- **3 SCFE Slipped Capital Femoral Epiphysis**: Modified Dunn Procedure
- **4 Spinal deformity**: Navigation, Spinal osteotomy
- **5 Limb Deformity**: Taylor Spatial Frame
-

1. Osteotomies for Adolescent Hip Reconstruction

XSJ F/11 Limp and limb shortening, Patient can run jumping around

What should we do with these hips?

Adolescent Hip Dysplasia

- Can present as
  - an occult DDH
  - a residual DDH after initial treatment “Phase of deterioration”
  - Progressive dislocation in Neuromuscular condition as in CP and Spina bifida hips
- Causes
  - Pain, osteoarthrosis in adolescent and young adulthood
  - Progressive subluxation, loss of congruence
    - Limitation of hip abduction & flexion abduction

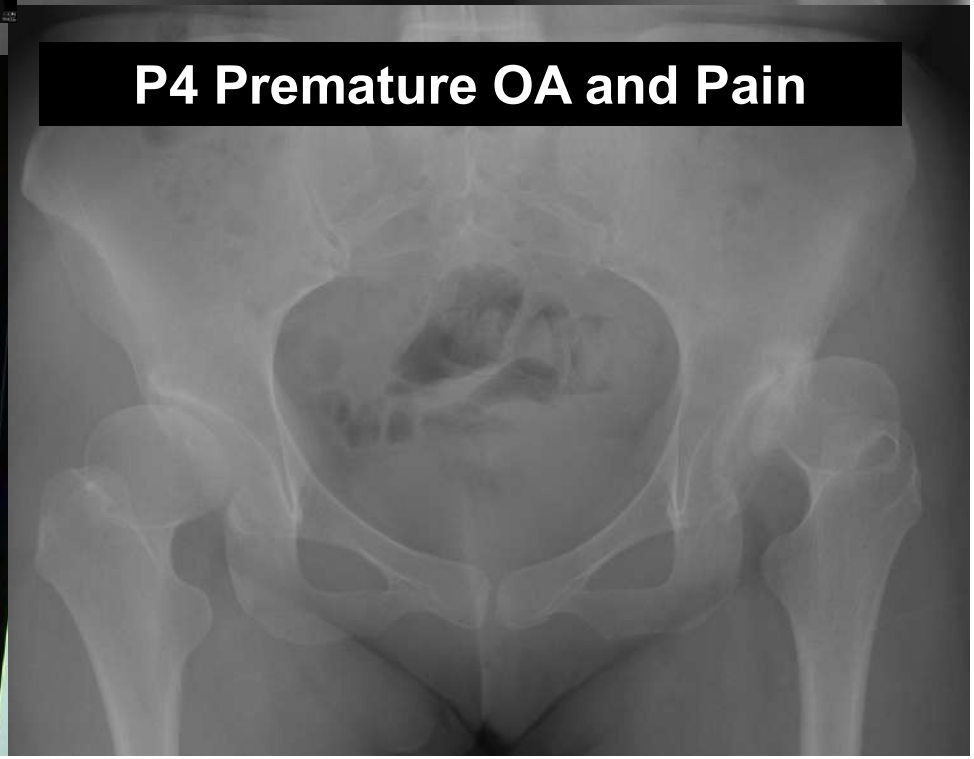

9 3 2007

P1 DDH after OR at age 18 months

P2 Limitation of motion, loss of concentricity

P3 Occult DDH from Scoliosis screening

P4 Premature OA and Pain



Challenges & Goals of Treatment

- Limited experience results from good early treatment of DDH
- Long standing dislocation
- Unfavorable results after reduction

- Restoration of the congruence
- Improvement of femoral head containment or coverage improving CE angles
- Maintenance of the containment

Late presentation of DDH

- **Open reduction of late presentation (age 3-16) of DDH is associated with poor result (n=11, 9/11 bilateral), no treatment gave good or better results than those treated**

  Crawford A. etal. JPO A Vol.;19(5) Sept/Oct.; 1999, 641-9

- **Untreated hips in adult life causes**
  - **severe pain that drives patients to seek treatment (n = 40/62, 59 hips)**

    PA Ring 1959 JBJS vol 41B, No.2

  - **Arthrosis, poor Harris Hip Score (n=54, 80 hips)**

    Wedge JH, Wasylenko MJ. Journal of Bone & Joint Surgery - British Volume. 61-B(3):334-8, 1979 Aug.

OR Treatment Combinations

- **Open reduction and acetabuloplasty**

  Eyre-Brook AL. JBJS vol. 48B, No 4 nov 1966

- **One stage open reduction, femoral shortening, pelvic osteotomy, no limbus excision procedure**

  (n30, age 5-15) RS Browne. JBJS B, Vol. :61-B, No. 1 Feb.;1979

  (FU 16.7years)Williamson, Glover, Benson.1989

  (FU 6.8 years)Vallamshetla, Mughal, O'Hara JBJS B 2006

  (FU 3-9 years) El Tayeby, HM J Child Orthop(2009)3:11-20

- **OR, Lance acetabuloplasty + Salter/ Pemberton for Bipartite Acetabulum**

  (FU 10years)Rejholec M. JBJS 93B, no.2 57-261 feb 2011

Stable Tension Free Reduction

- Stability
  - Acetabuloplasty (Pemberton, Dega, Albee)
    - Triple/ Bernese PAO
    - Femoral VDRO
  - Soft tissue
- Tension free
  - Femoral Shortening

PAO Important Literatures

RT Trousdale, A Ekkernkemp, R Ganz, and SL Wallricks

Periacetabular and intertrochanteric osteotomy for the treatment of osteoarthrosis in dysplastic hips

J Bone Joint Surg AM 1995;77:73-85

Kumar D, Bache CE, O'Hara JN.

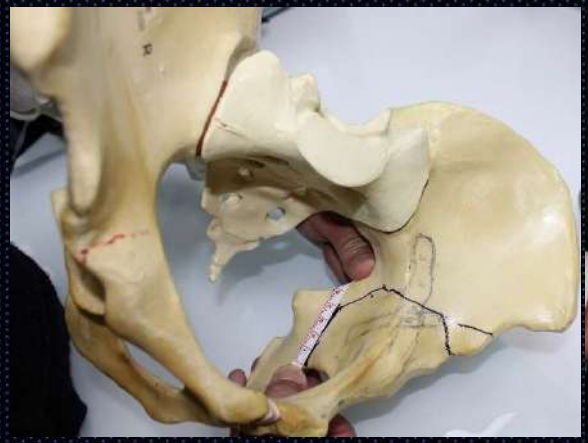
Interlockig Triple Osteotomy in severe Legg-Calve'-Perthes Disease.

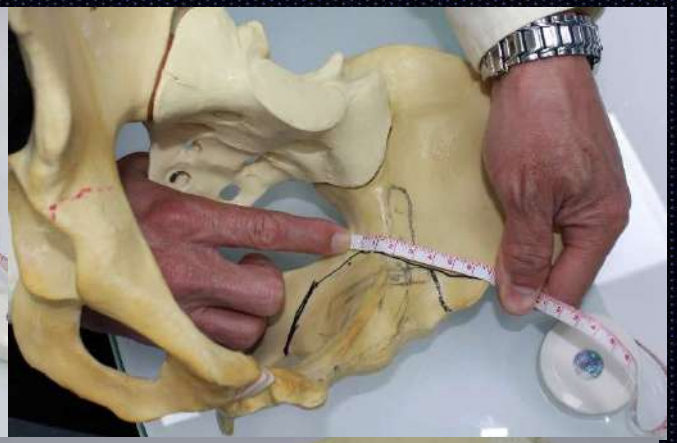
J Pediatr Orthop;vol22,No.4 2002

Pogliacomi F, Stark A, Vaienti E, Wallensten R.

Periacetabular osteotomy of the hip: the ilioingunal approach.

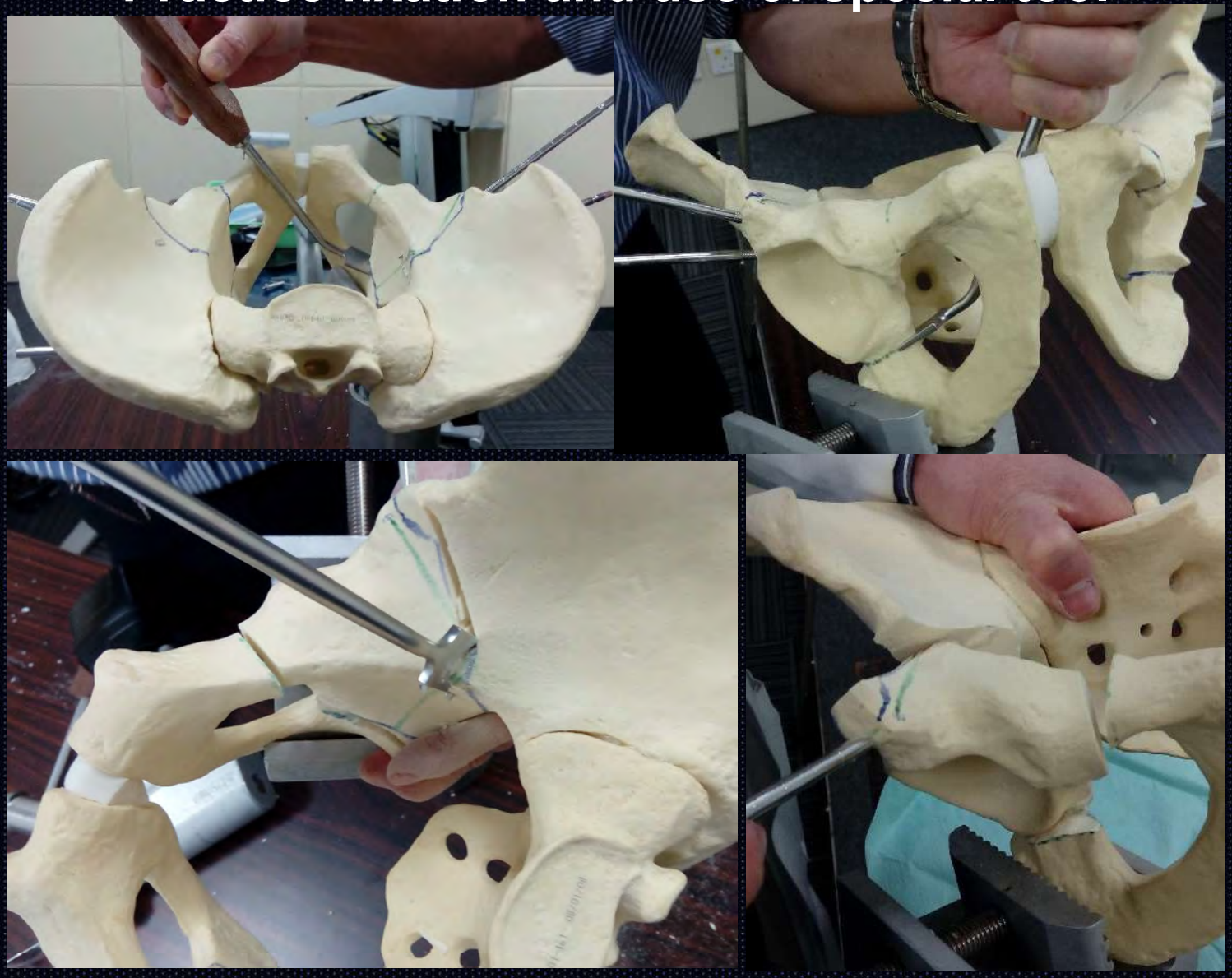
ACTA BIO MEDICA 2003;74:38-46



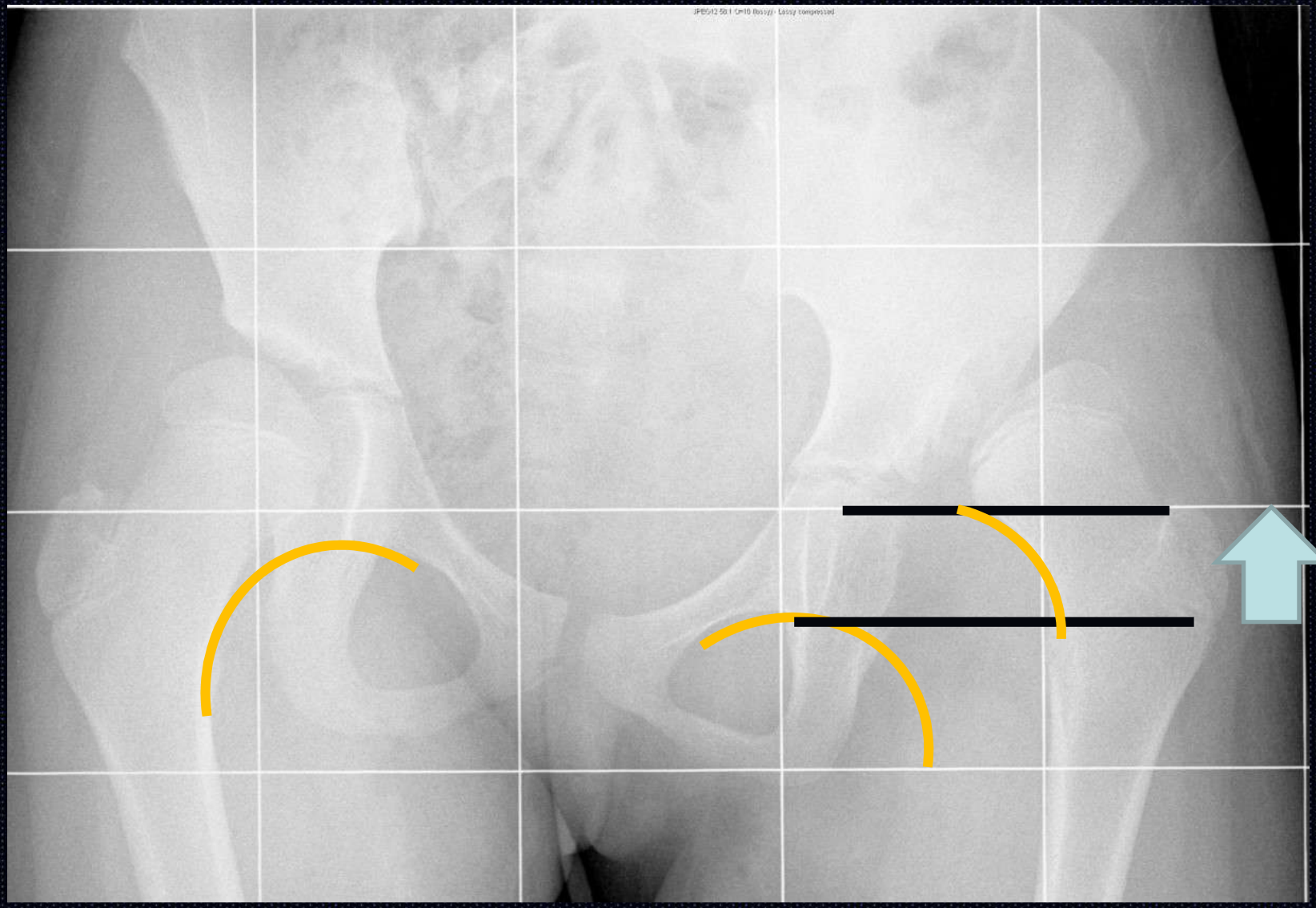


The Pelvis is the most complex structure Must Play on Dry Bone Try Surgical approaches in Cadaver

Practice fixation and use of special tool

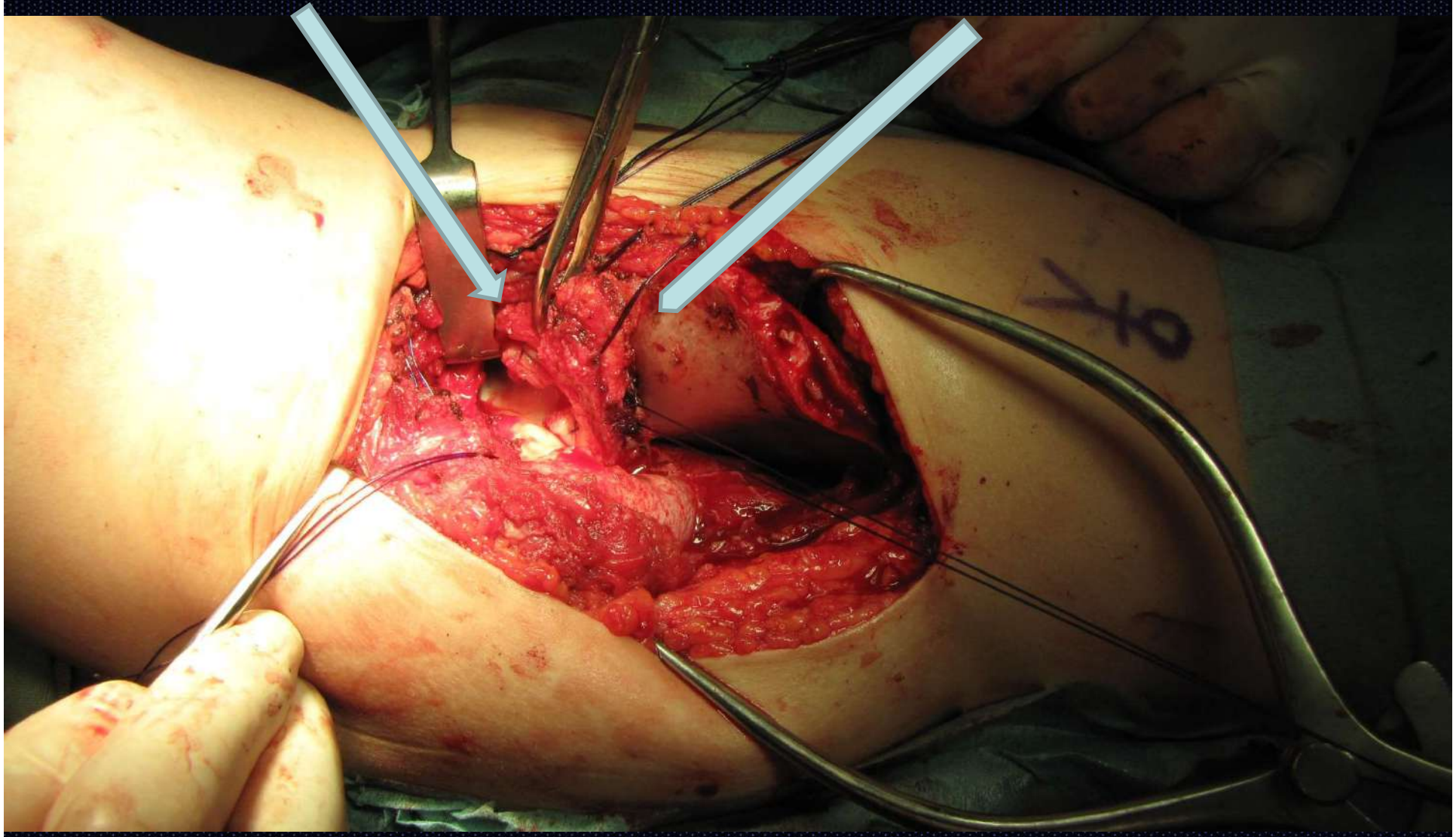


KSW F/8 Left DDH Tonnis IV

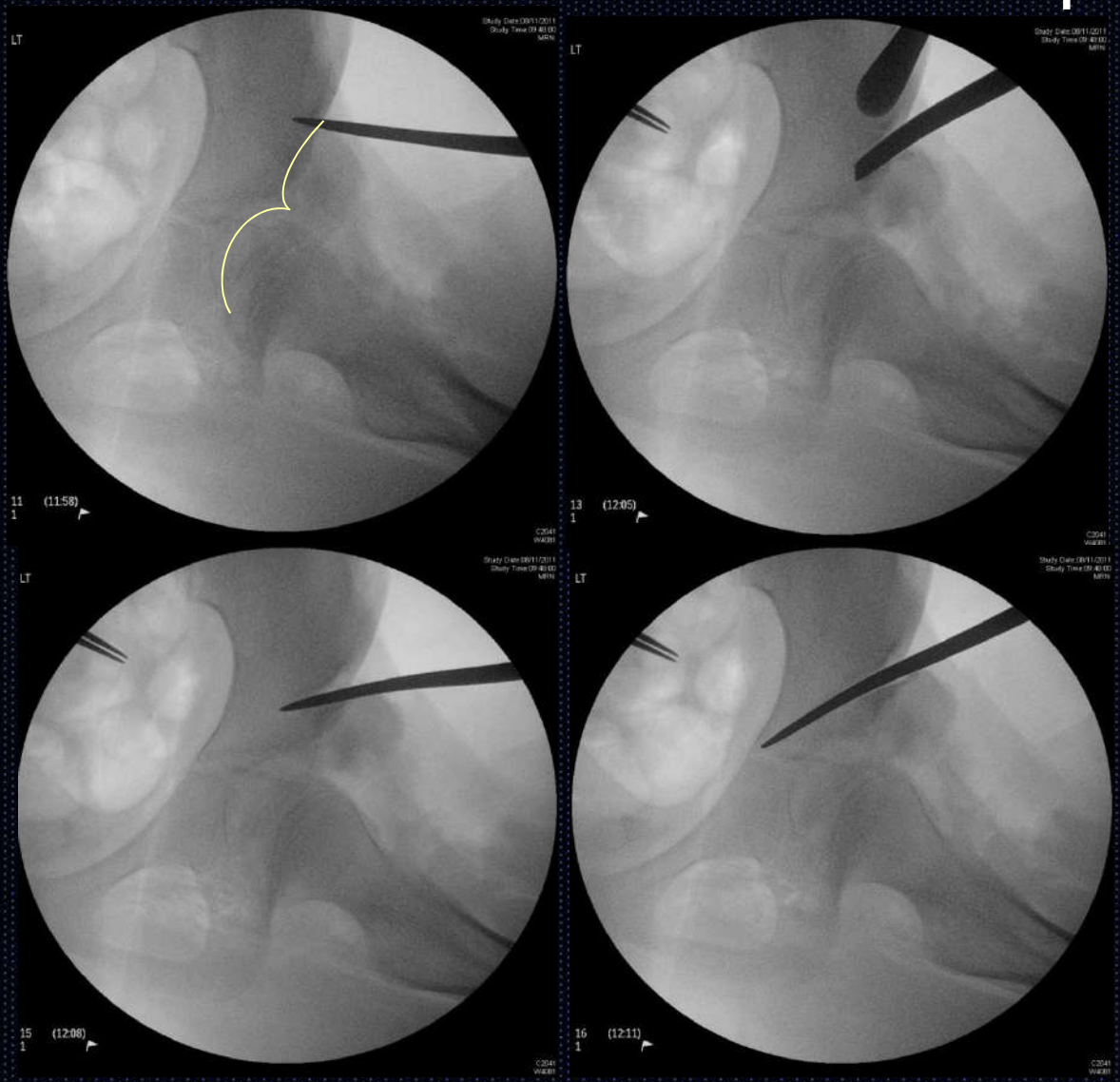


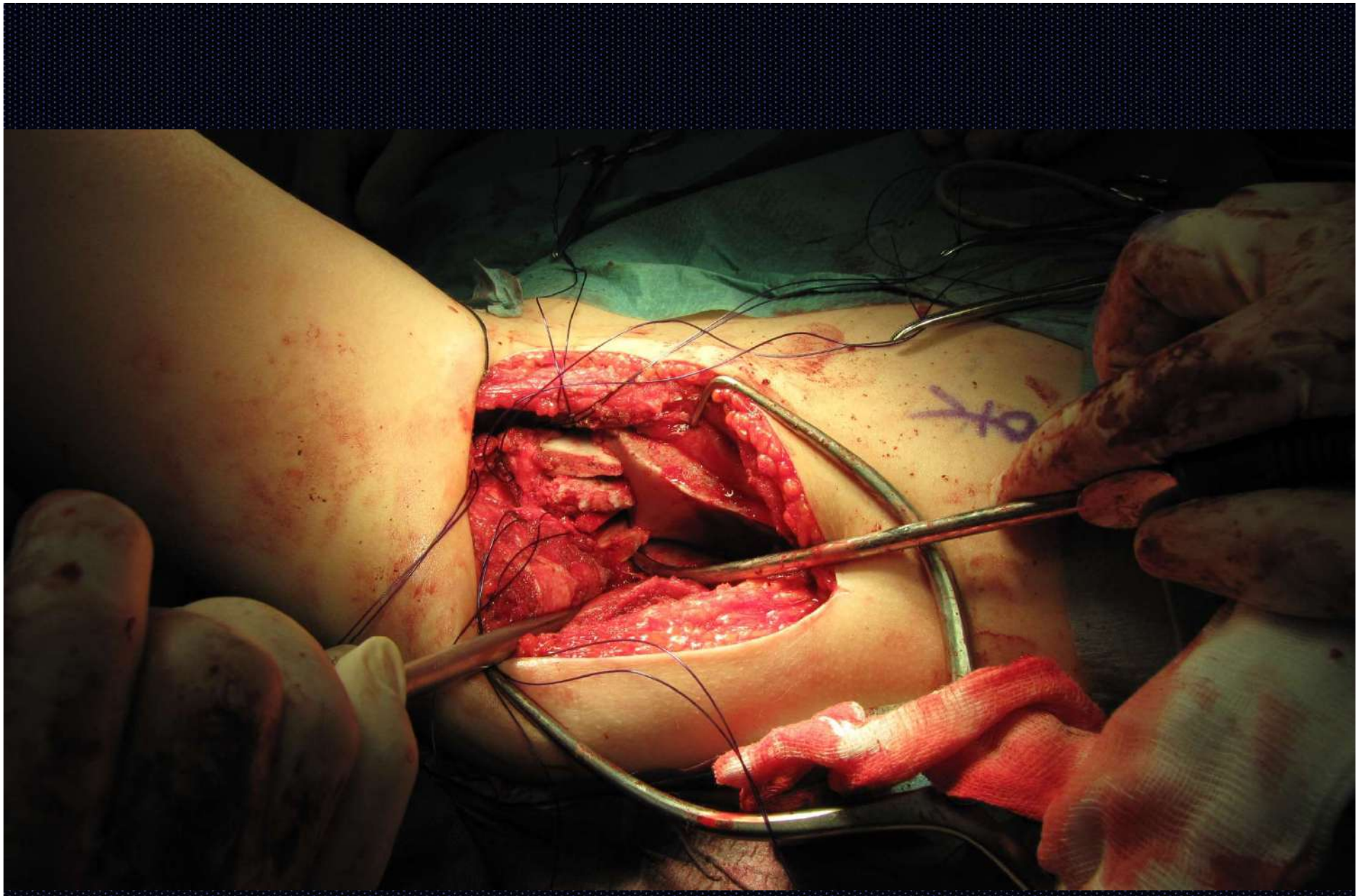
Arthrogram: Note the large Limbus “ Rose Thorn” obstructing reduction

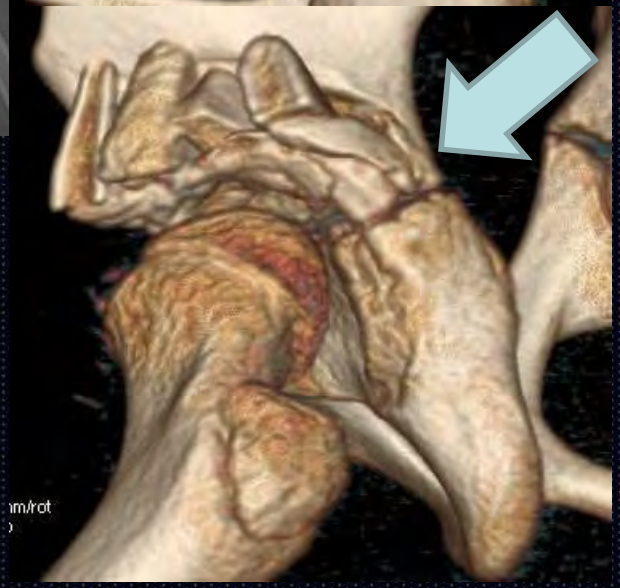
Eversion of limbus sutured to capsule



Lance and Pemberton Acetabuloplasty







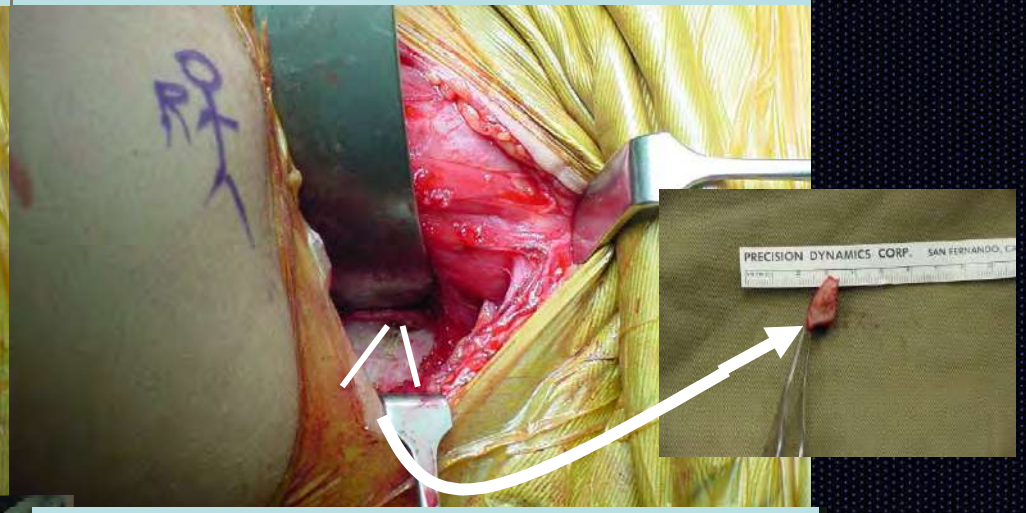
2 Year Follow up

Modified Triple Innominate Osteotomy

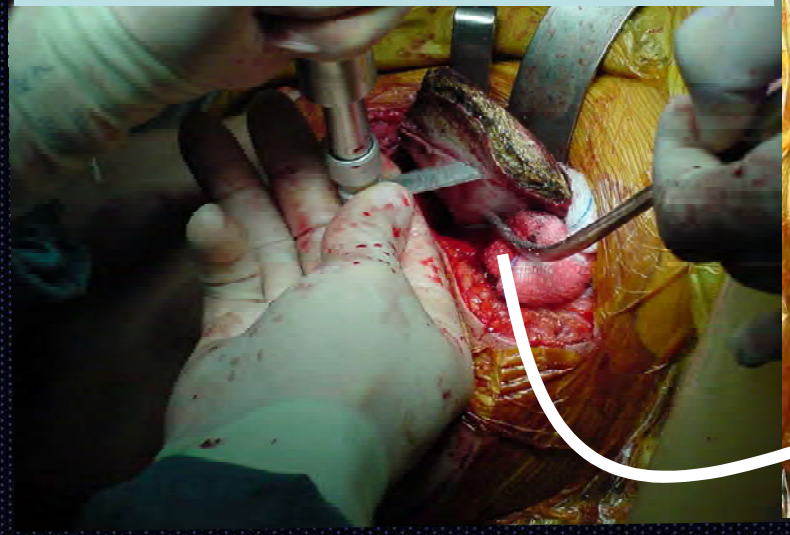
- **Iliac osteotomy**
  - Standard Bikini incision
  - Division with Gigli saw osteotomy
- **Pubic and Ischium osteotomy**
  - 8 cm transverse incision at adductor origin for
  - Adductor release if there is significant limitation of abduction
  - Superior pubic ramus approached through lateral pectineal approach
  - Inferior Pubic ramus ischium through Space between Adductor brevis and magnus
- **Anterior, lateral rotation and medial displacement of the acetabulum after osteotomies**
- **Insertion of Bone graft from Iliac crest**
- **Fixation with two canulated screws**

Pubic Osteotomy

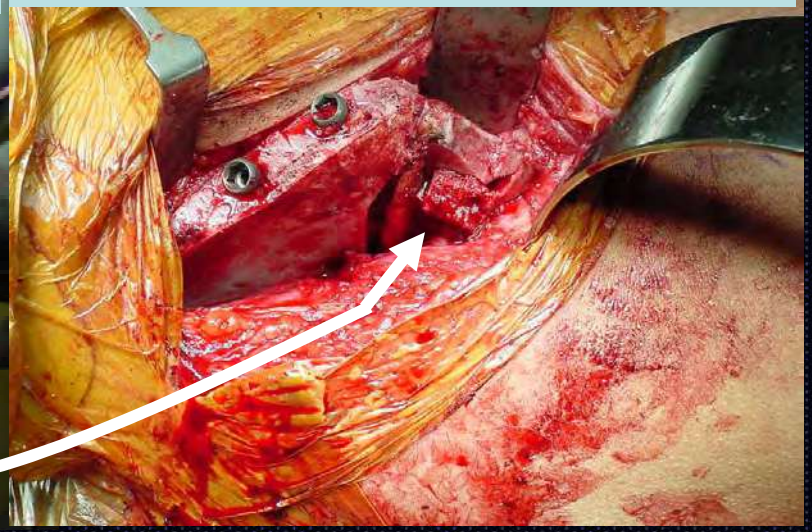
Ischium wedge Osteotomy



Graft harvest



Graft insert in iliac osteotomy



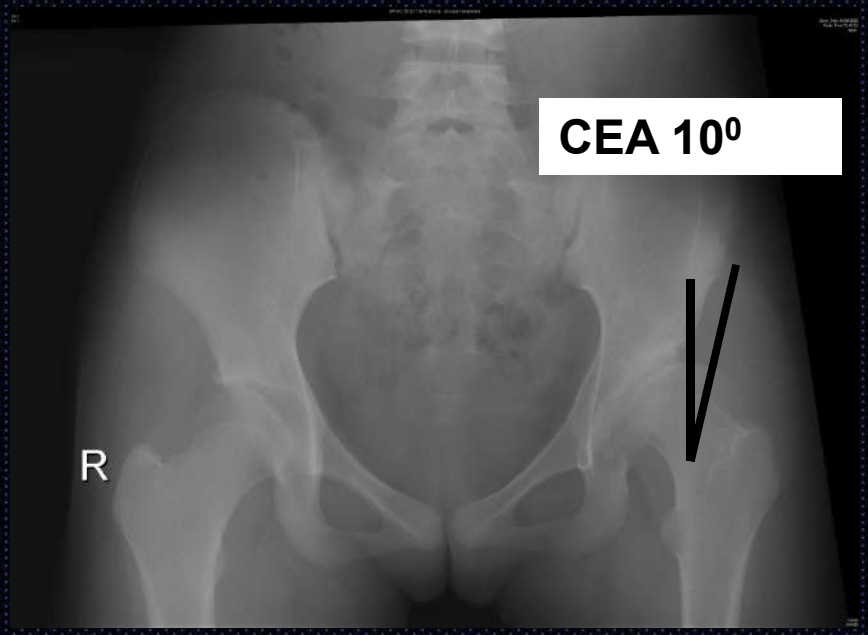
Triple osteotomy Clinical outcomes

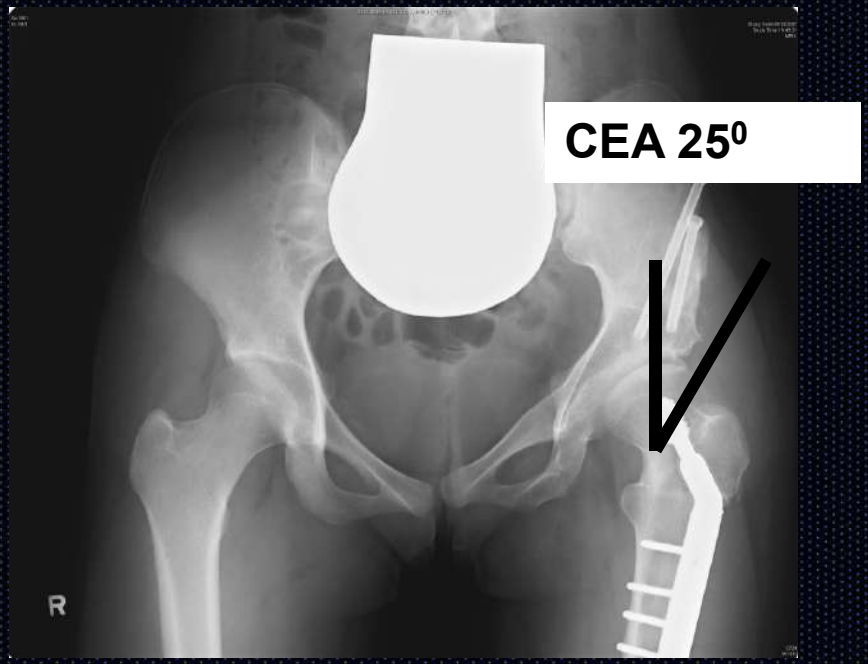
- Transfusion 0.86 units (0-2)
- No wound infection
- No neurological complications
- No vascular complications
- No implant complication
- Length of stay 23.9 days(19-34)
- Follow up 1.5 years(0.63-2.74)

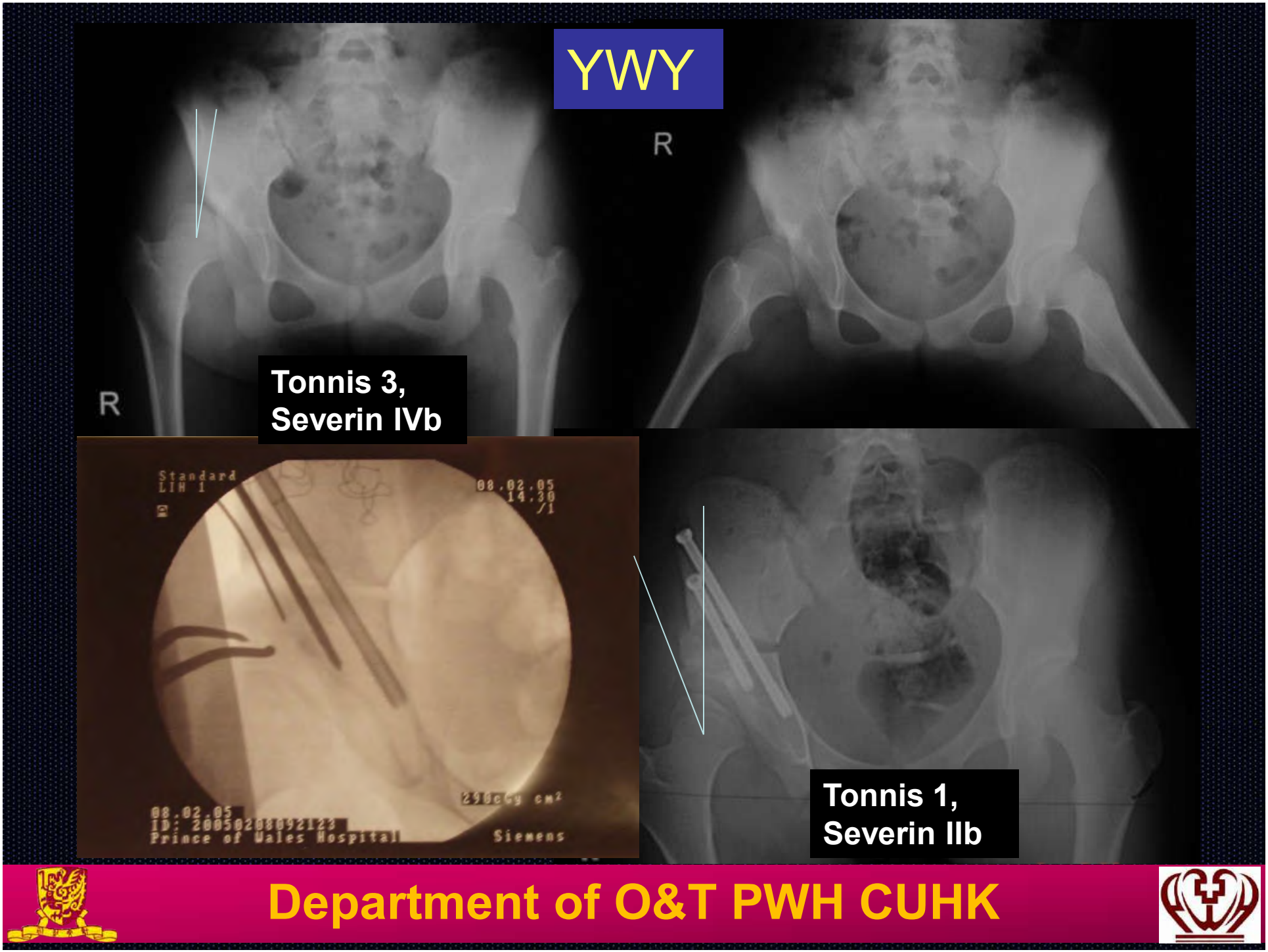
Severin, Tonnis,Harris Hip Scores

Name	Severin Gp pre op	Severin Gp post op	Tonnis pre op	Tonnis post op	Pre-Op HHS	Post op HHS	Patient Satisfn out of 10
ChaMH	IV a	II a	2	1	88	98	8
MaSW	IV b	II a	2	1	87	93	8
TanWM	IV b	II b	3	1	58	95	9
KwaMH	IV b	II b	3	2	21	67	7
YipWY	IV b	II b	3	1	93	100	8.5
Xia SJ	IV b	II a	2	1	85	97	9
Won KY	III	II a	2	1	94	98	9
			2.43	1.14	75.10	92.57	8.36

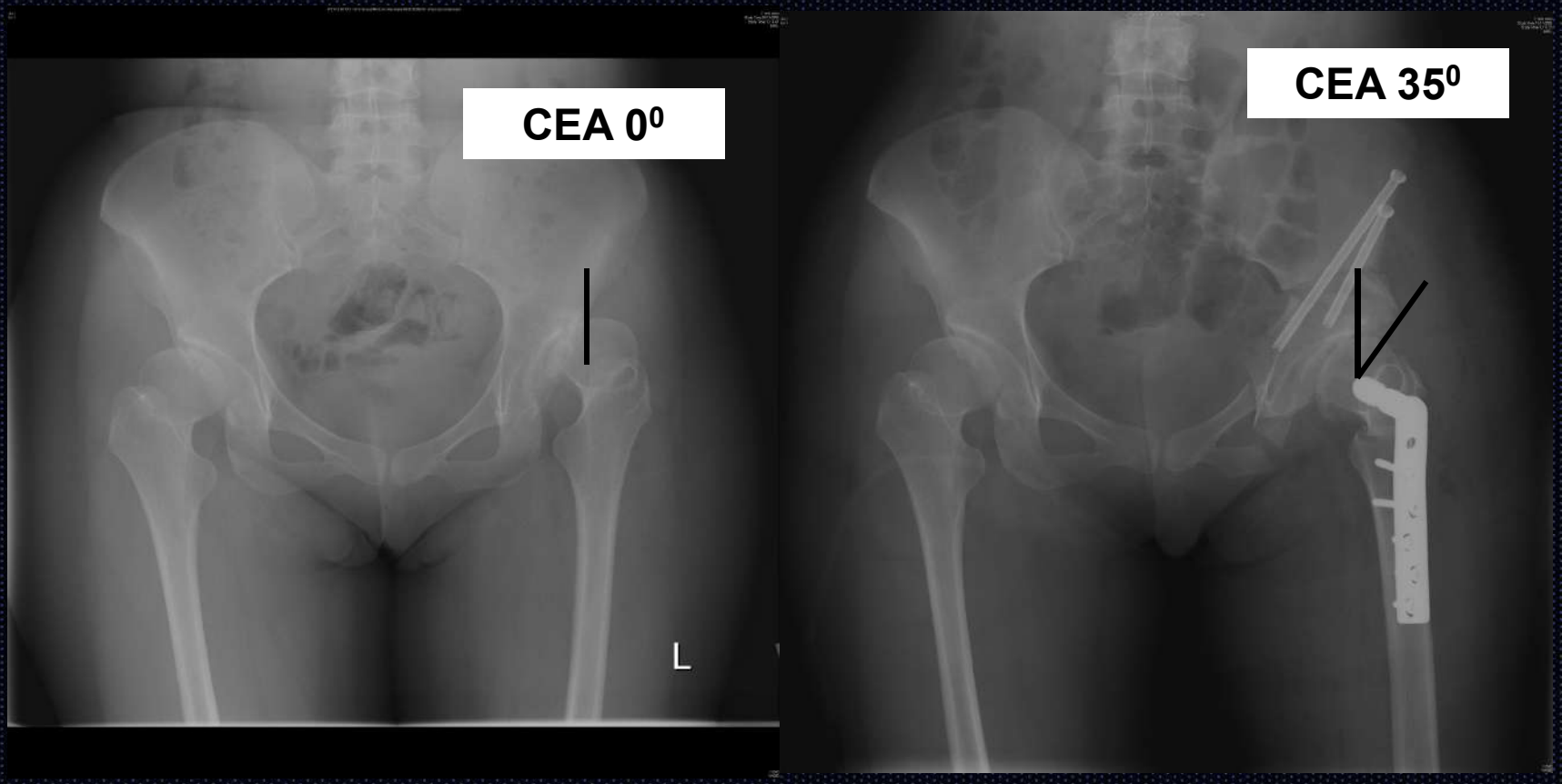
CMH X-rays Severin Class III






YWY
R
R
Tonnis 3,
Severin IVb
Standard
LIH 1
08.02.05
14.30
/1
08.02.05
Prince of Wales Hospital
Siemens
Tonnis 1,
Severin IIb

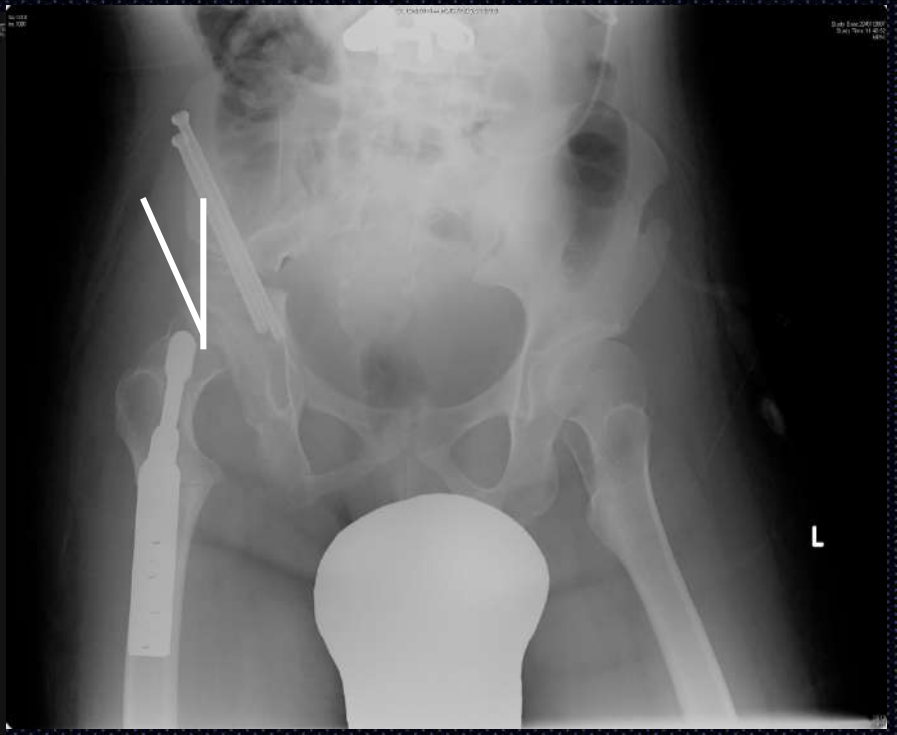
TWM F/31 X-rays



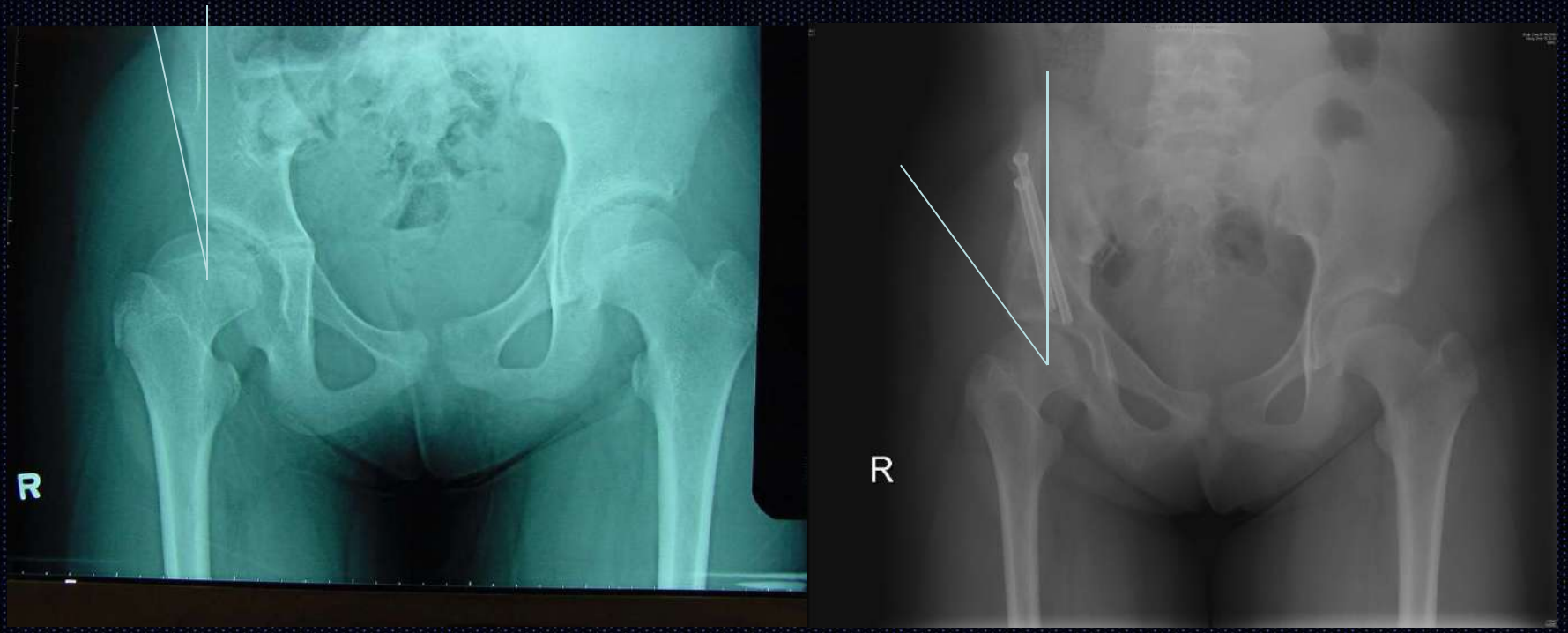
KMH Spina Bifida

CEA -10^0

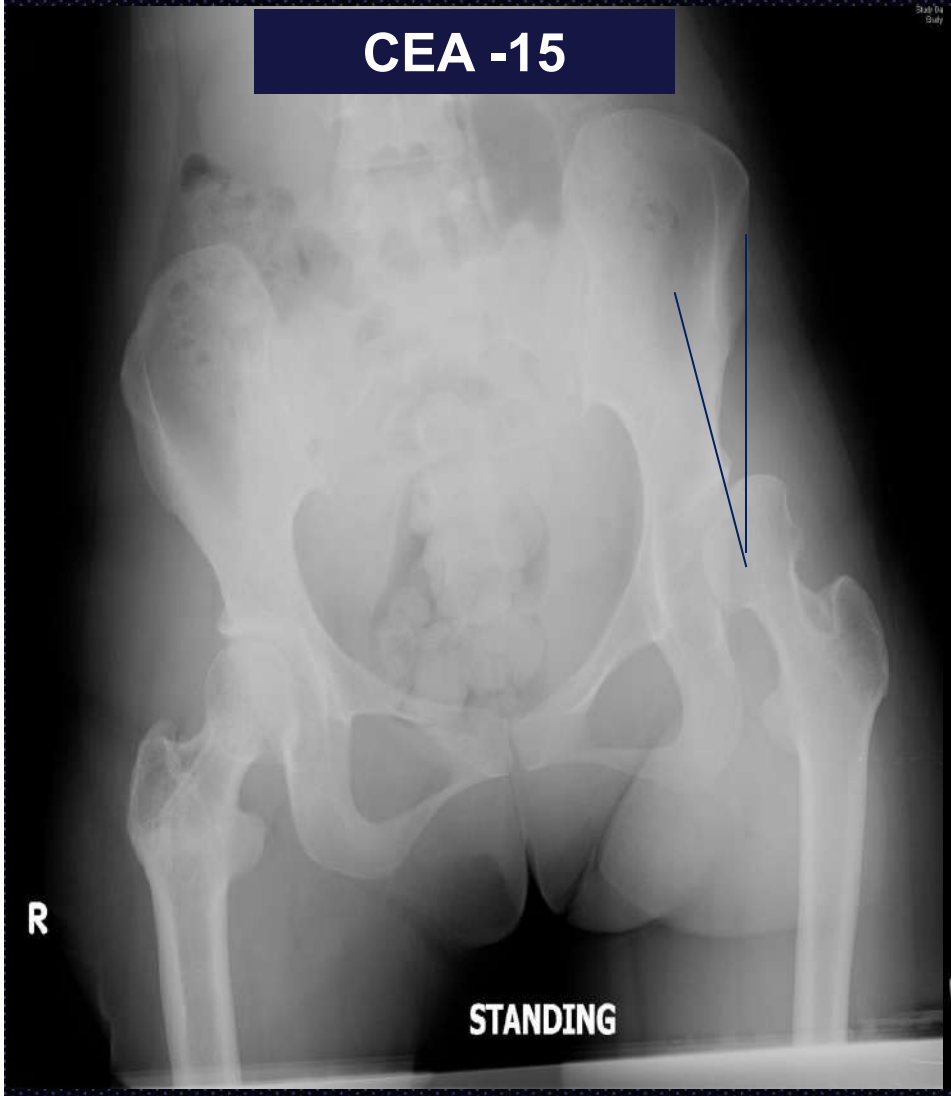
CEA 25^0

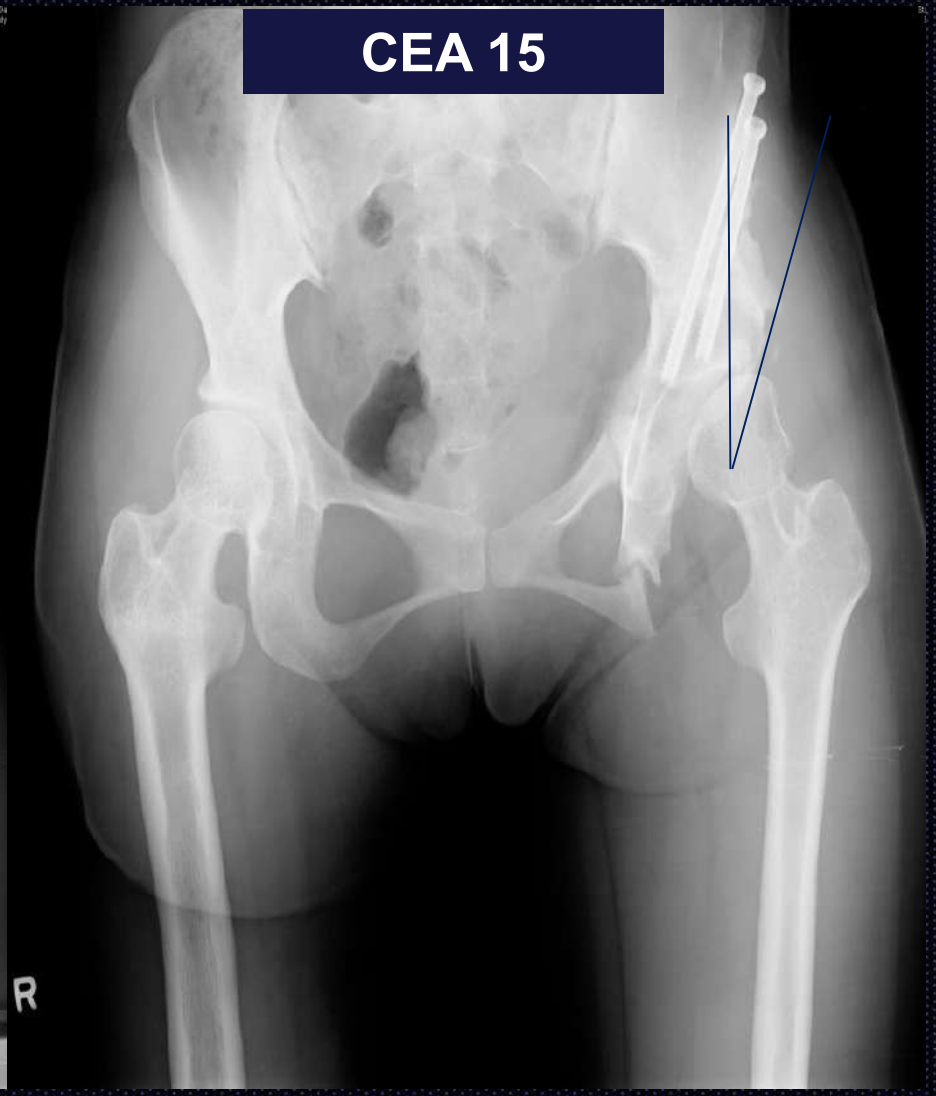


WKY

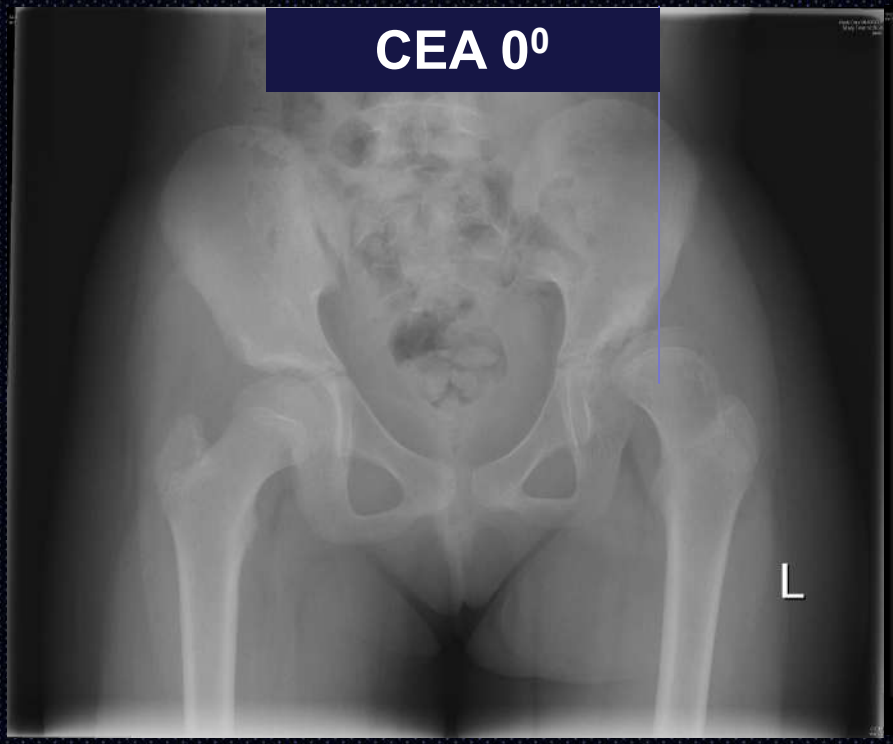


MSW





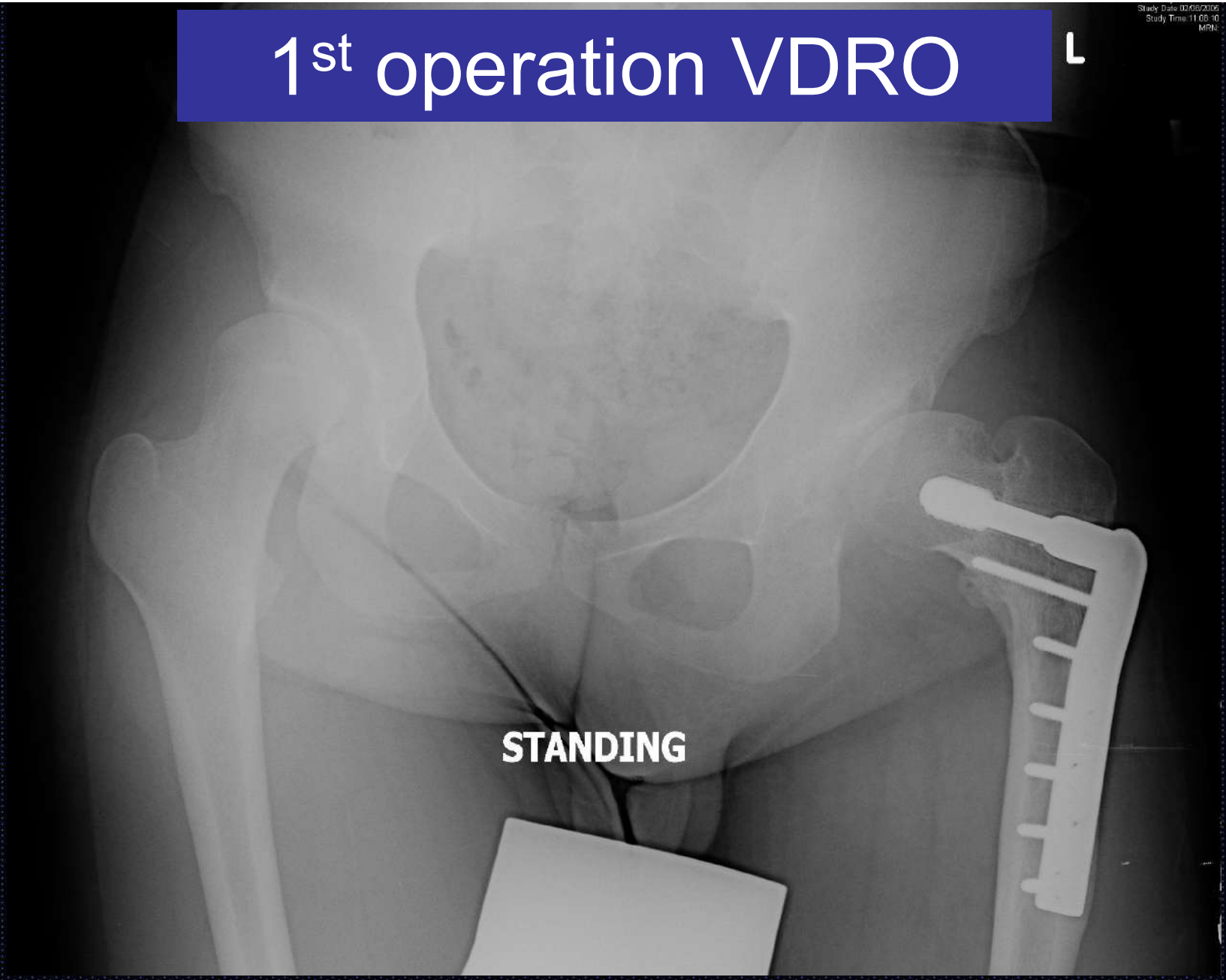
XSJ



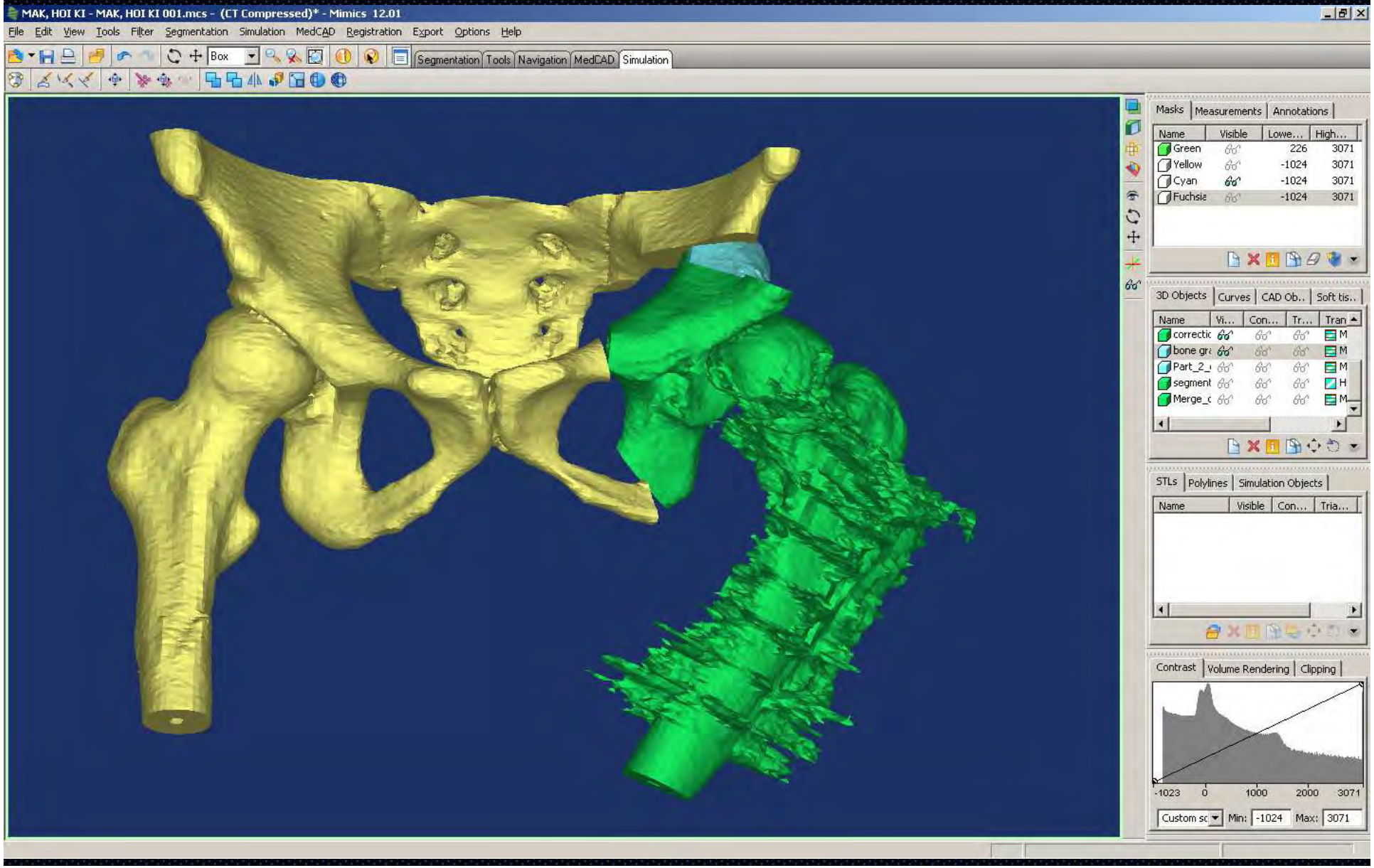
Navigation Guided Triple Osteotomy

MHKM/13 Left DDH Tonnis 2/3 CE-25^0

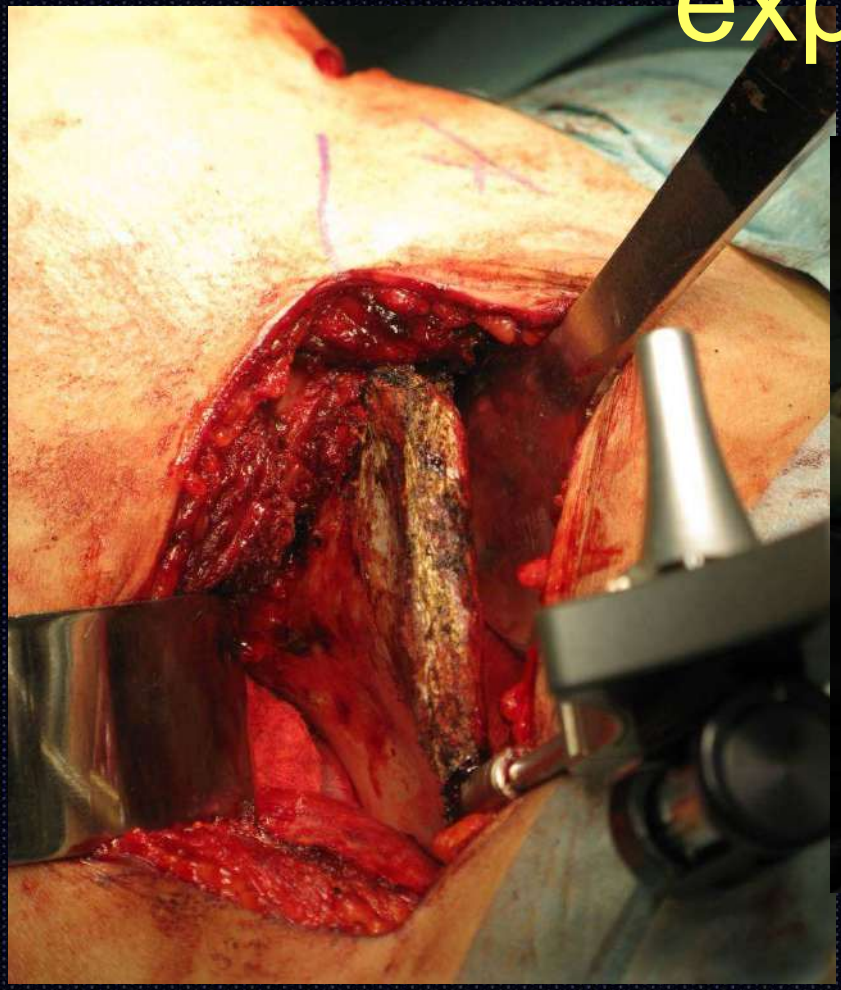
1st operation VDRO

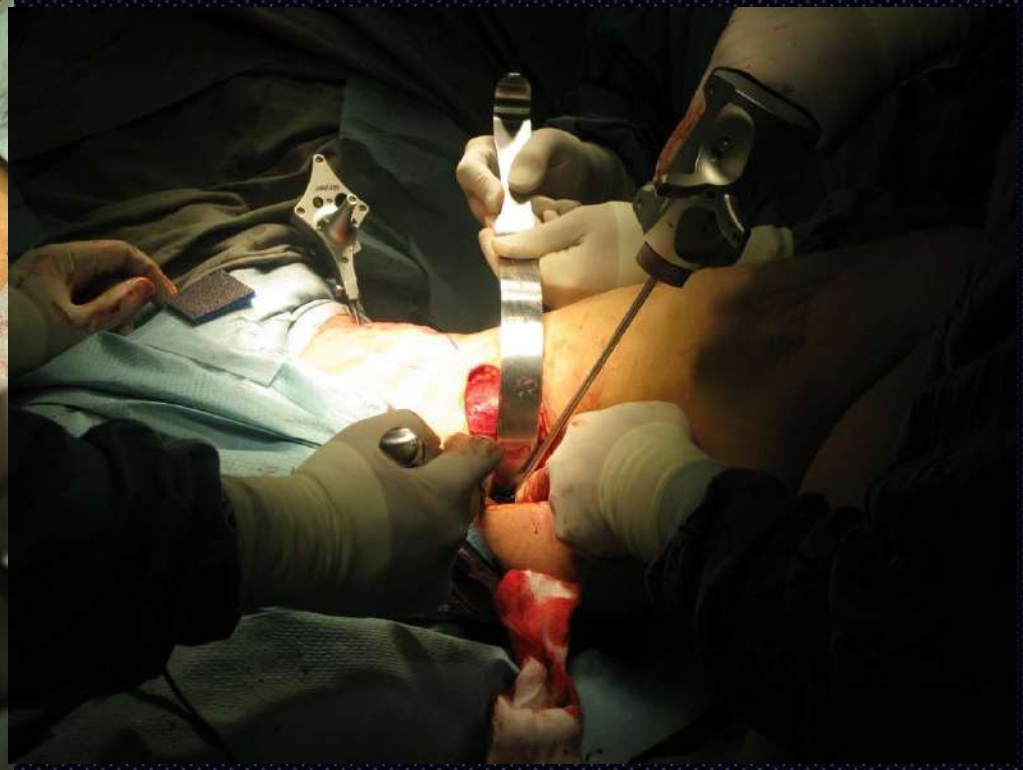


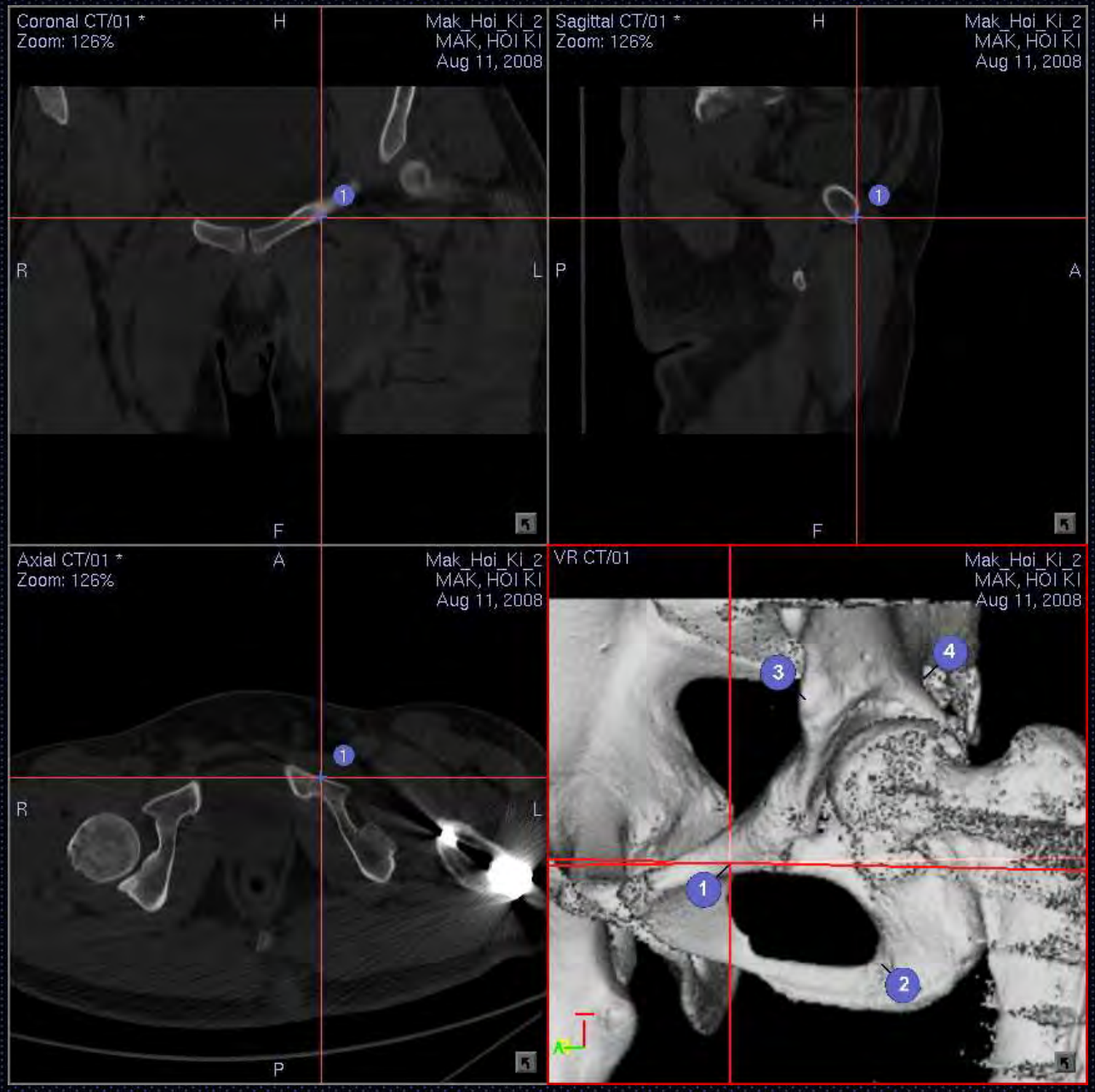
Planning of Triple osteotomy with Mimics soft ware
Osteotomy and degree of rotation size of wedge



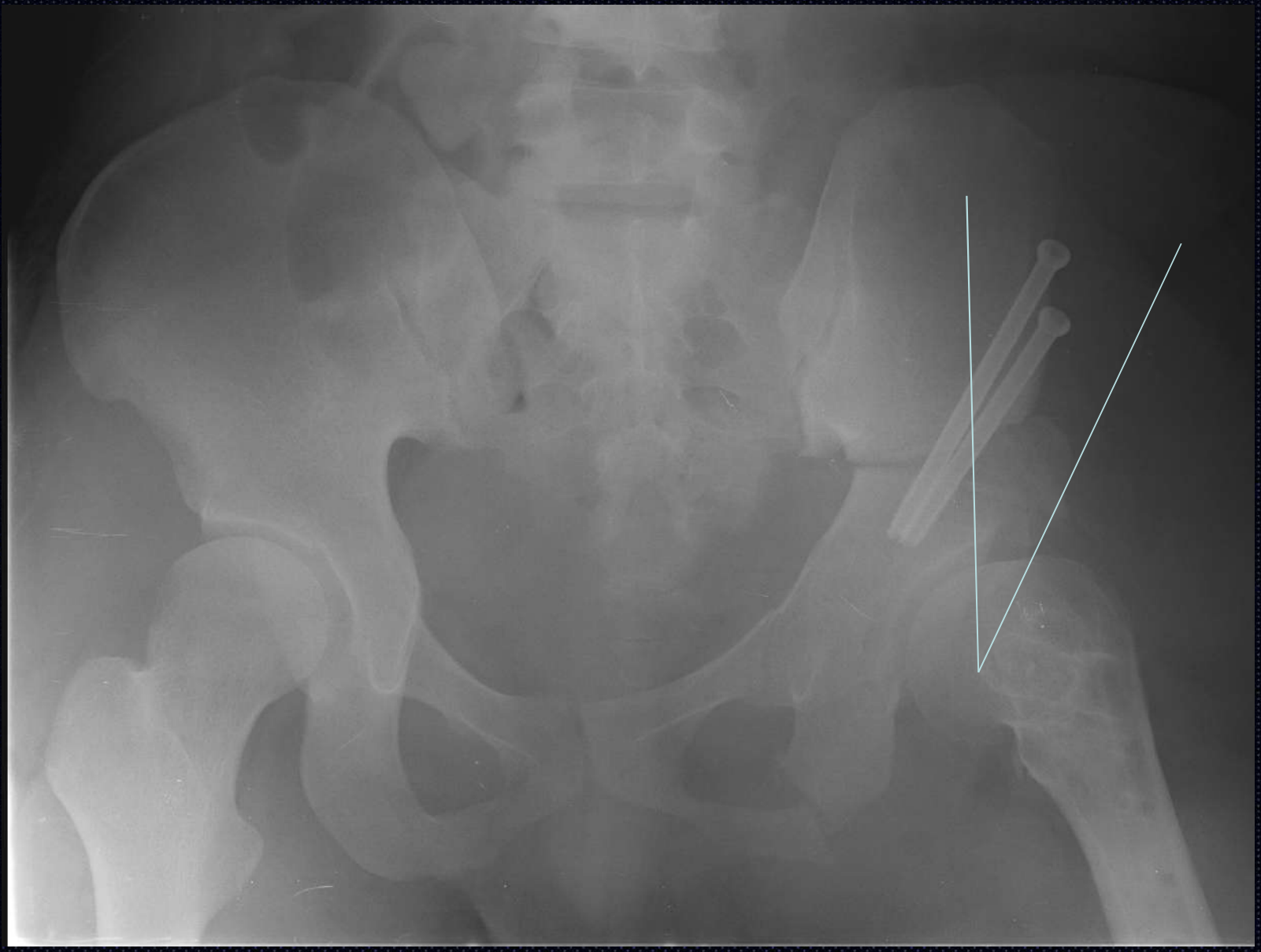
Intra-operative navigation after exposure

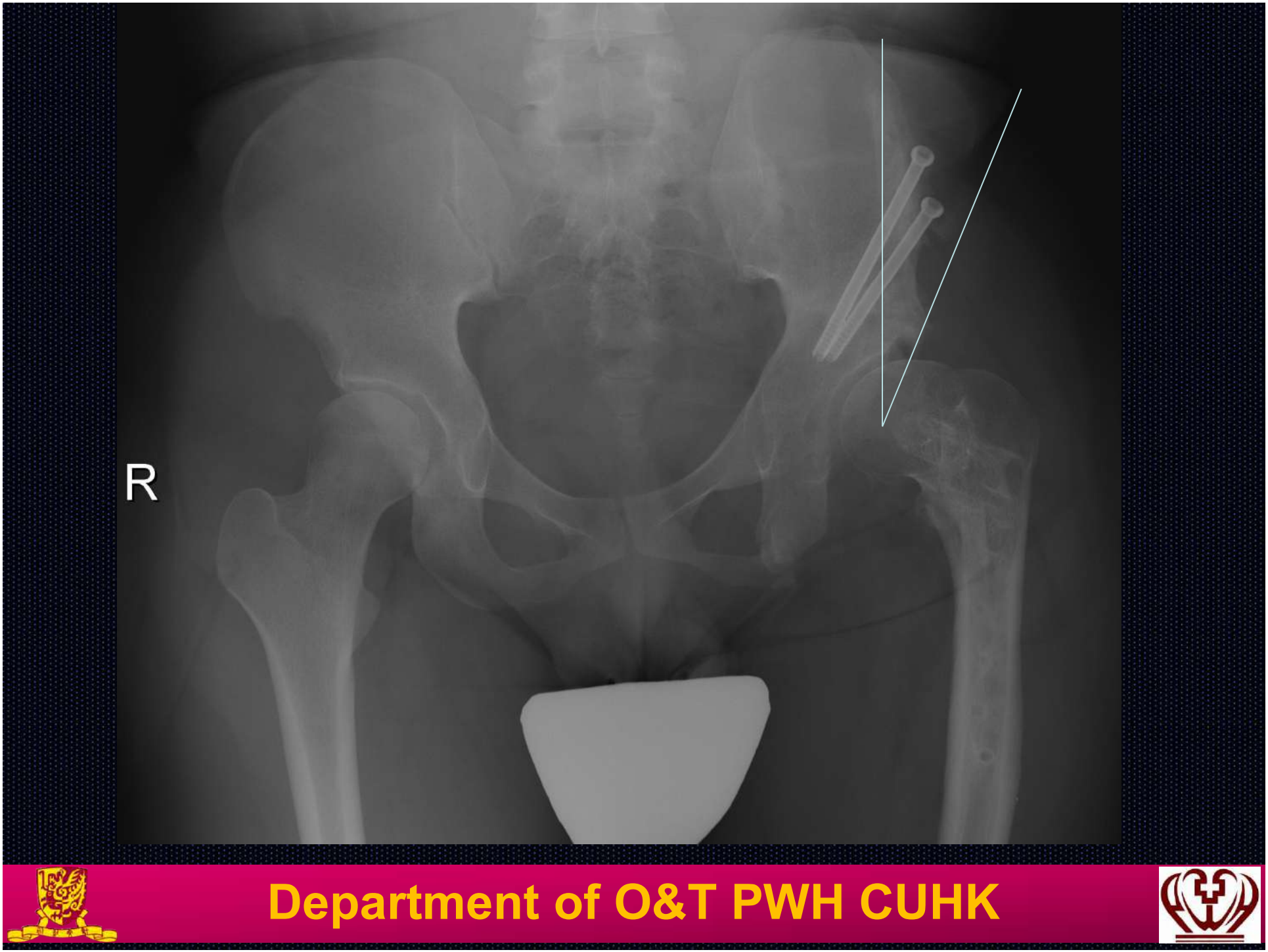





Coronal CT/01 *
Zoom: 126%
H
Mak_Hoi_Ki_2
MAK, HOI KI
Aug 11, 2008
R
L
F
Sagittal CT/01 *
Zoom: 126%
H
Mak_Hoi_Ki_2
MAK, HOI KI
Aug 11, 2008
P
A
F
Axial CT/01 *
Zoom: 126%
A
Mak_Hoi_Ki_2
MAK, HOI KI
Aug 11, 2008
R
L
P
VR CT/01
Mak_Hoi_Ki_2
MAK, HOI KI
Aug 11, 2008
1
2
3
4

Navigation Guided Drilling of Cutting Plane



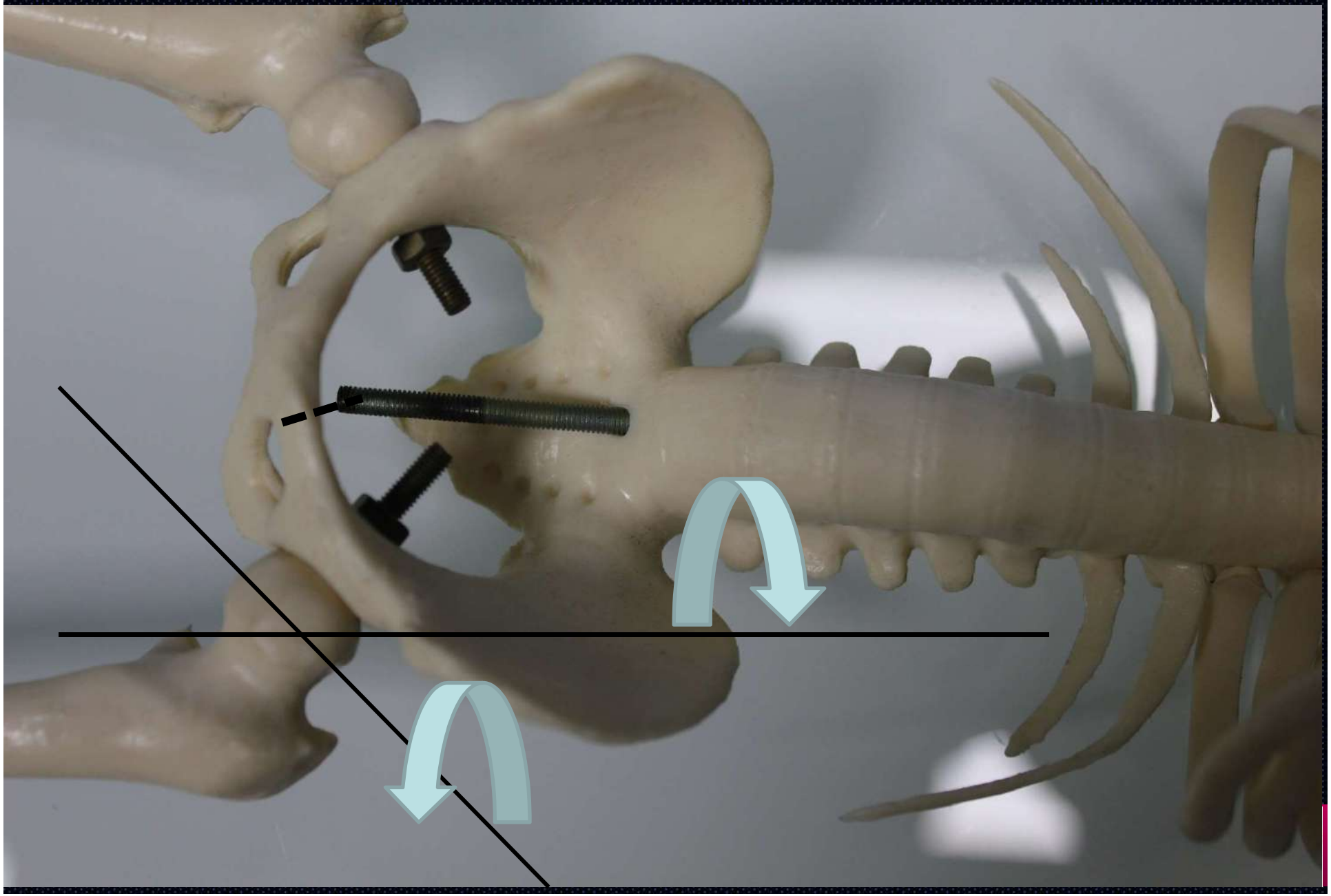

R


SONY

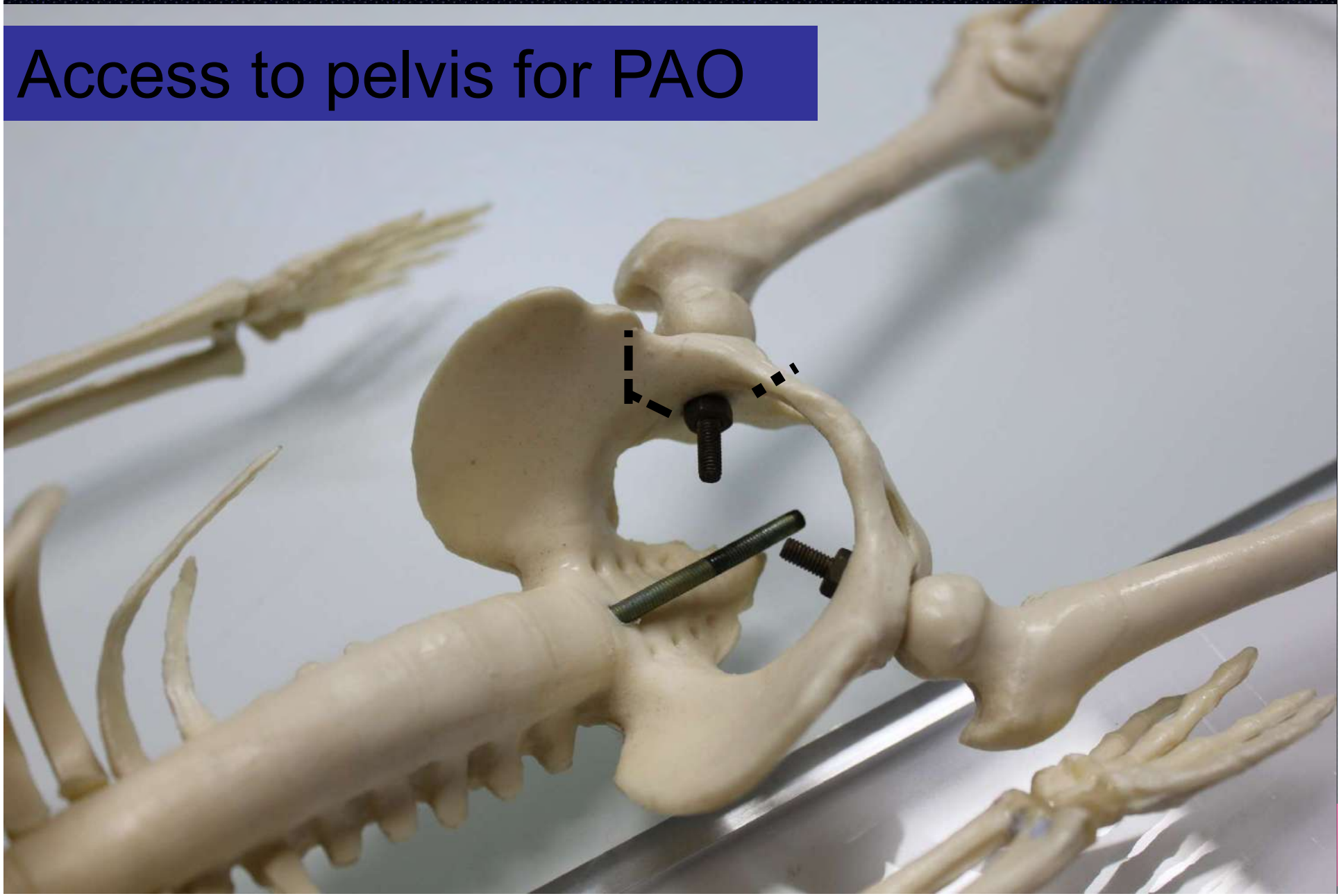
Peri-Acetabular Osteotomy PAO

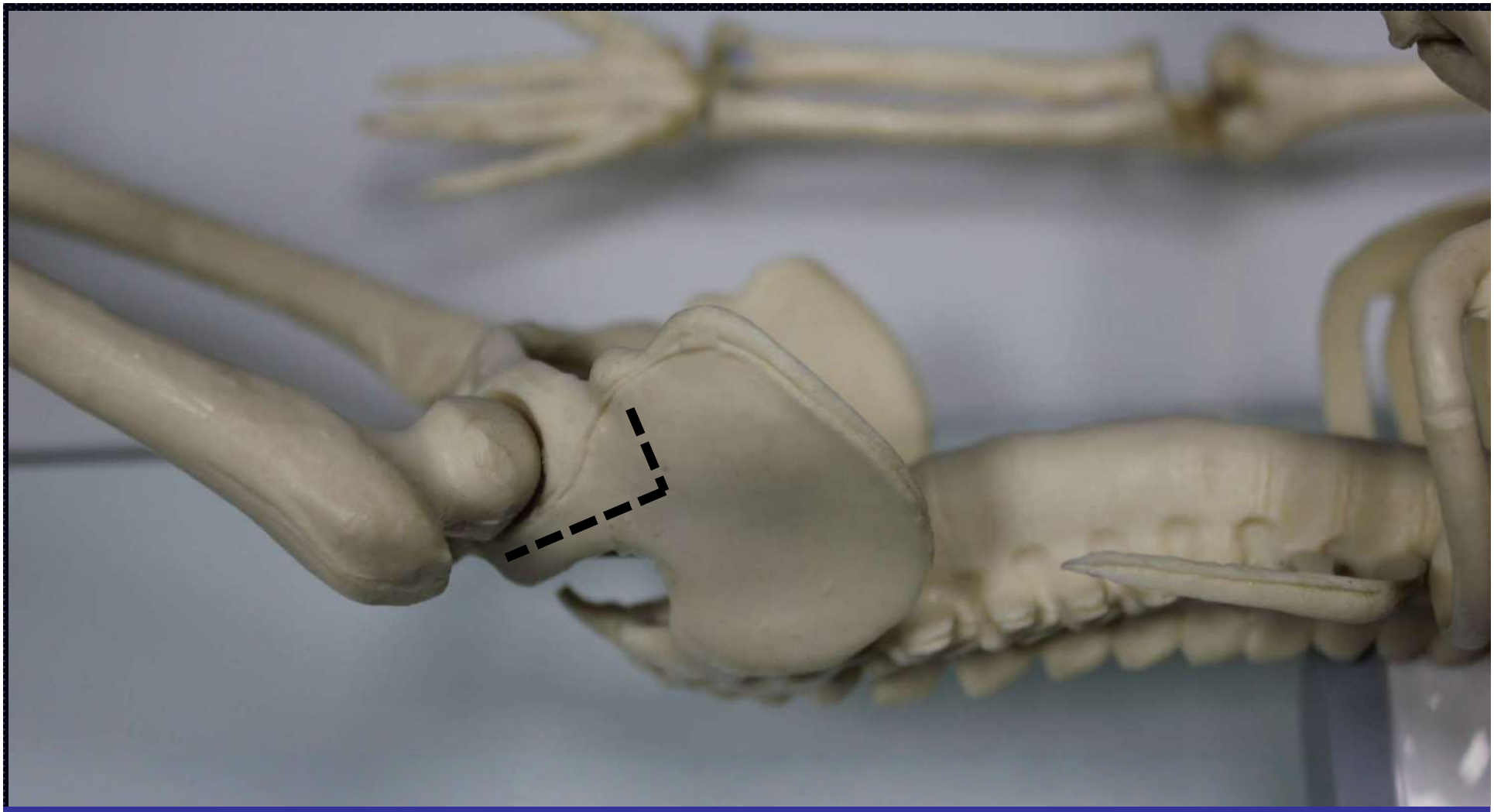
- Complex Anatomy of the pelvis
- Access to osteotomy site
- Awareness of soft tissue structures
  - Muscles: Adductors, Psoas, Rectus, Pectineus, Gluteus
  - Nerves: Femoral / Sciatic
  - Vessels: Femoral artery and vein

2 Euler axes of rotation for anterolateral cover



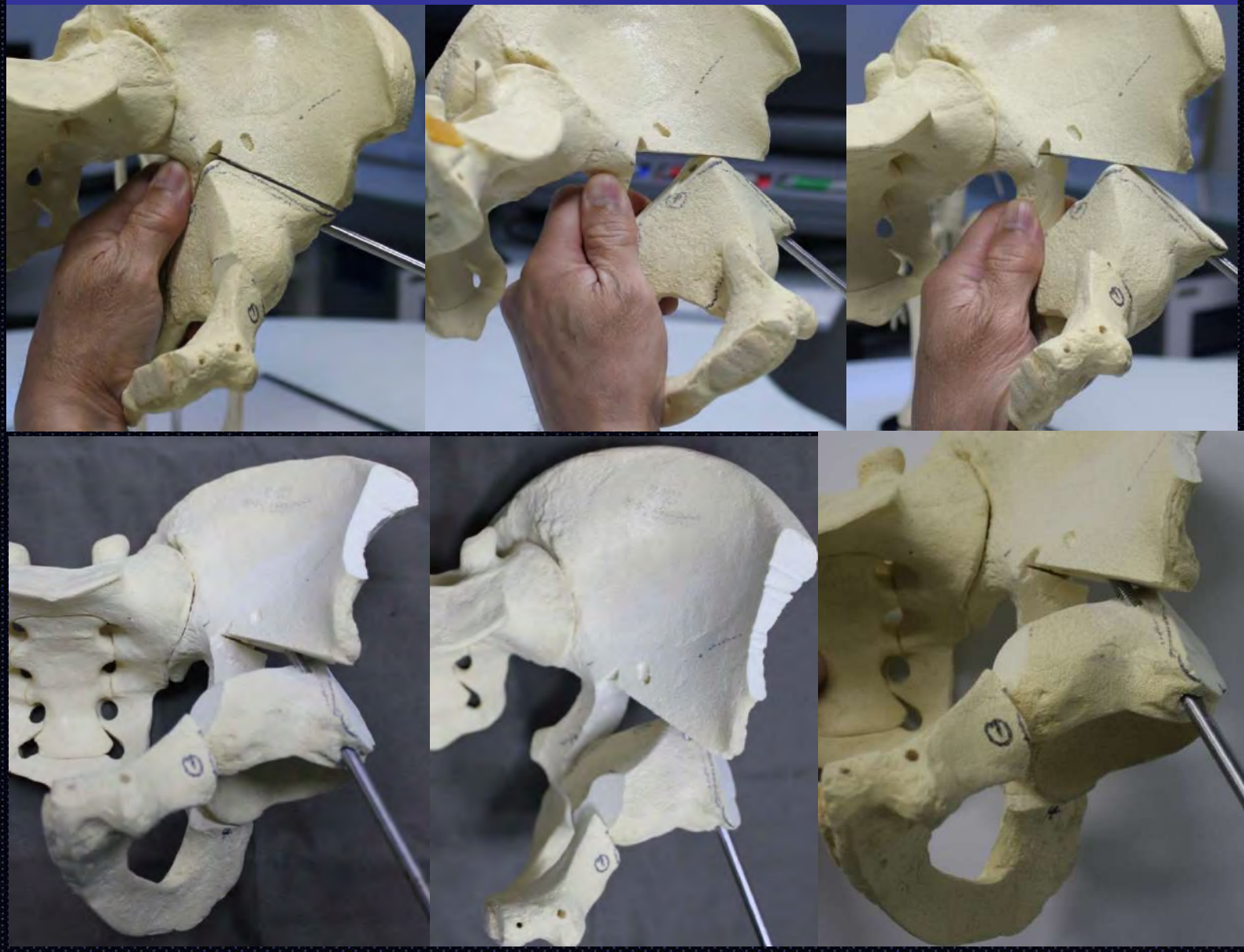
Access to pelvis for PAO





Access to pelvis for PAO from posterior or lateral aspect very limited in supine position

Planned “Joystick” Screw to manipulate Free fragment

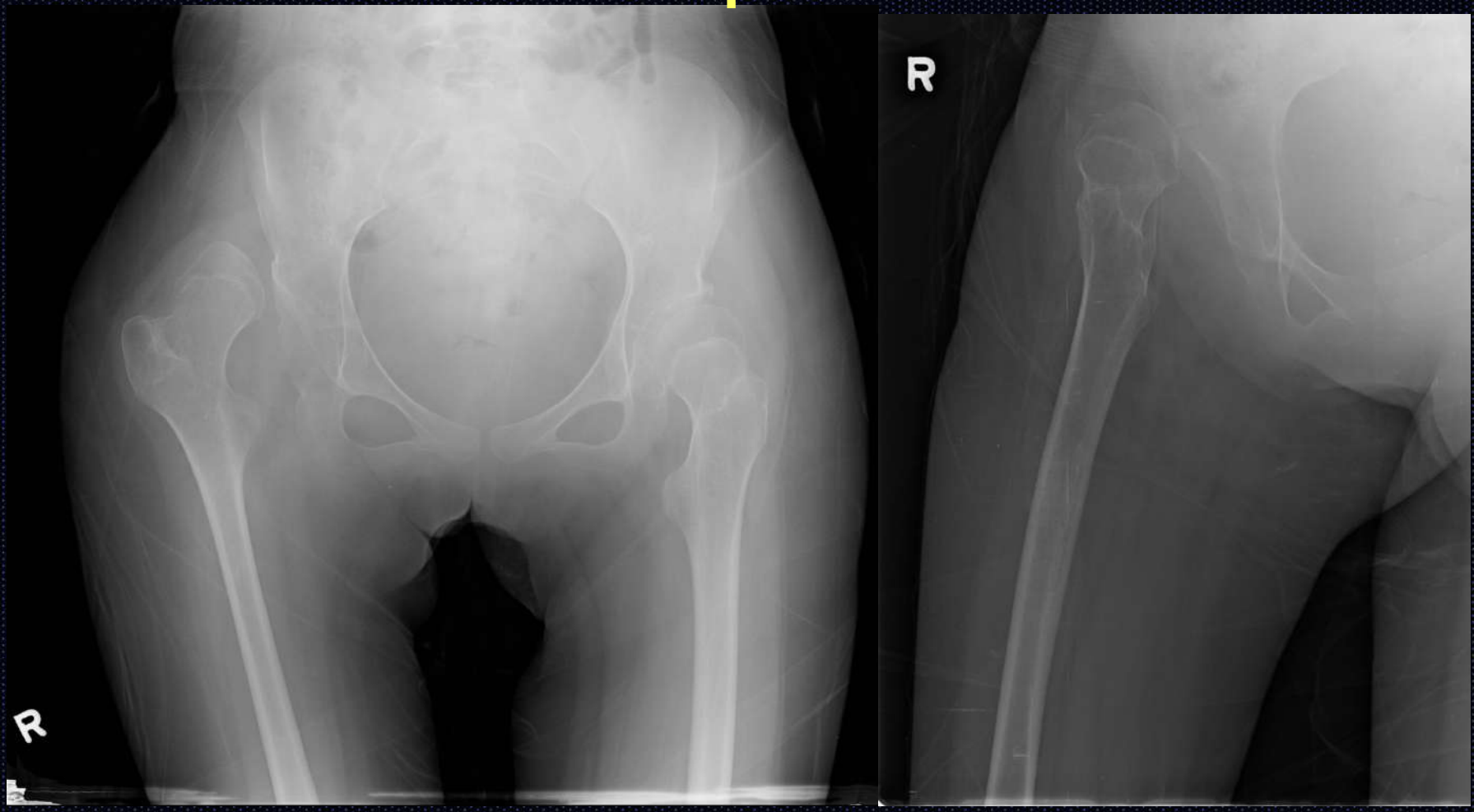


Ilio-inguinal approach Letournel

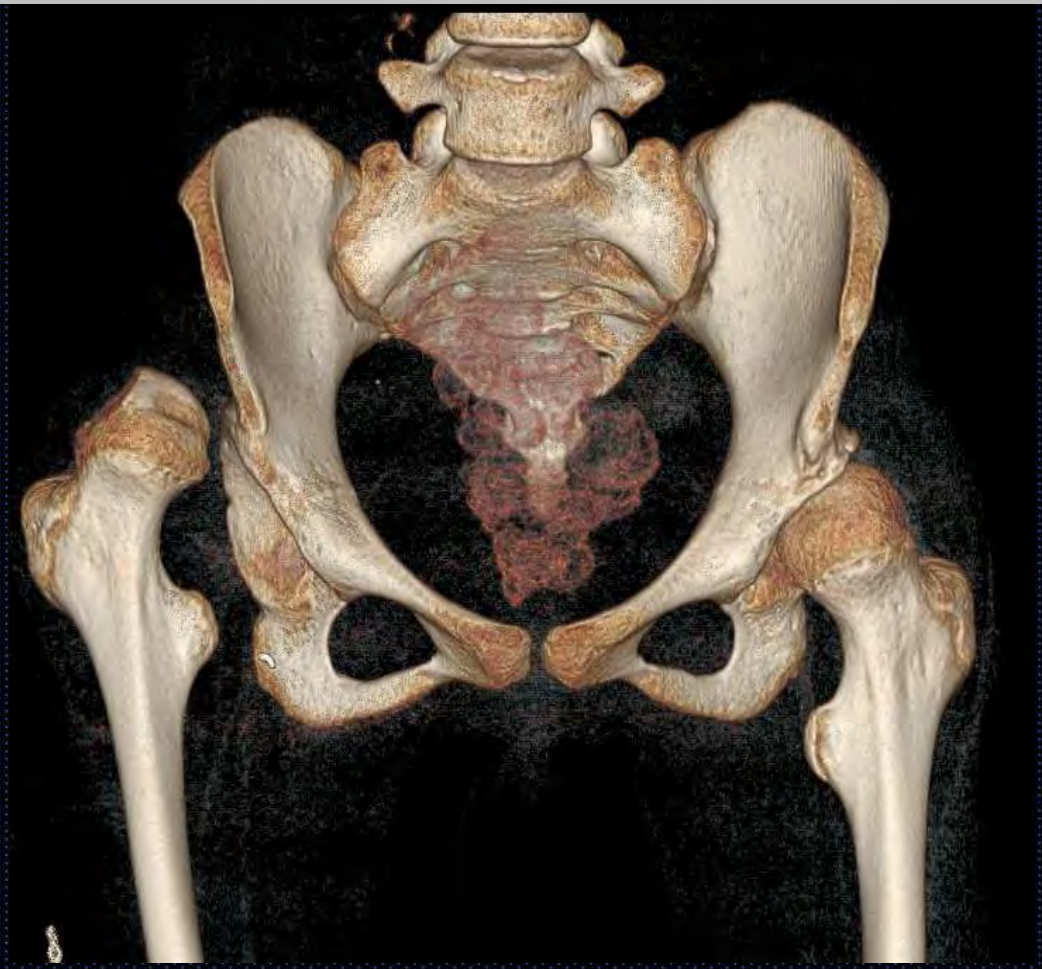
- Osteotomy sequence
  - 1 Complete pubic ramus
  - 2 Supra-acetabular iliac
  - 3 Retro-acetabular iliac
  - 4 Incomplete ischiatic
  - 5 Fracture control 3+4

Francesco Pogliacomi, Andre Stark, Enrico Vaienti, Richard Wallensten. ACTA BIO MEDICA 2003;74;38-46

CP Spastic Dislocaiton
Pre- Operation

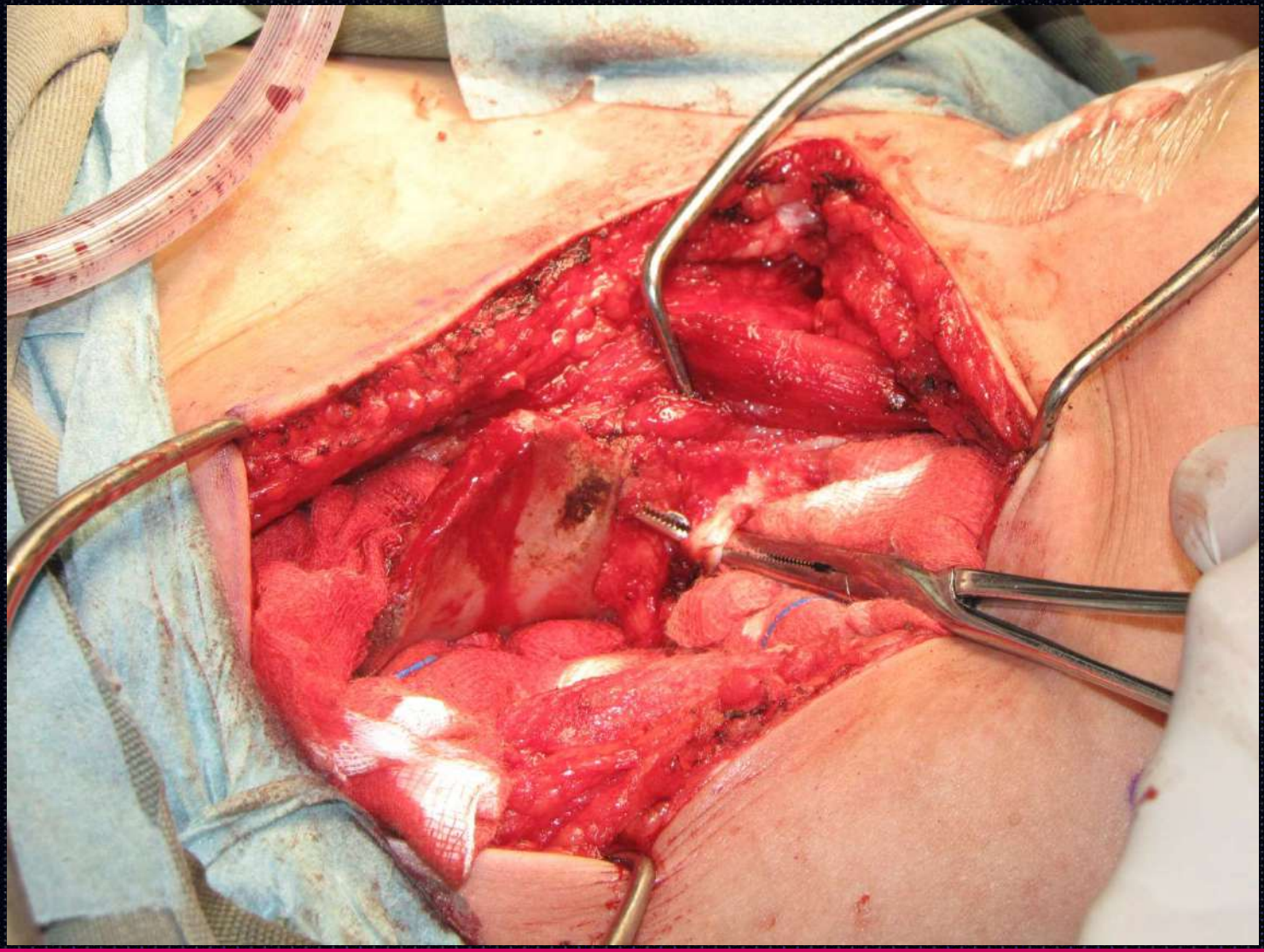


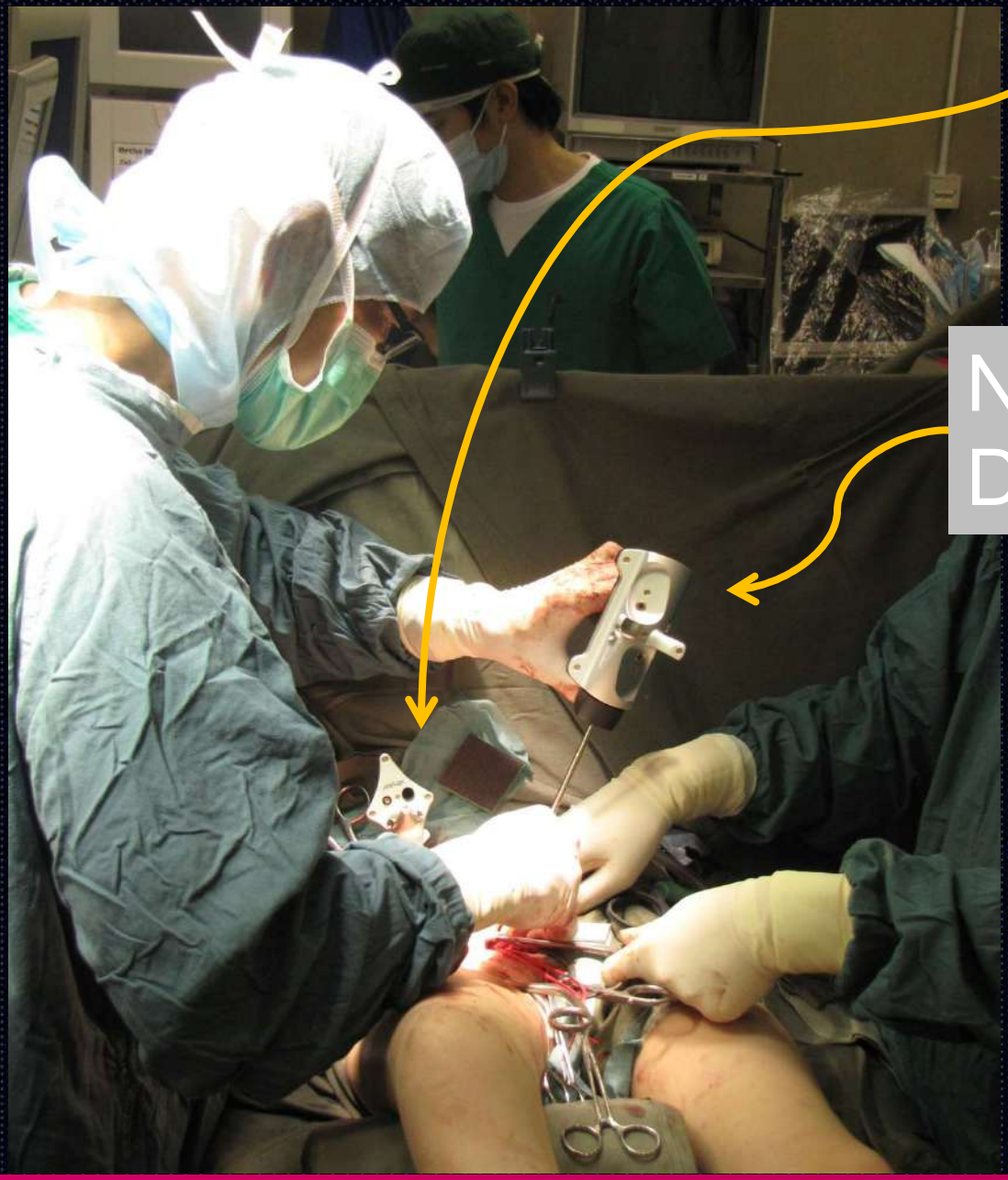
Plan : Open reduction. Navigation guided PAO



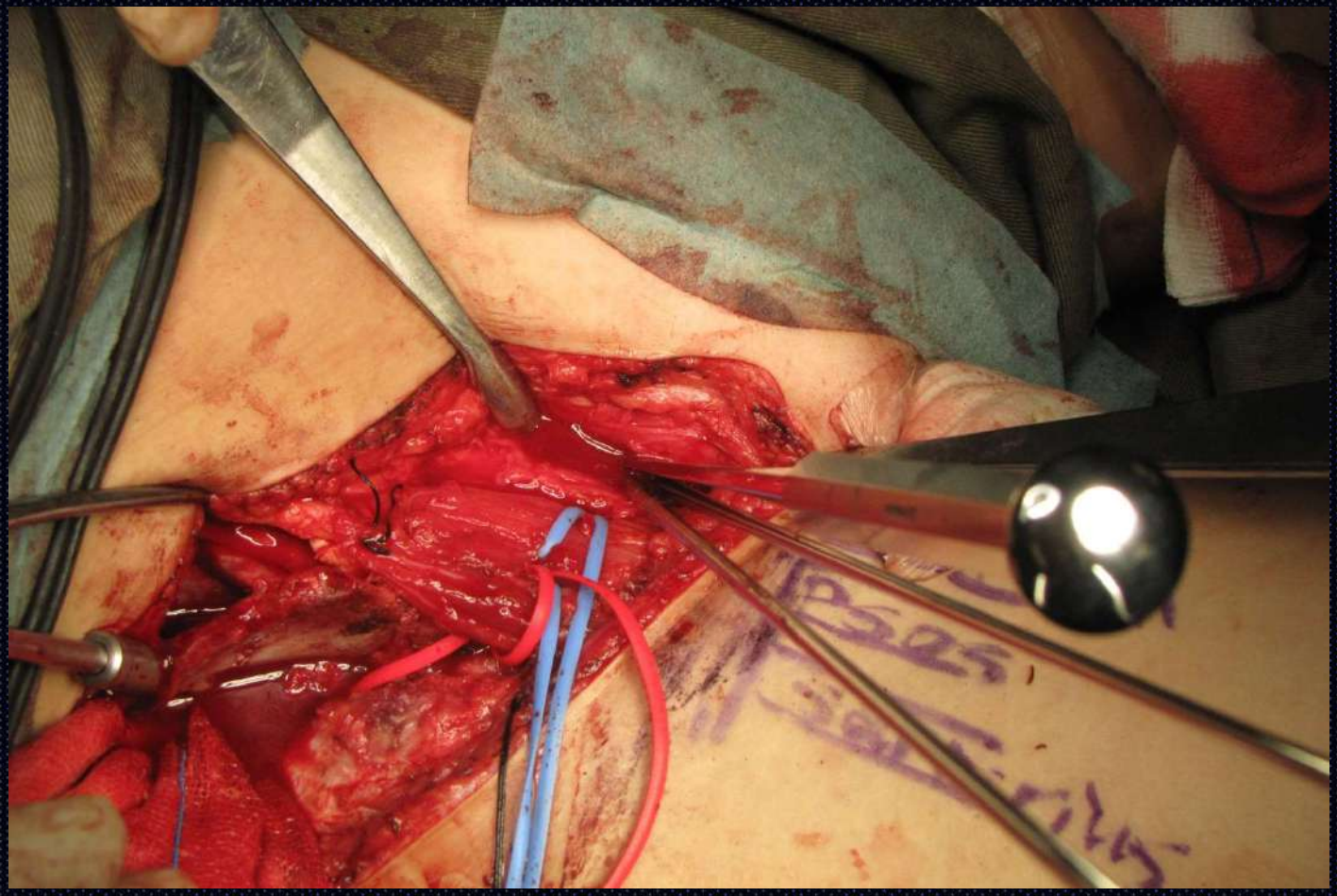

OK

Ilioinguinal Exposure

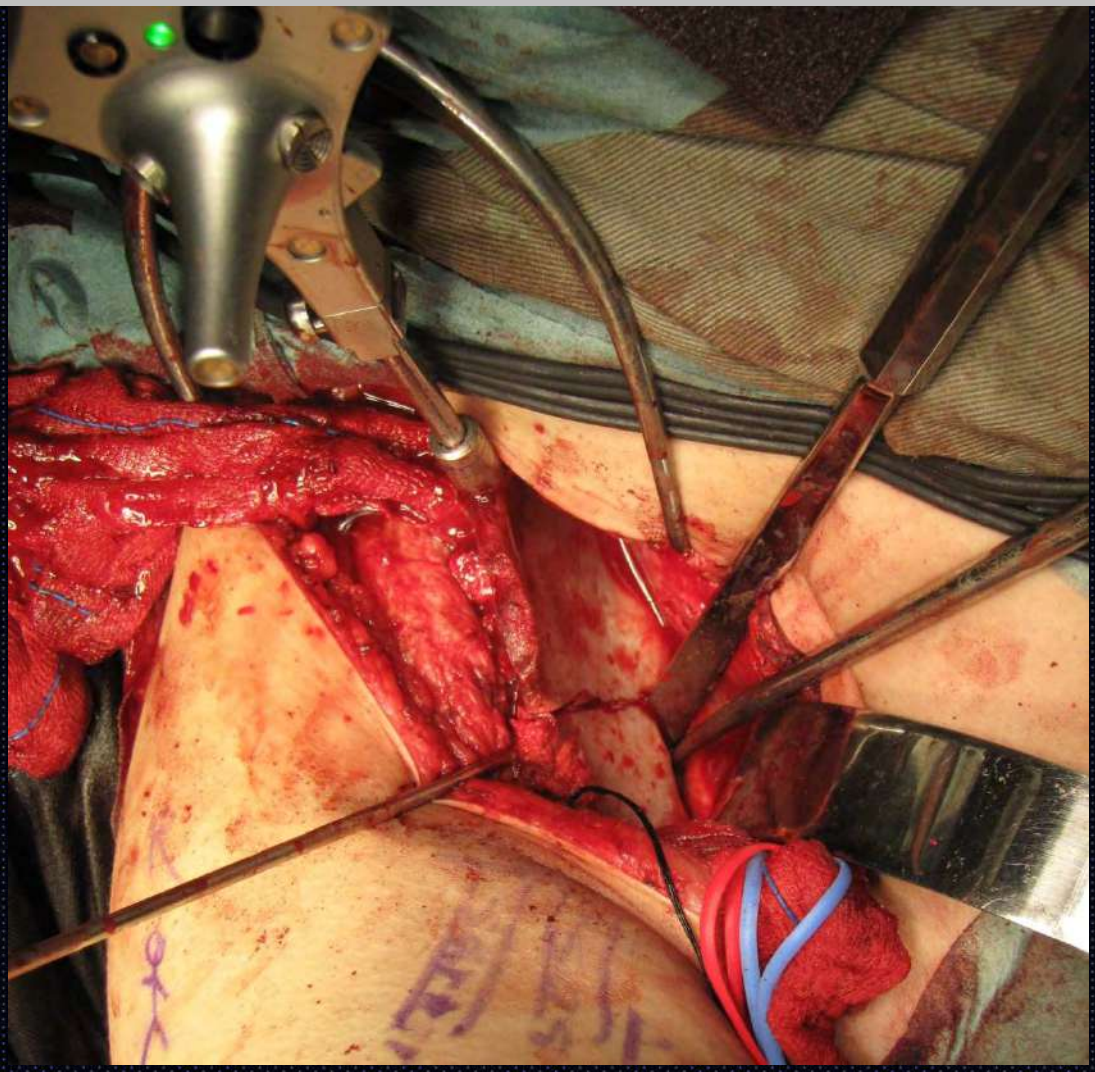


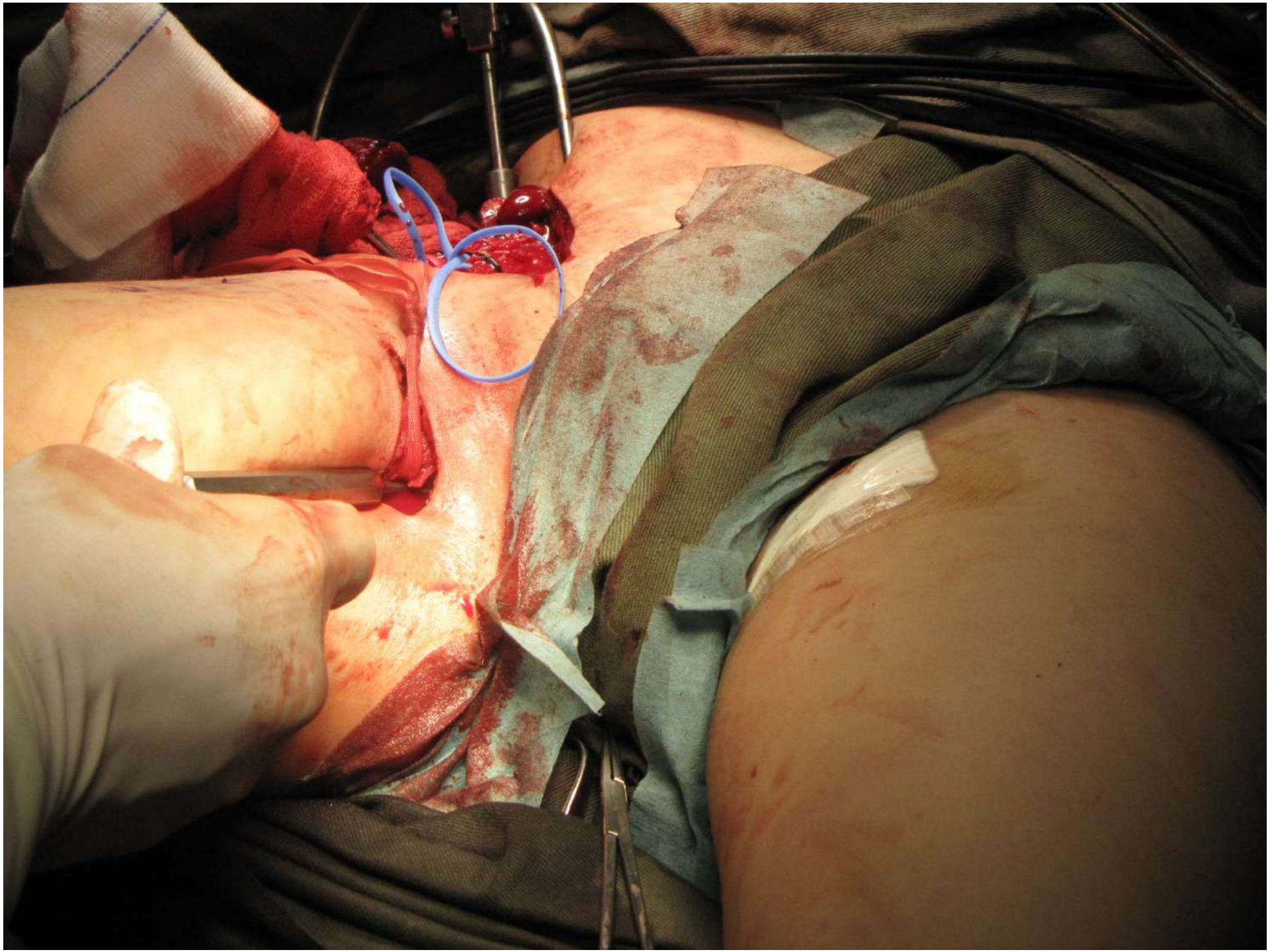

Patient
Tracker
Navigated
Drill

Osteotomy through plane created by guide wires through windows

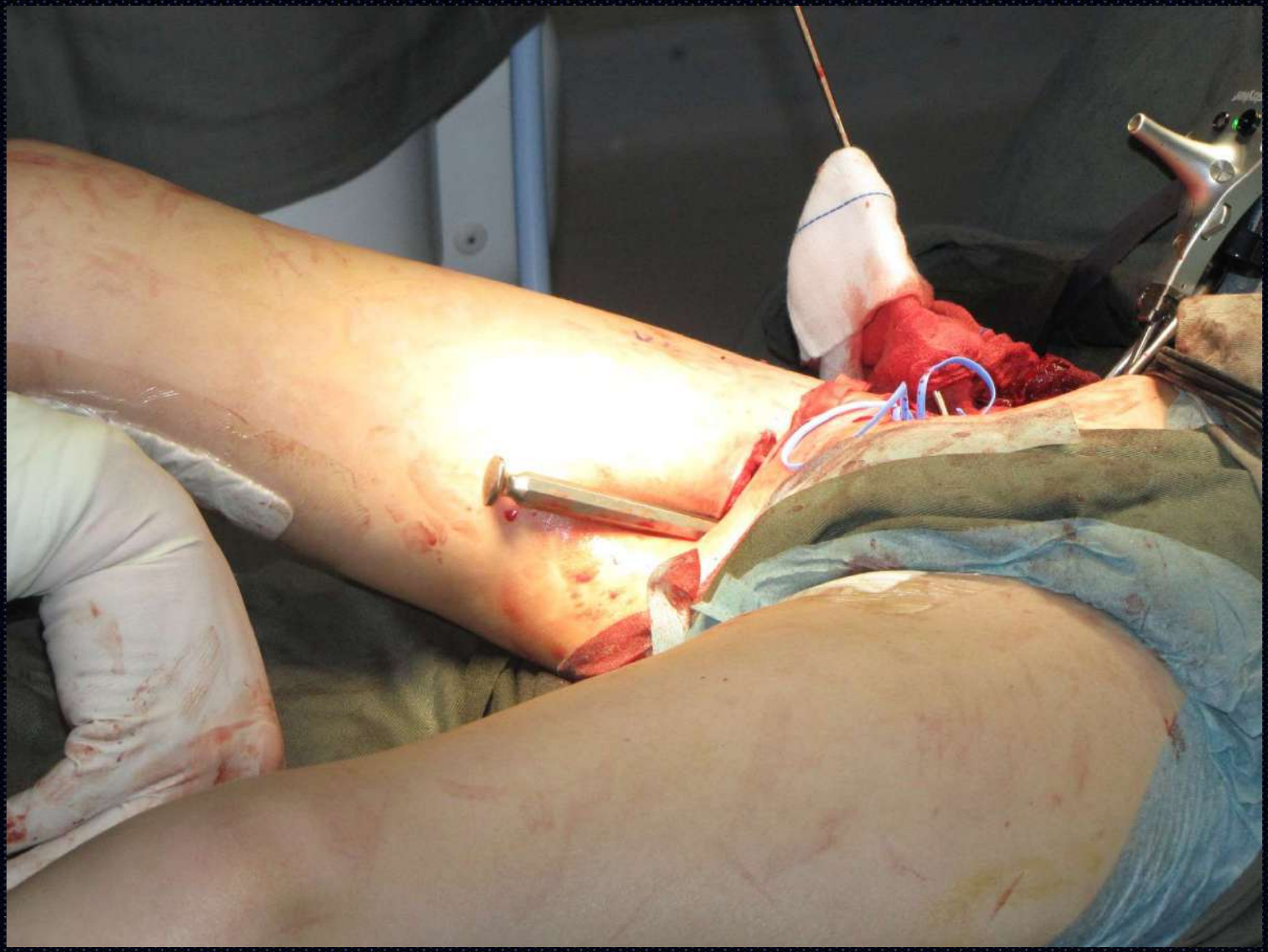


Retro-acetabular cut marked with navigated pointer and cut





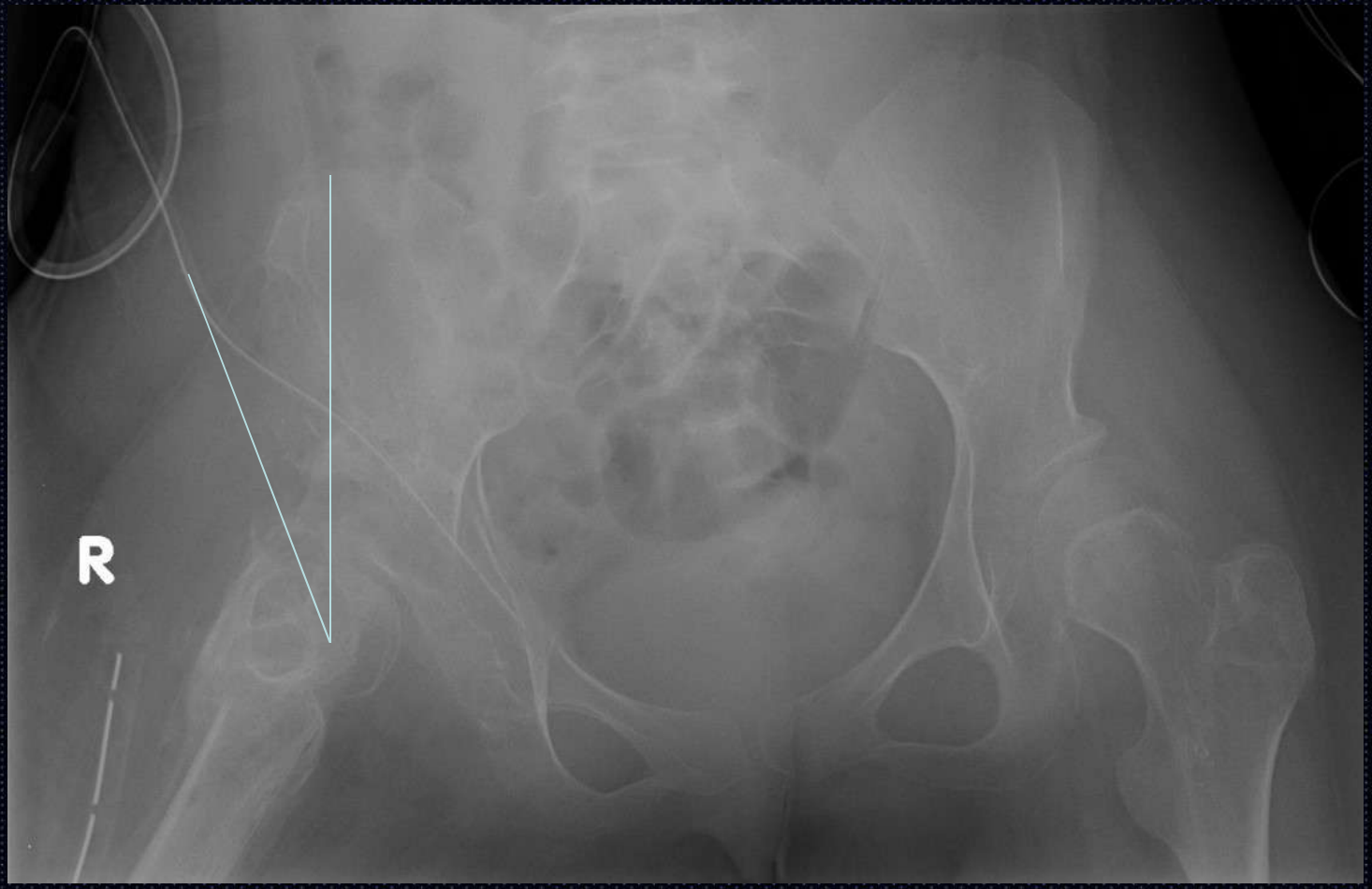
Ischium cut easier done with conventional approach use XR FPV



Post operation

After removal of implants

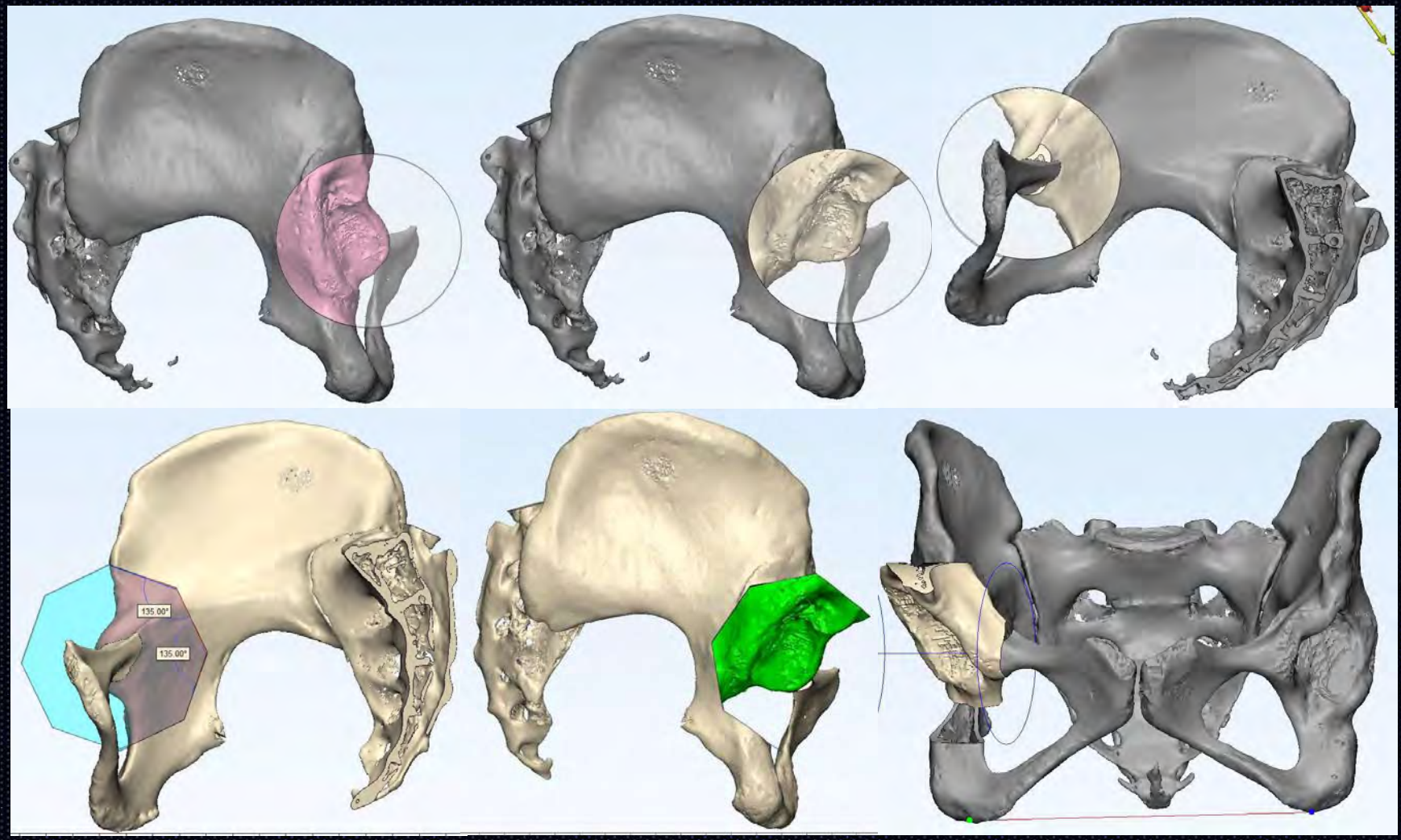
Clinically Pain free full range of Motion



ML MRCP,Discussed McHale or PAO VDRO


R

Future directions Computer planning

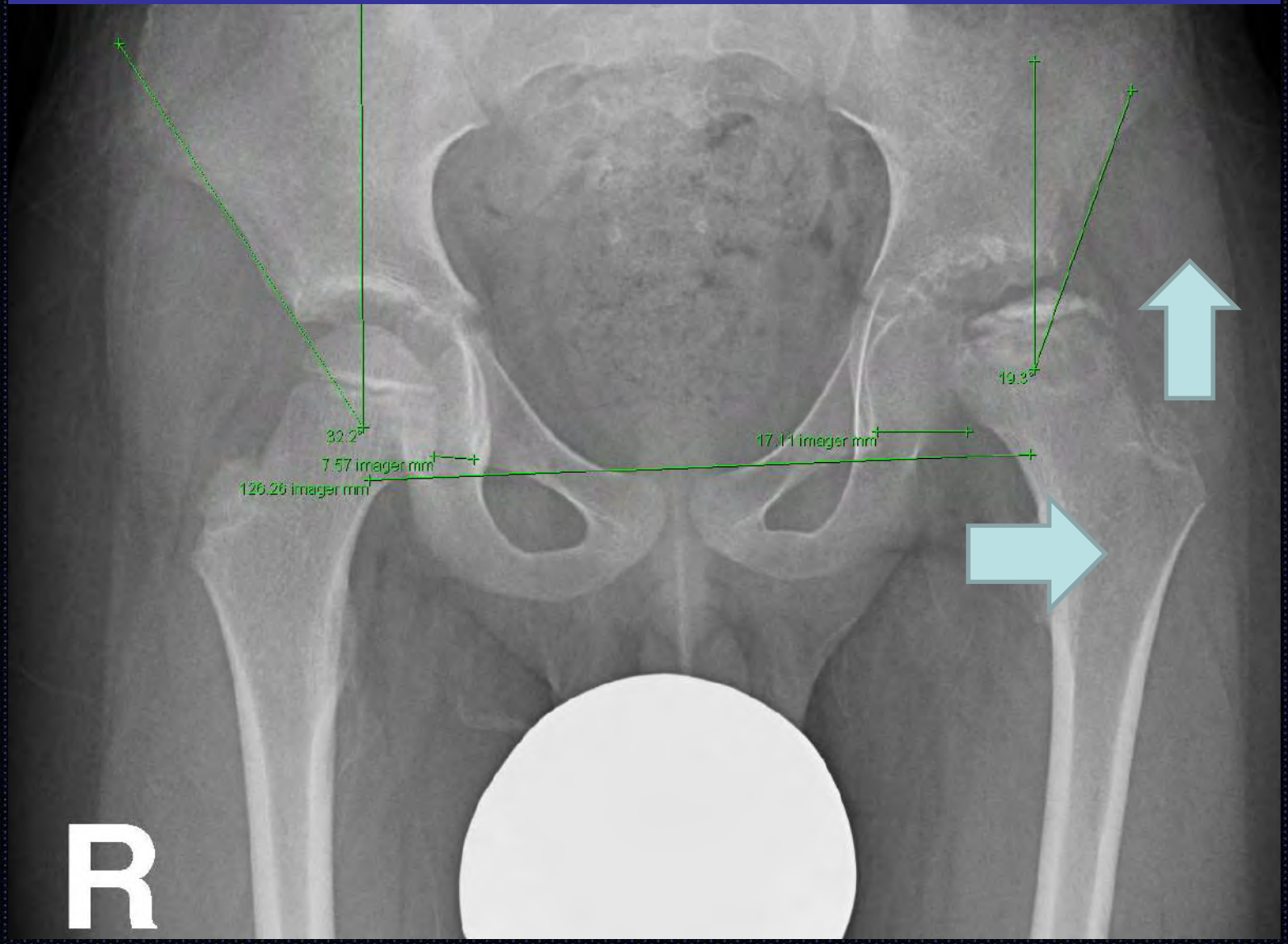


Conclusion

- DDH can deteriorate in stable dysplastic hips leading to symptomatic progressive dysplastic or subluxing hips
- Triple, Bernese, Interlocking osteotomies can all restore satisfactory concentricity and greatly improve range of motion, often proximal femoral osteotomy and shortening is also required
- **Restoration of normal hip mechanics is excellent in reducing pain and improves function**
- **Procedure is complex and technically difficult**

2 Perthes A Frame and ROWO

This hip needs treatment



Soft Tissue Release

- Adductor releases + TSRH Brace, Petri cast, Medial capsular release, A-Frame
- ? Prolonged treatment- not attractive
- ? Difficult to comply
- Reported excellent result

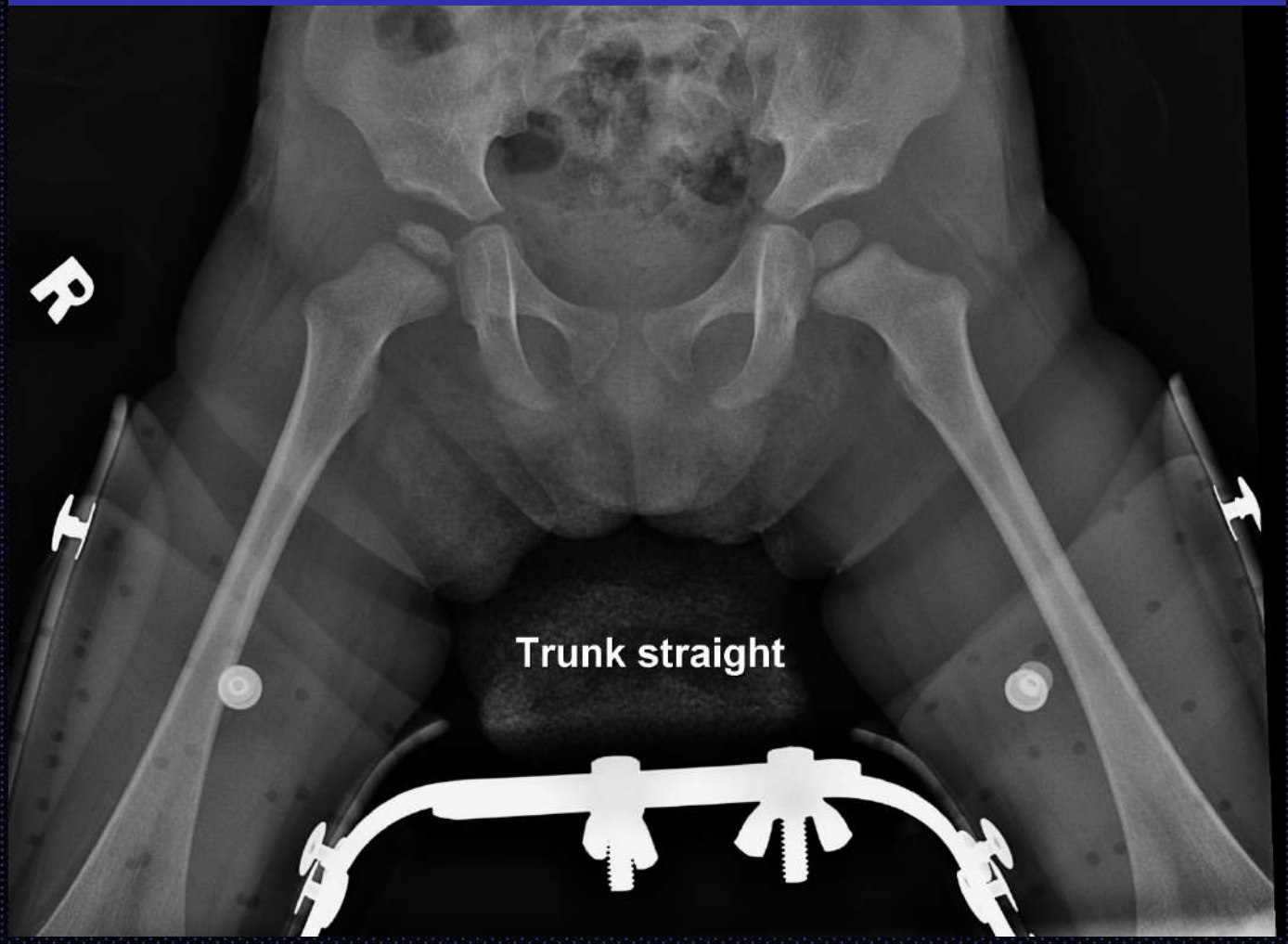
Management of Legg-Calvé-Perthes Disease Using an A-Frame Orthosis and Hip Range of Motion: A 25-Year Experience

Margaret M. Rich, MD, PhD and Perry L. Schoenecker, MD*†‡*

A- Frame and Soft tissue release

- Adopted A –Frame as primary treatment after work from Perry Schoenecker
- Start with simple cases- young age
- Follow same standard regime
- Compliance surprisingly good
- Combined this with Medial Capsular release
- Head reduction much better

THC, M2y2m limping- Proceed to A-frame
Good compliance to Rich Schoenecker regime



THC, Developed left hip perthes, went to local hospital, continue with A frame good compliance, Both Hips well contained

CPT M/6y4m Nephrotic syndrome on steroid
left hip pain 5 months, well contained,
Adductor tenotomy , A frame

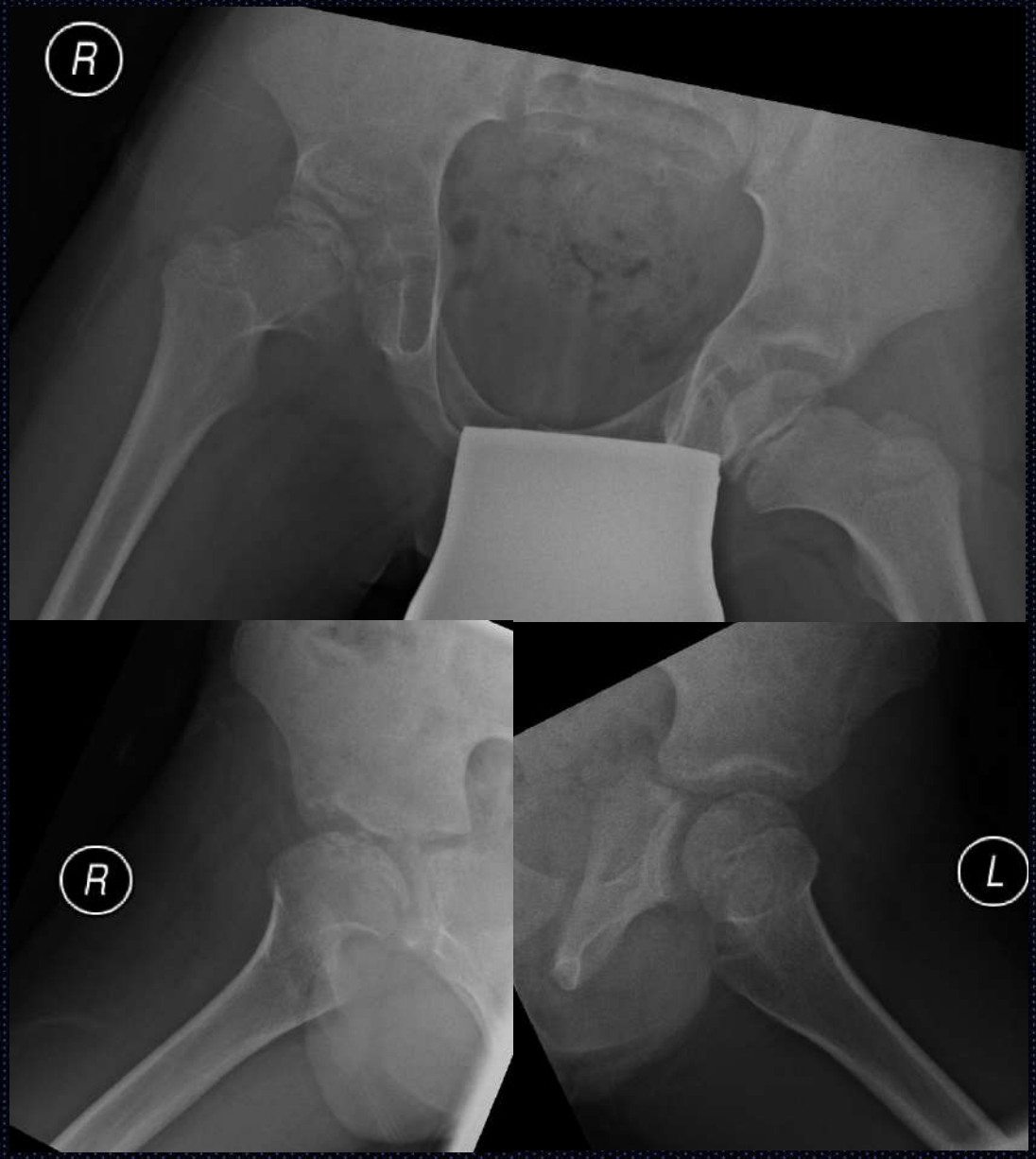
CPT


CPT
L


CPT

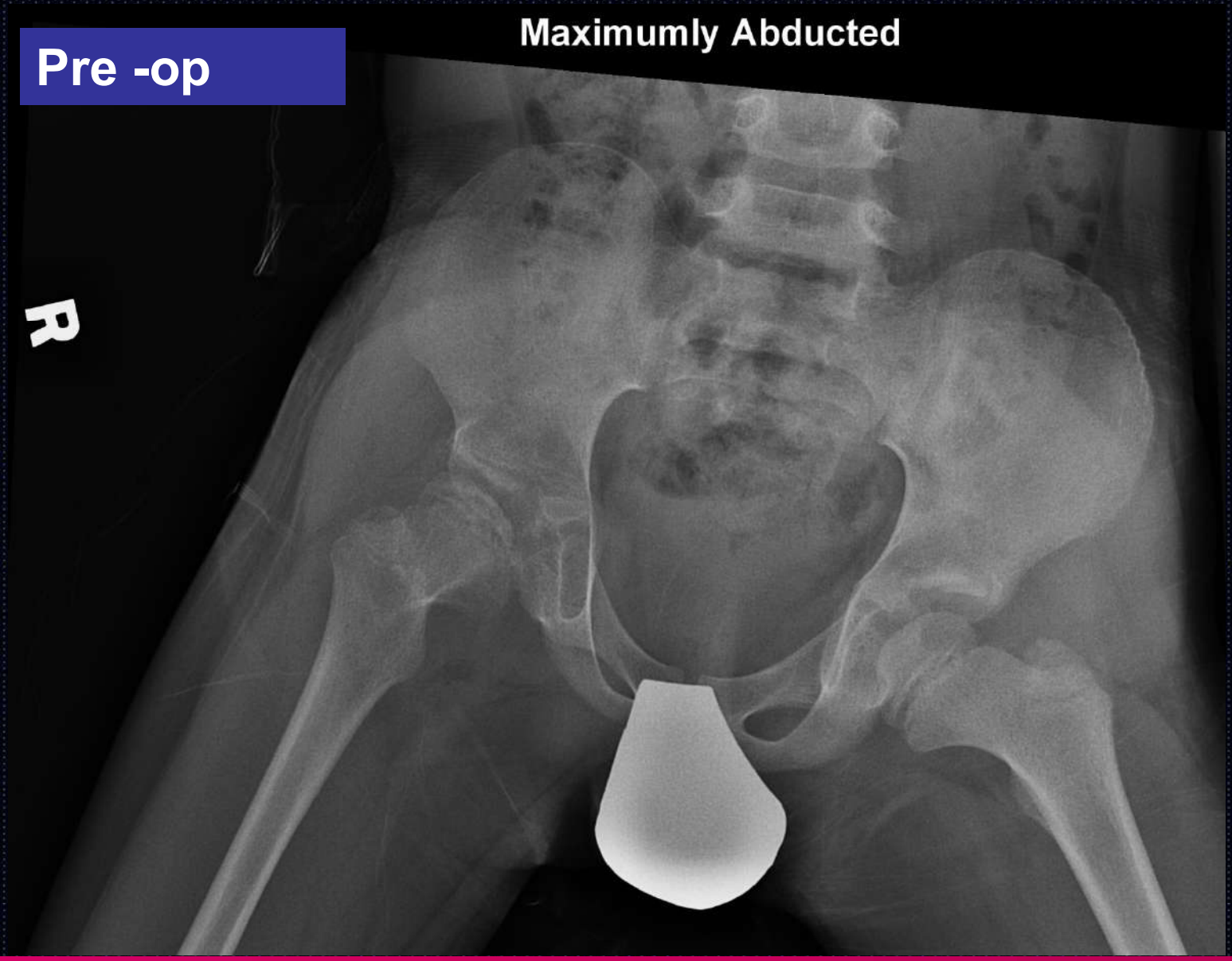
CPT

CYH M/6y10m
Right hip pain
Limping 6 months
Strange deformity of the head

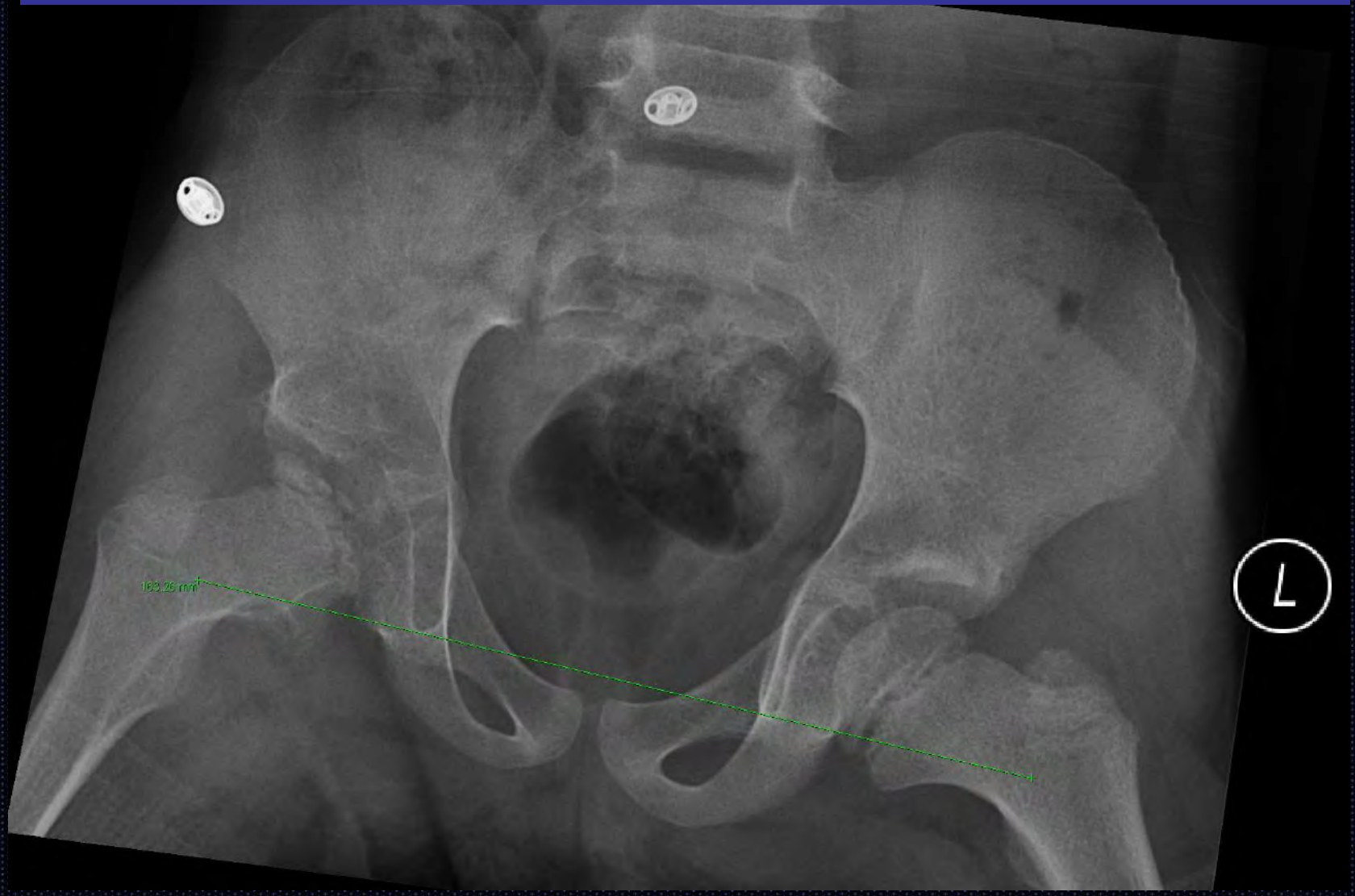


Adductor Tenotomy Medial Capsular release- A Frame

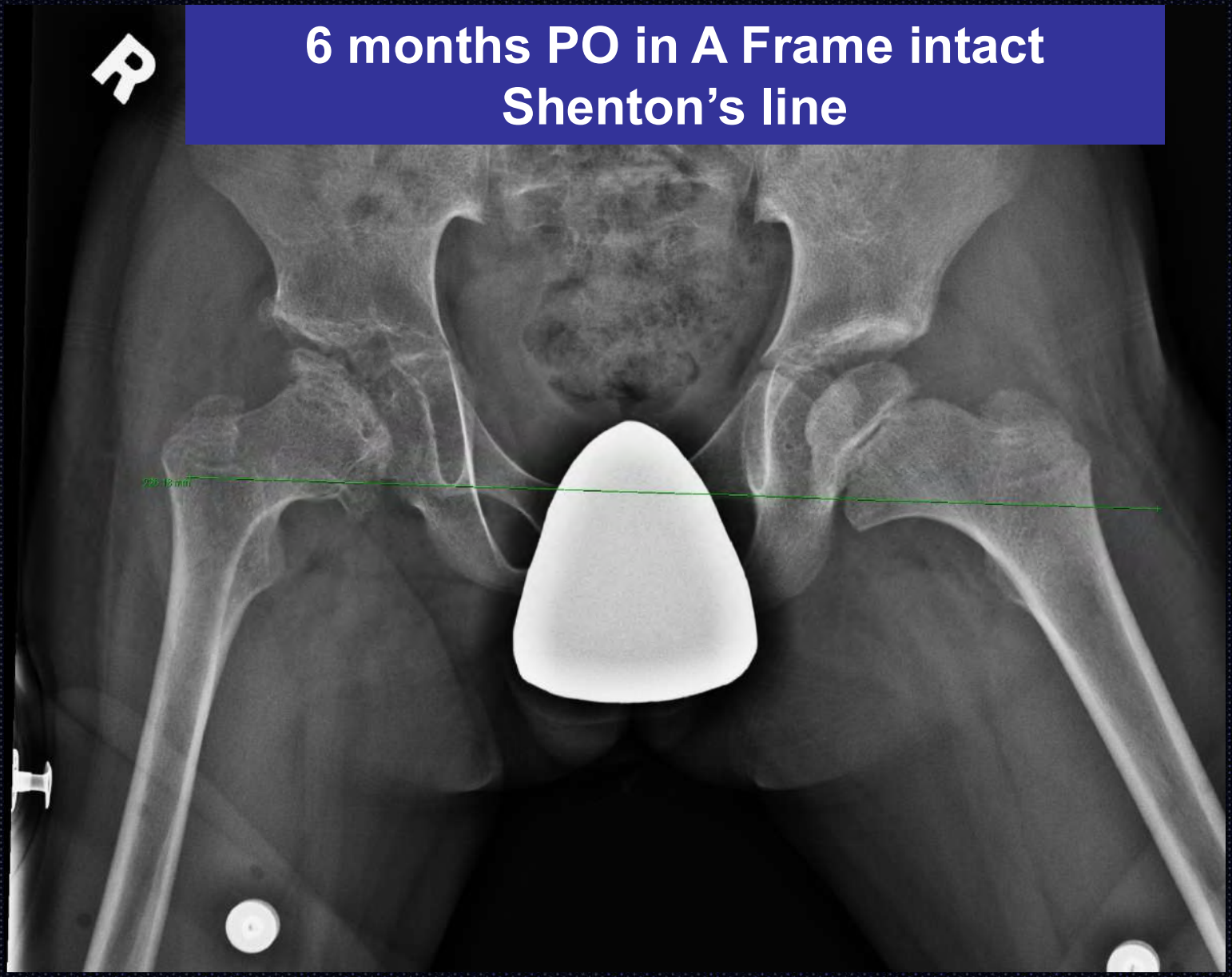
Pre -op



1 week post op Hip better contained



6 months PO in A Frame intact
Shenton's line

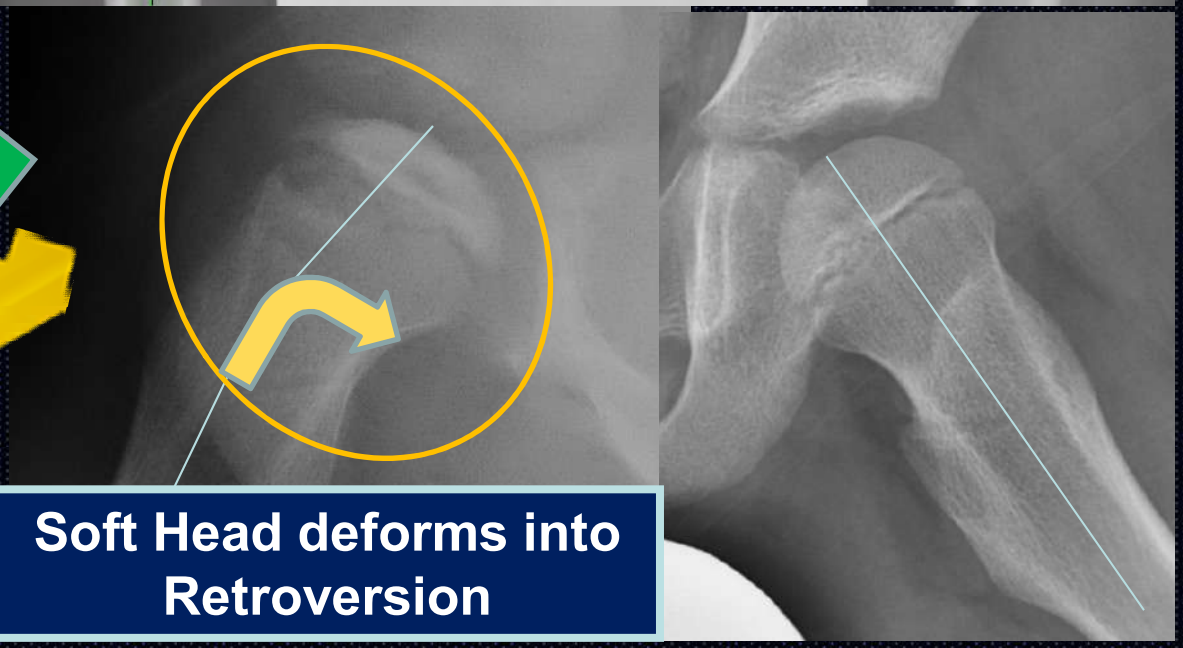


Asia Pacific Wr
October 3

Post op
1y4m
months
Off frame

Medial Capsular release and A frame

Treatment restores anteversion



Soft Head deforms into Retroversion

“Rowo” T Atsumi

- Observation of the **pathological deformity of femoral head and the associated loss of range of motion of hip joint**
- Osteotomy corrects femoral head to reduce posterior and lateral subluxation
- Flexion, varus osteotomy

M 6Y7M

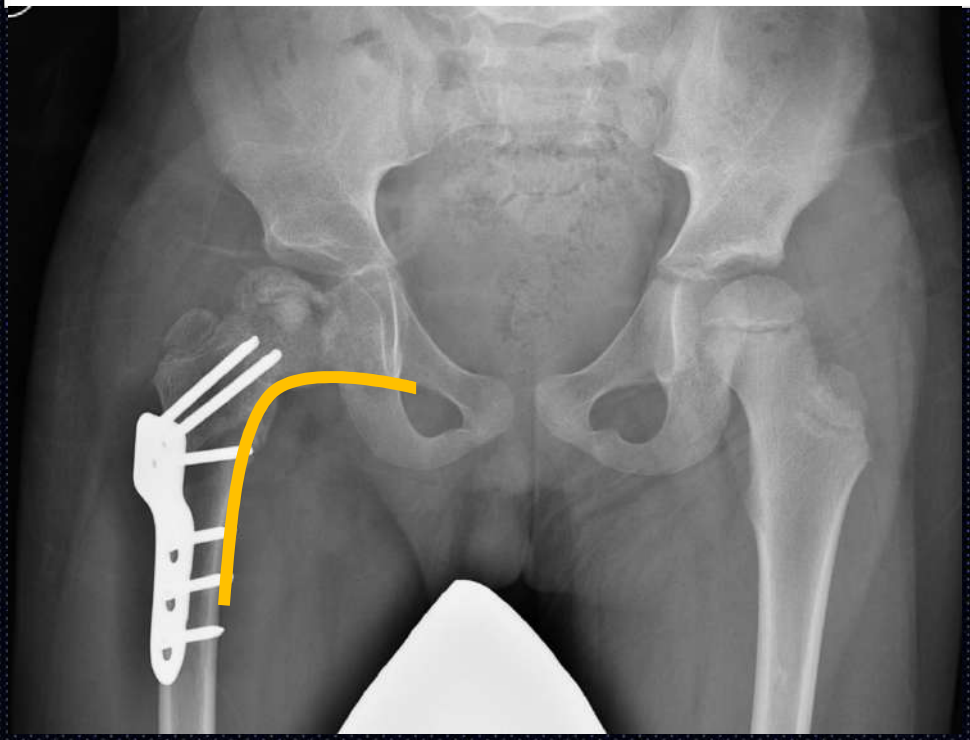
A fragmented head subluxed, extruded

Arch Orthop Trauma Surg (2002) 122:346–349
DOI 10.1007/s00402-002-0408-5

ORIGINAL ARTICLE

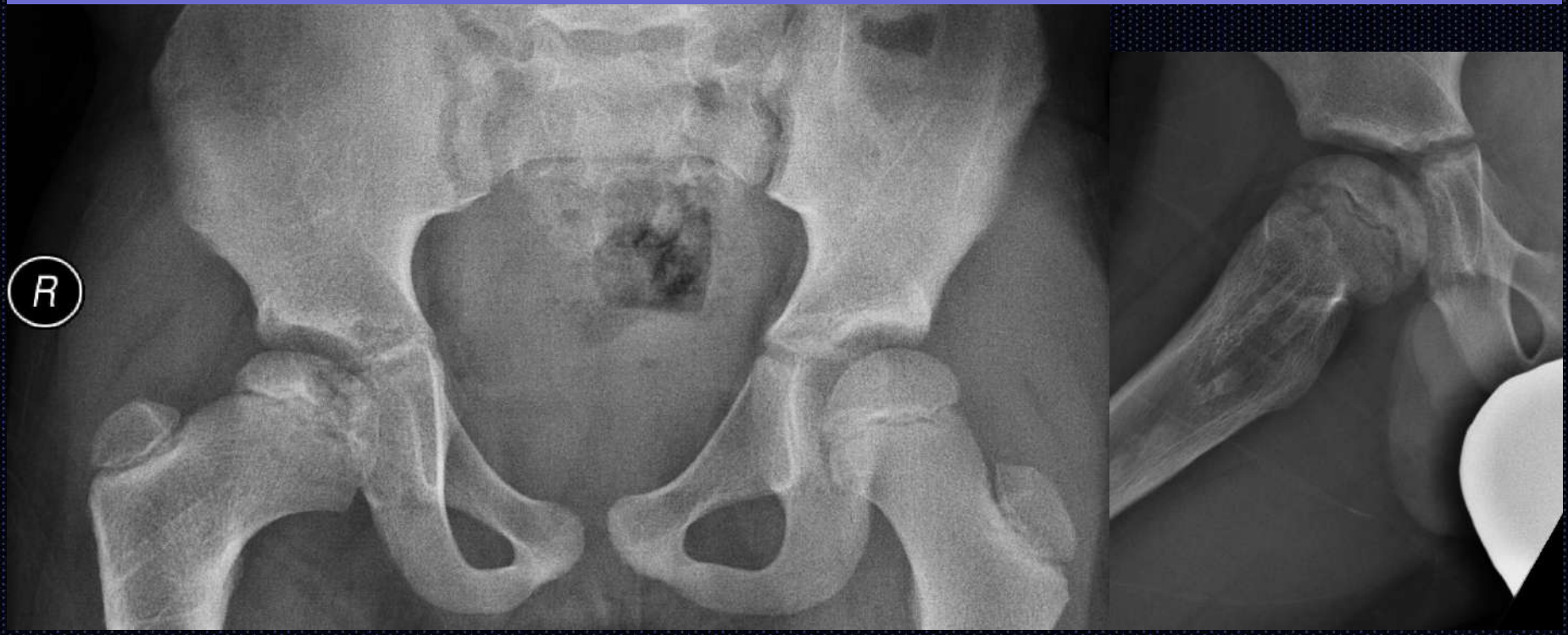
Takashi Atsumi · Satoshi Yoshiwara

Rotational open wedge osteotomy in a patient aged older than 7 years with Perthes' disease – a preliminary report



A Logical osteotomy that restores the bony anatomy and hip function

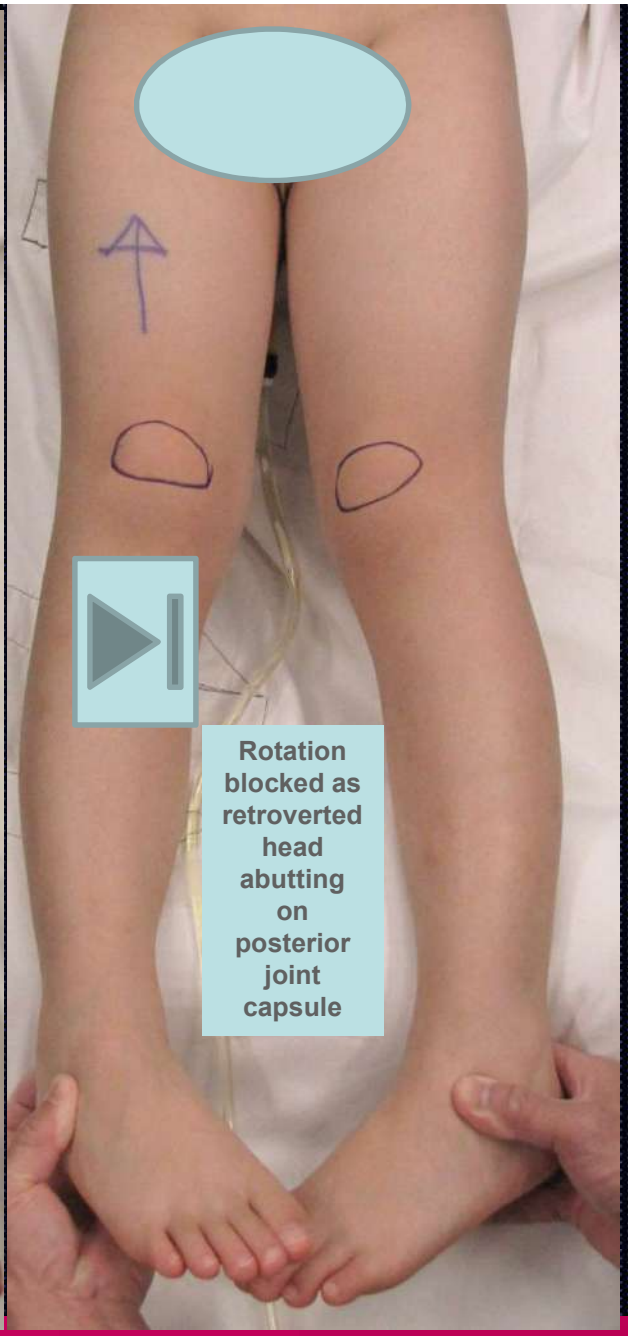
ROWO-Completed all treatment in 2 years head healed! Metals removed



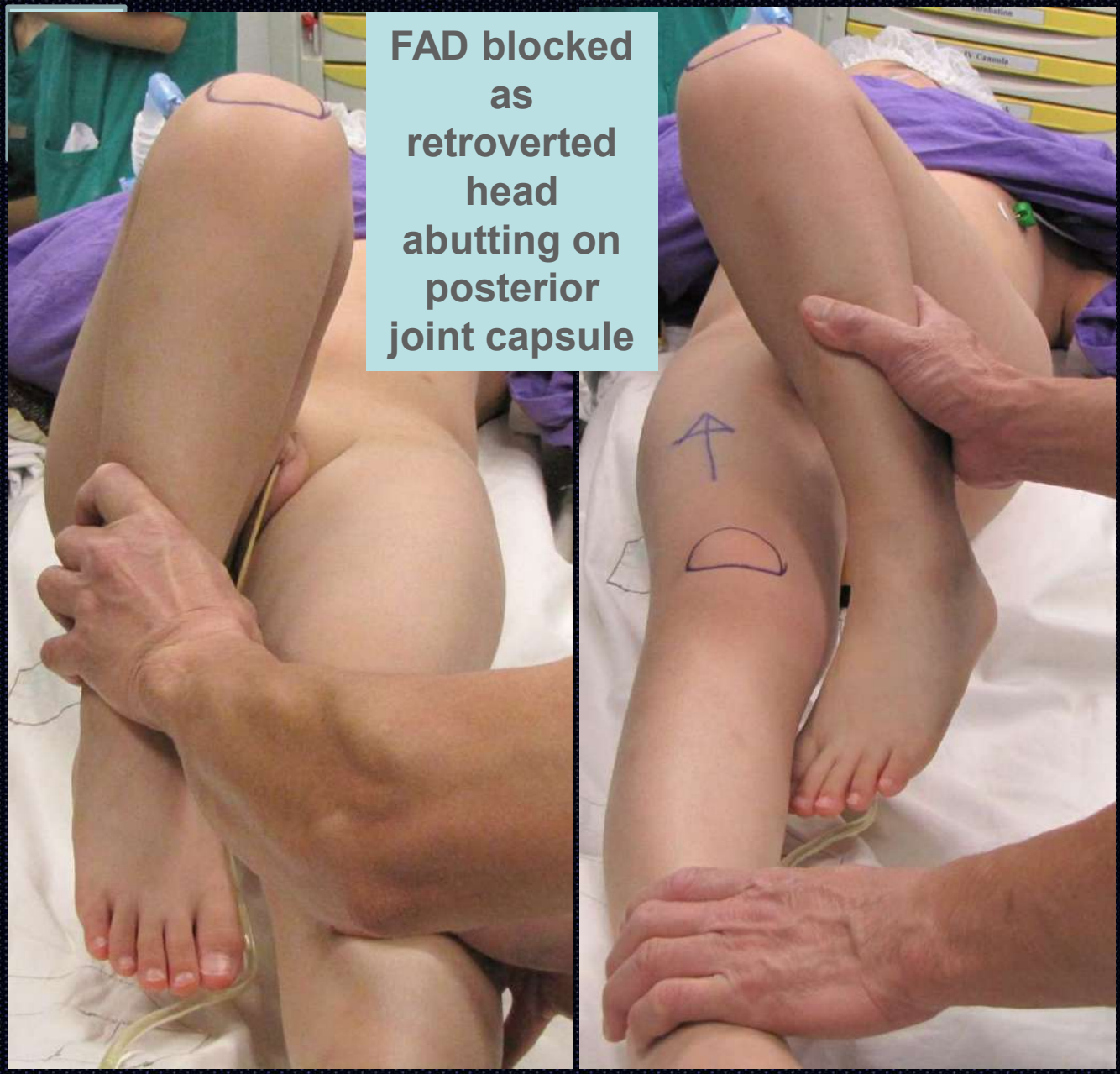
Femoral head collapsed anteriorly and laterally displaced in retroverted position compatible with FAD and IR loss of ROM

Mechanics of containment

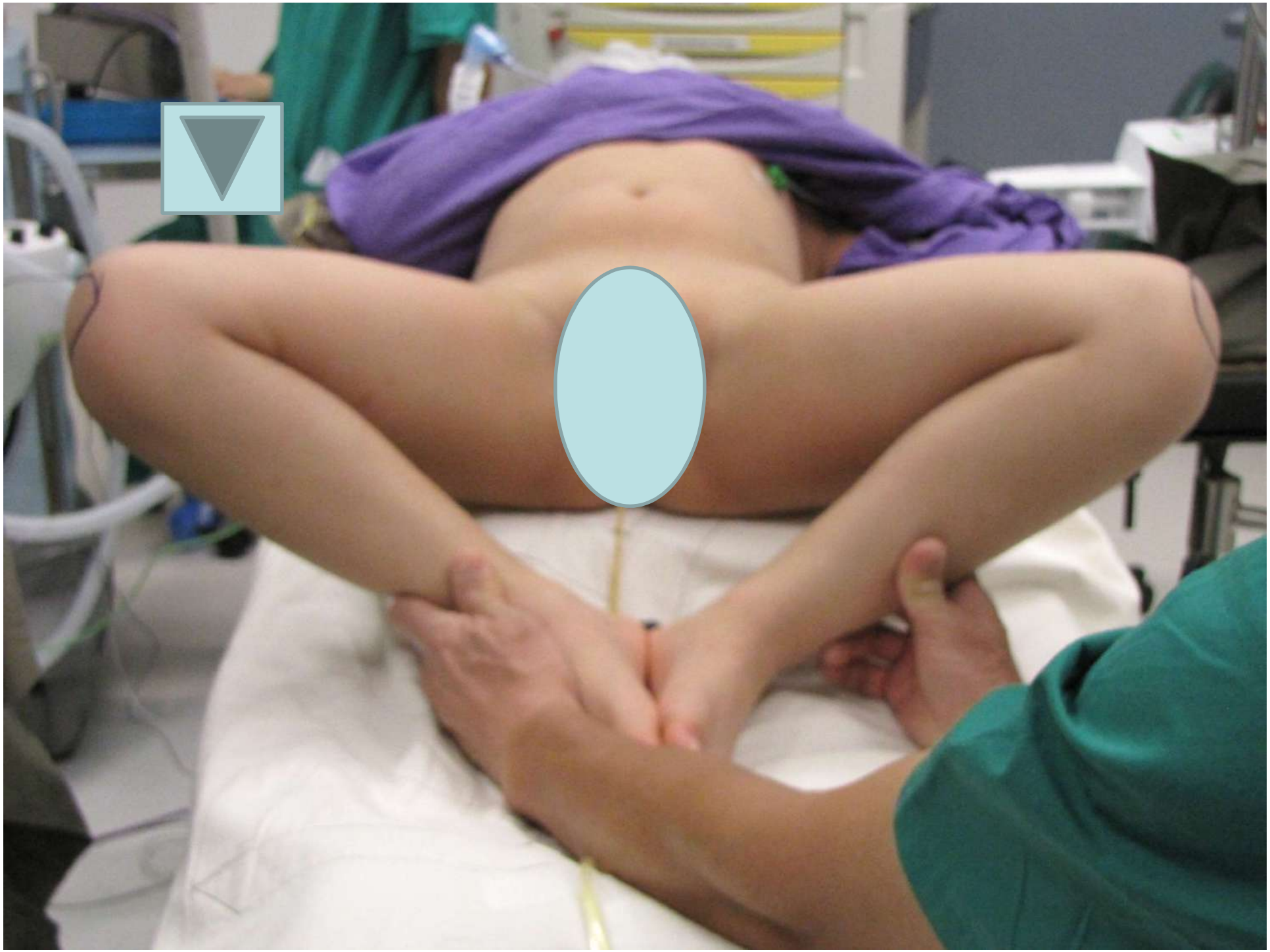
- 1 Flexion of proximal femur with respect to shaft to bring femoral head forward
- 2 Adduction of proximal femur with respect to shaft or abduction of hip to bring femoral head medially
- 3 Anteversion of the femoral neck with respect to shaft or external rotation of the femur to bring the femoral head forwards ***(Not a good solution, changes muscle mechanics)***



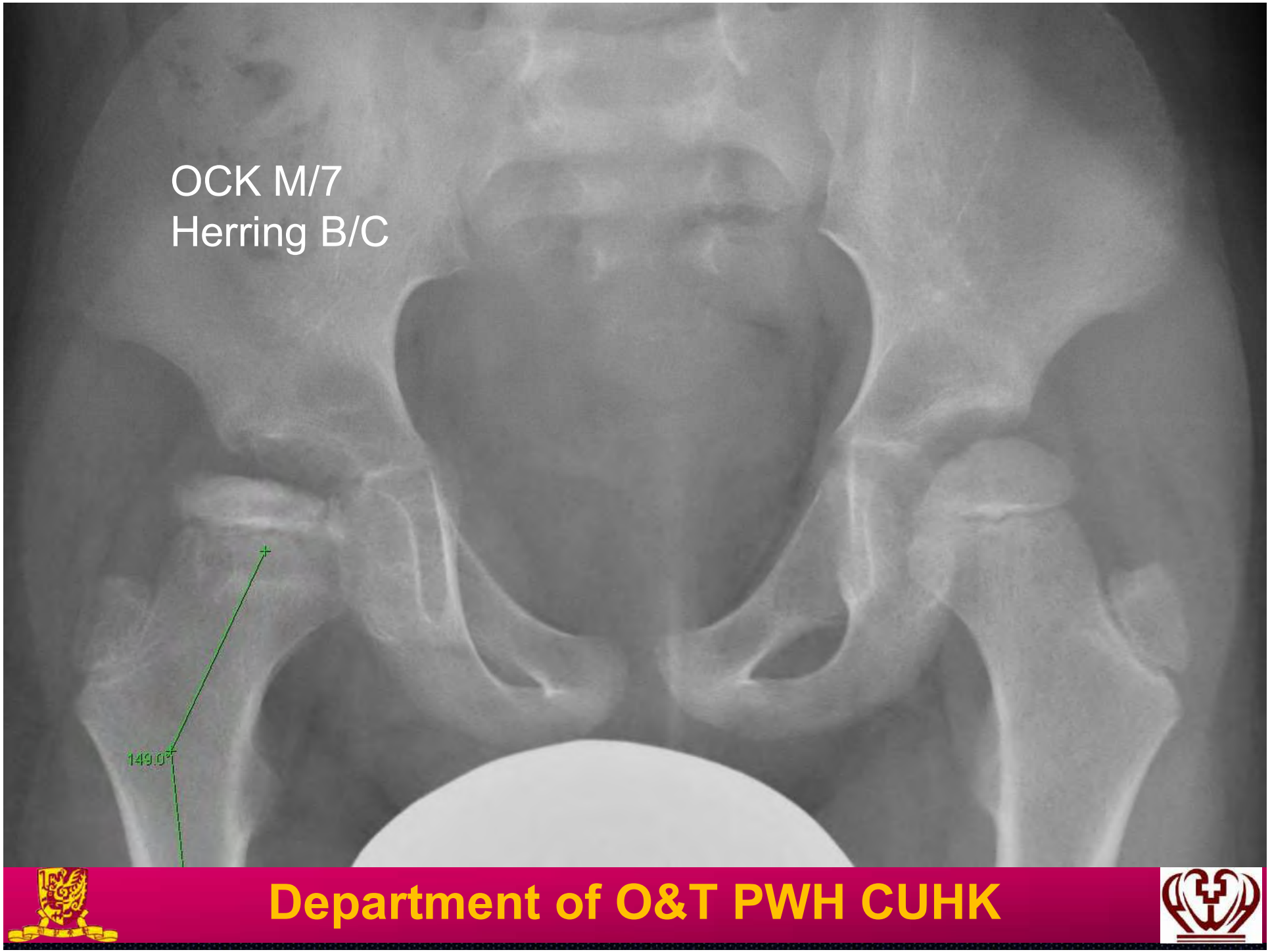
Rotation blocked as retroverted head abutting on posterior joint capsule

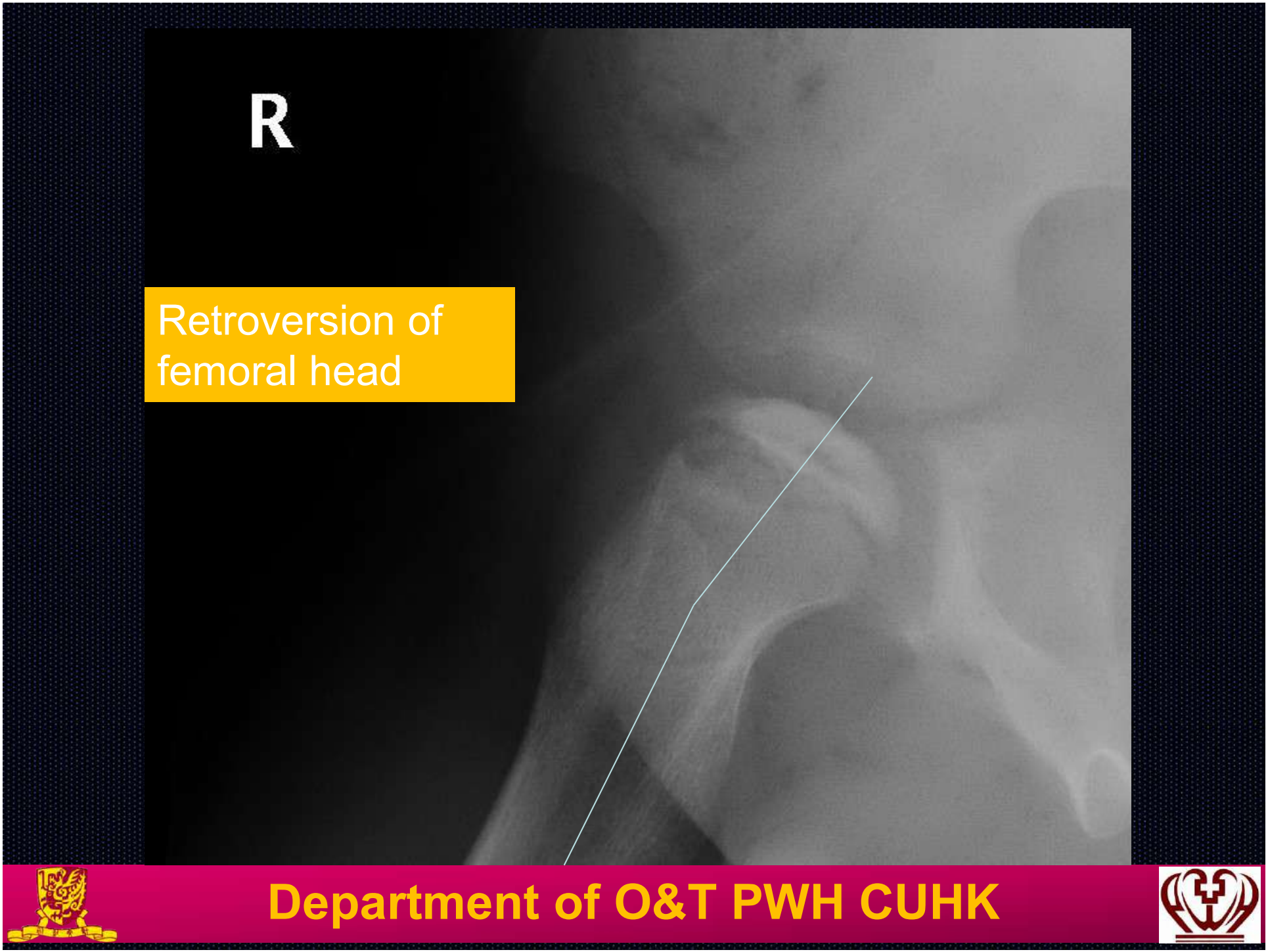


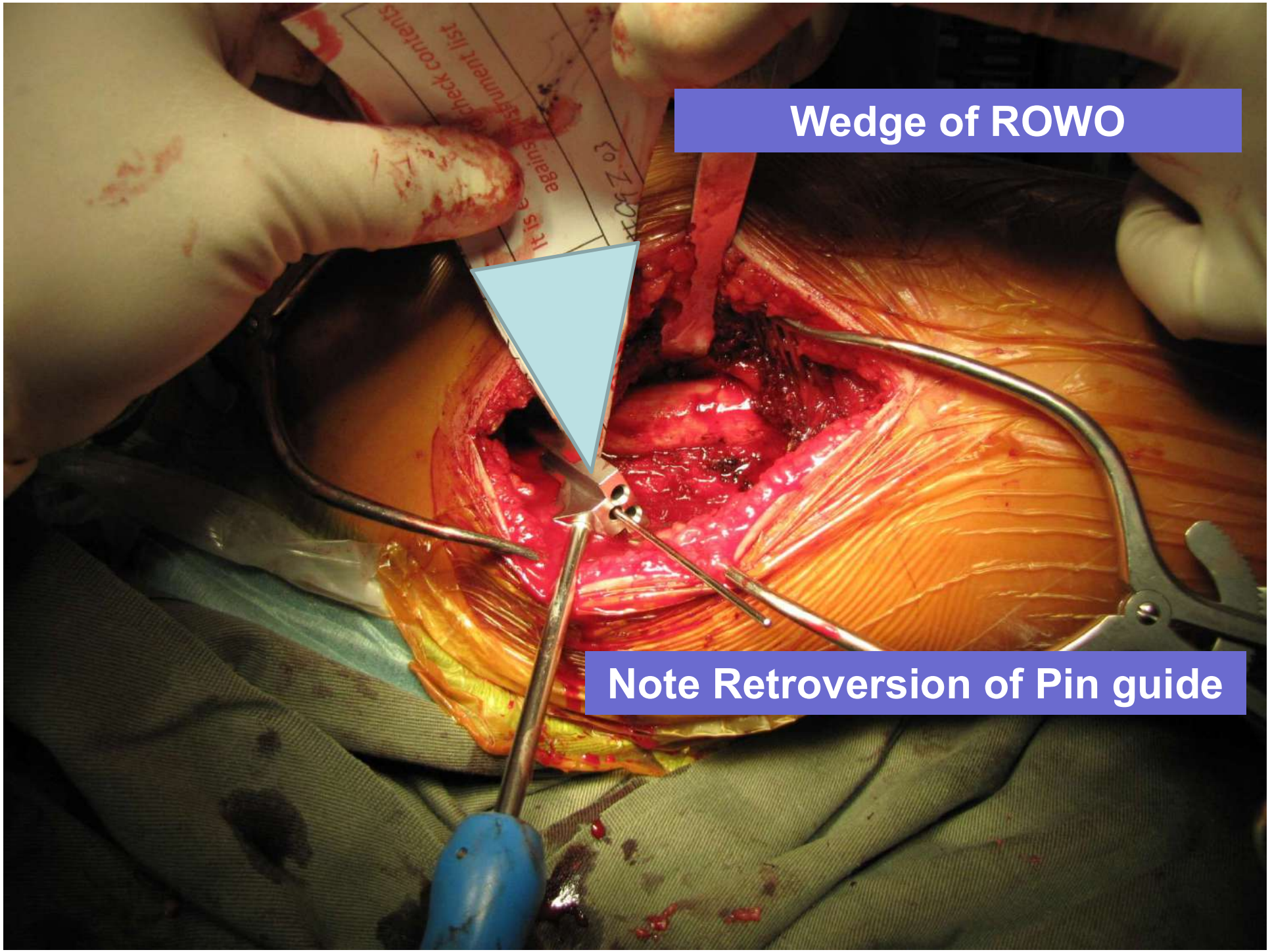
FAD blocked as retroverted head abutting on posterior joint capsule

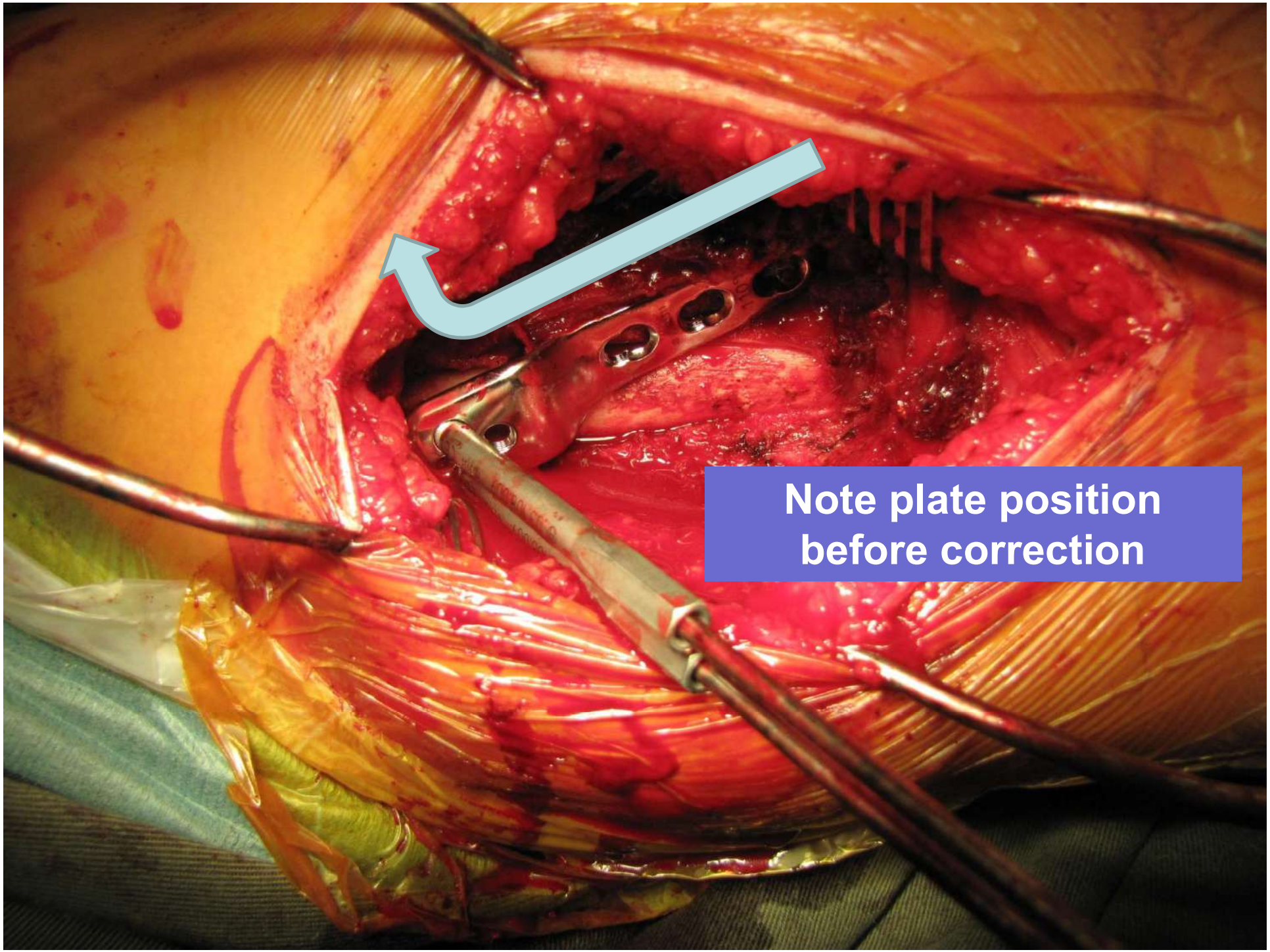


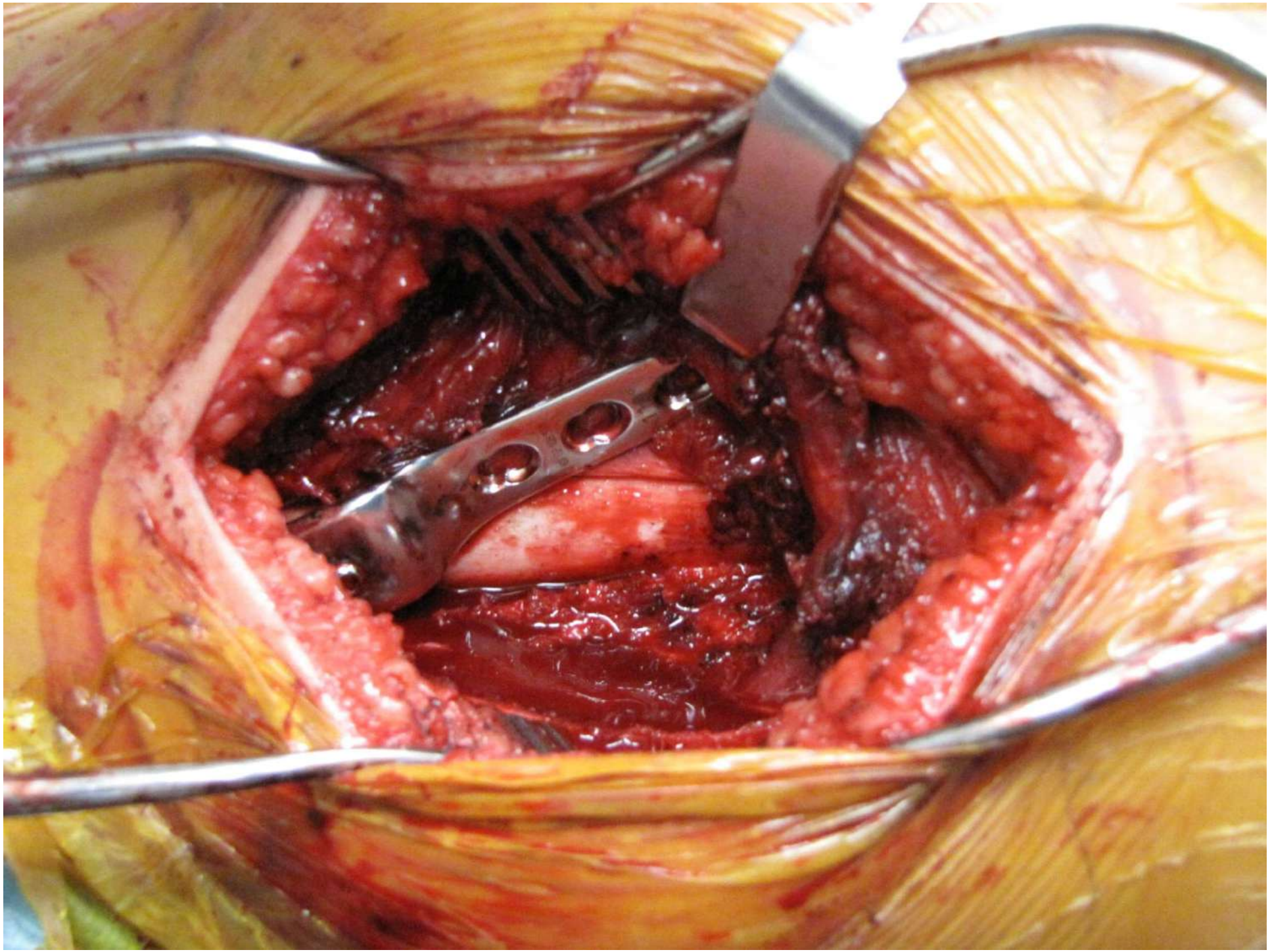
In extension head return to joint full abduction

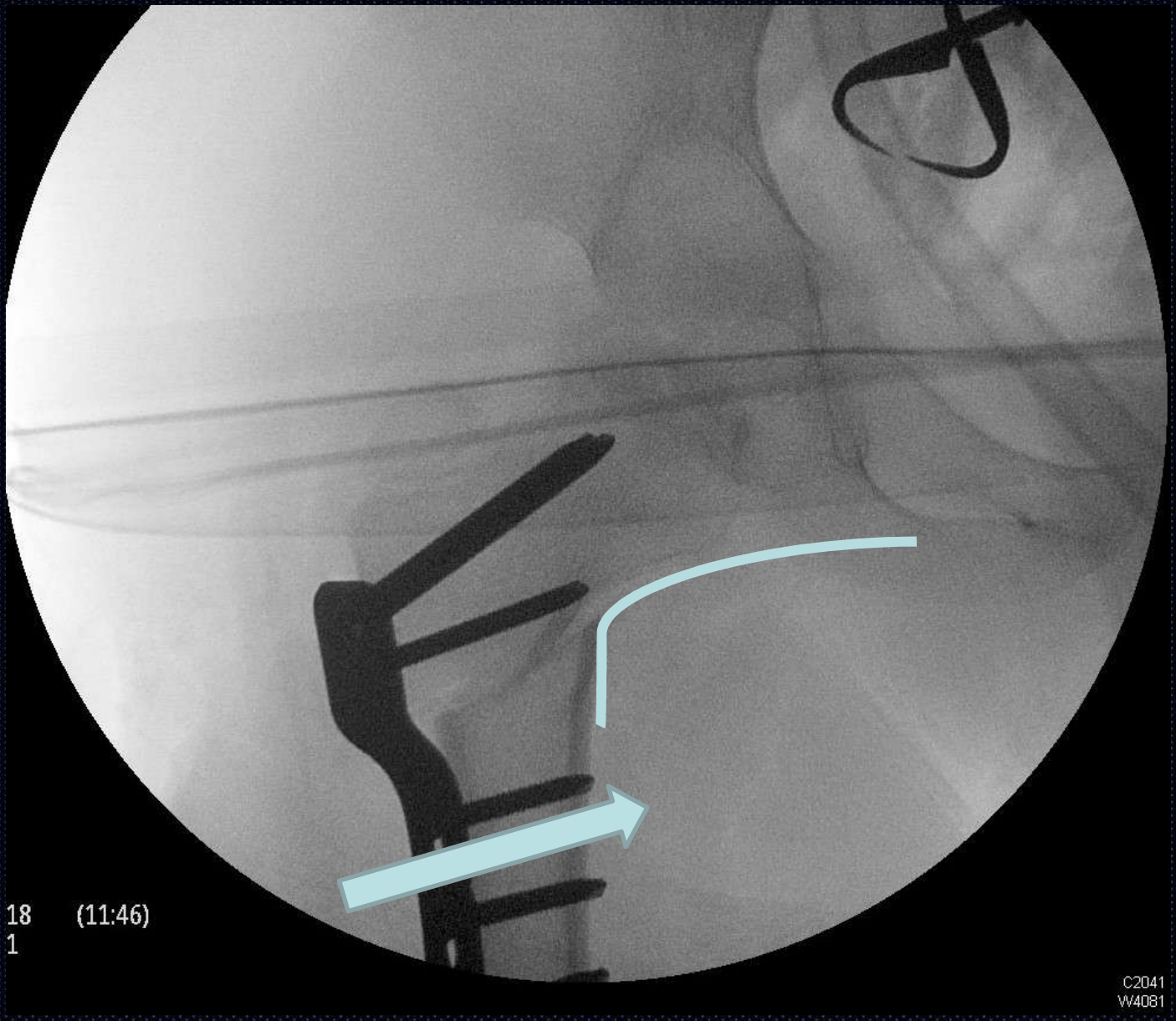

OCK M/7
Herring B/C
149.0°


R
Retroversion of femoral head

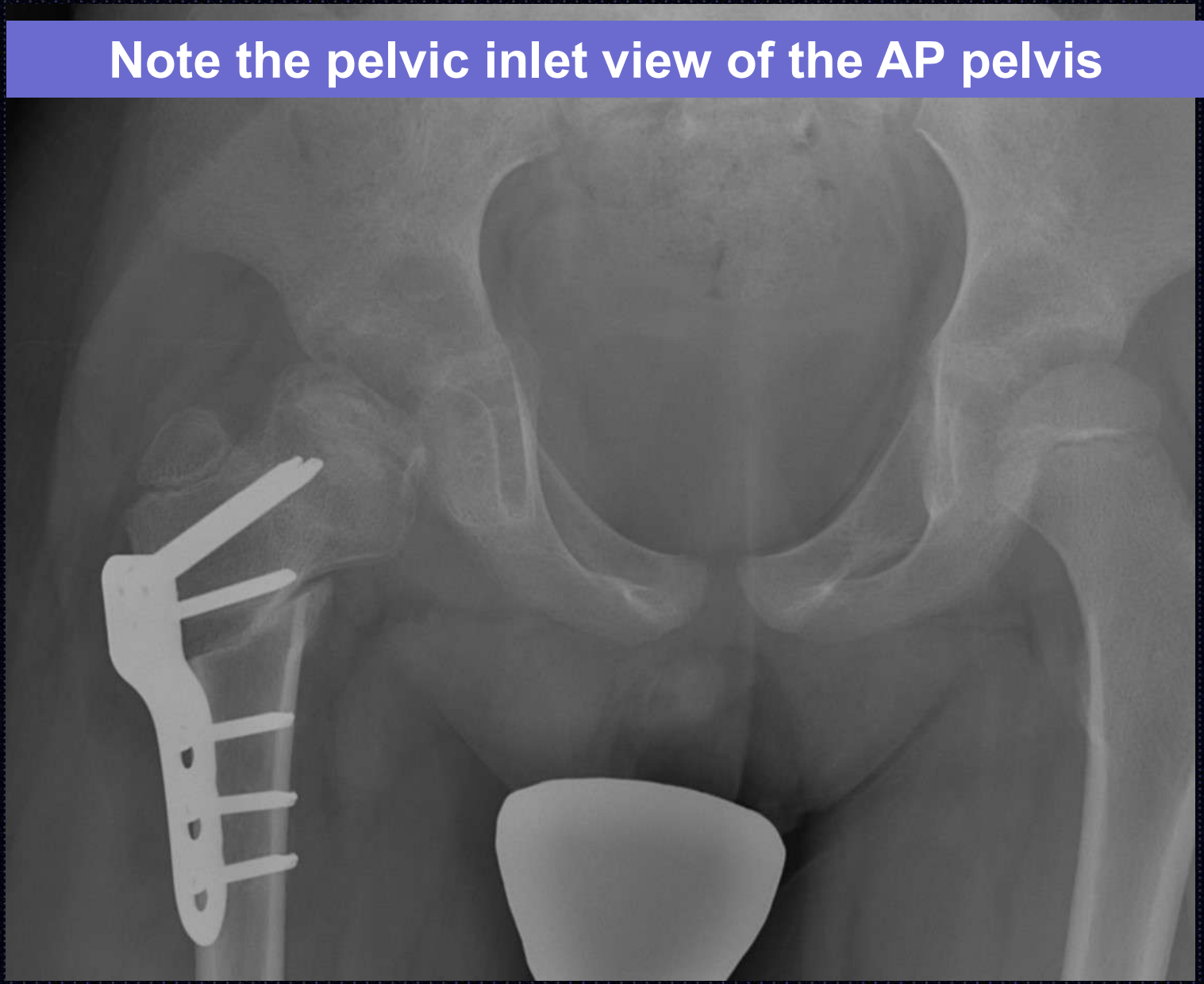

Wedge of ROWO
Note Retroversion of Pin guide


Note plate position
before correction

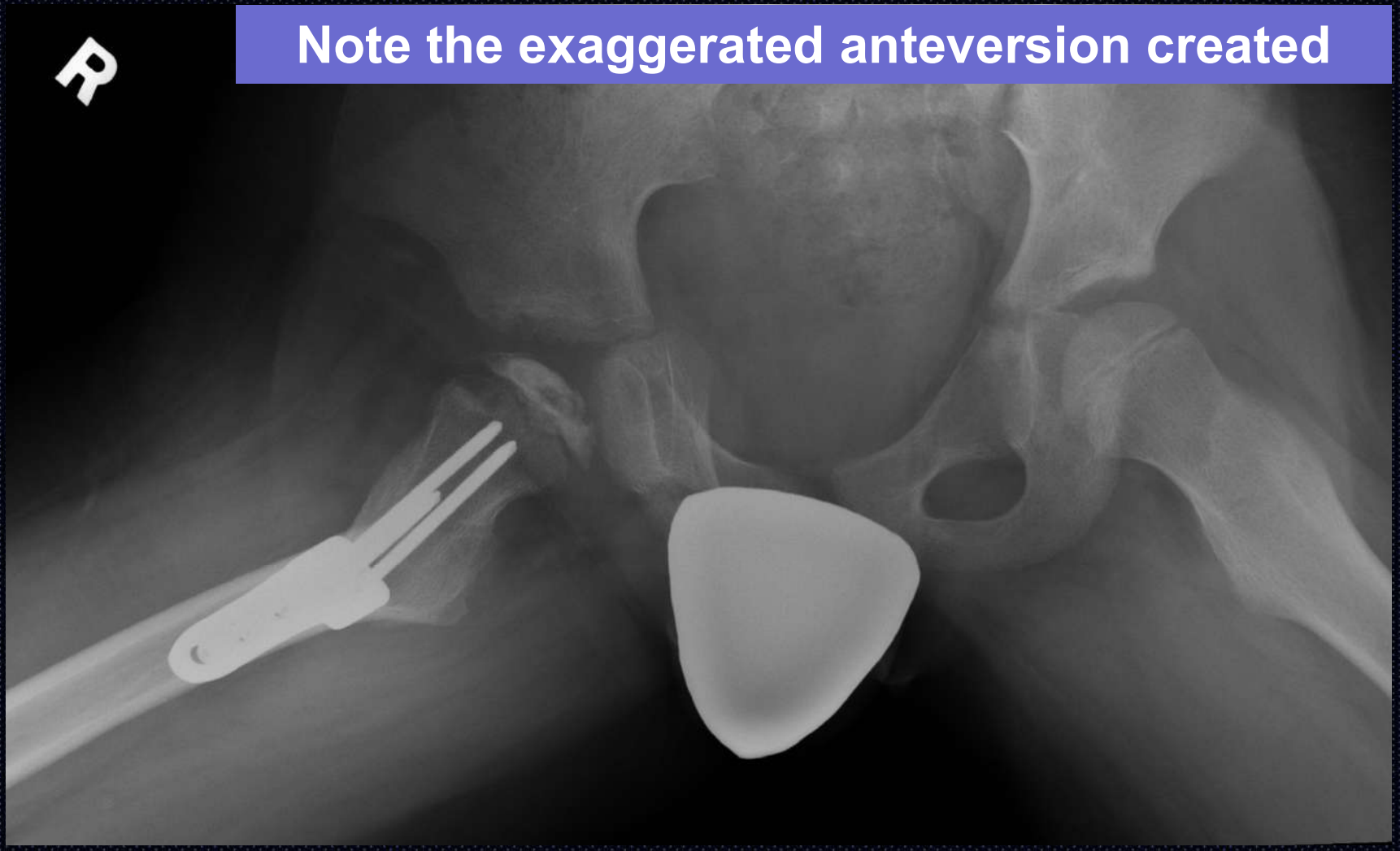


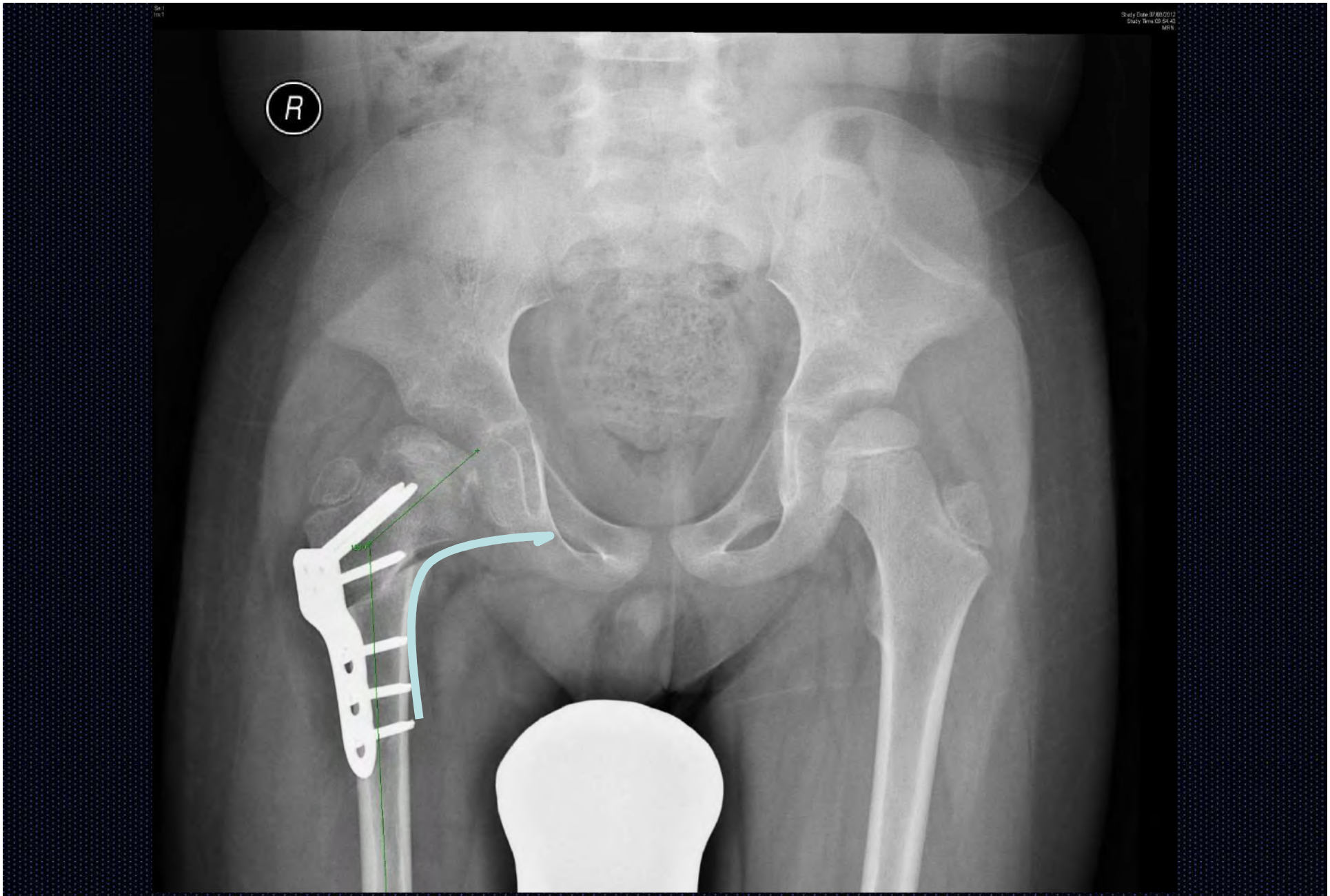

18 (11:46)
1
C2041
W4081

Note the pelvic inlet view of the AP pelvis

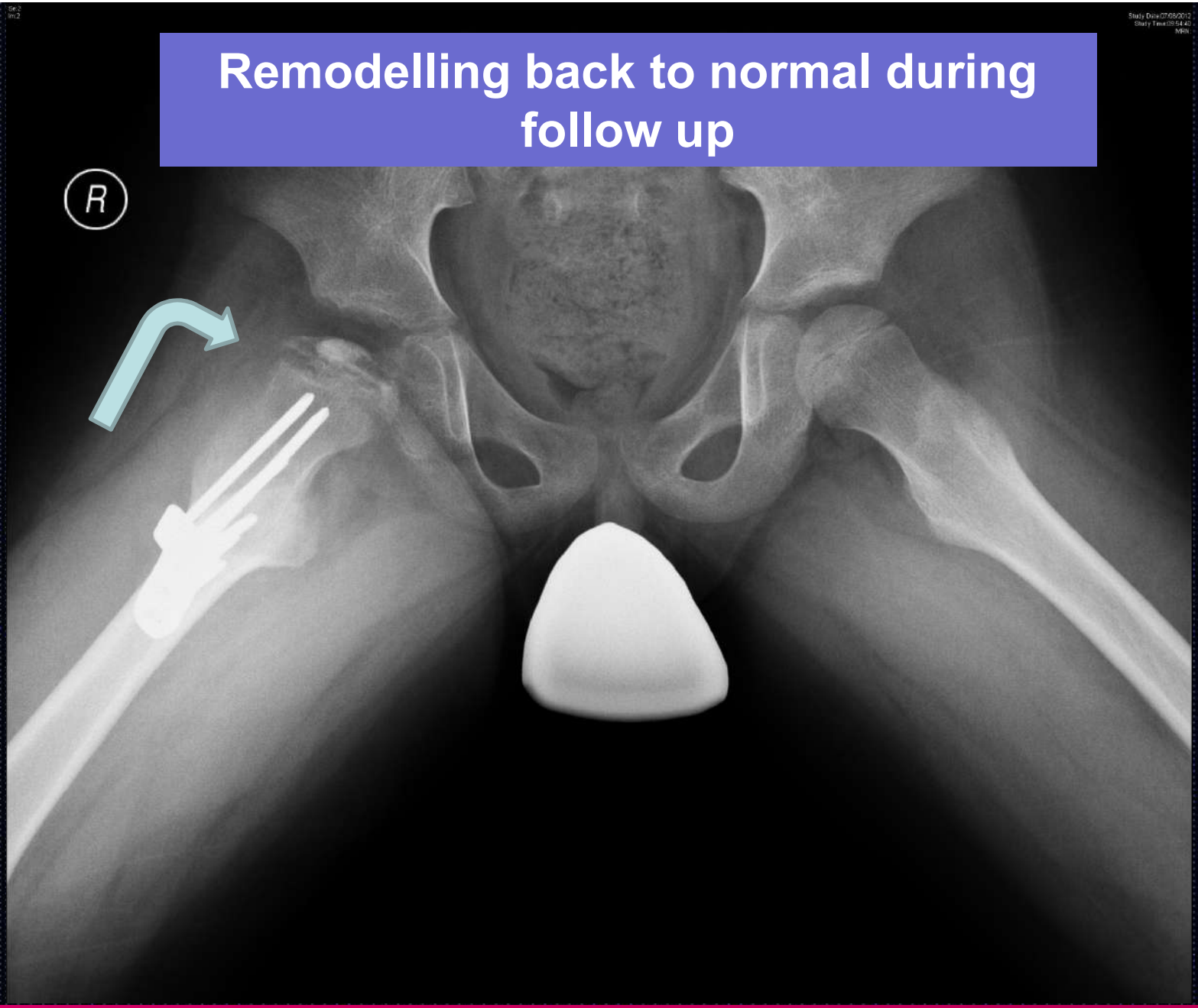


Note the exaggerated anteversion created

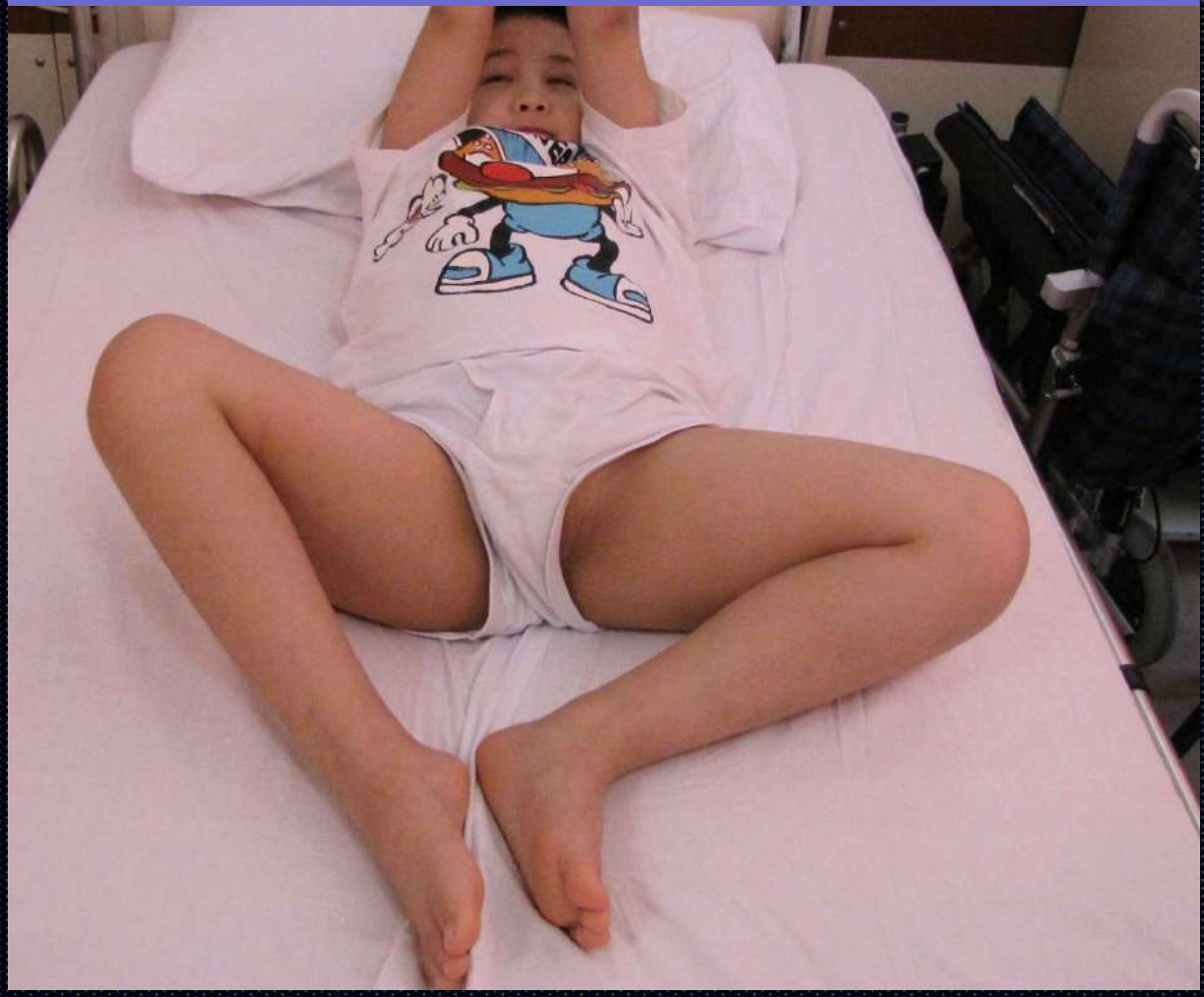



R

Remodelling back to normal during follow up



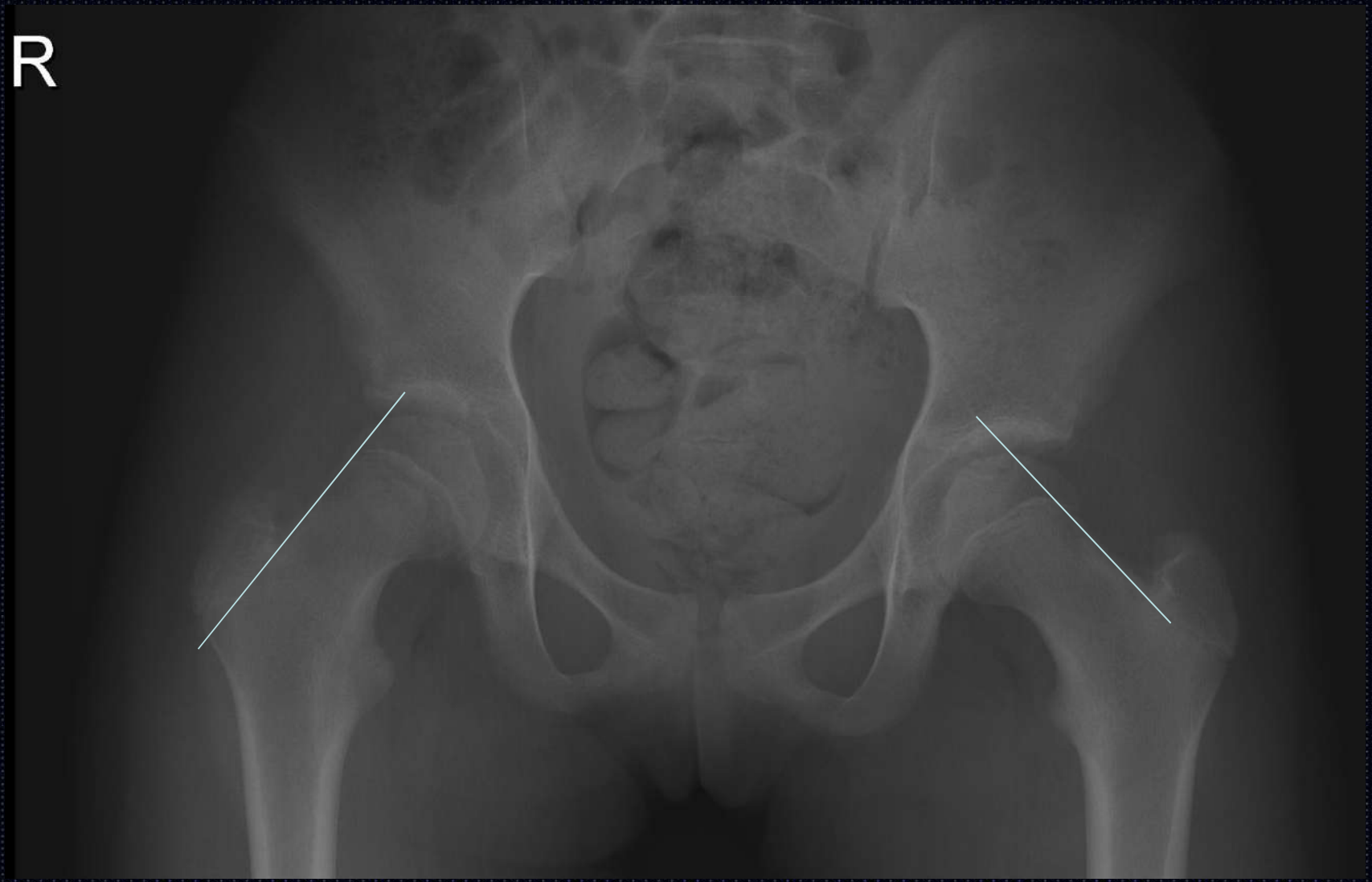
Over correct so much that FAB was reduced!



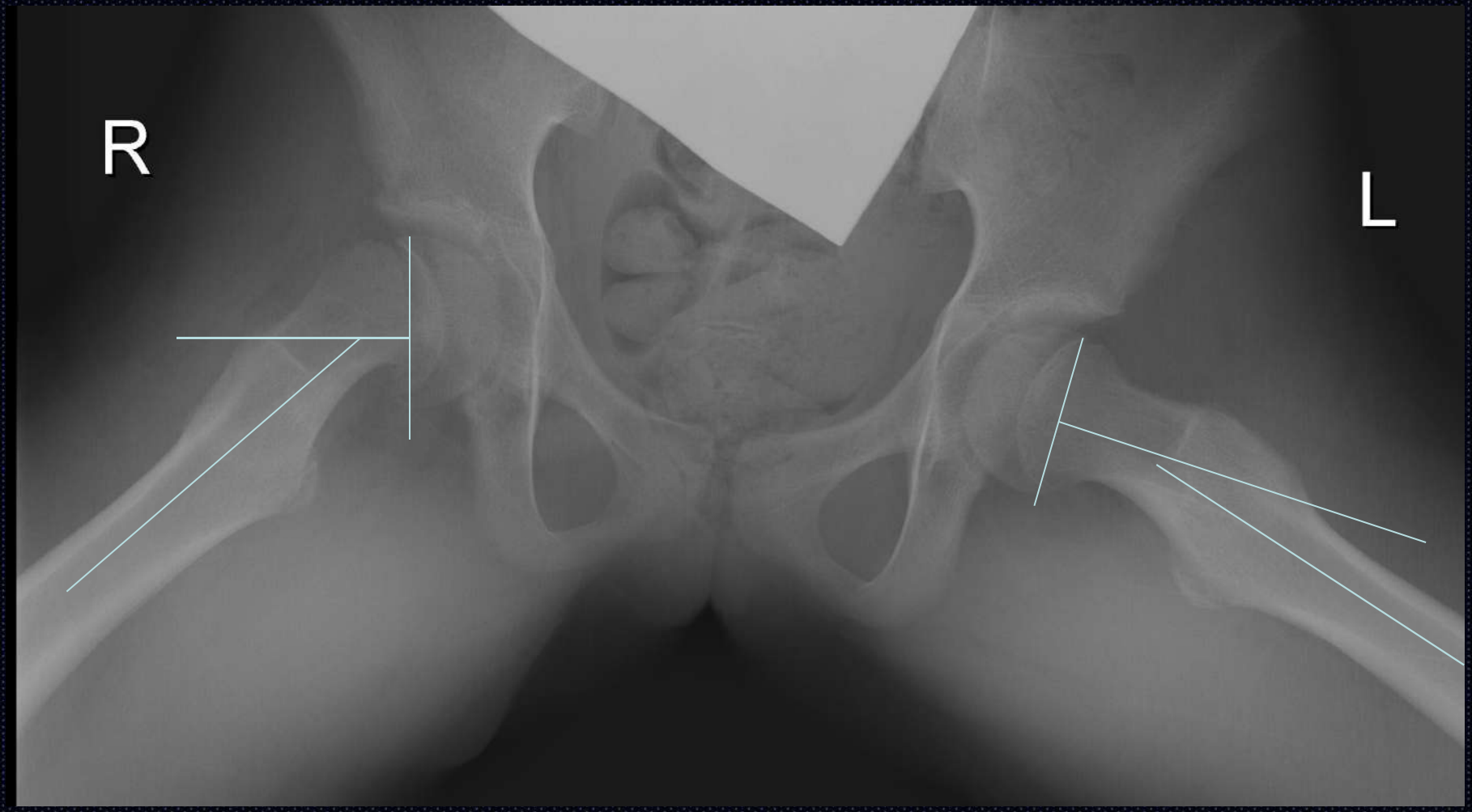

3 month
post op
TIGGER
TIGGER

Slipped Capital Femoral Epiphysis
SCFE

F/12, persistent right hip pain since a hopping injury 2 months ago, able to bear weight

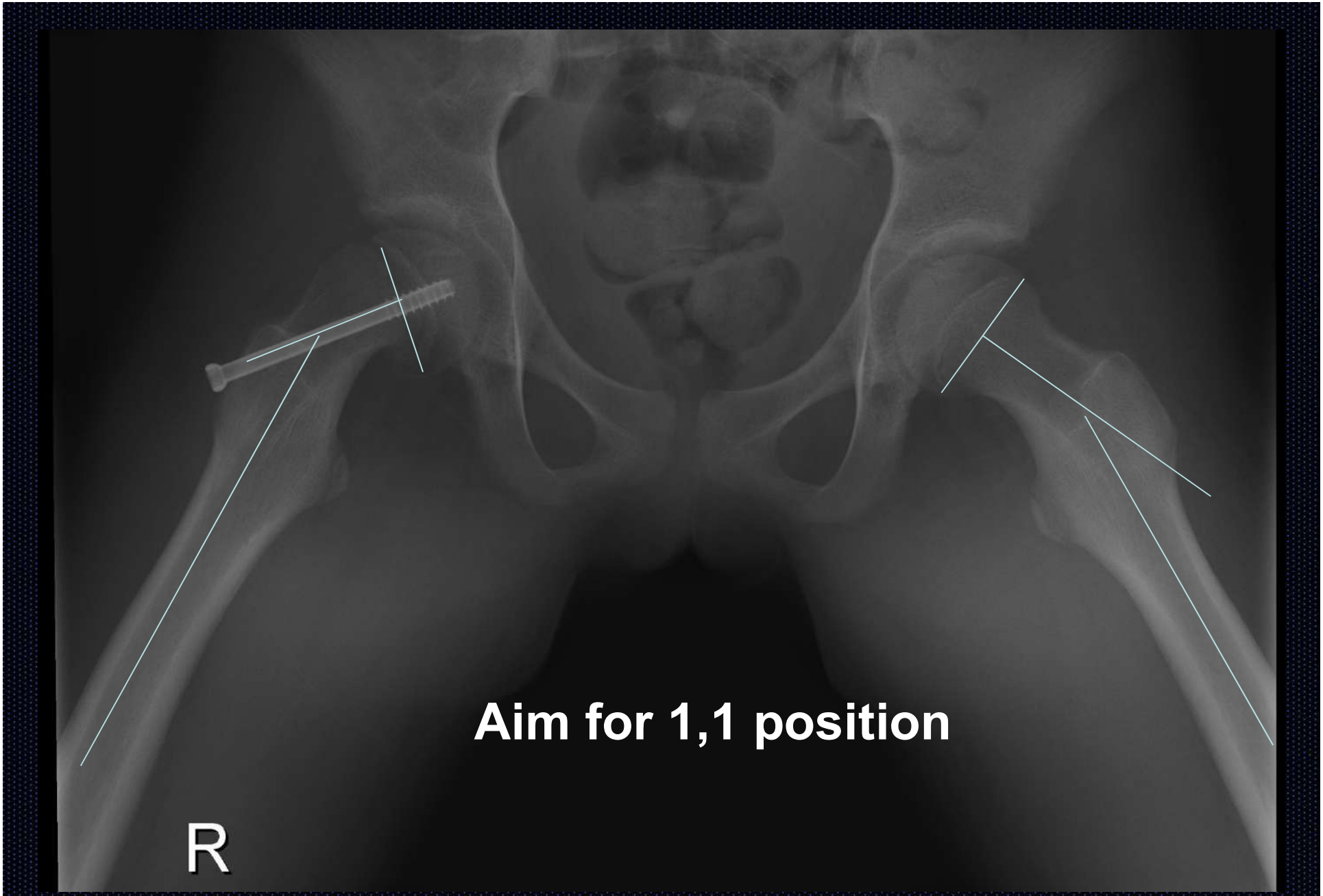


Southwick Slip Angle 47-16 = 31



Insitu Single 6.5mm Canulated Screw Fixation

Ward, WT, Stefko J, Wood KB, Stanitski K. JBJS 1992 Vol 74-A No.6:799-809

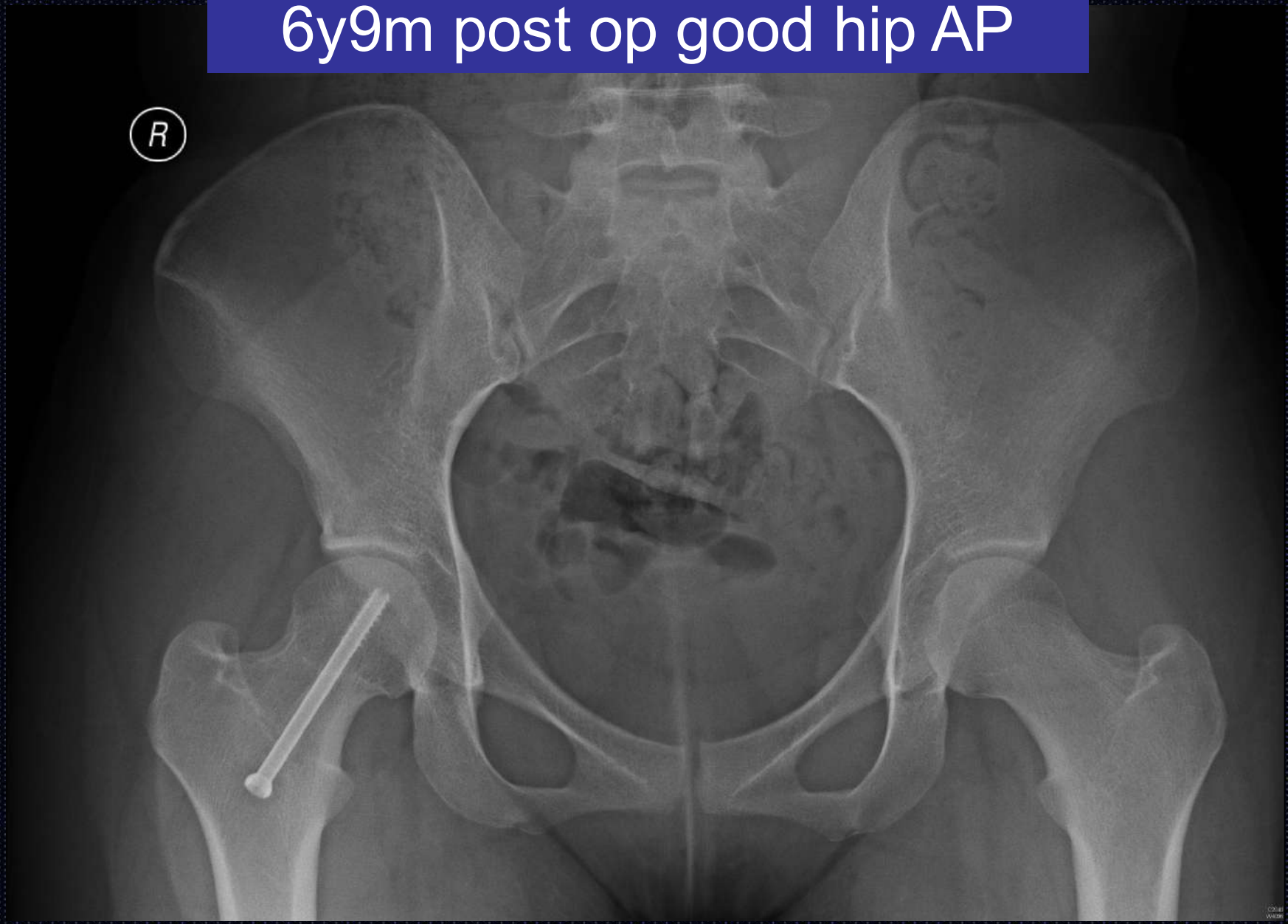

Aim for 1,1 position
R

Grading of screw position

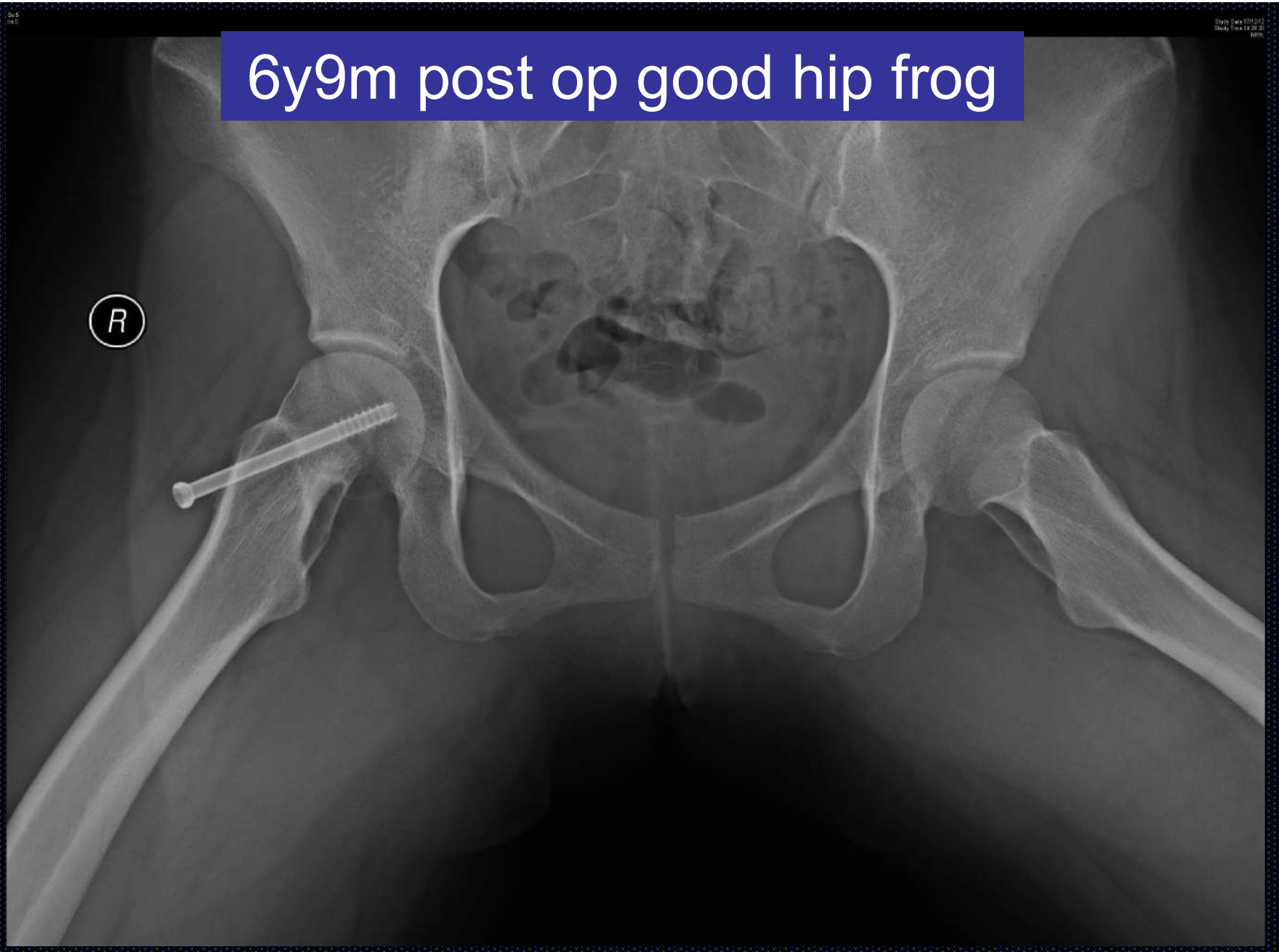
Distance between Axis of screw and center of femoral epiphysis	Grading
< 1/2 width of screw	1
> 1/2 < 1 width of screw	2
> 1width of screw	3

Aronson DD, Carlson WE JBJS1992 vol 74-A No.6: 810-819

6y9m post op good hip AP

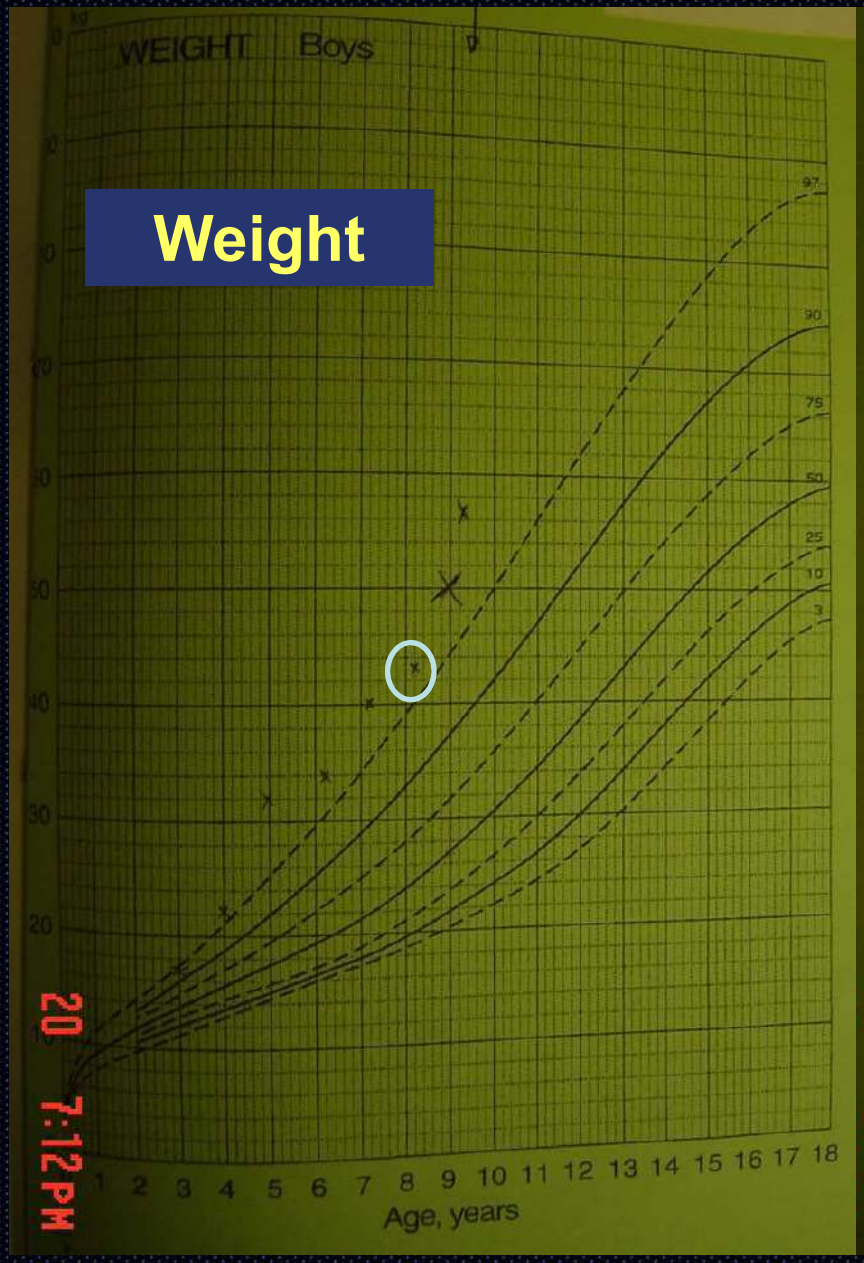


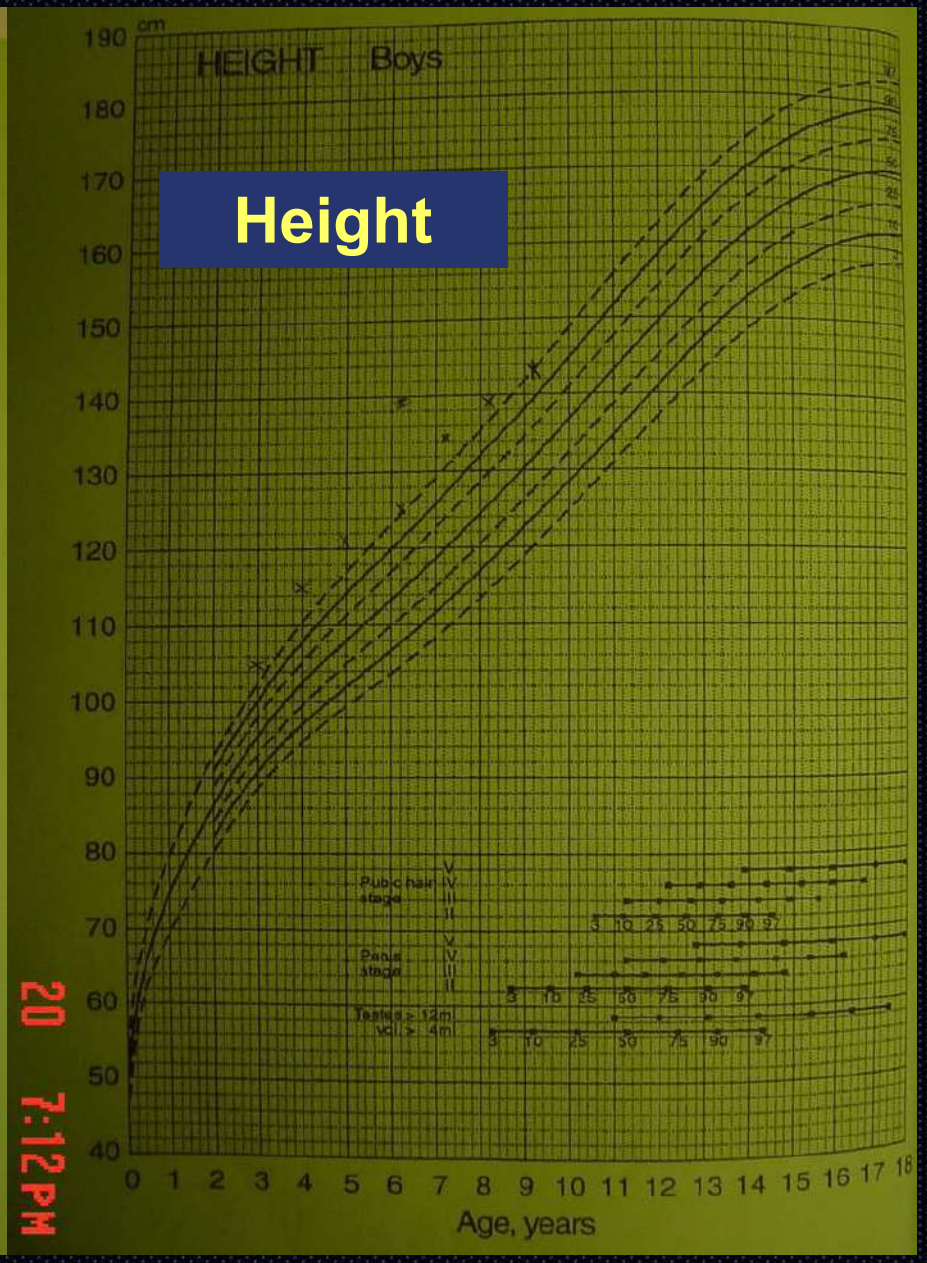
6y9m post op good hip frog



Life's Never so Simple/ Ideal!

M/8Y4m left hip pain after stretching at PE able to walk

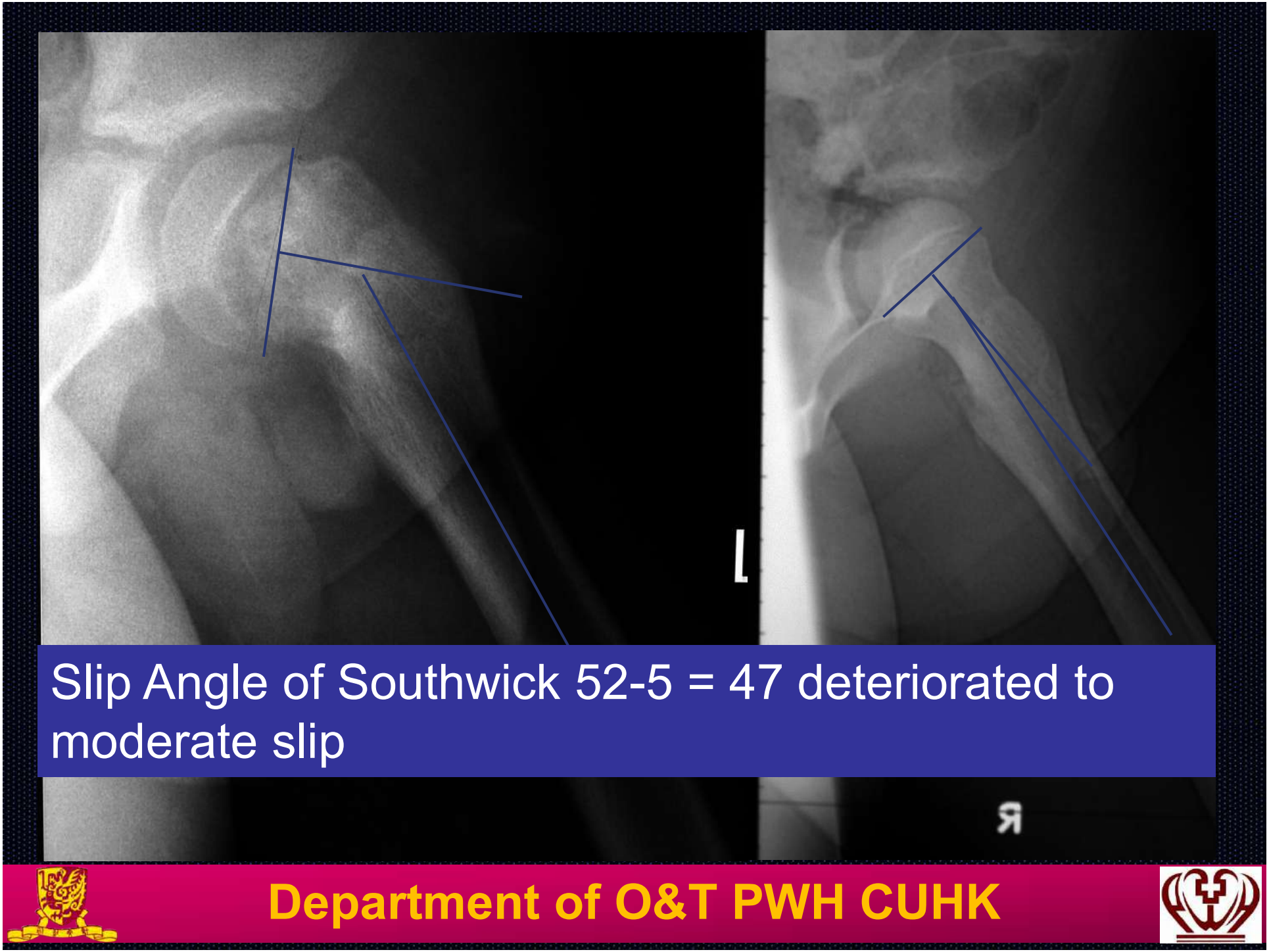

WEIGHT Boys
Weight
Age, years


HEIGHT Boys
Height
Age, years

Slip Angle of Southwick 40-13=27

Advised Operation but parents declined, took discharge against medical advice sought alternative treatment !

Presented again 8 months later with left pain after second fall



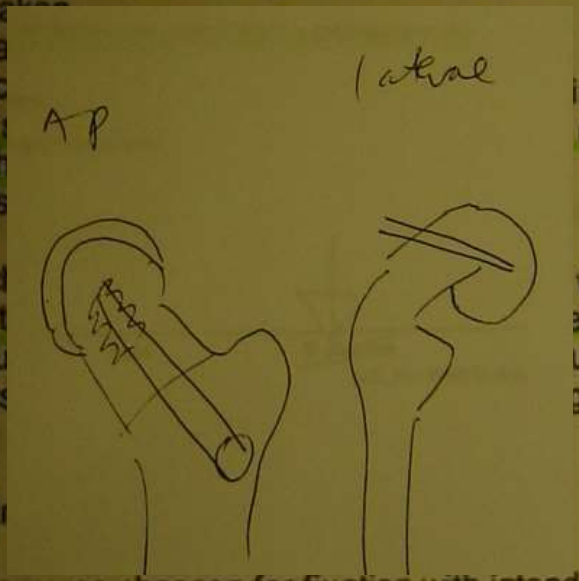
Slip Angle of Southwick 52-5 = 47 deteriorated to moderate slip

Due to large size of patient Intra-operative x-rays had been difficult – 2D fluoroscopy intra-operative matching for Navigation Guided Pinning

Tracker first placed at anterior iliac crest throught 1.5cm incision.
AP and Lateral X rays then t
Drill sleev, targeting device a
Targetting device used to loc
Sue to the severe degree of
of femoral neck can be purch
The ideal track was located s

3cm skin incision made whic
cuff of the rectus was made t
to bone the calibrated drill gu
length of guide wire was pass
accurate.

The length of screw was esti

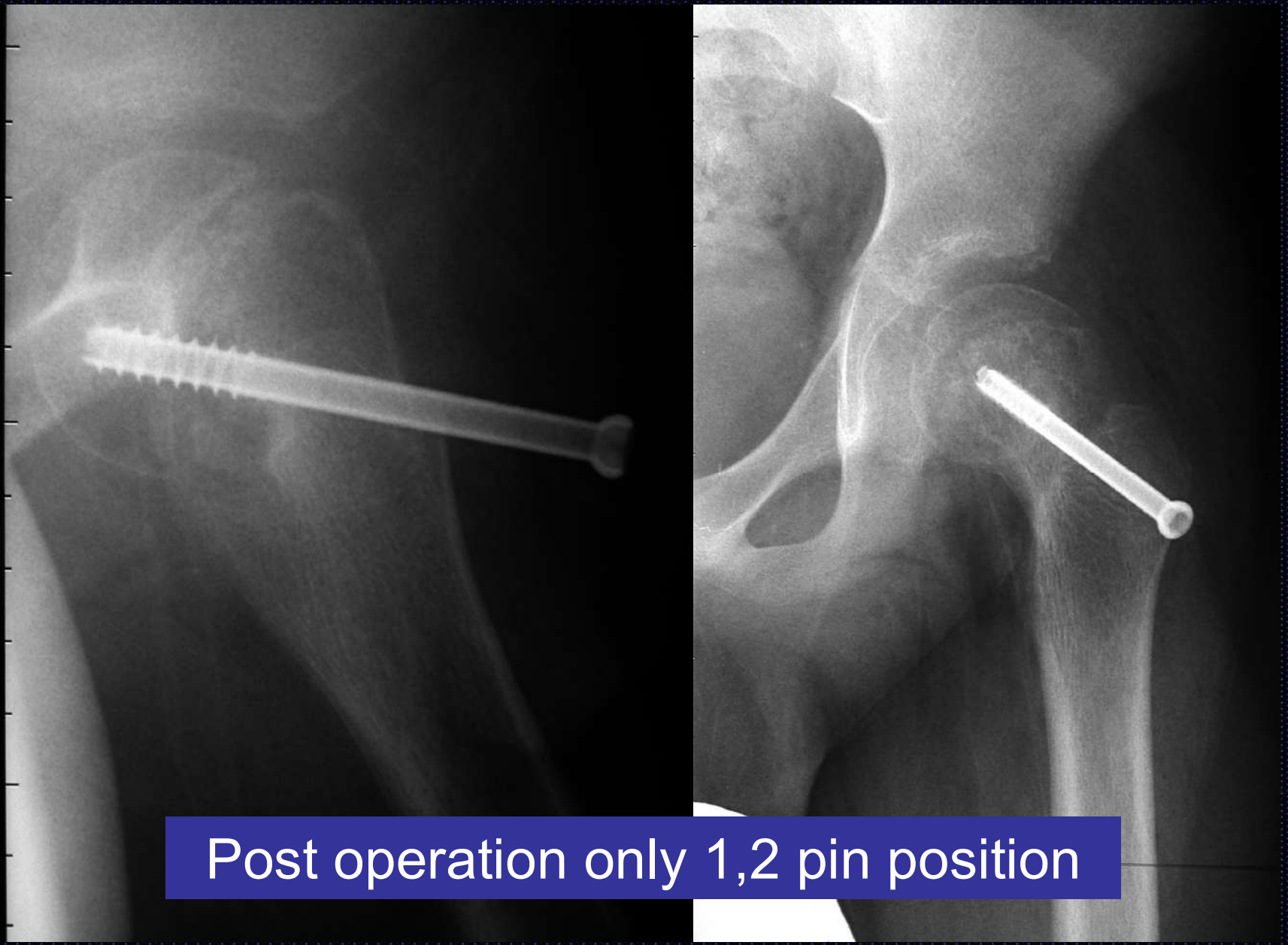


in AP and Lateral midline position.
distally to ensure adequate amount

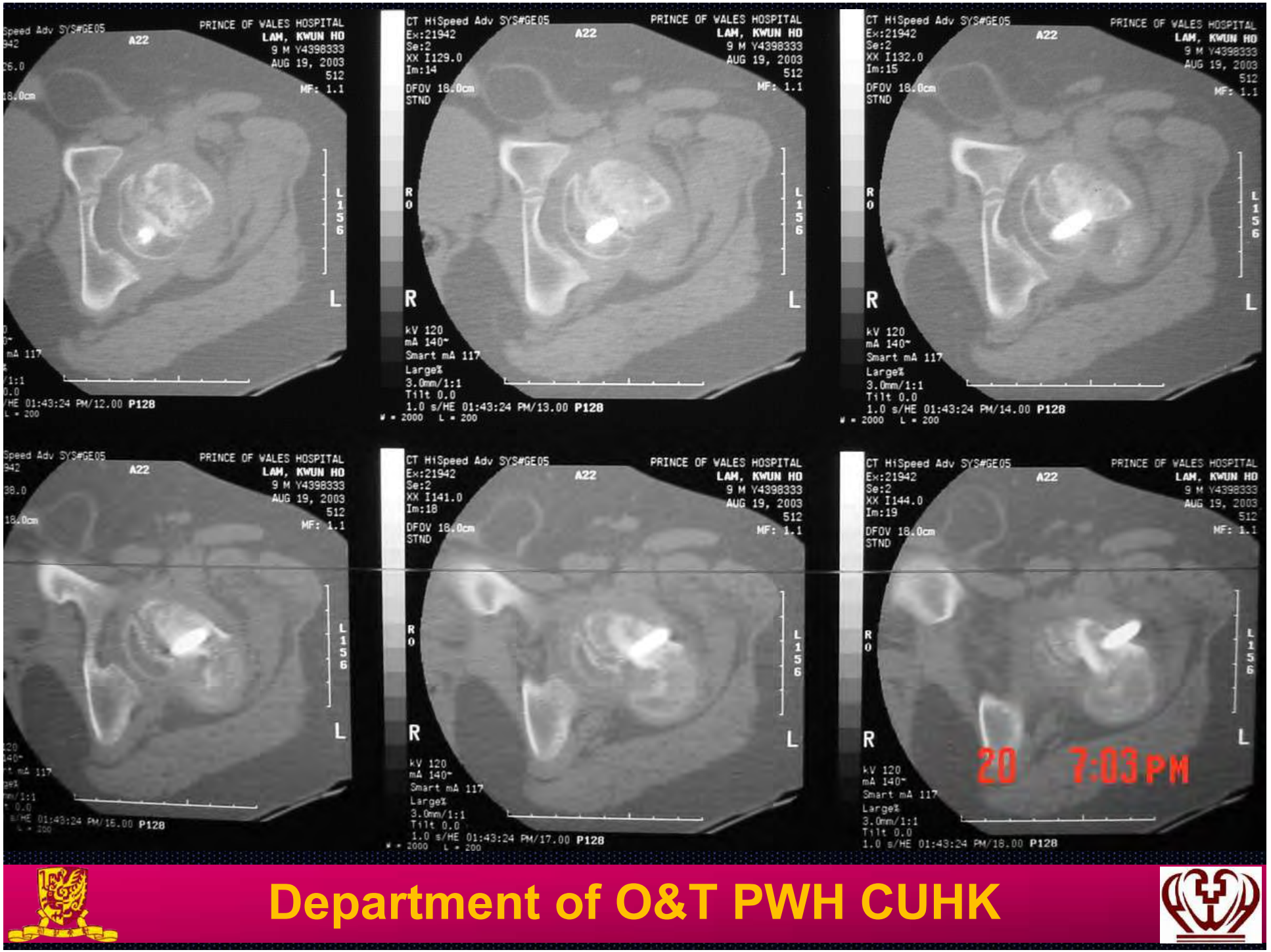
was retracted medially and a muscle
edially. Once dissection was made on
under navigation. Once the desired
gain to ensure passage to be

A 2 cm longer canulated screw was choosen for fixation with intend to leave a good stump on the outside for ease of removal in future.

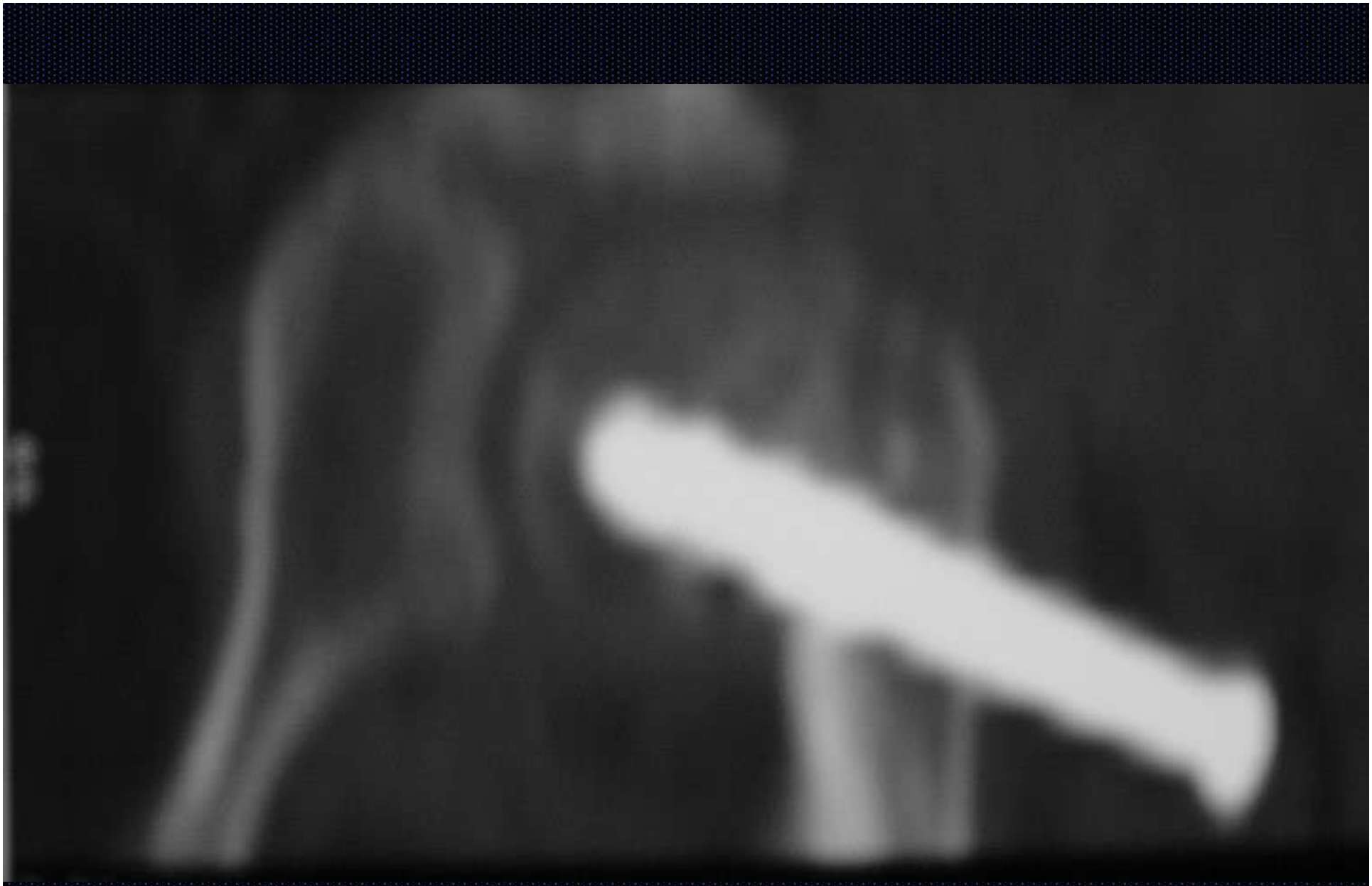
Screw was placed home and checked on X rays.



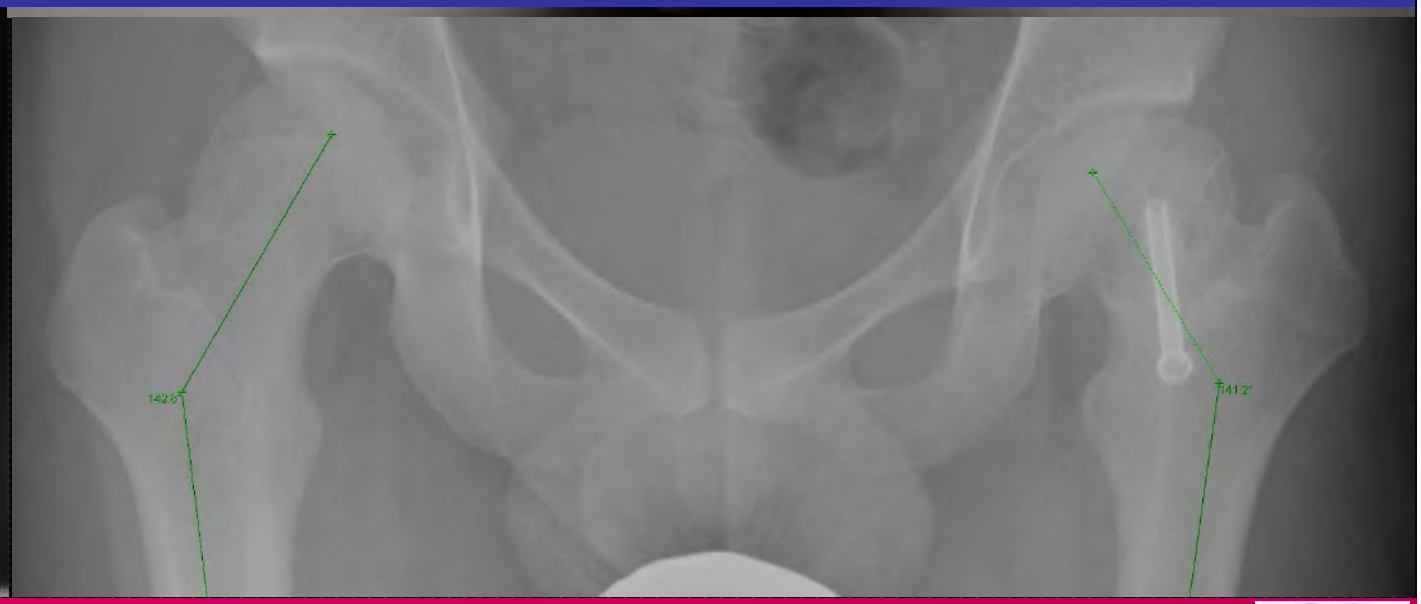
Post operation only 1,2 pin position



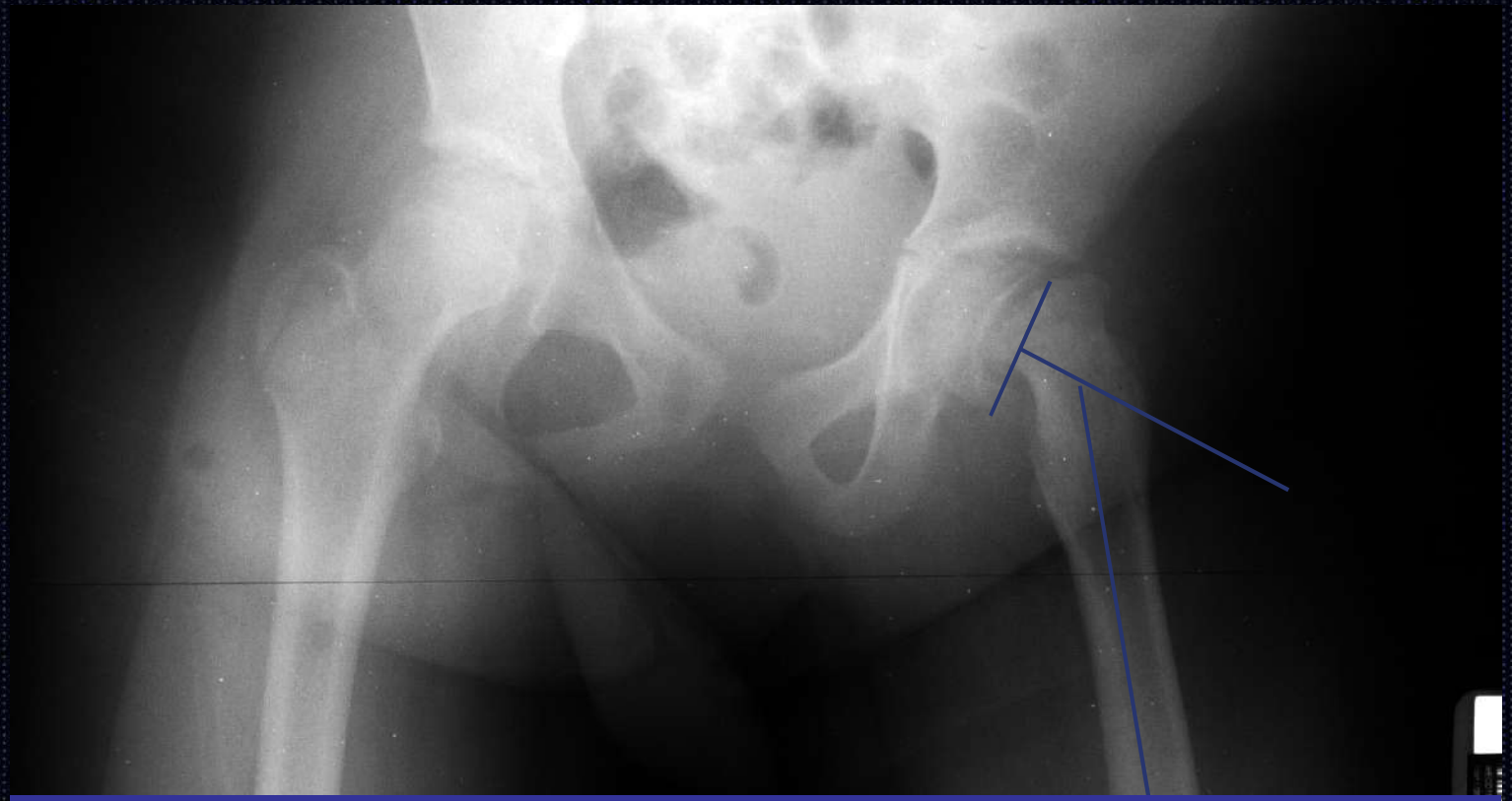
Department of O&T PWH CUHK



10 year follow up no AVN No LLD loss of 20 degrees of abduction and IR



F/9 sudden onset of severe left hip pain unable to bear weight, BW 95th centile



Slip angle of Southwick 55-12= 43
Moderate slip

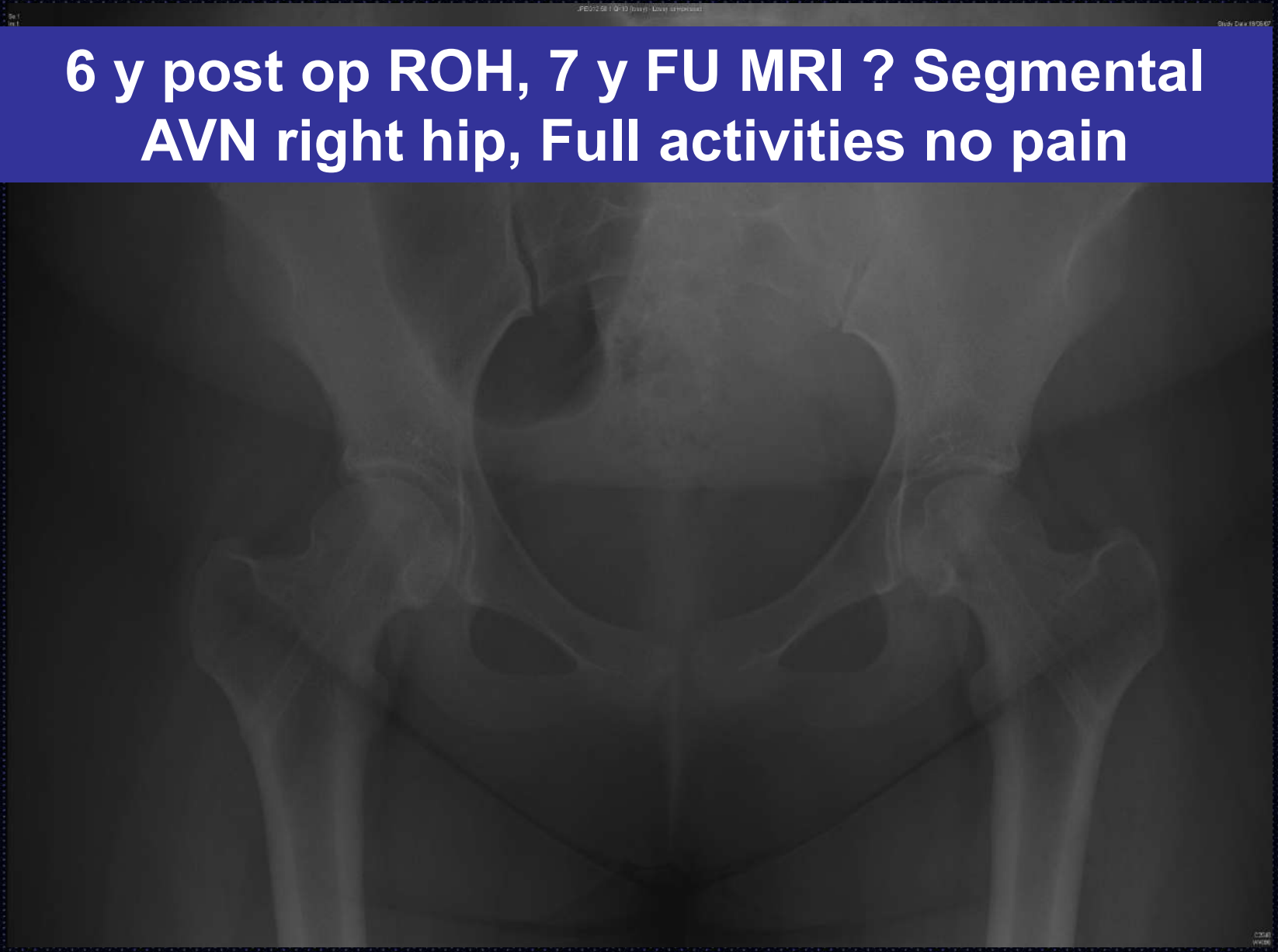
Operated urgently reduction on positioning Incidental Percutaneous pinning

2 months later acute right hip pain going upstairs More severe slip

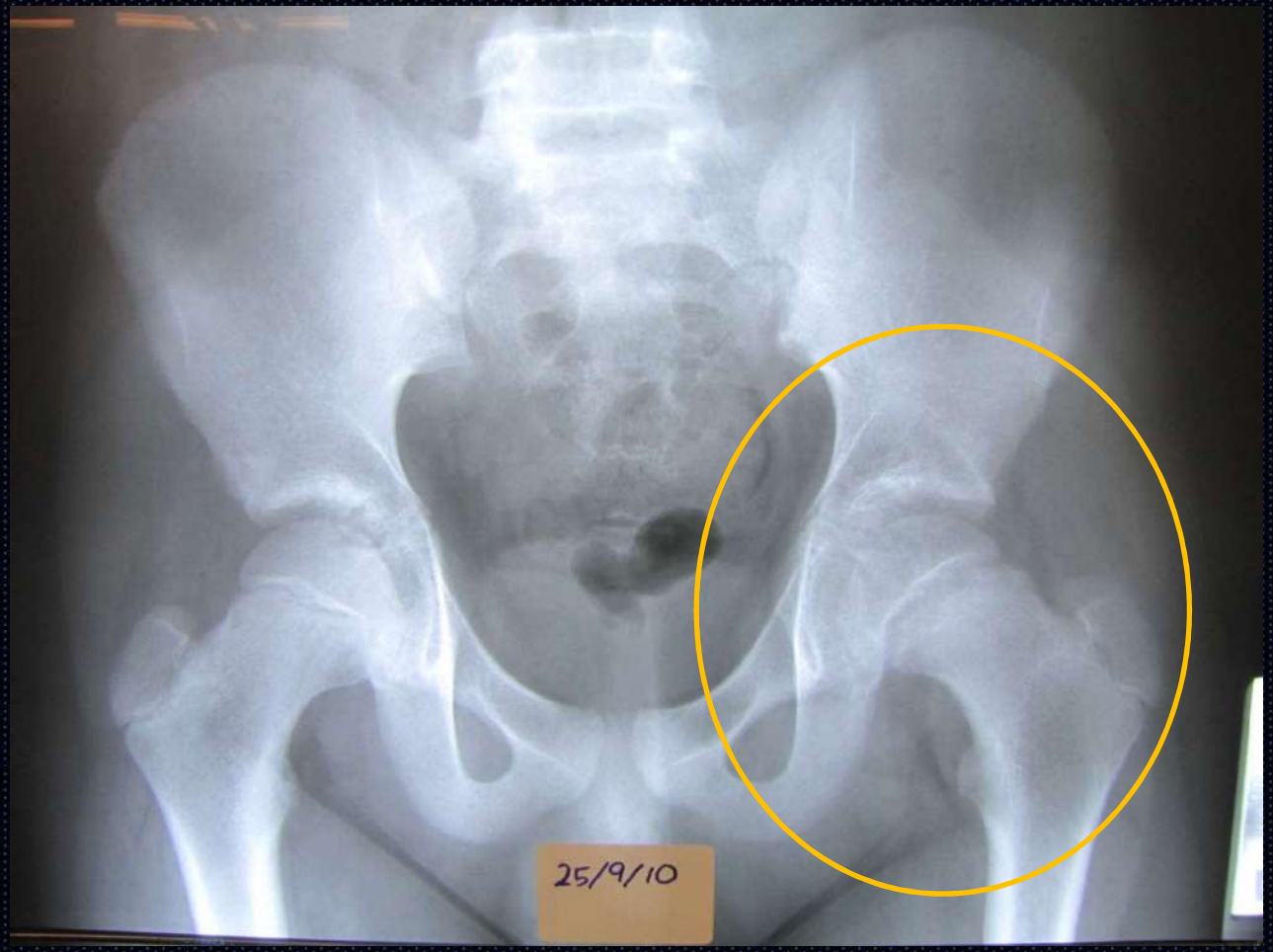
Also operated urgently achieved incidental reduction and percutaneous pinning

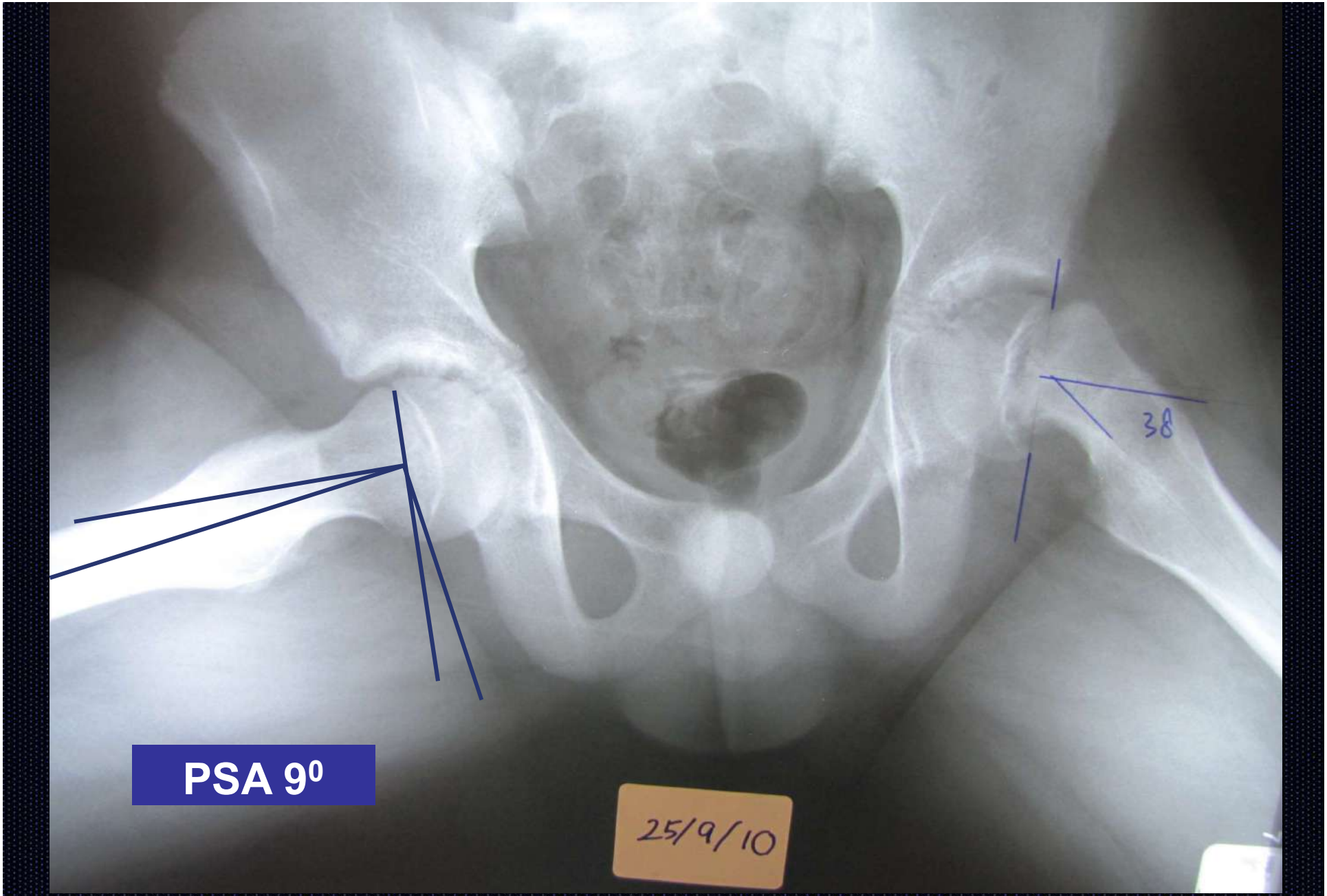
Screw position 2,1 on right 1,2 on left

6 y post op ROH, 7 y FU MRI ? Segmental AVN right hip, Full activities no pain

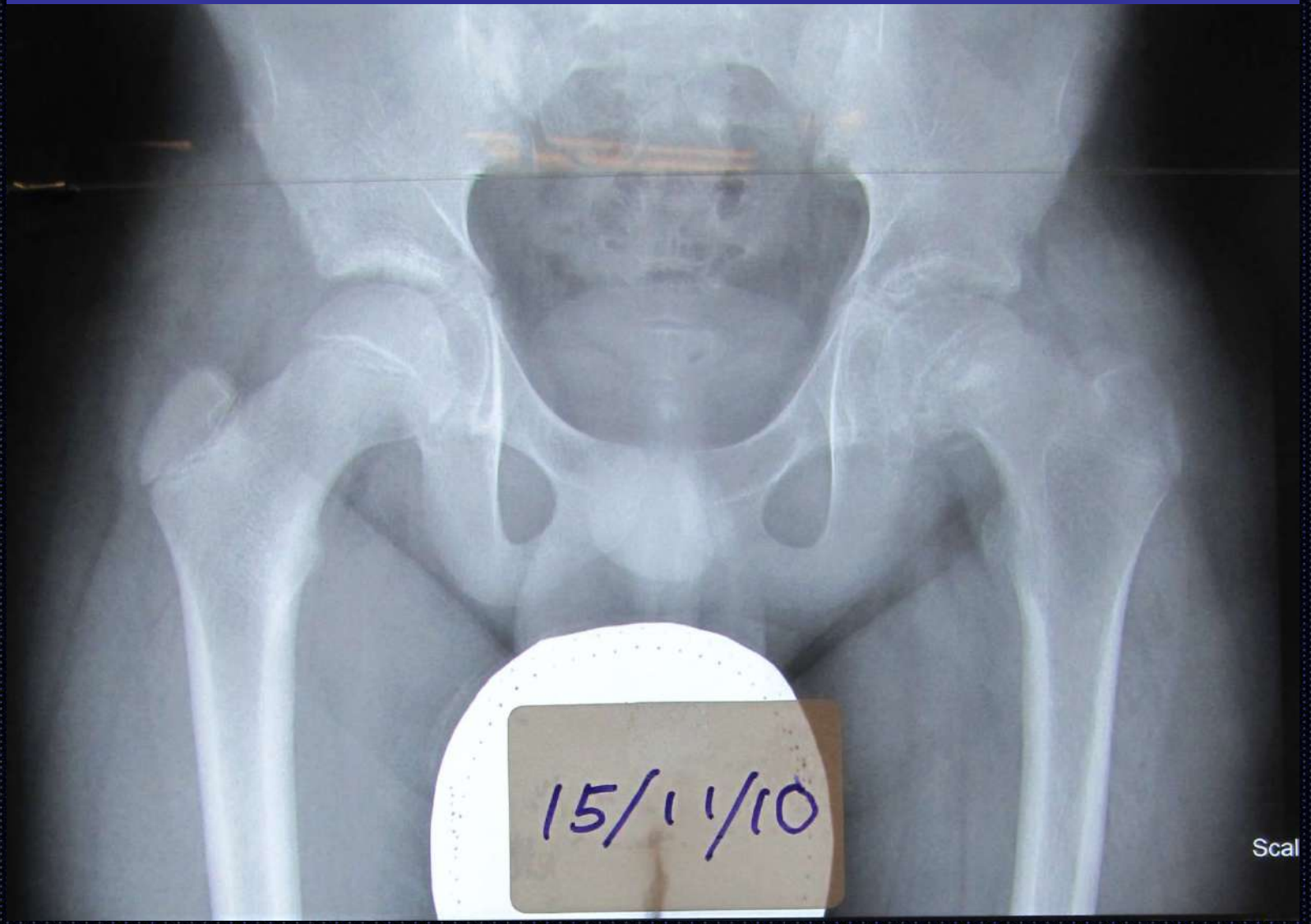


LHW M13, **2 episodes of Left hip pain** after kicking football **4 months ago** and running at PE lessen

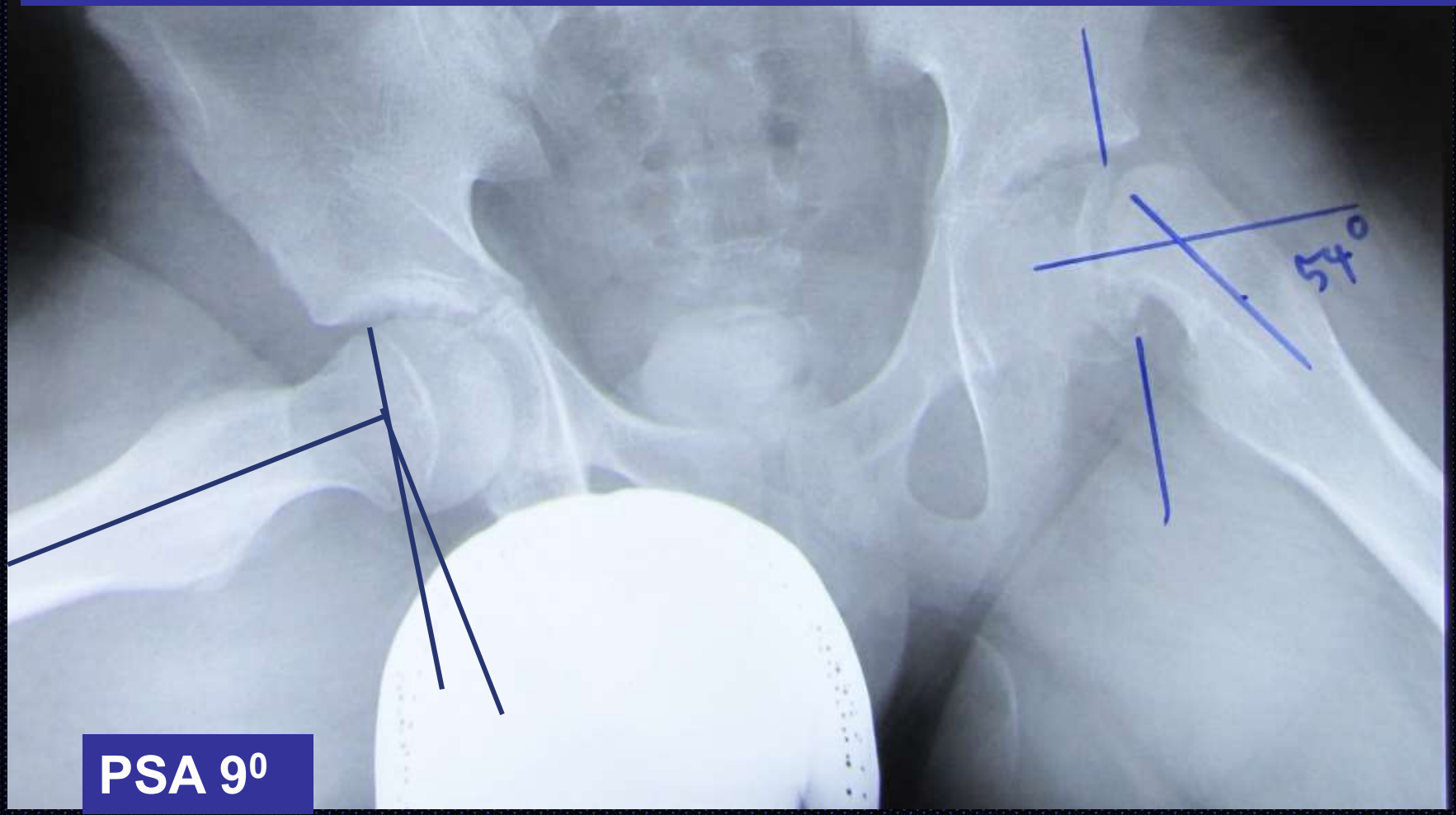


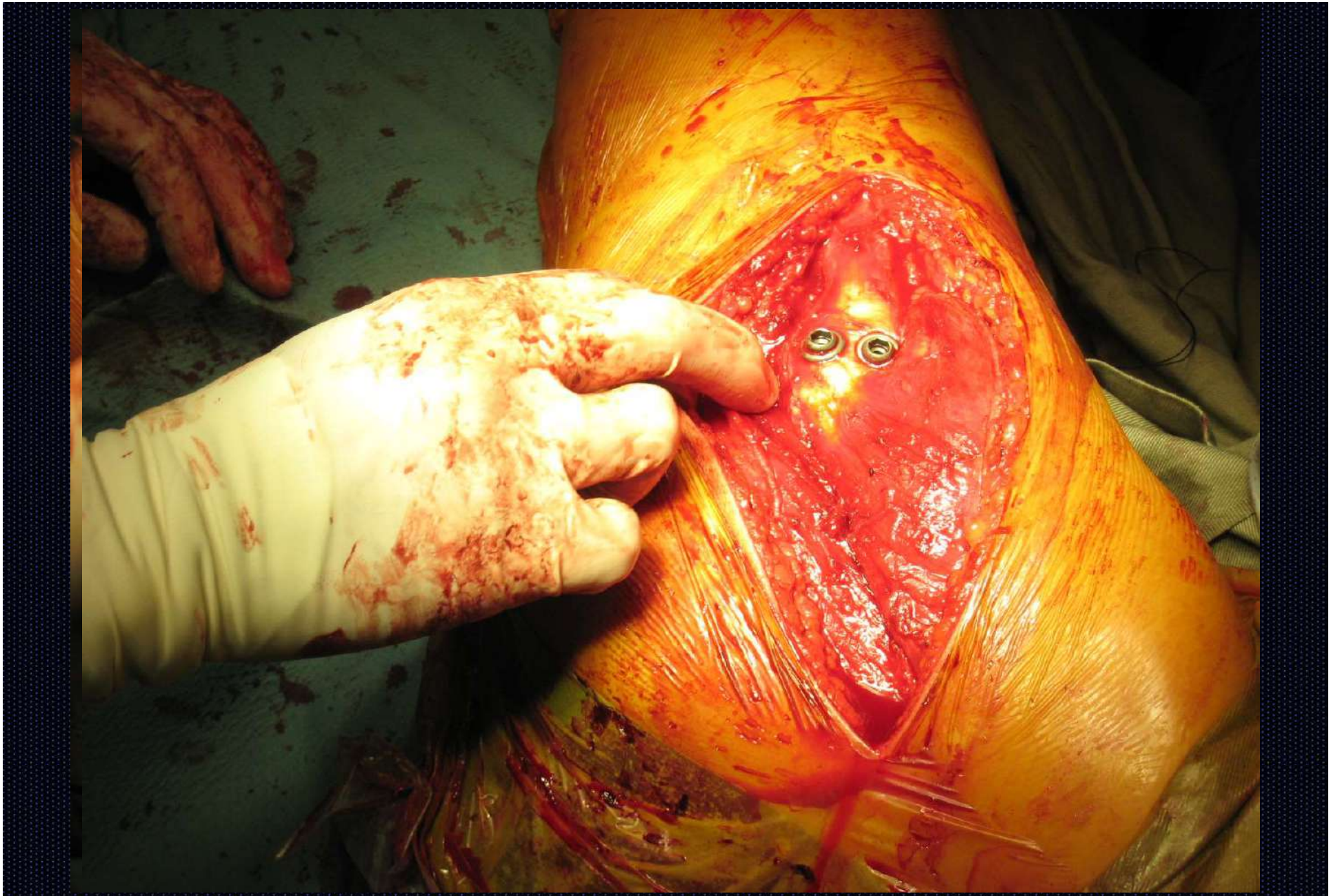

38
PSA 9⁰
25/9/10

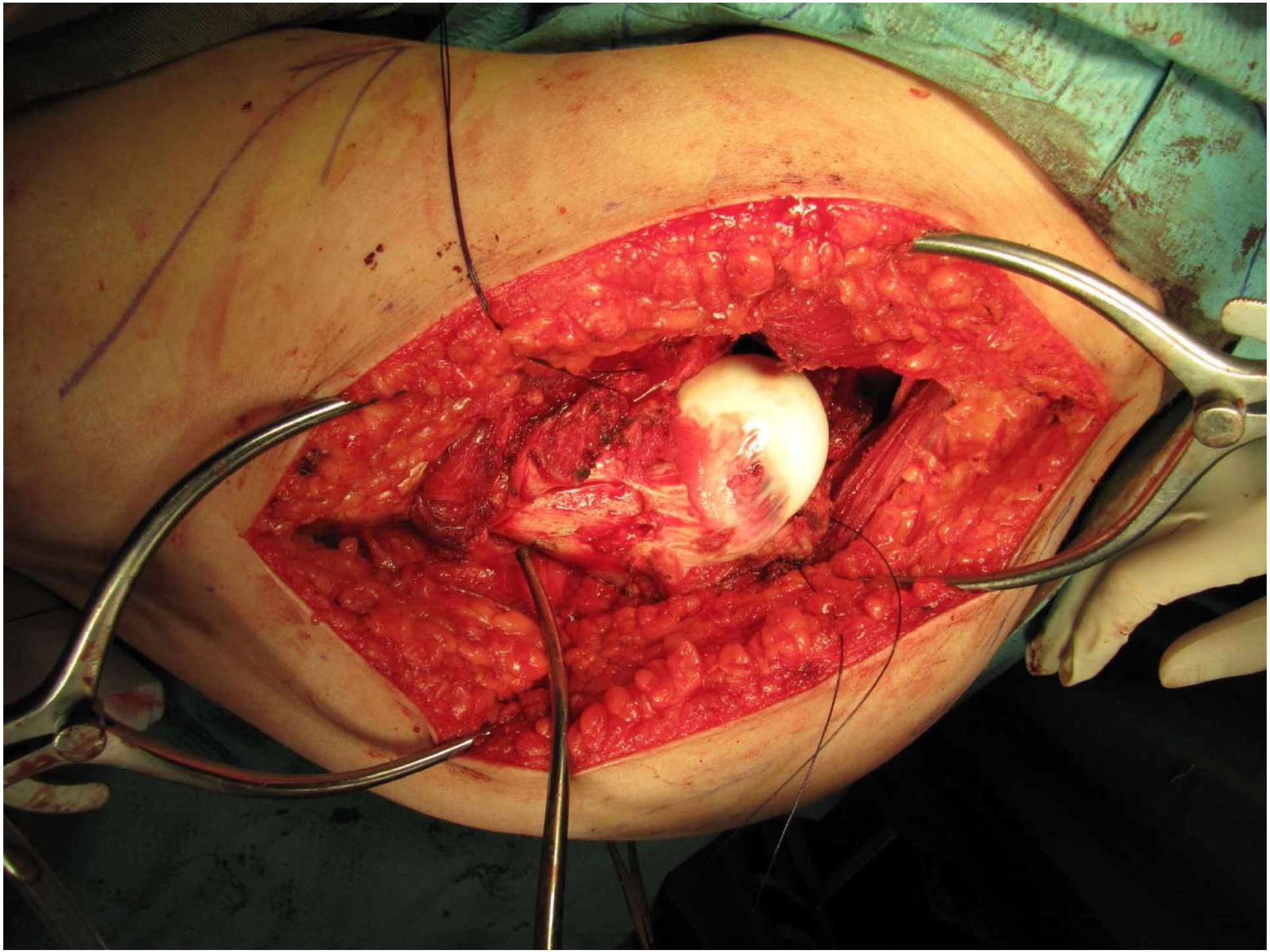
Third fall and further slip

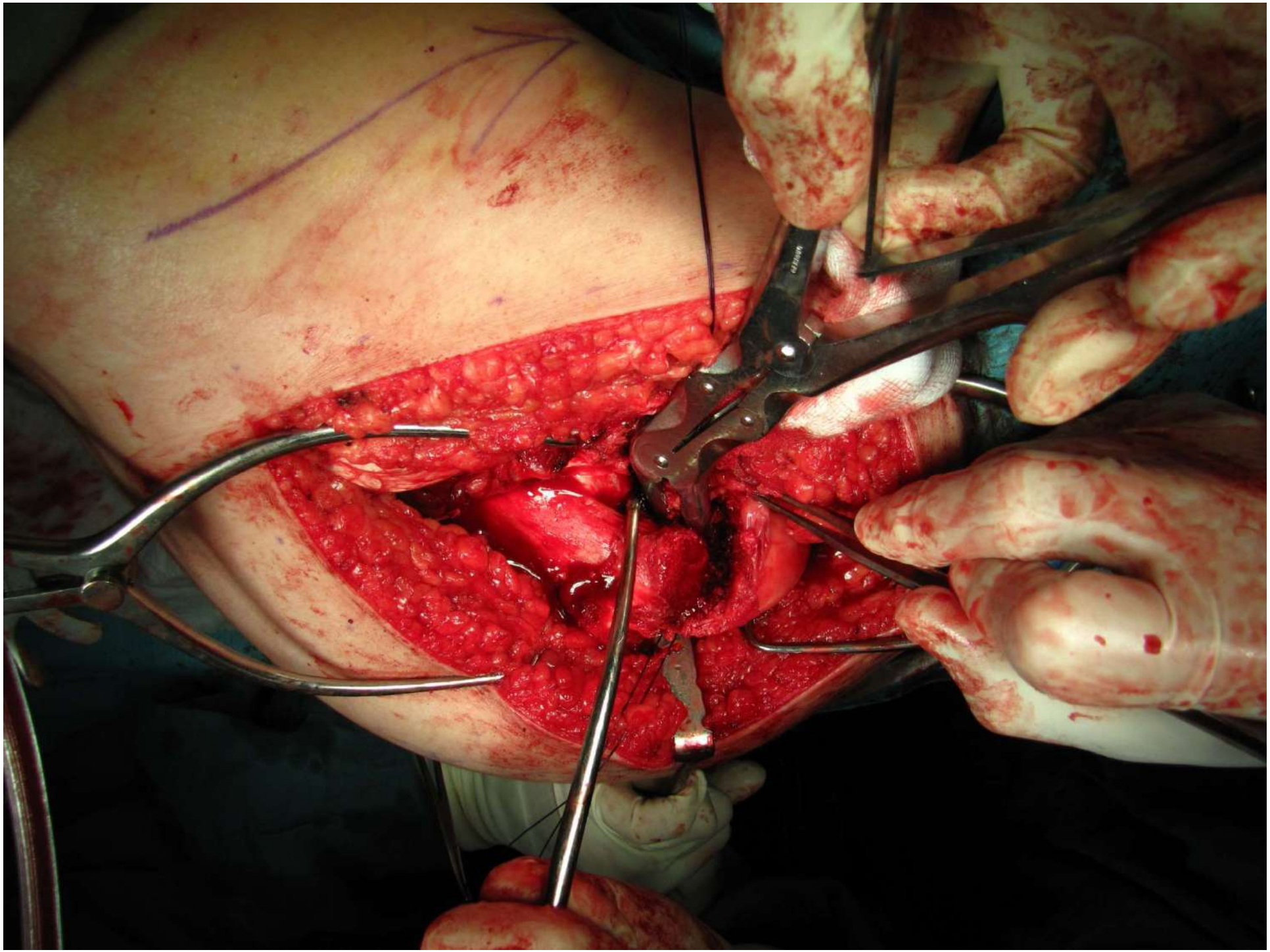


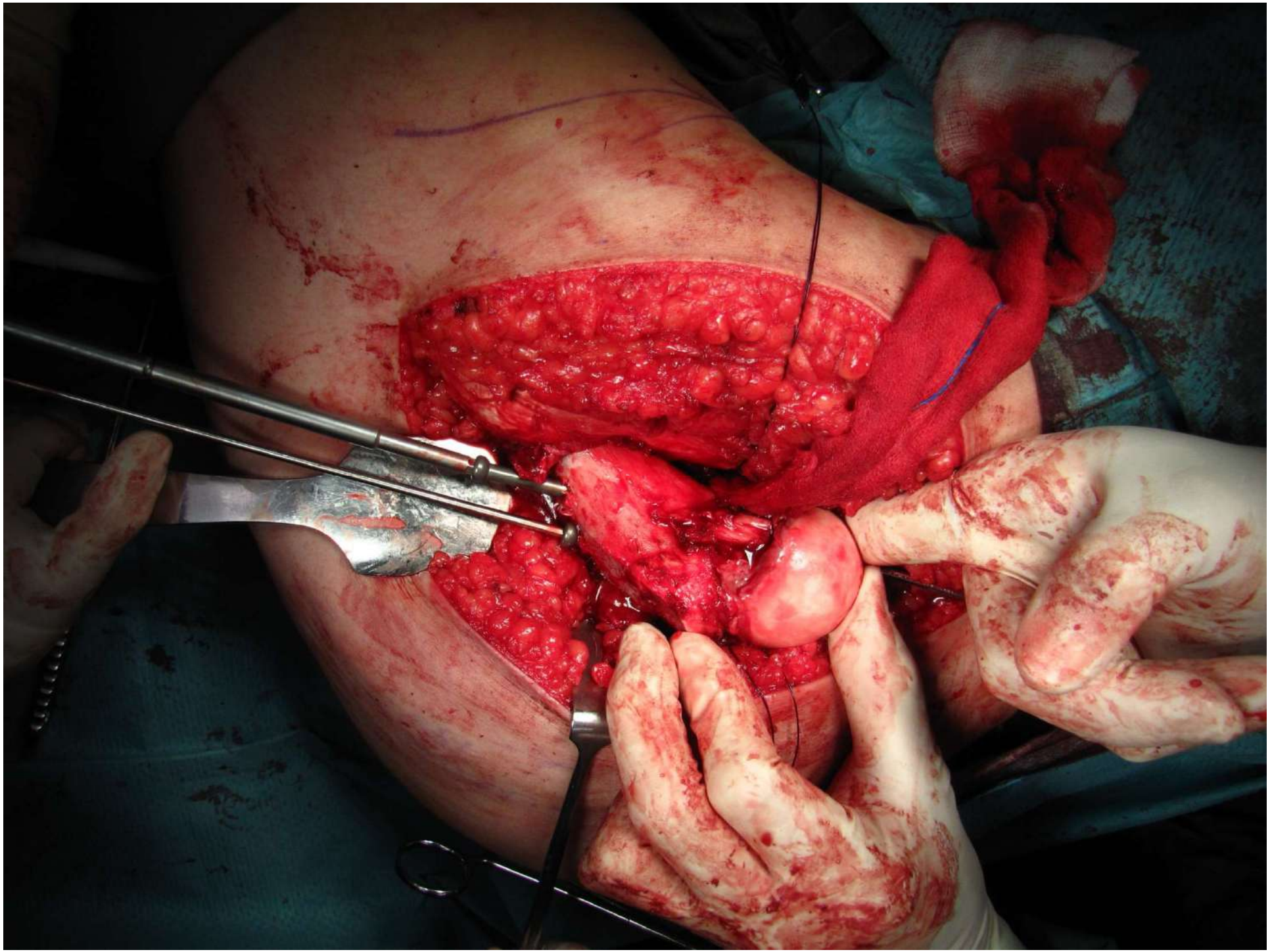
Slip ankle 54^0 Chronic Moderate slip all options- Pinning in situ/ realignment. **After discussion opted for SHD, subcapital realignment**

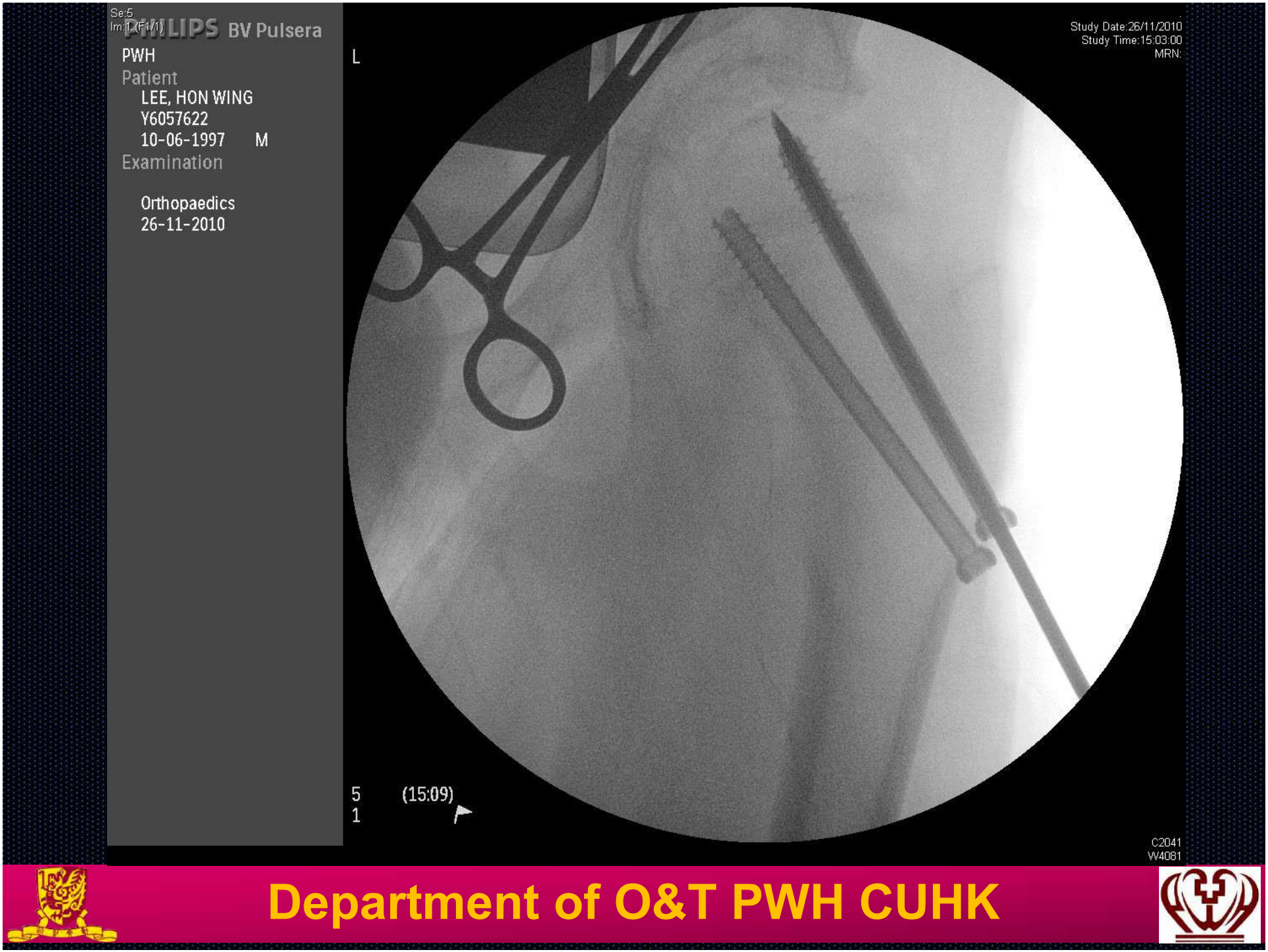


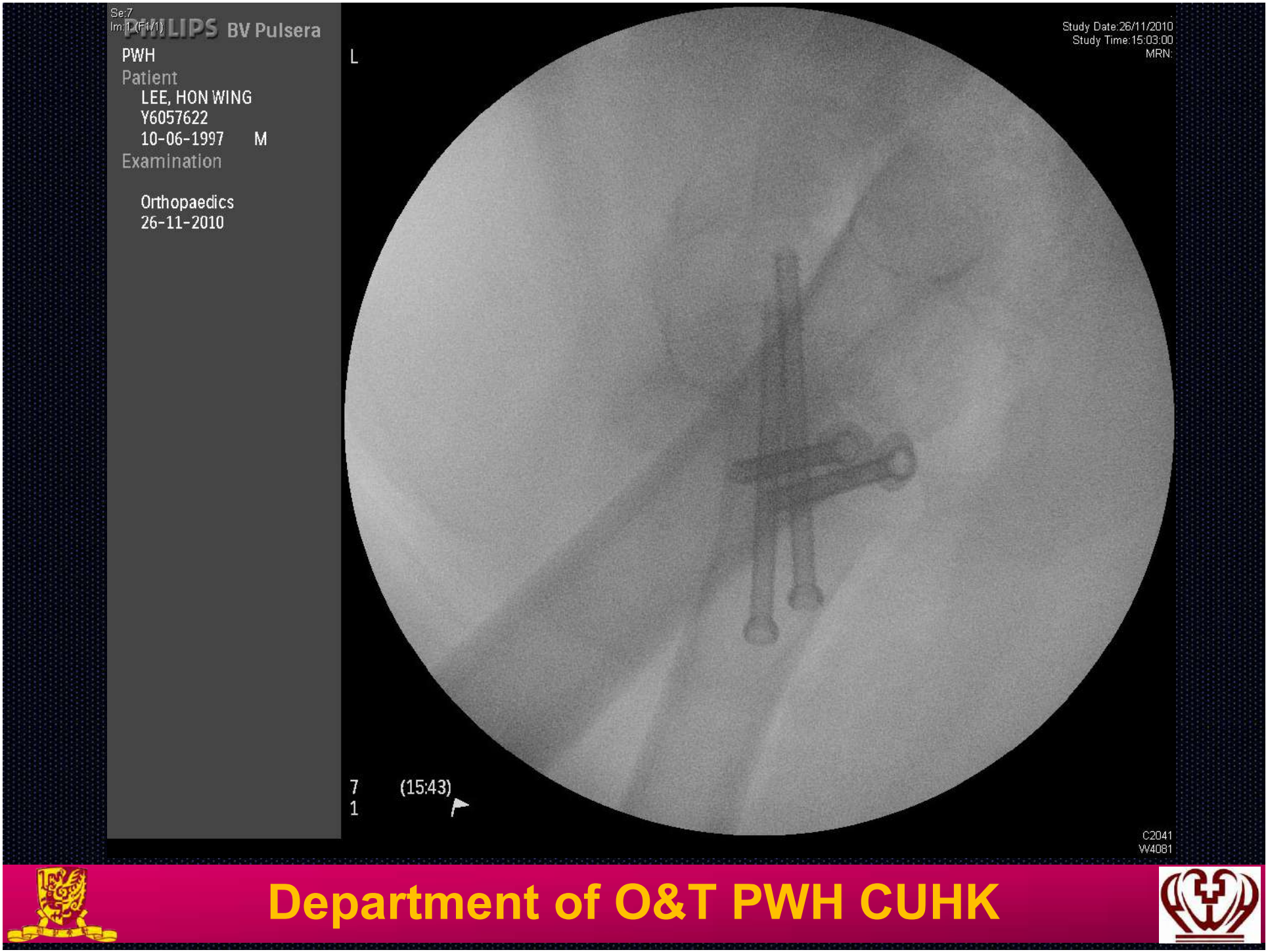









Se:5
Im:1 (F1/1)
PHILIPS BV Pulsera
PWH
Patient
LEE, HON WING
Y6057622
10-06-1997 M
Examination
Orthopaedics
26-11-2010
L
Study Date:26/11/2010
Study Time:15:03:00
MRN:
5
1
(15:09)
C2041
W4081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Im:1 (F1/1)
PHILIPS BV Pulsera
PWH
Patient
LEE, HON WING
Y6057622
10-06-1997 M
Examination
Orthopaedics
26-11-2010
L
Study Date:26/11/2010
Study Time:15:03:00
MRN:
7
1
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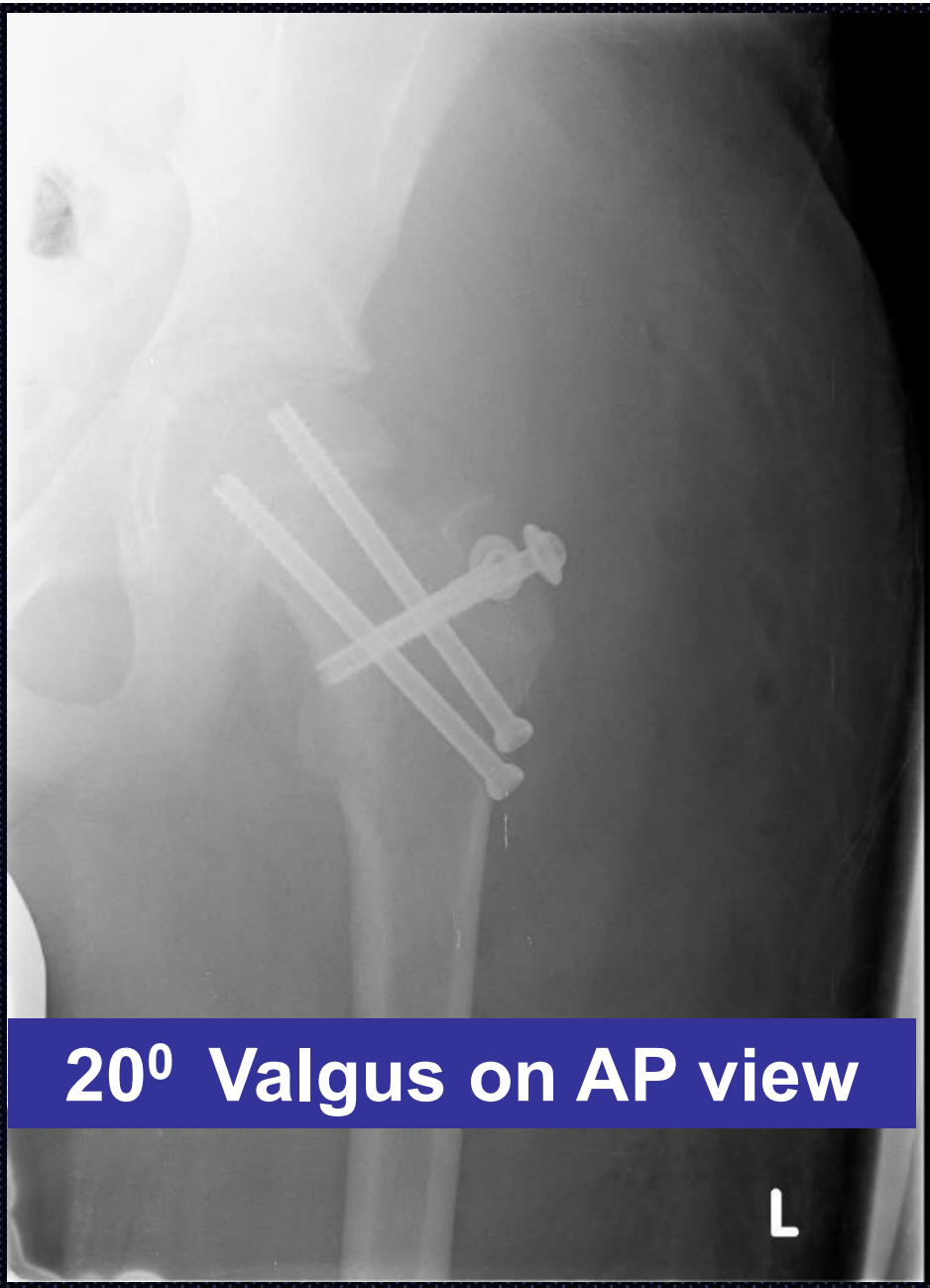
C2041
W4081

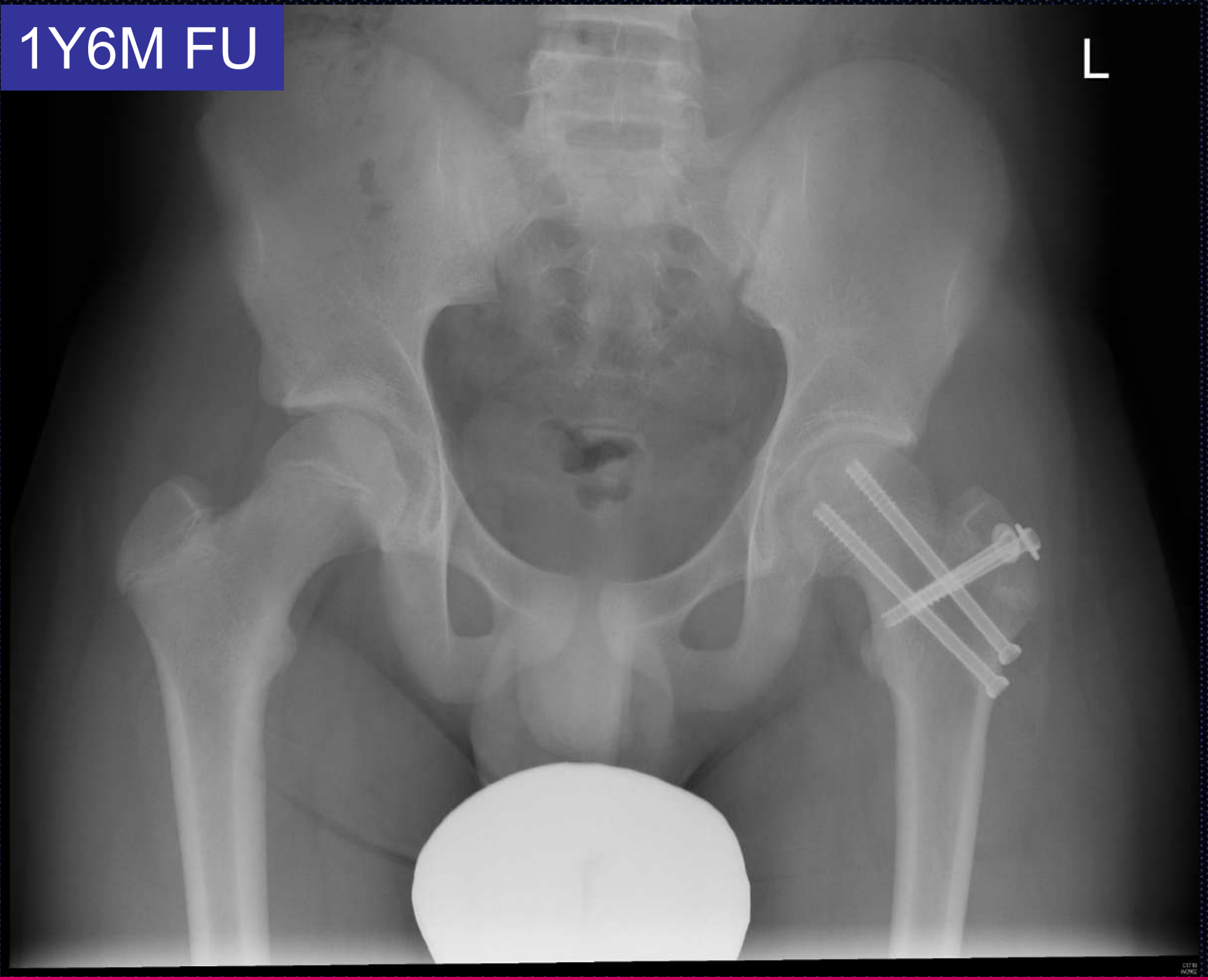
Square on lateral view



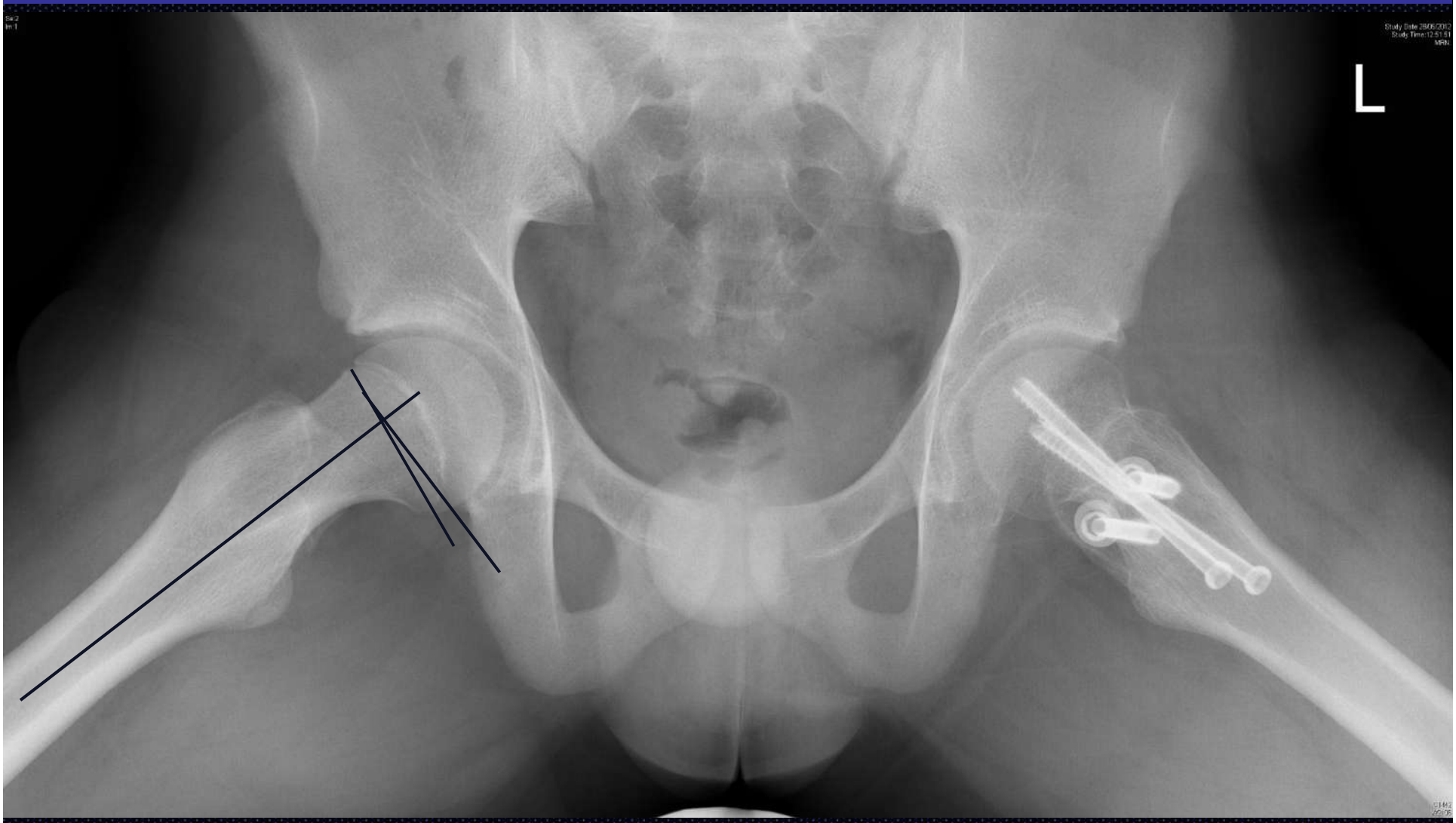
20^0 Valgus on AP view

MRI 3 months post operation no AVN

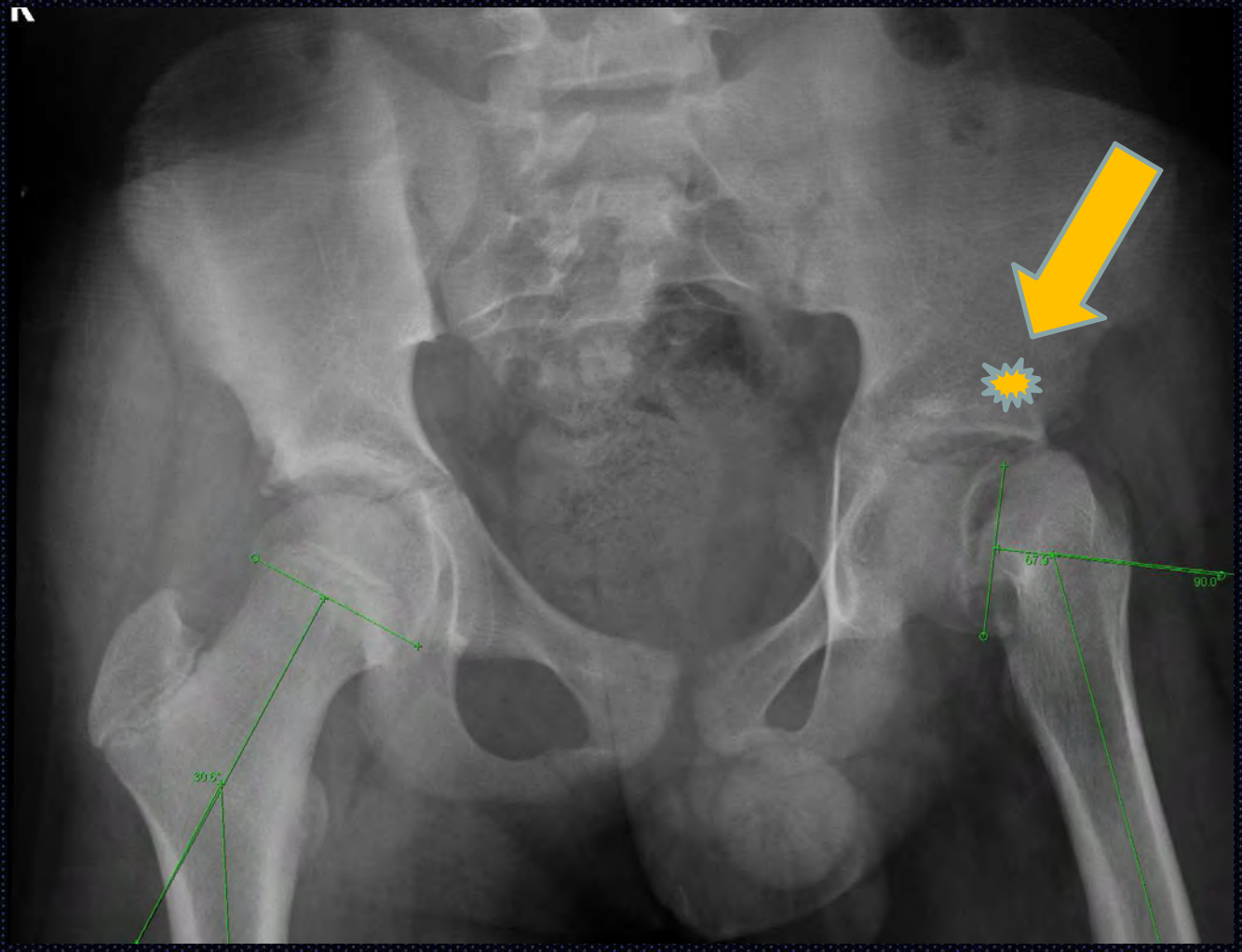
1Y6M FU

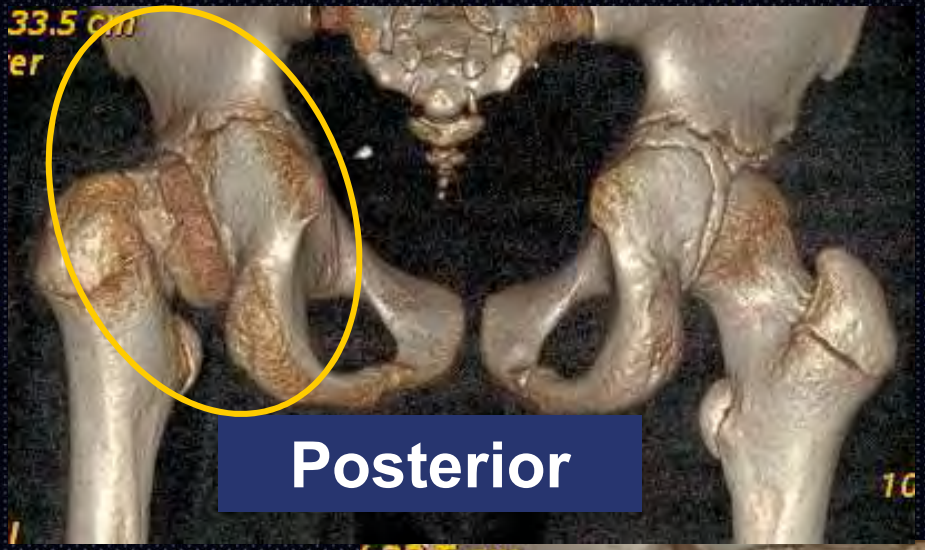


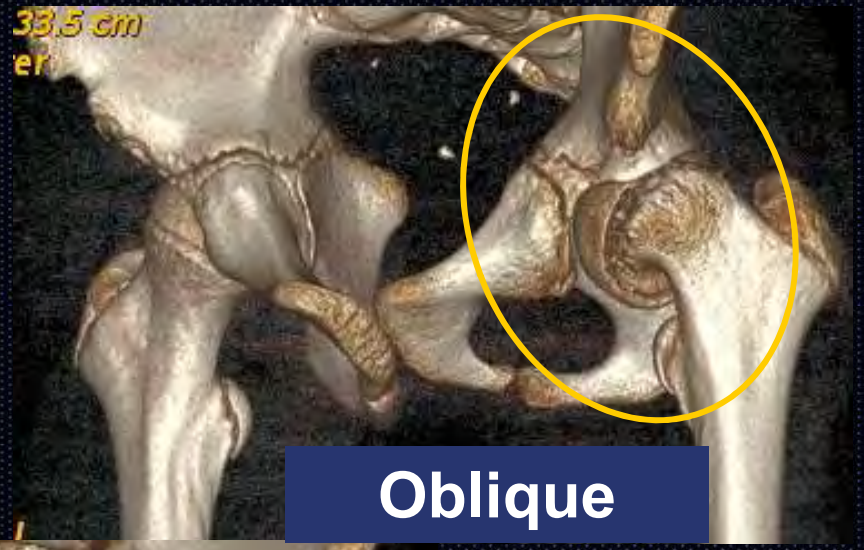
Well aligned, No AVN, Contralateral PSA 5^0

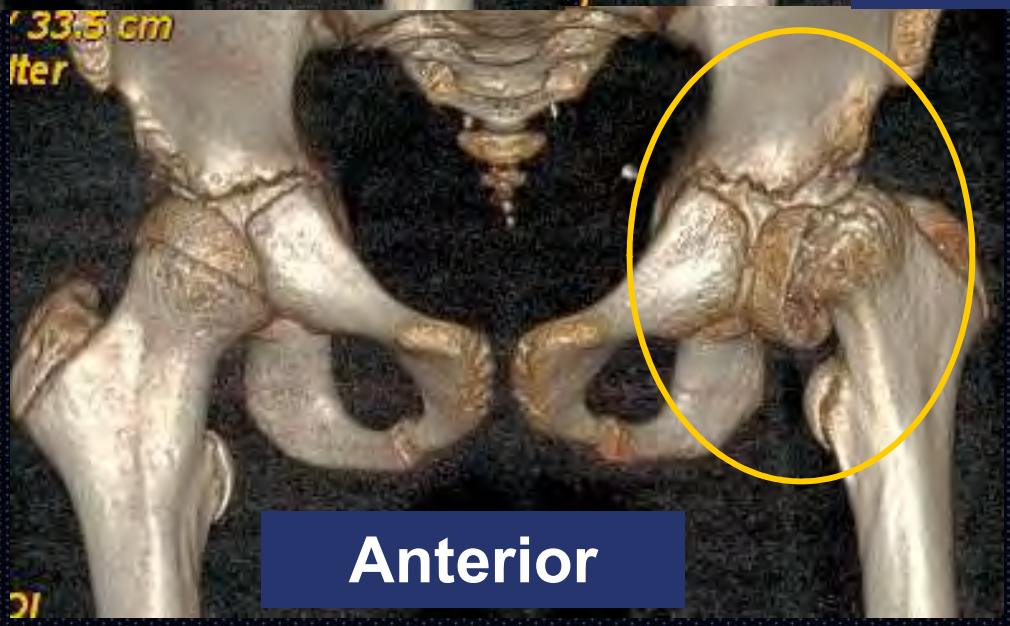


NKO M/12 left hip pain after basketball
Recent onset of limb shortening, limping, out toeing gait,
Initially mild slip, Fall again, Severe Slip, cannot walk!

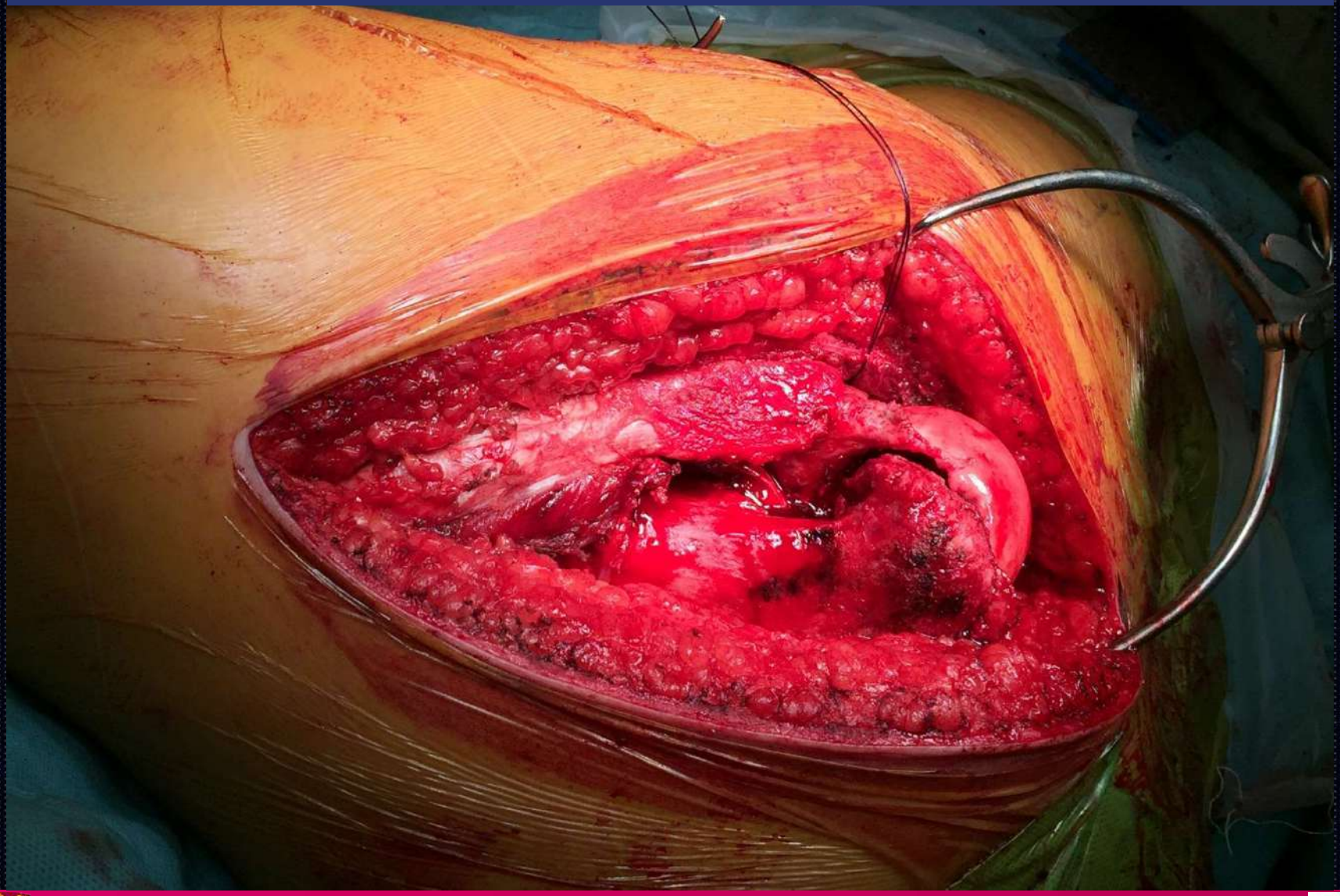



Posterior

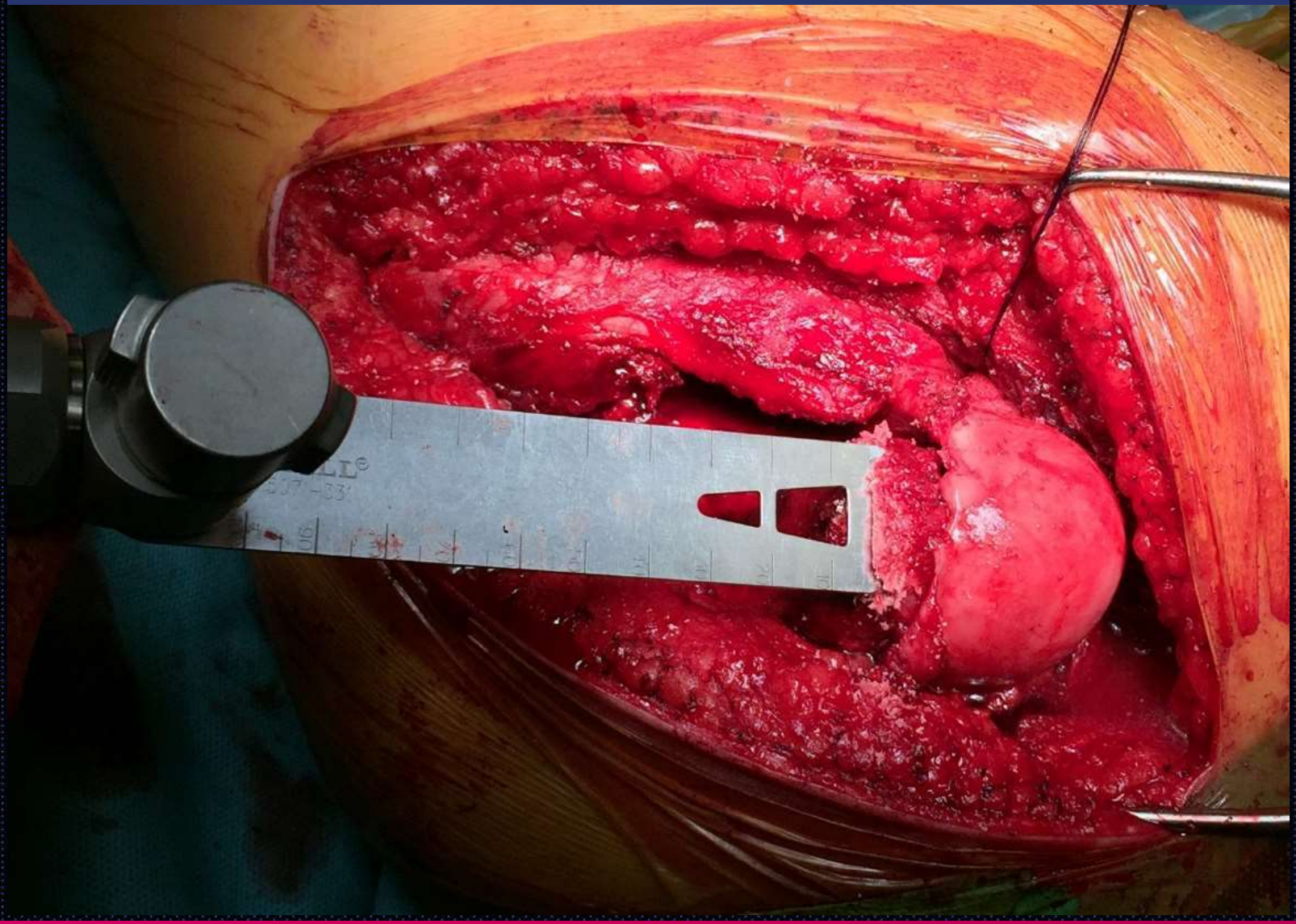

Oblique


Anterior

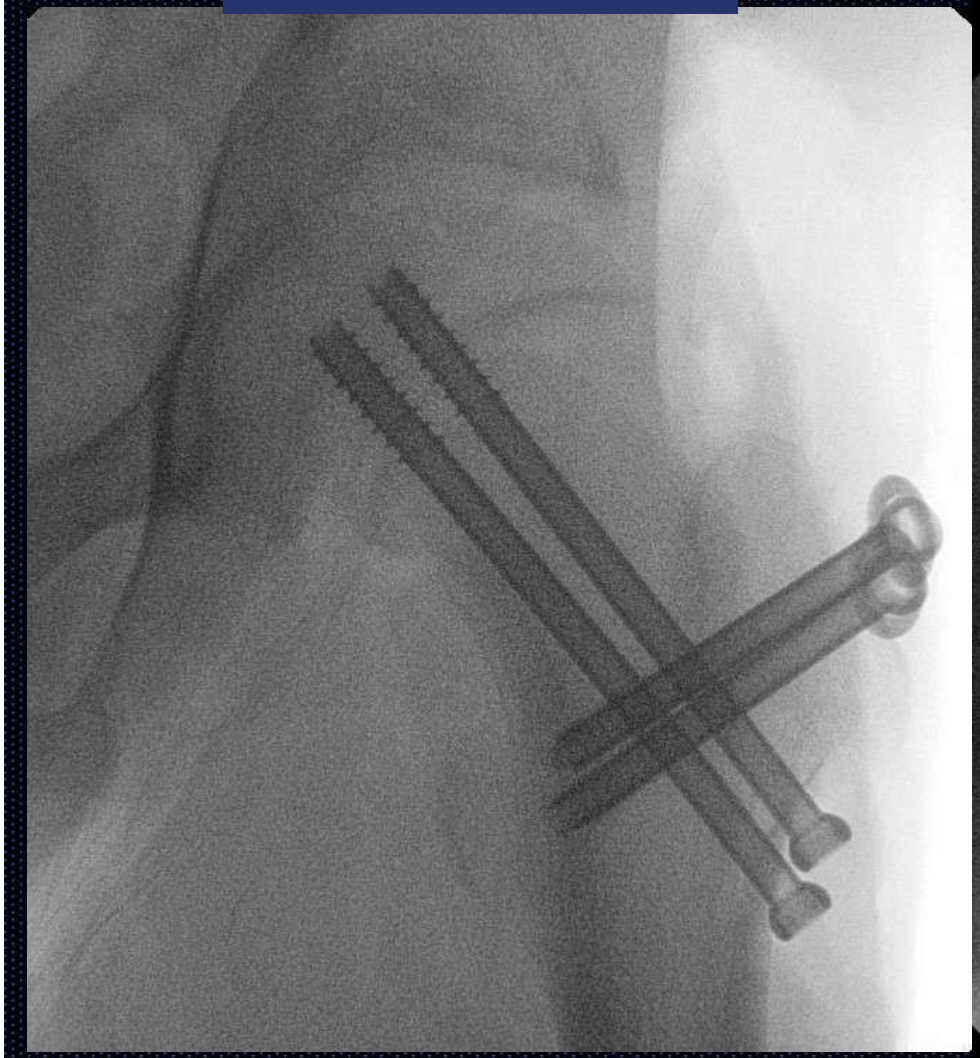
Surgical dislocation Dunn's Procedure- ORIF



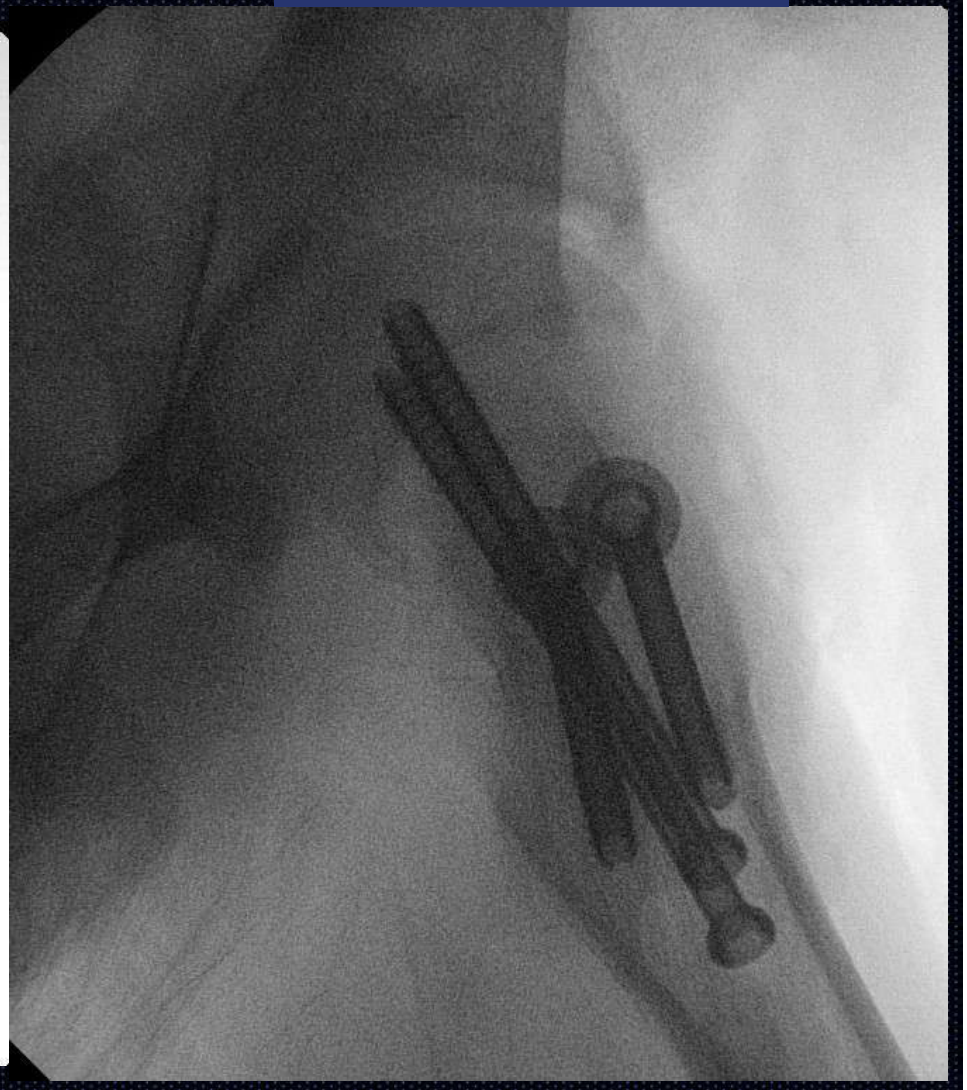
Trimmed Excess bone shorten neck for decompression



AP



Lateral



Post op 11 weeks No AVN

Post op 6 months No AVN good gait

Subcapital Realignment

- Moderate and severe SCFE leads to premature OA from FAI, realignment prevents OA
- Systematically studied by Dunn, refined by Ganz
- Exact procedures for realignment techniques
- Must decompress by shortening neck, remove posterior metaphyseal beak
- **Must achieve square alignment on lateral and 20^0 valgus AP**

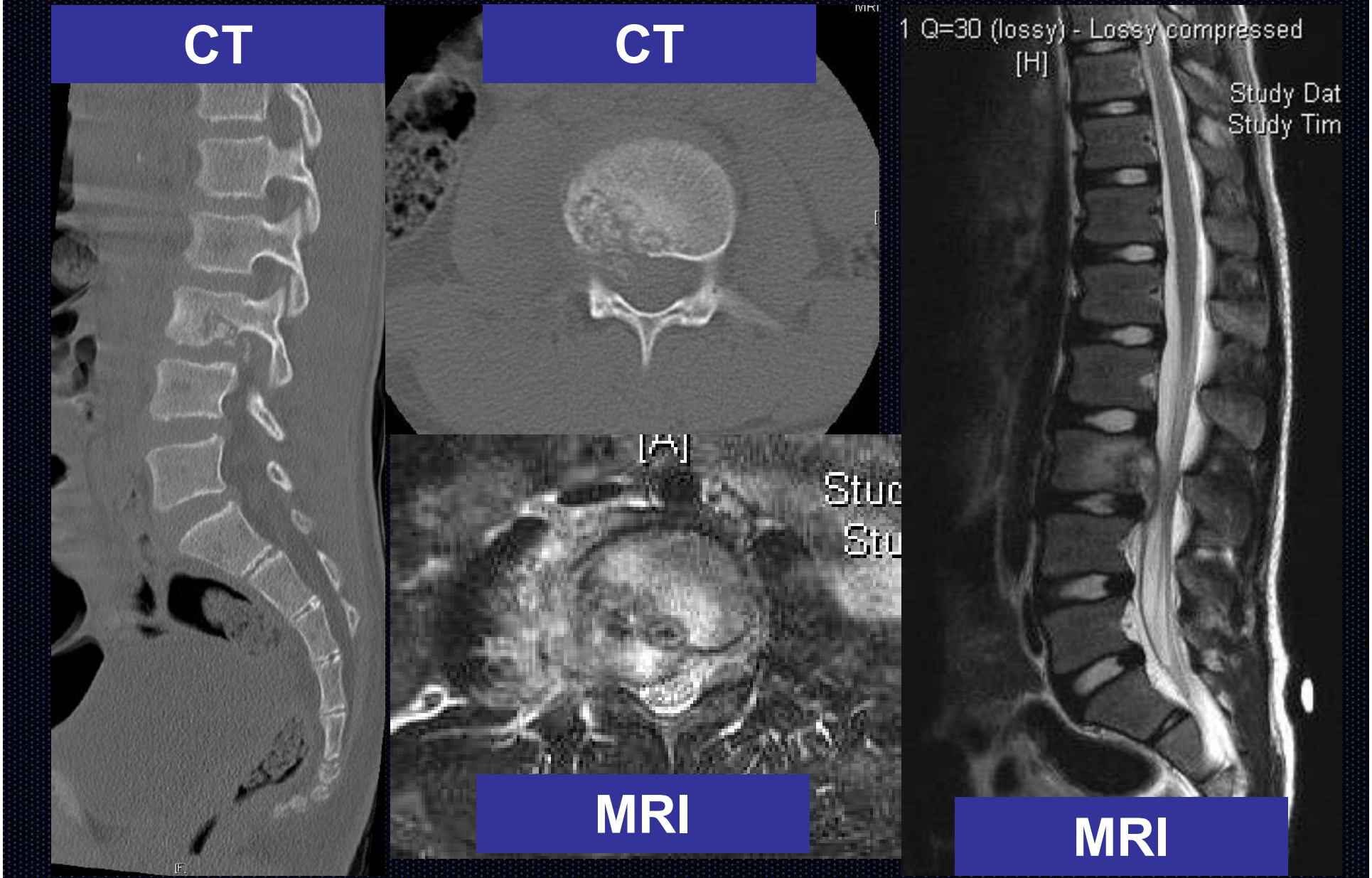
Spinal Deformity

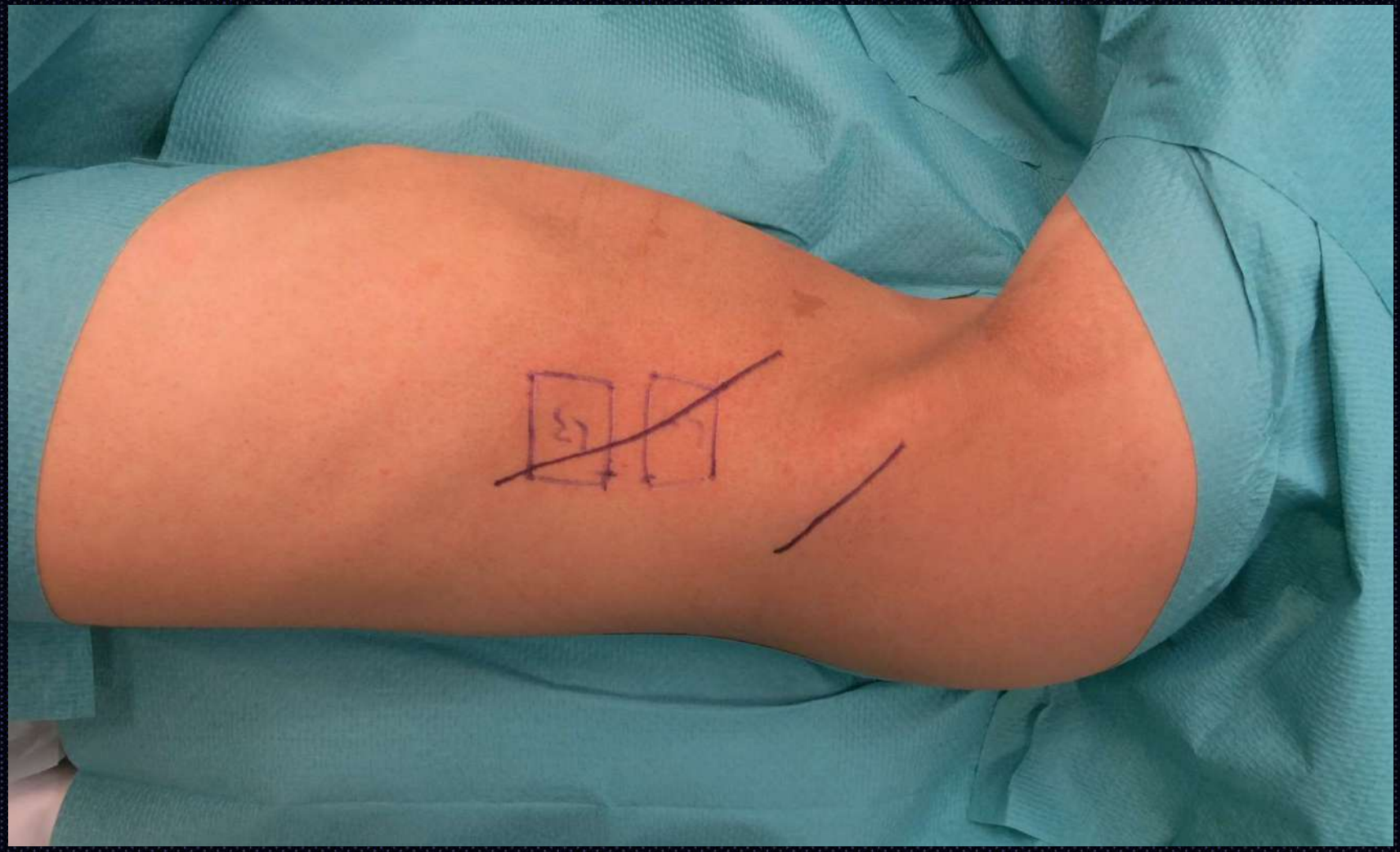
Advances that Change Practice

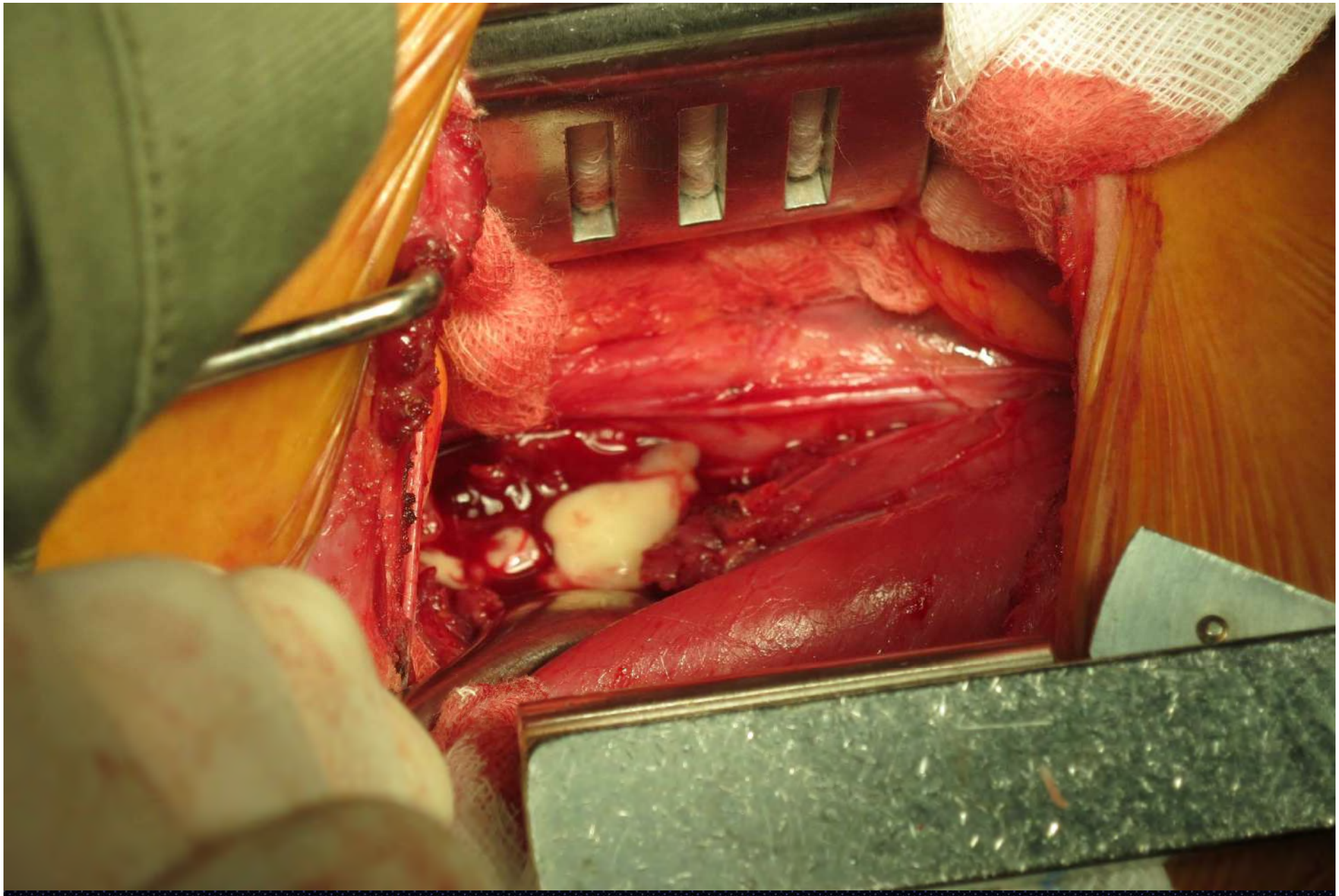
- 1 Imaging techniques
  - CT, MRI, EOS
- 2 Computer technology
  - Ossirix, Pacs, Mimmics system, Navigation
  - Image reconstruction and surgical planning
- 3 Pharmacology for bleeding control
- 4 Advances in surgical principles

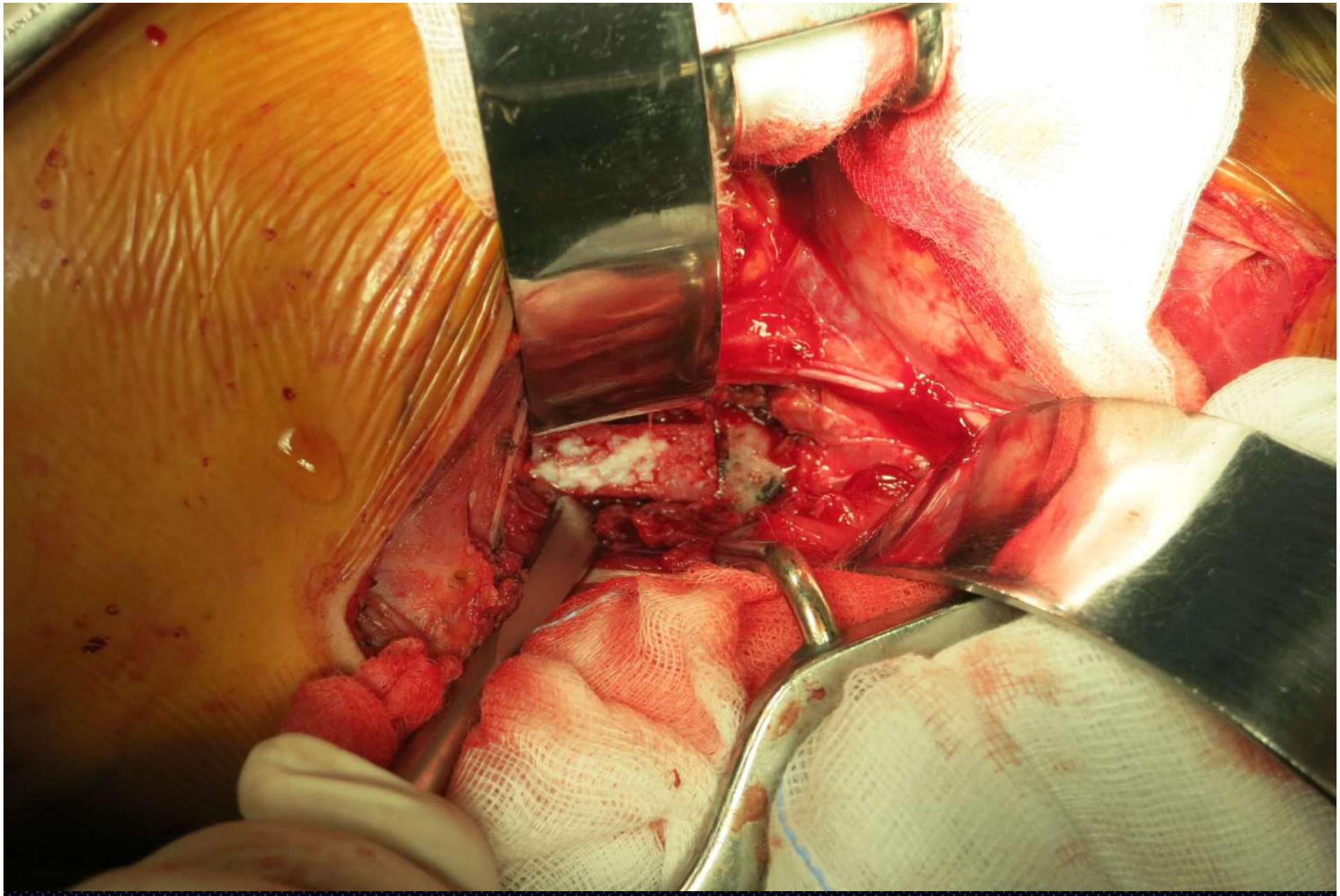
FLW, M/12, MR
Hunch back gait, abdominal pain, Kyphosis of LS spine! Nothing wrong on APXR

Ped colleague requested
CT Abdomen
? Pelvic / psoas abscess, orchitis / scrotal haemorrhage

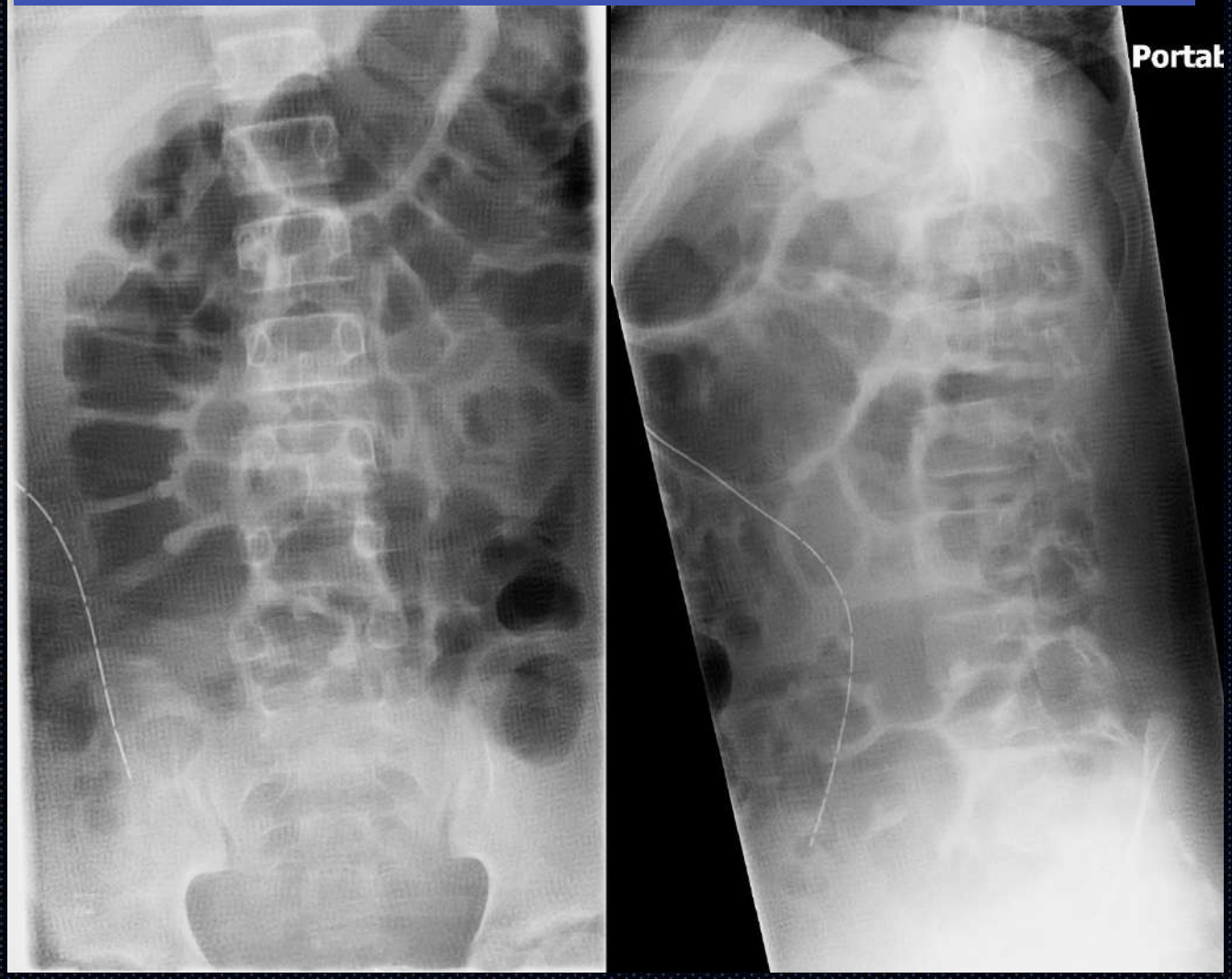

CT
CT
1 Q=30 (lossy) - Lossy compressed
[H]
Study Dat
Study Tim
MRI
MRI







Post op X-rays

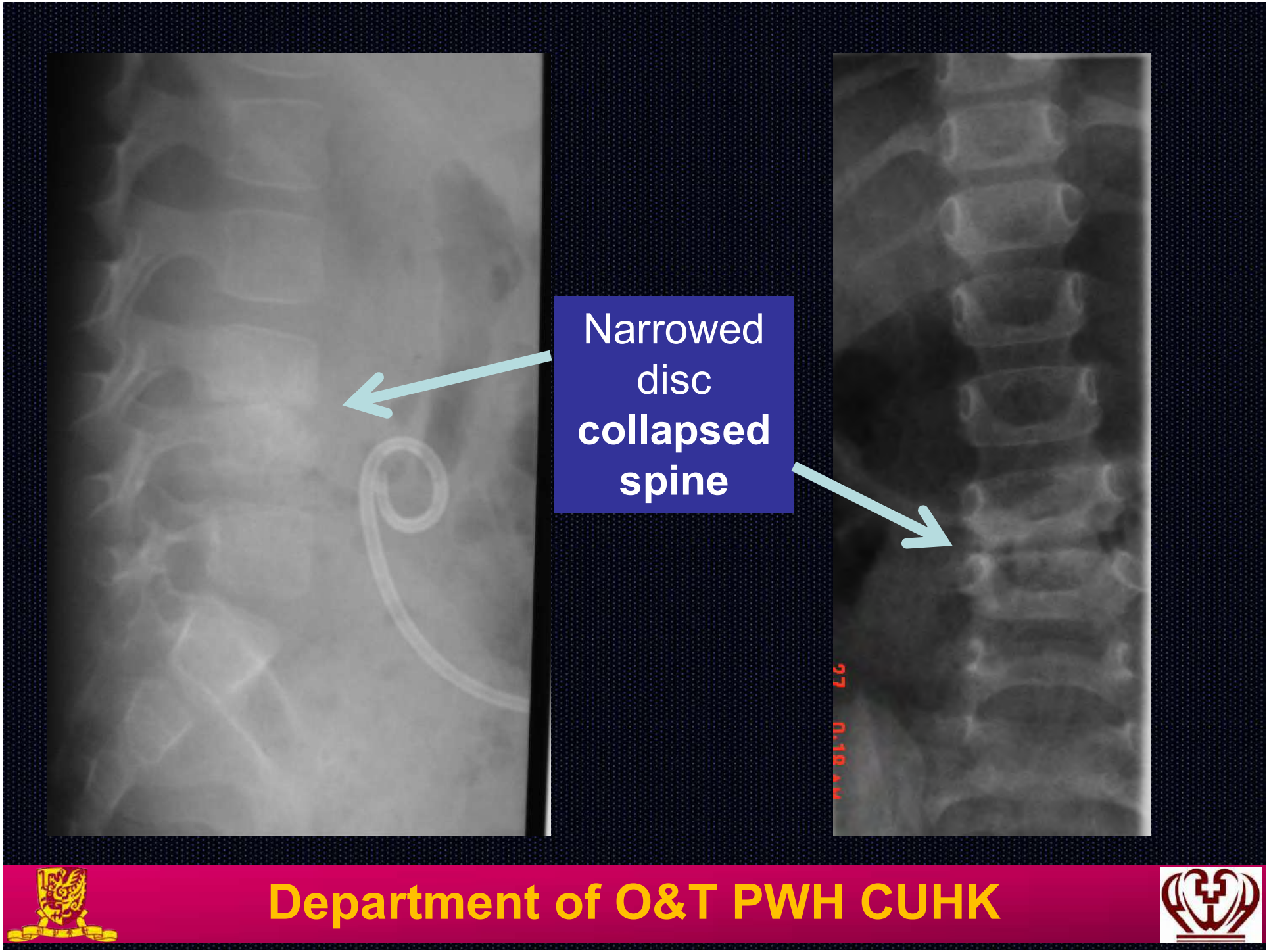


F4

- Abnormal gait walked like a lord!
- Abdominal mass- “Can of coke” in RIF
- X-rays showed narrowing of L34 disc
- Scoliosis
- **MRI confirmed TB abscess**
- Anterior abscess drainage and spinal fusion

Patient before operation needs to keep leg in this position to be comfortable

Pus Drained from pigtail catheter

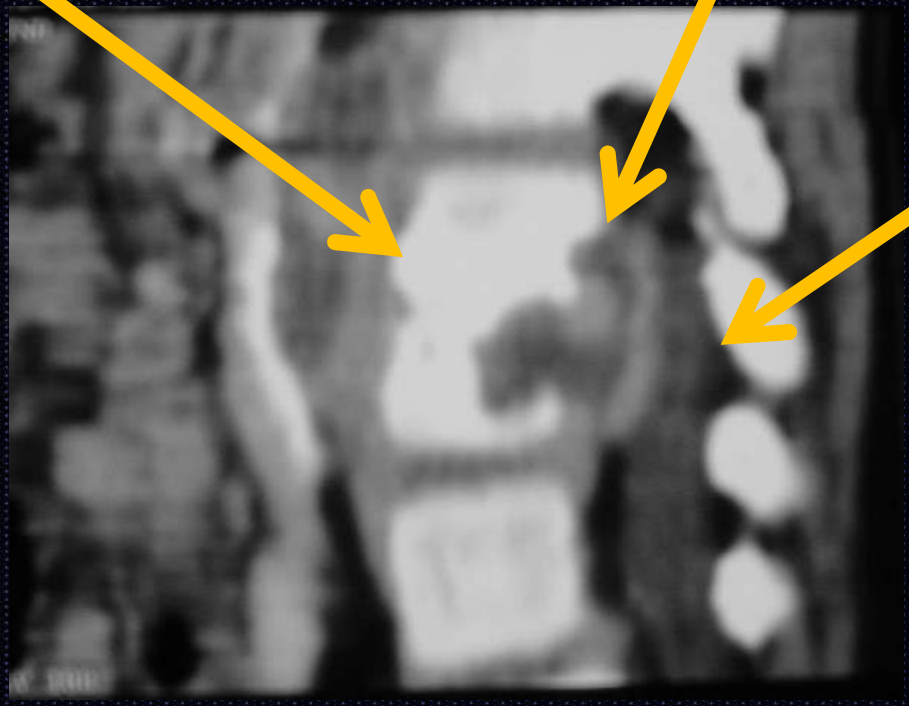

Narrowed disc **collapsed spine**

Destroyed L3,4 body

Abscess

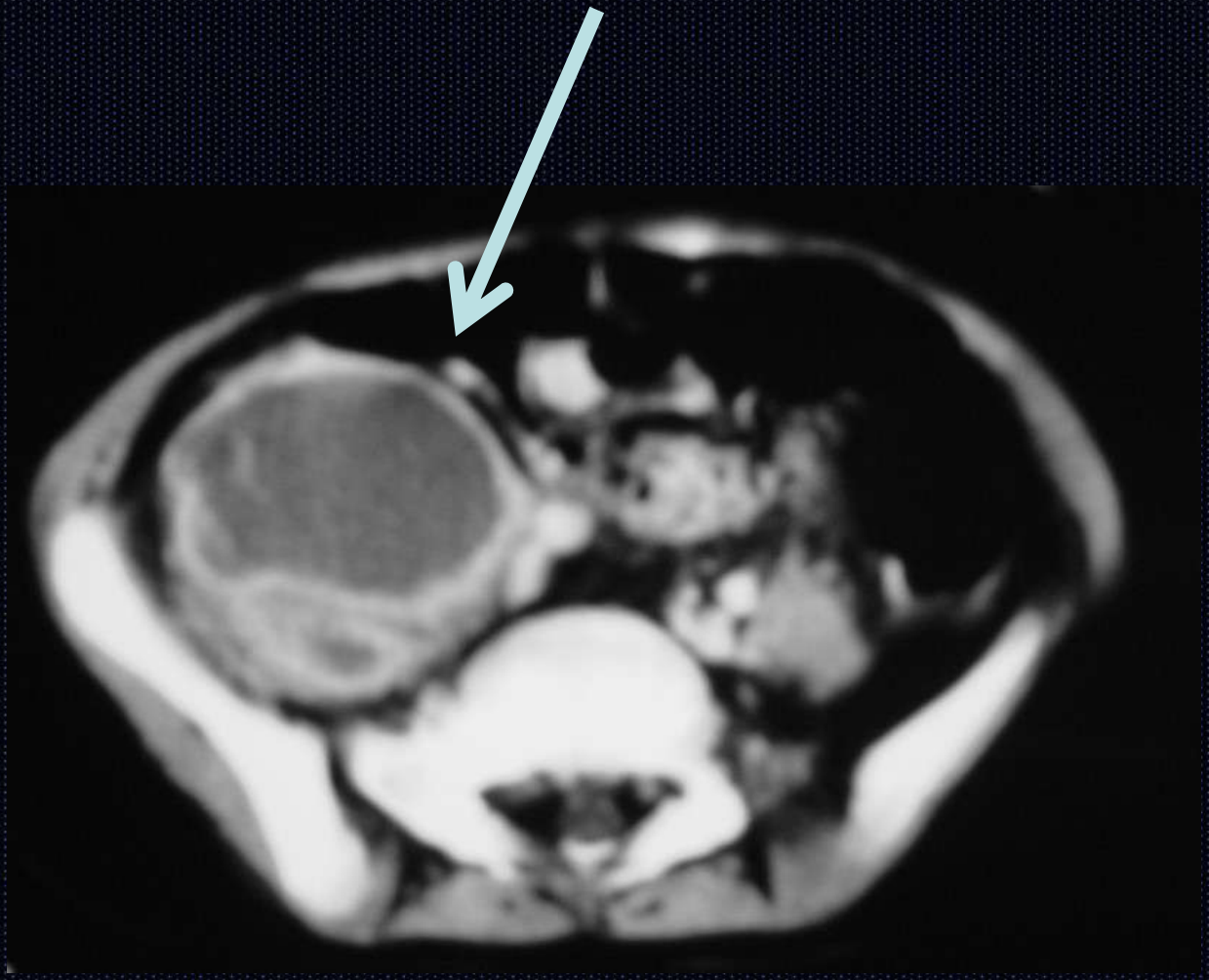
Spinal cord

MRI

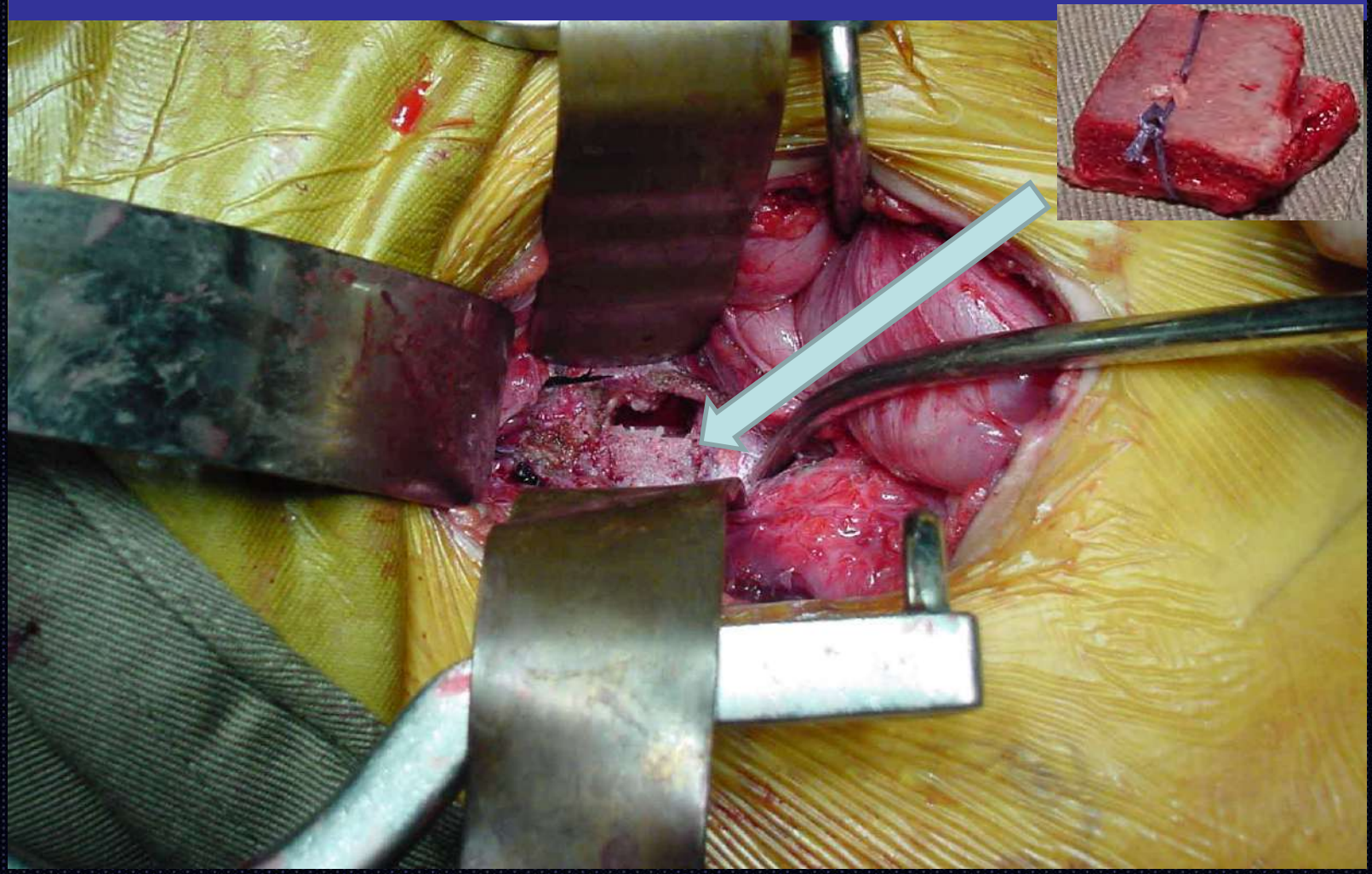


Lateral view of spine showing abscess destroyed bone and compressed dura and cauda equina

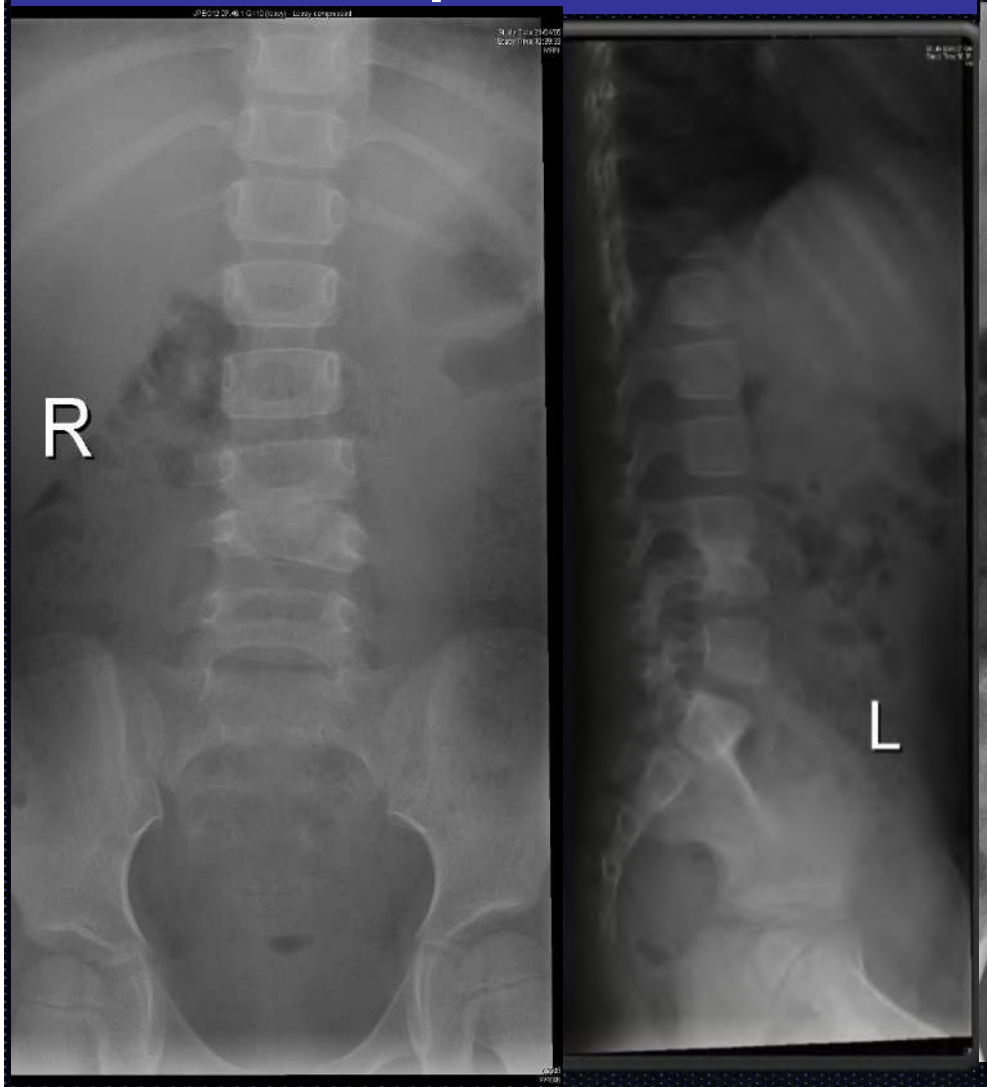
Axial View Massive abscess- “Can of Coke”



Debridement and Bone graft impacted for anterior fusion

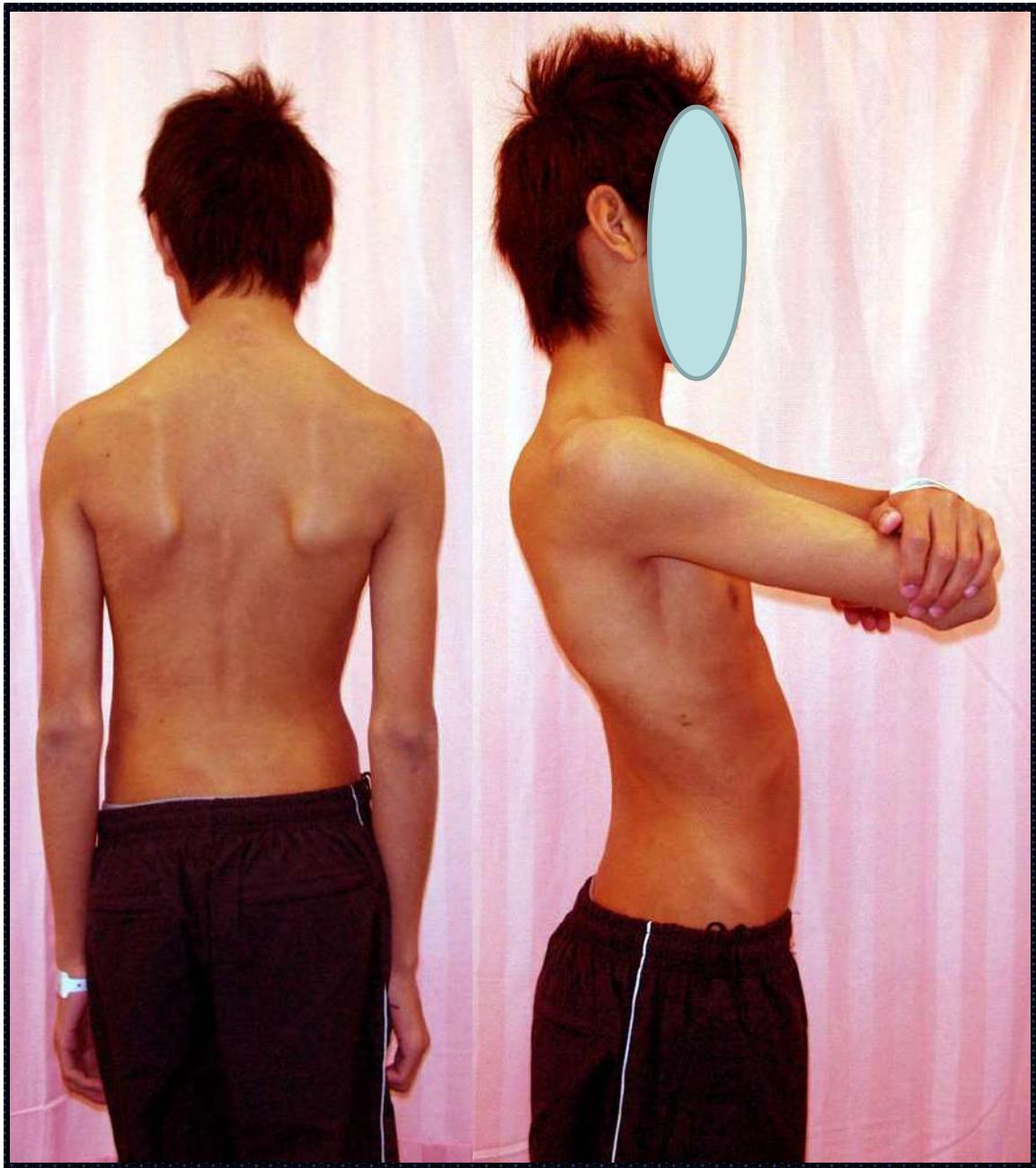


Post Op 9 months



Post Op 9 years

Happy girl post op in brace



- M/12
- Acute back pain
- “Kneed” at back at football
- Pain at rest and night
- Pain on movement
- Back stiff
- Left TL scoliosis

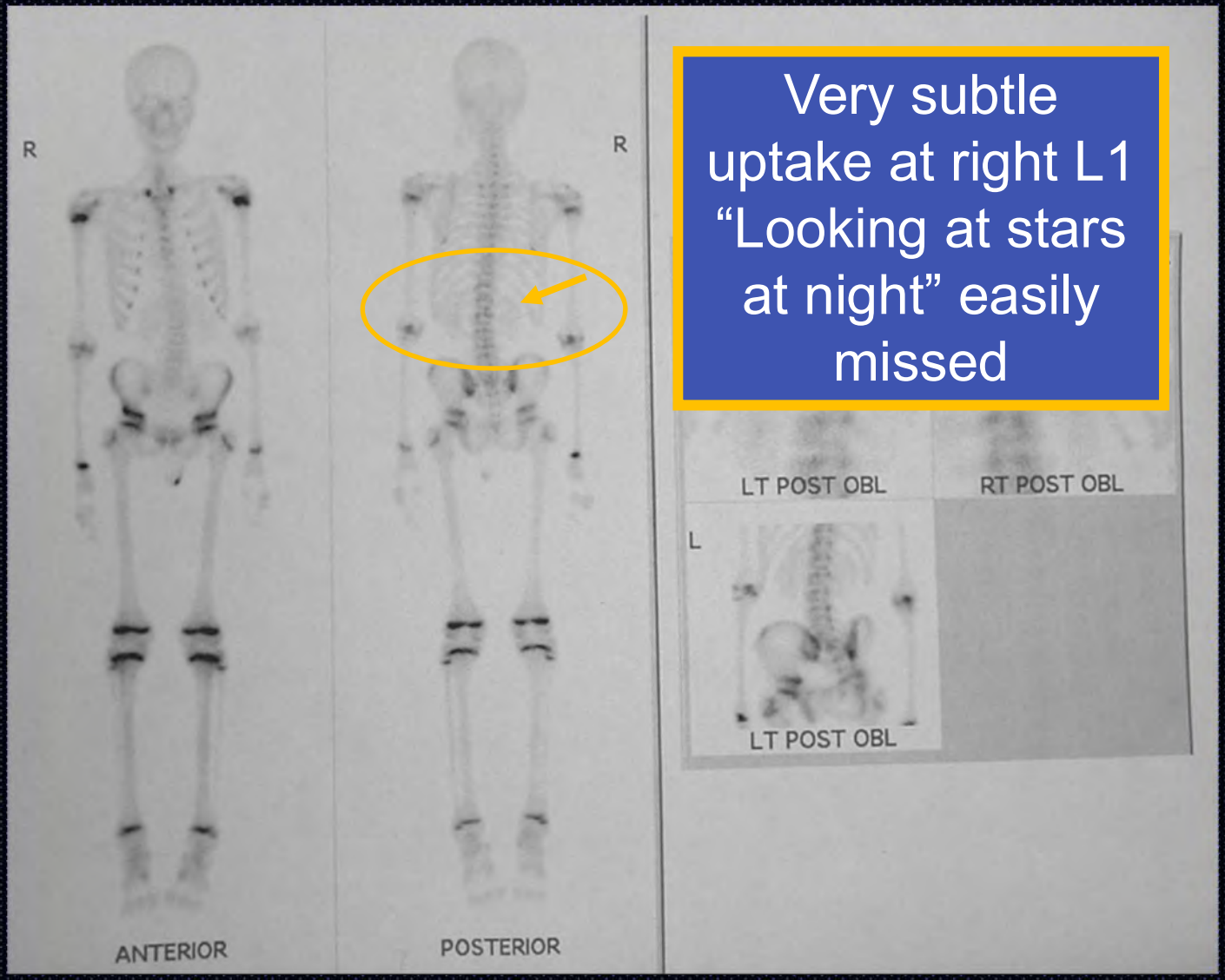
“Painful scoliosis”
Can move but like robot

Apart from the scoliosis basically normal

Lab results normal
WCC
ESR
CRP
L/RFT

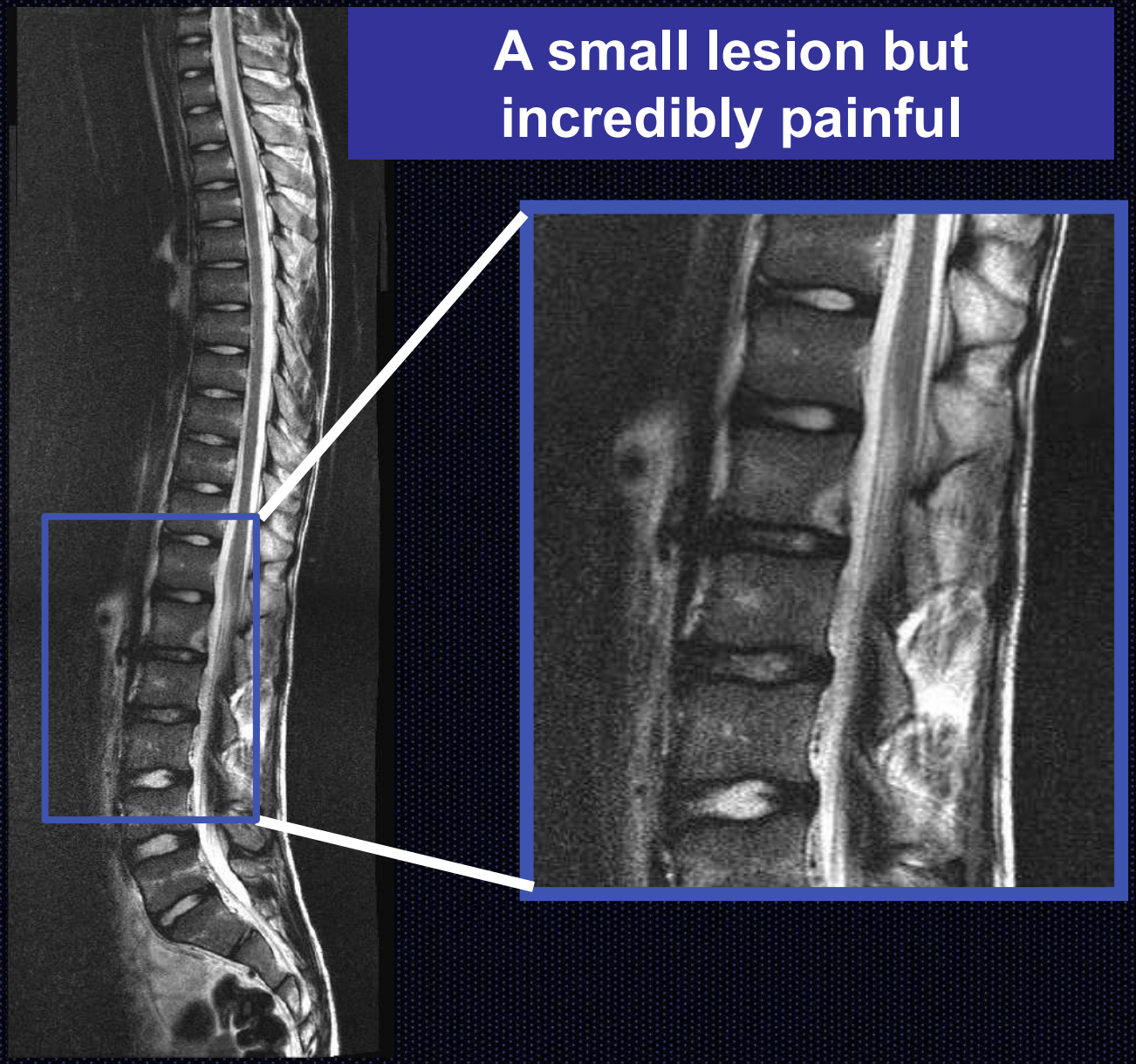
NSAID relief 80% pain

Bone Scan



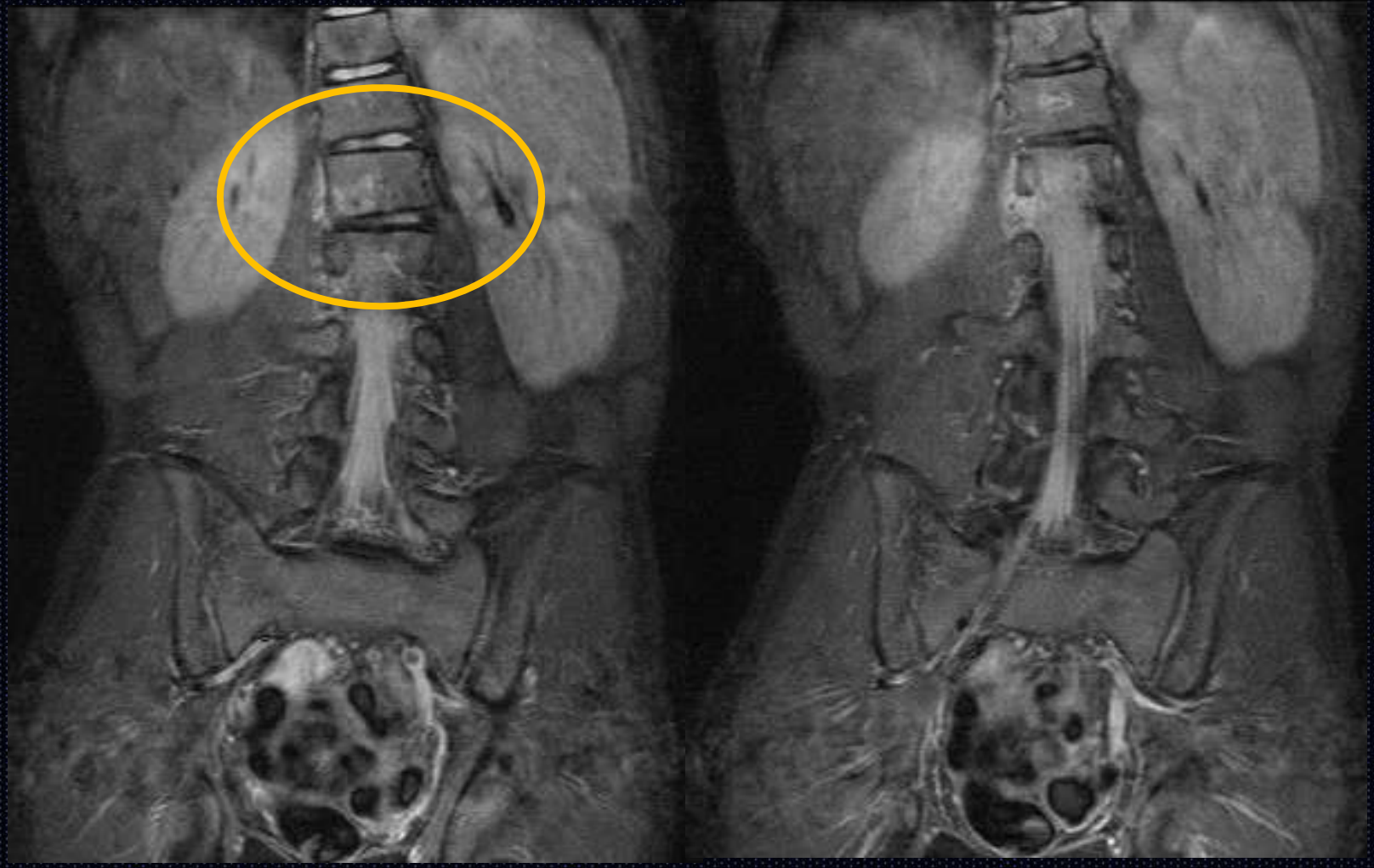
Very subtle uptake at right L1 "Looking at stars at night" easily missed

MRI whole Spine

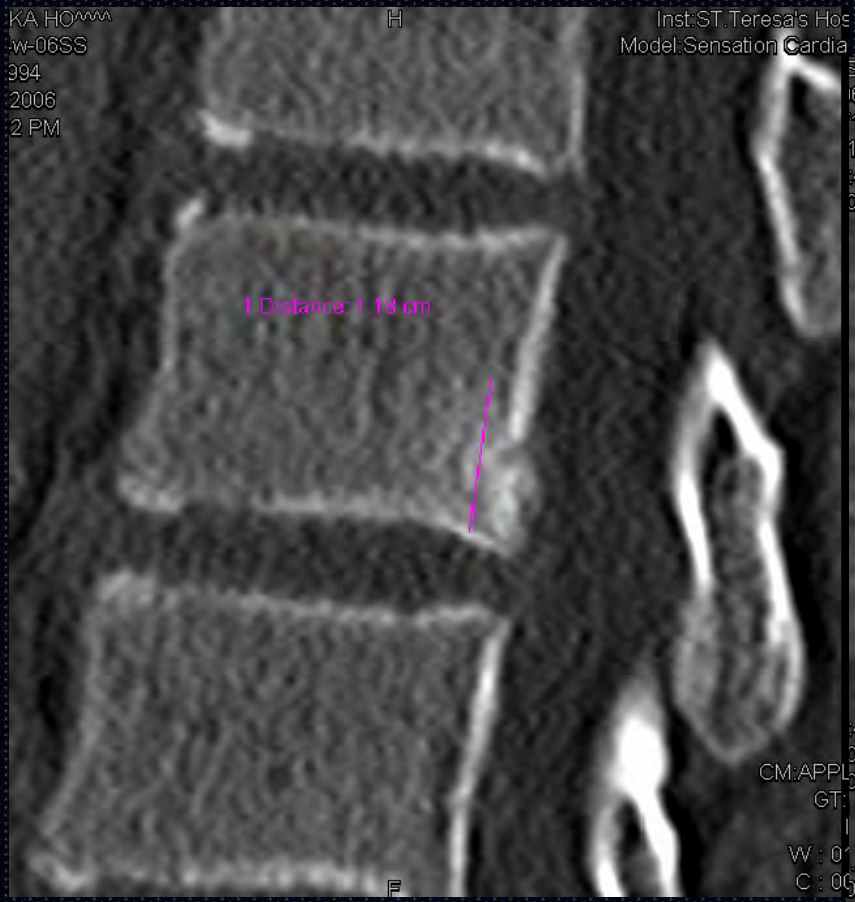


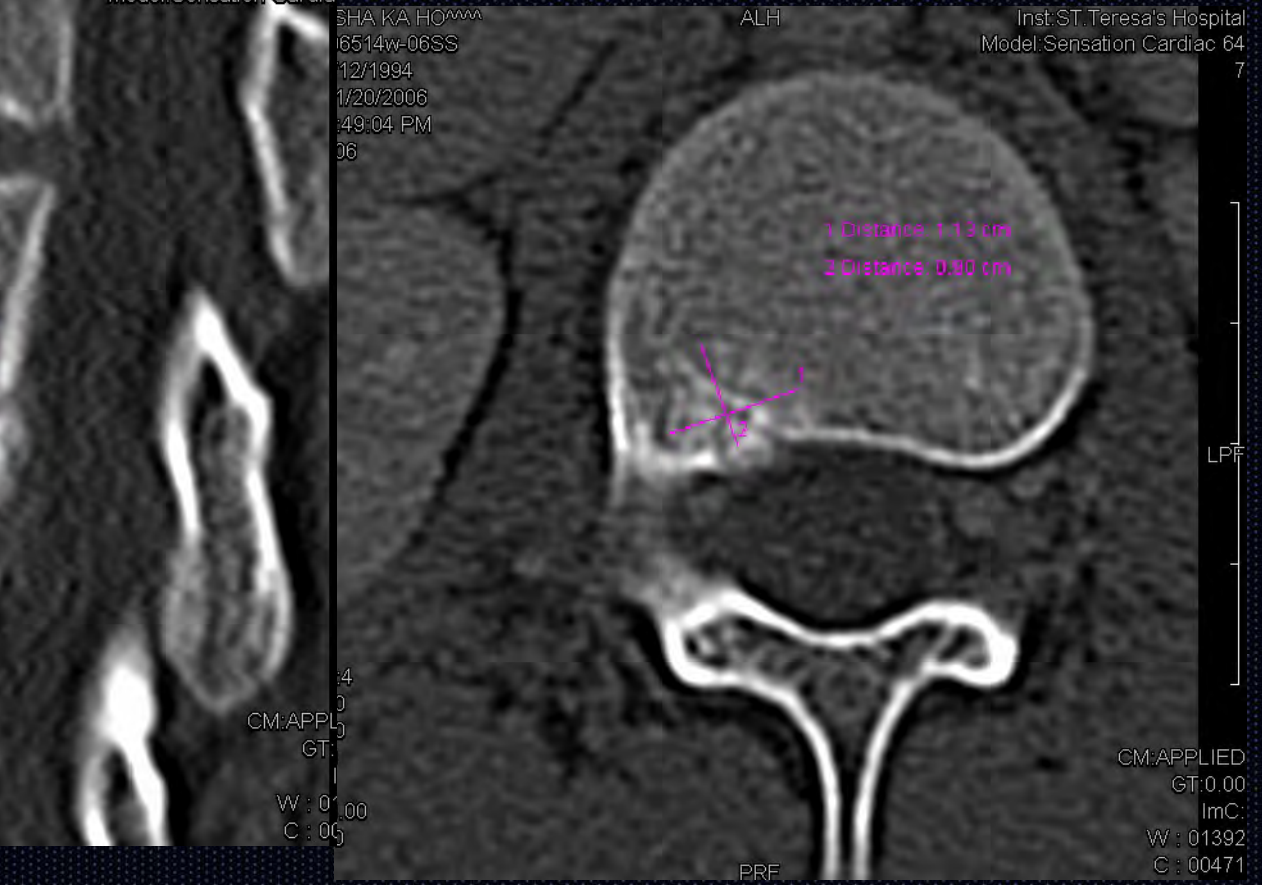
The Classic surround sclerosis and central grey Nidus

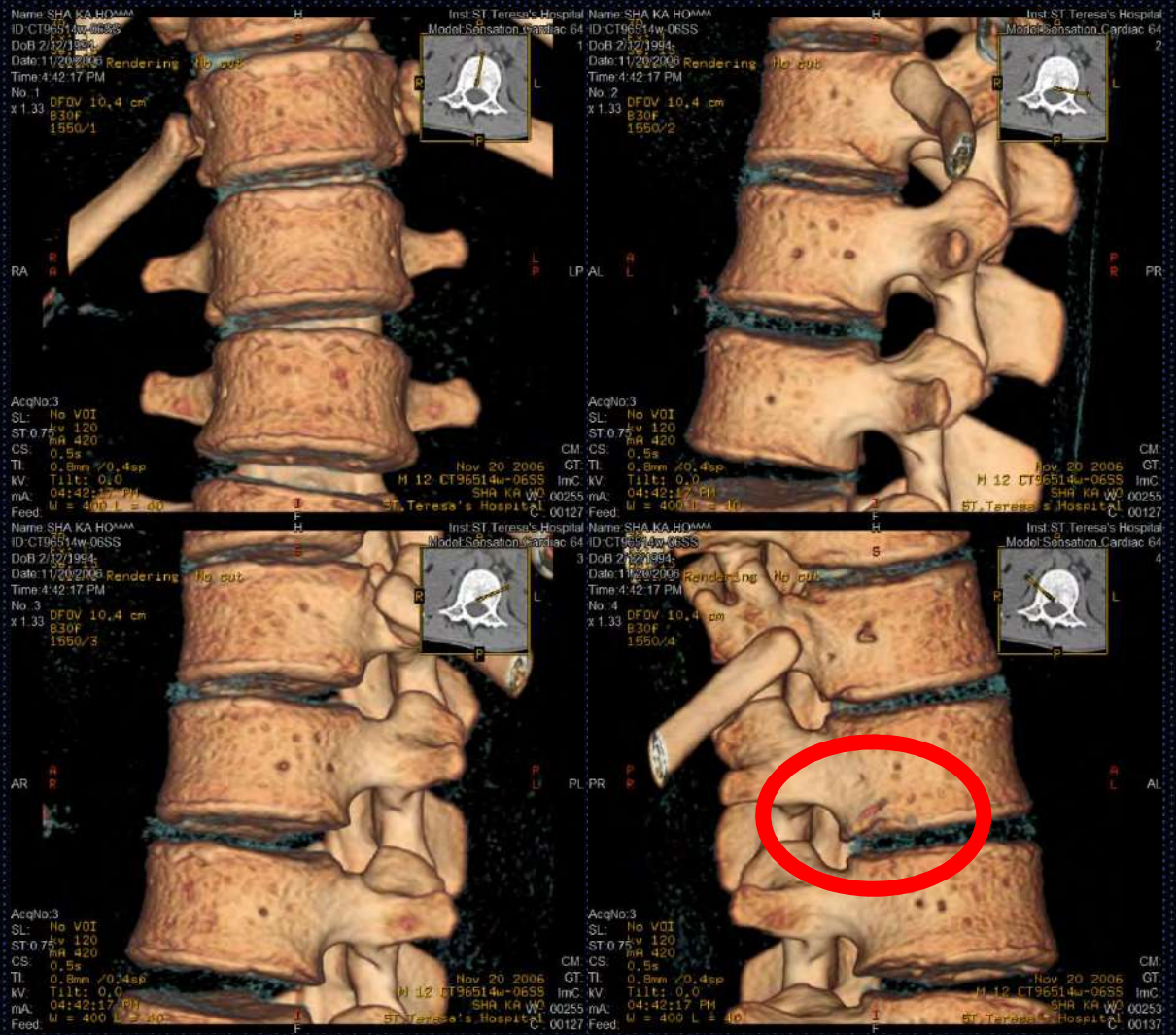
Osteoid Osteoma of Right Postero- Inferior L1



CT Scan


KA HO^^^^
-w-06SS
994
2006
2 PM
H
Inst:ST.Teresa's Hos
Model:Sensation Cardia
1 Distance: 1.13 cm
CM:APPL
GT:
W : 0
C : 0
E


SHA KA HO^^^^
6514w-06SS
12/1994
1/20/2006
:49:04 PM
06
ALH
Inst:ST.Teresa's Hospital
Model:Sensation Cardiac 64
7
1 Distance: 1.13 cm
2 Distance: 0.90 cm
LPF
CM:APPLIED
GT:0.00
ImC:
W : 01392
C : 00471
PRF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Inst:ST.Teresa's Hospital
Model:Sensation_Cardiac 64
DoB 2/12/1994
Date:11/20/2006 Rendering No cut
Time:4:42:17 PM
No .1
x 1.33 DFOV 10.4 cm
B30F
1550/1
RA
AcqNo:3
SL: No VOI
ST:0.75 kv 120
mA 420
CS: 0.5s
TI: 0.8mm /0.4sp
kV: Tilt: 0.0
mA: 04:42:17 PM
Feed:
Nov 20 2006
M 12 CT96514w-06SS
SHA KA W: 00255
ST.Teresa's Hospital C: 00127
Name:SHA KA HO^^^^
Inst:ST.Teresa's Hospital
Model:Sensation_Cardiac 64
DoB 2/12/1994
Date:11/20/2006 Rendering No cut
Time:4:42:17 PM
No .2
x 1.33 DFOV 10.4 cm
B30F
1550/2
LP AL
AcqNo:3
SL: No VOI
ST:0.75 kv 120
mA 420
CS: 0.5s
TI: 0.8mm /0.4sp
kV: Tilt: 0.0
mA: 04:42:17 PM
Feed:
Nov 20 2006
M 12 CT96514w-06SS
SHA KA W: 00255
ST.Teresa's Hospital C: 00127
Name:SHA KA HO^^^^
Inst:ST.Teresa's Hospital
Model:Sensation_Cardiac 64
DoB 2/12/1994
Date:11/20/2006 Rendering No cut
Time:4:42:17 PM
No .3
x 1.33 DFOV 10.4 cm
B30F
1550/3
AR
AcqNo:3
SL: No VOI
ST:0.75 kv 120
mA 420
CS: 0.5s
TI: 0.8mm /0.4sp
kV: Tilt: 0.0
mA: 04:42:17 PM
Feed:
Nov 20 2006
M 12 CT96514w-06SS
SHA KA W: 00255
ST.Teresa's Hospital C: 00127
Name:SHA KA HO^^^^
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Model:Sensation_Cardiac 64
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No .4
x 1.33 DFOV 10.4 cm
B30F
1550/4
PL PR
AcqNo:3
SL: No VOI
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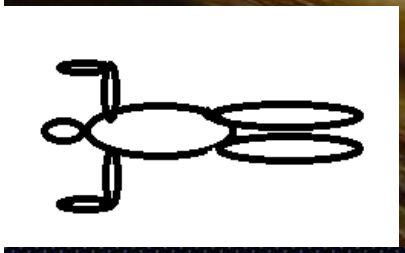
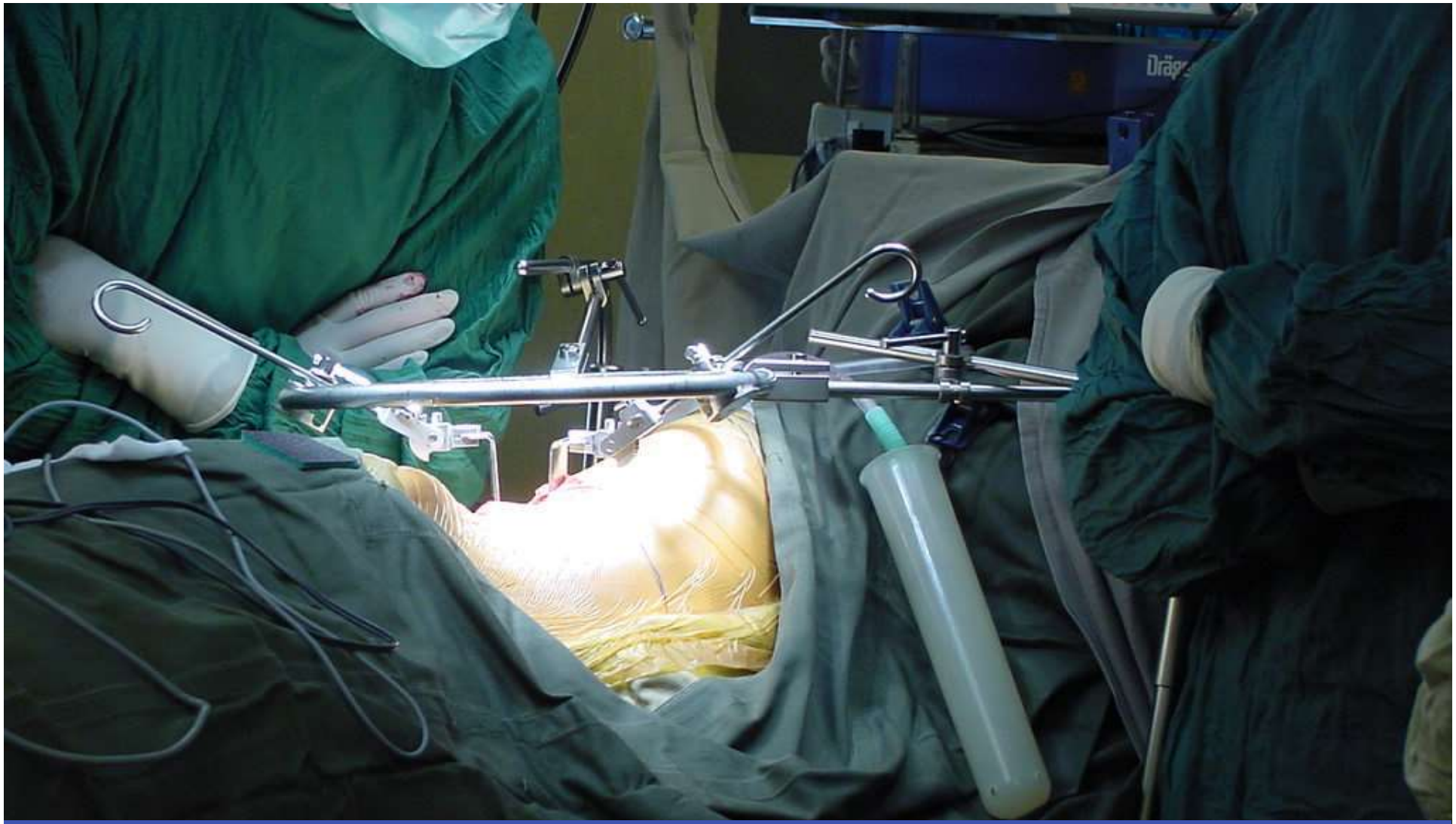
mA 420
CS: 0.5s
TI: 0.8mm /0.4sp
kV: Tilt: 0.0
mA: 04:42:17 PM
Feed:
Nov 20 2006
M 12 CT96514w-06SS
SHA KA W: 00253
ST.Teresa's Hospital C: 00137

Treatment Options

- Percutaneous Ablation under CT guidance
  - Percutaneous excision
  - Radiofrequency (RF)
  - Laser
  - Ethanol
  - Thermocoagulation

Open excision as no experience with percutaneous technique

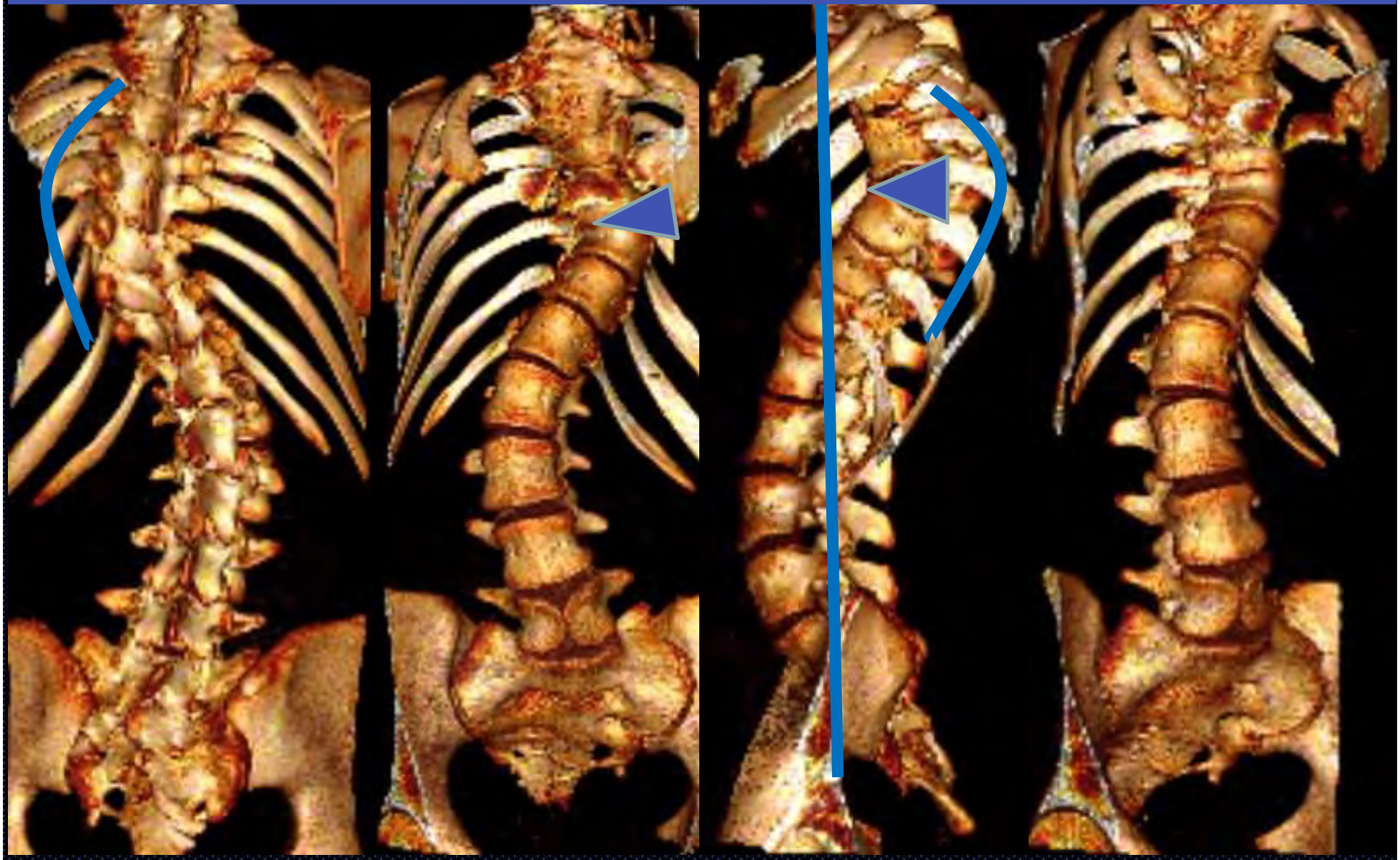




With Synframe no retraction by surgeons! We don’t do nothing

No pain like out of Hell !

Image reconstruction and computer age surgery



Loading 100mg/kg over one hour followed by 10mg/kg/hr continuos infusion

Ng *et al. Scoliosis* (2015) 10:28
DOI 10.1186/s13013-015-0052-9

Scoliosis

RESEARCH Open Access

Use of Tranexamic Acid (TXA) on reducing blood loss during scoliosis surgery in Chinese adolescents

Bobby K. W. Ng[1,3*], WW Chau[1], Alec L. H. Hung[1], Anna CN Hui[2], Tze Ping Lam[1] and Jack C. Y. Cheng[1]

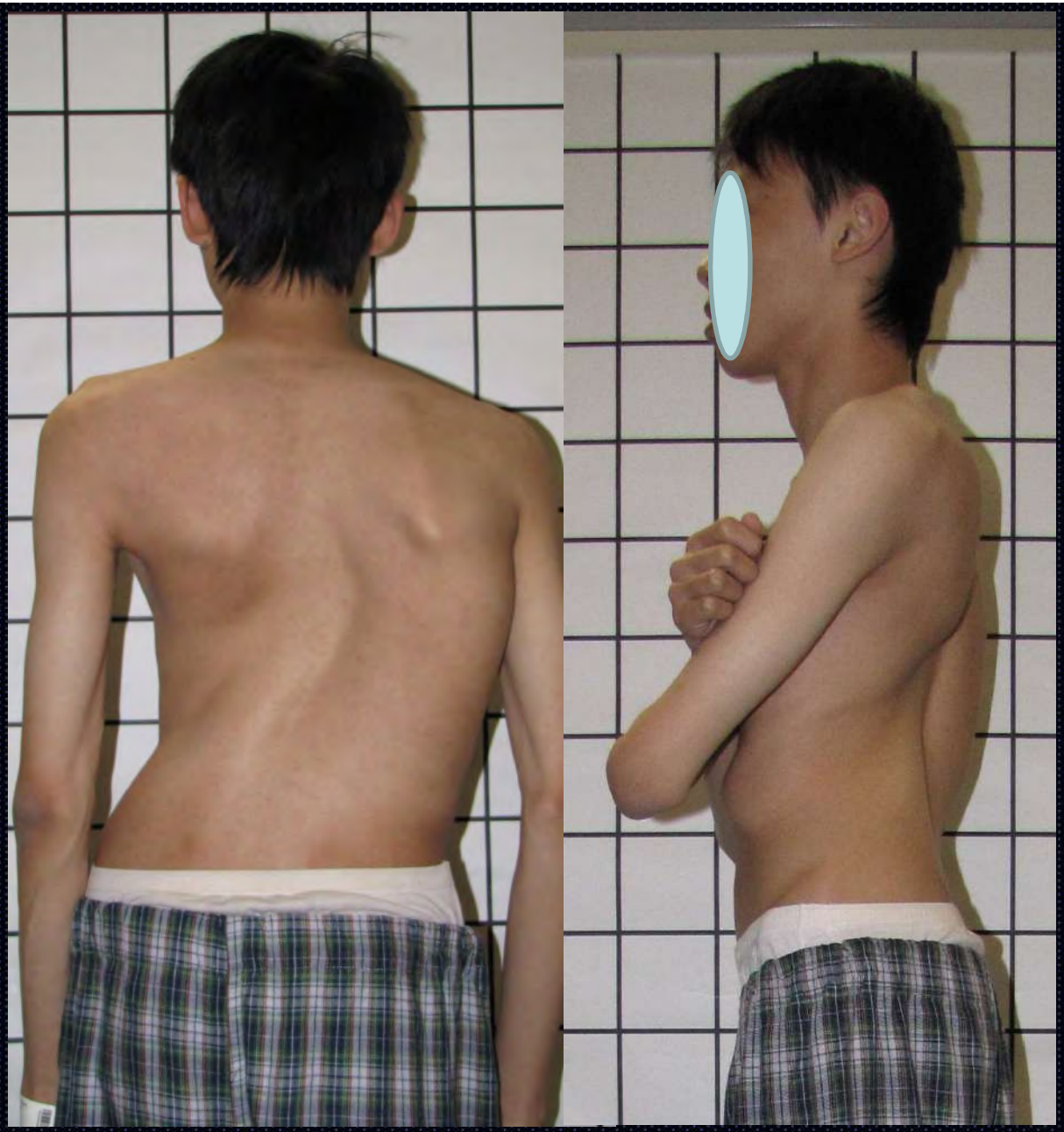
Results

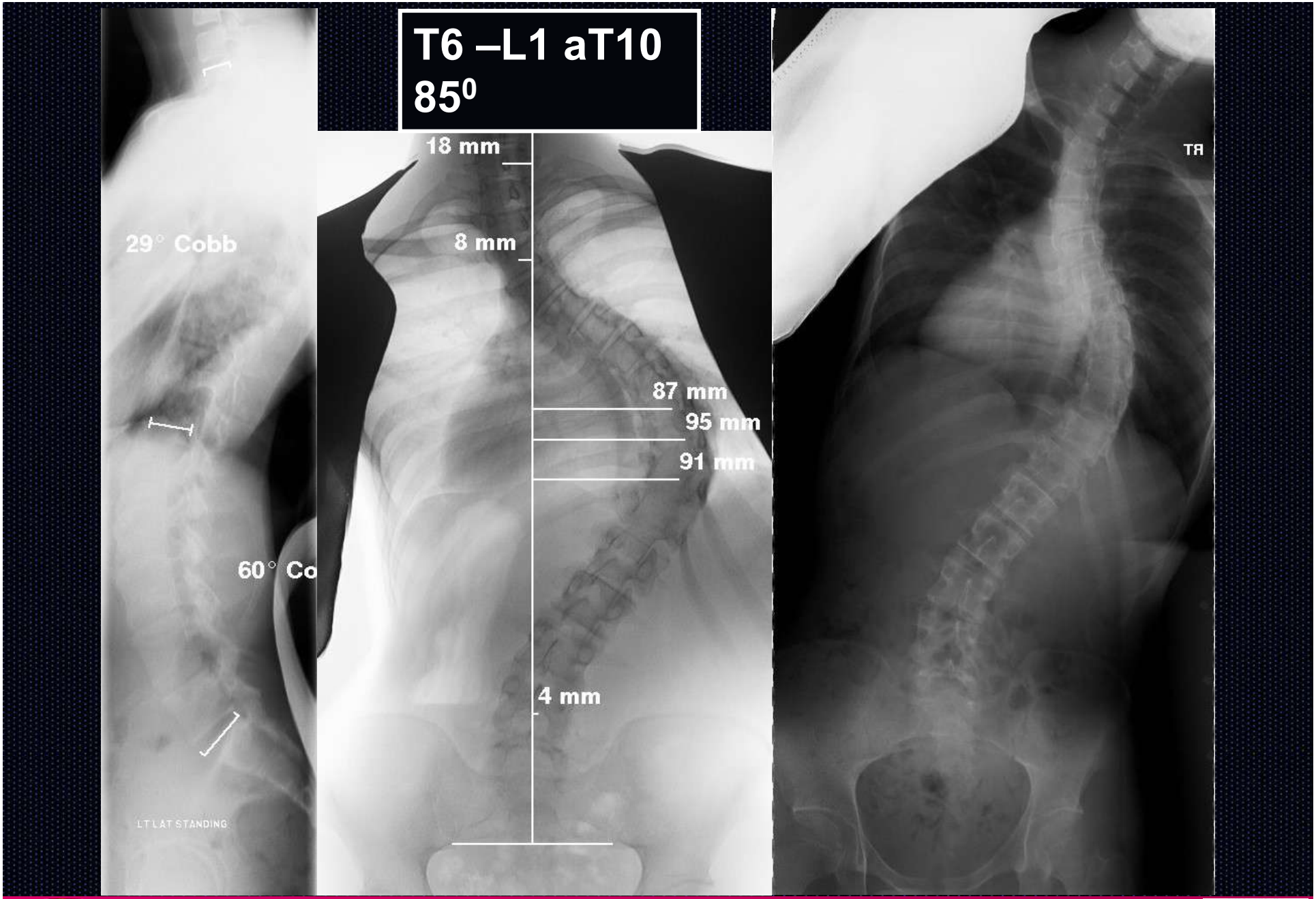
53.0% reduction

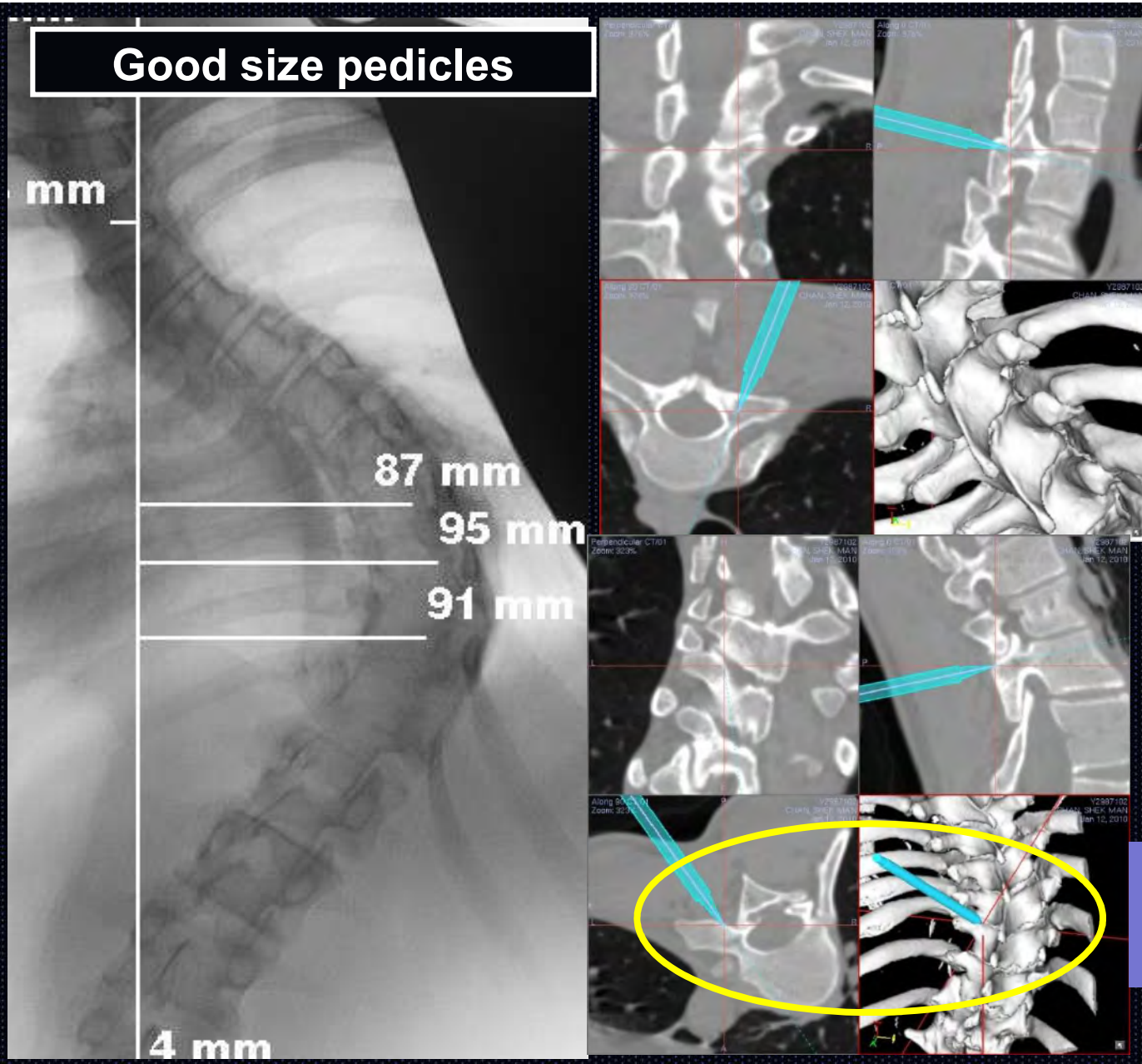
Parameters	Tranexamic acid		P
	TXA (N = 55)	Control (N = 35)	
Estimated Blood Loss recorded by anaesthetist (ml)	1826.11±1081.45	3889.60±2440.80	<0.01
Total blood loss per segment by anaesthetist estimation (ml/segment)	135.62±78.10	328.44±222.68	<0.01

CSM

M/17.4



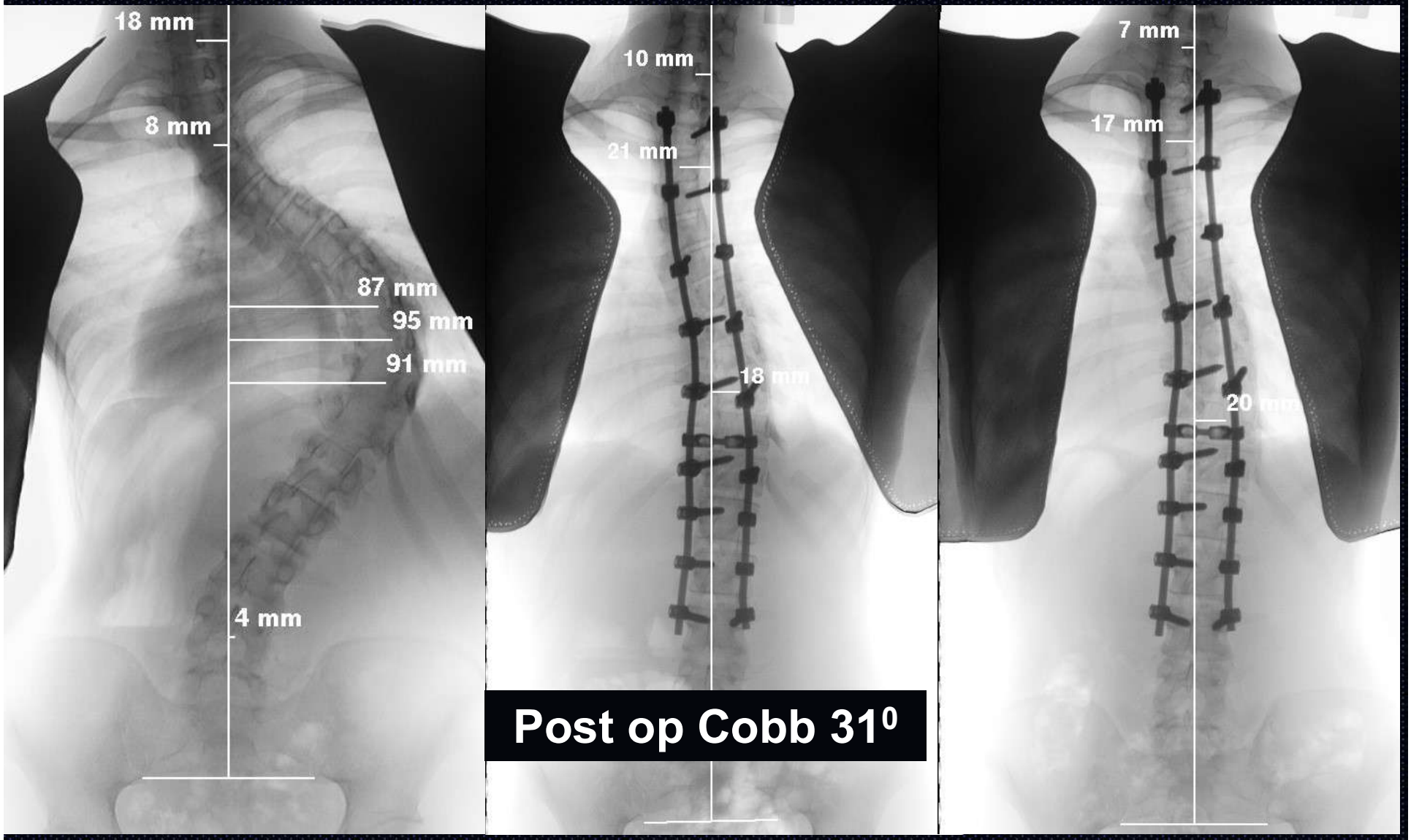

T6 –L1 aT10
85⁰
29° Cobb
60° Co
LT LAT STANDING
18 mm
8 mm
87 mm
95 mm
91 mm
4 mm
TR



T10
Concave

VATSAR T7-11, PISF T2 –L3

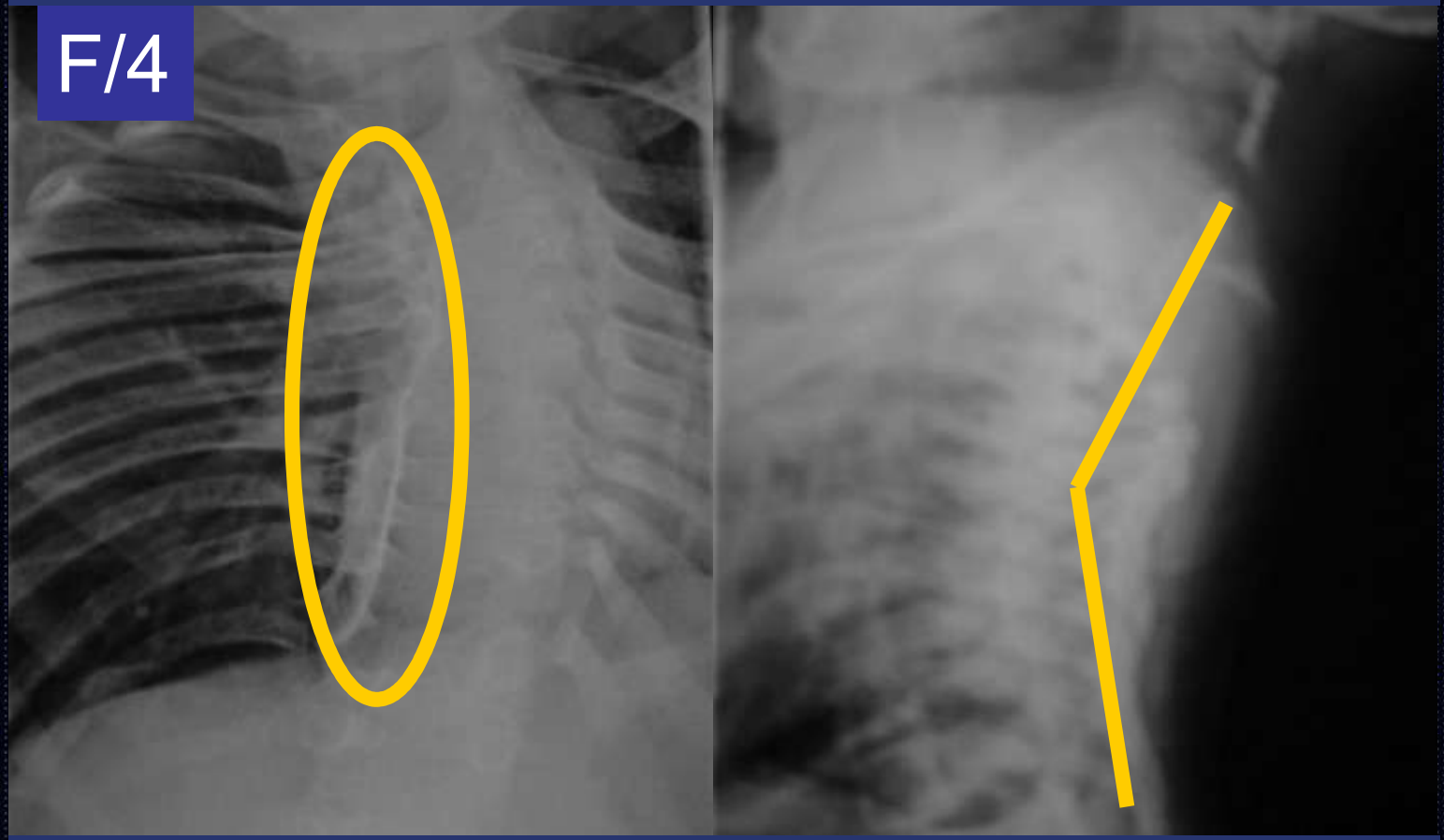
3 months post operation



Post op Cobb 31^0

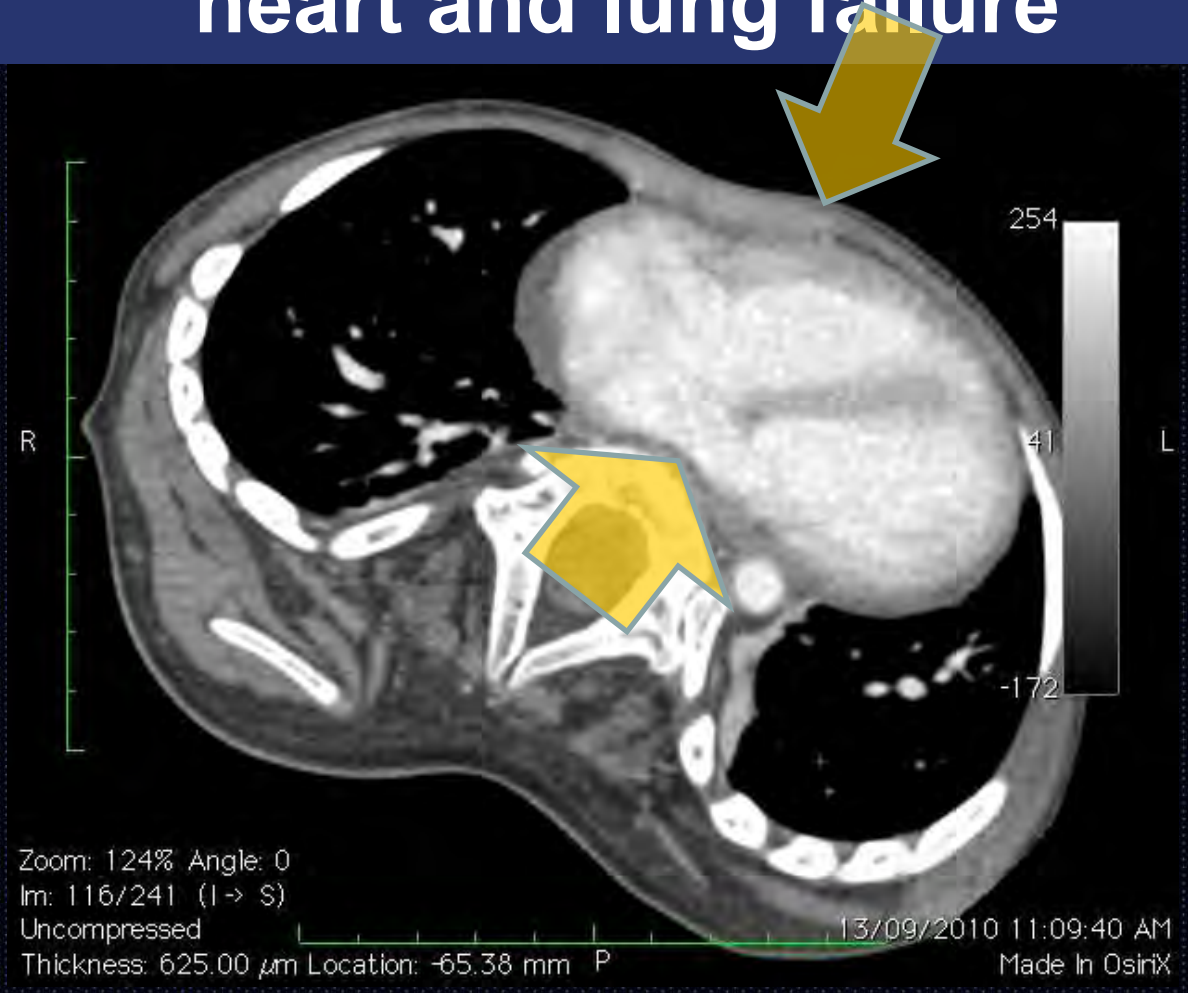
Escobar Syndrome consists of Thoracic Lordosis, Multiple pterygium Arthrogryposis

Dodson & Boachie Adjei
" Hollow in Chest" Winter RB



Patient was inpatient in NICU till age 2

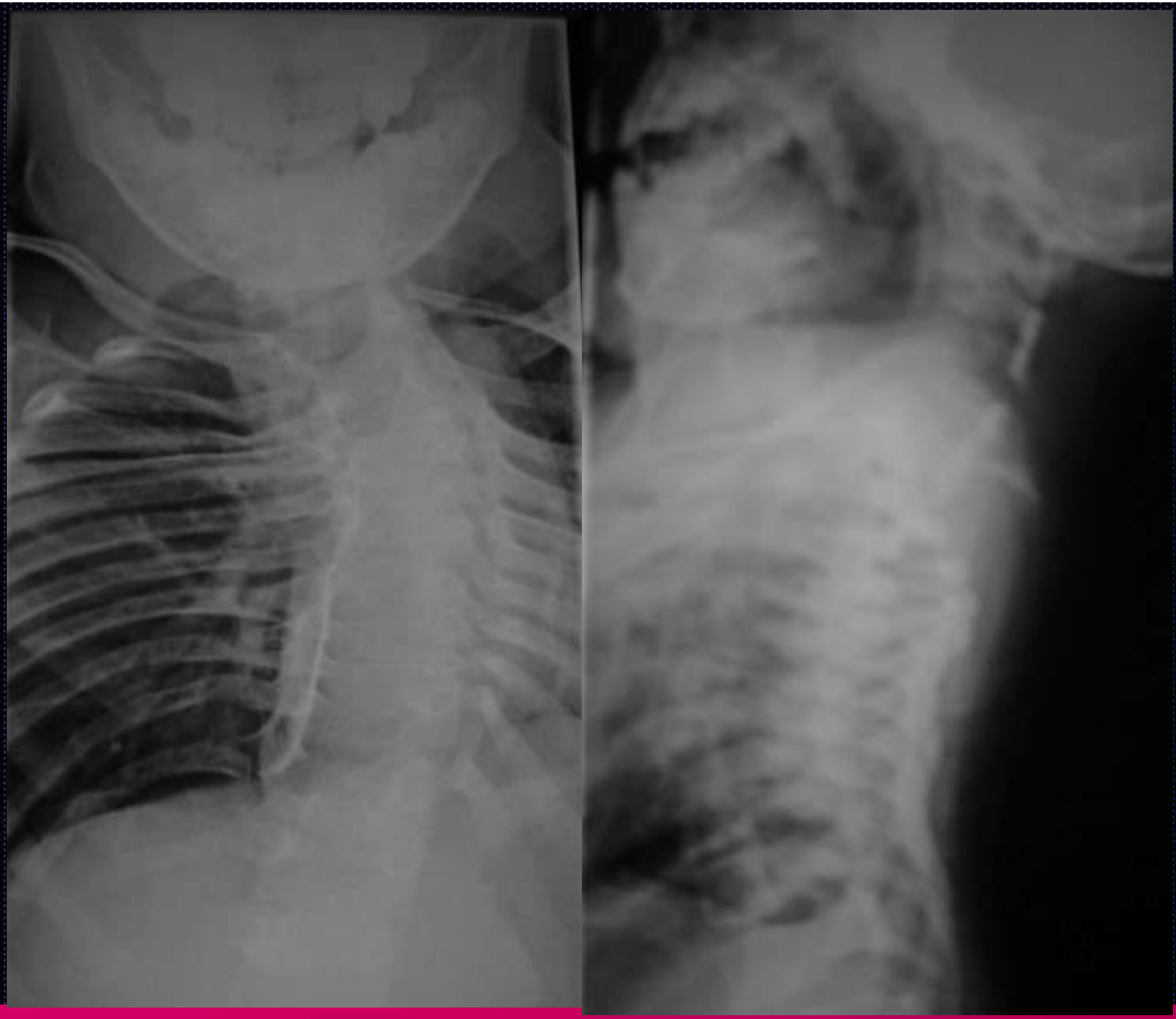
At age 4 condition worsened with critical heart and lung failure



T10 Body – Compression Pulmonary trunks

DNM Age 2

Hole in the chest

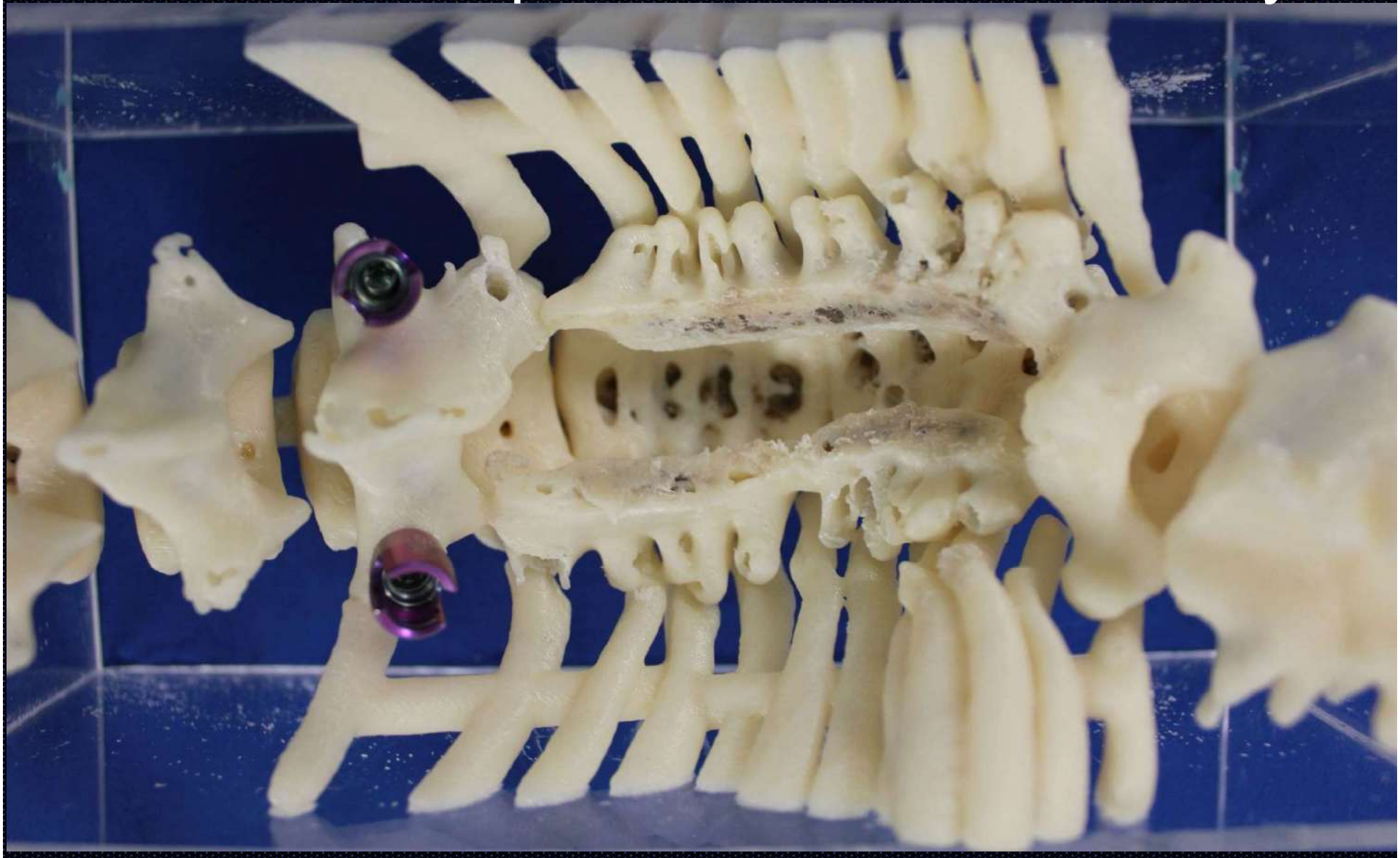


Rapid prototyping model allows pre-operative simulation surgery

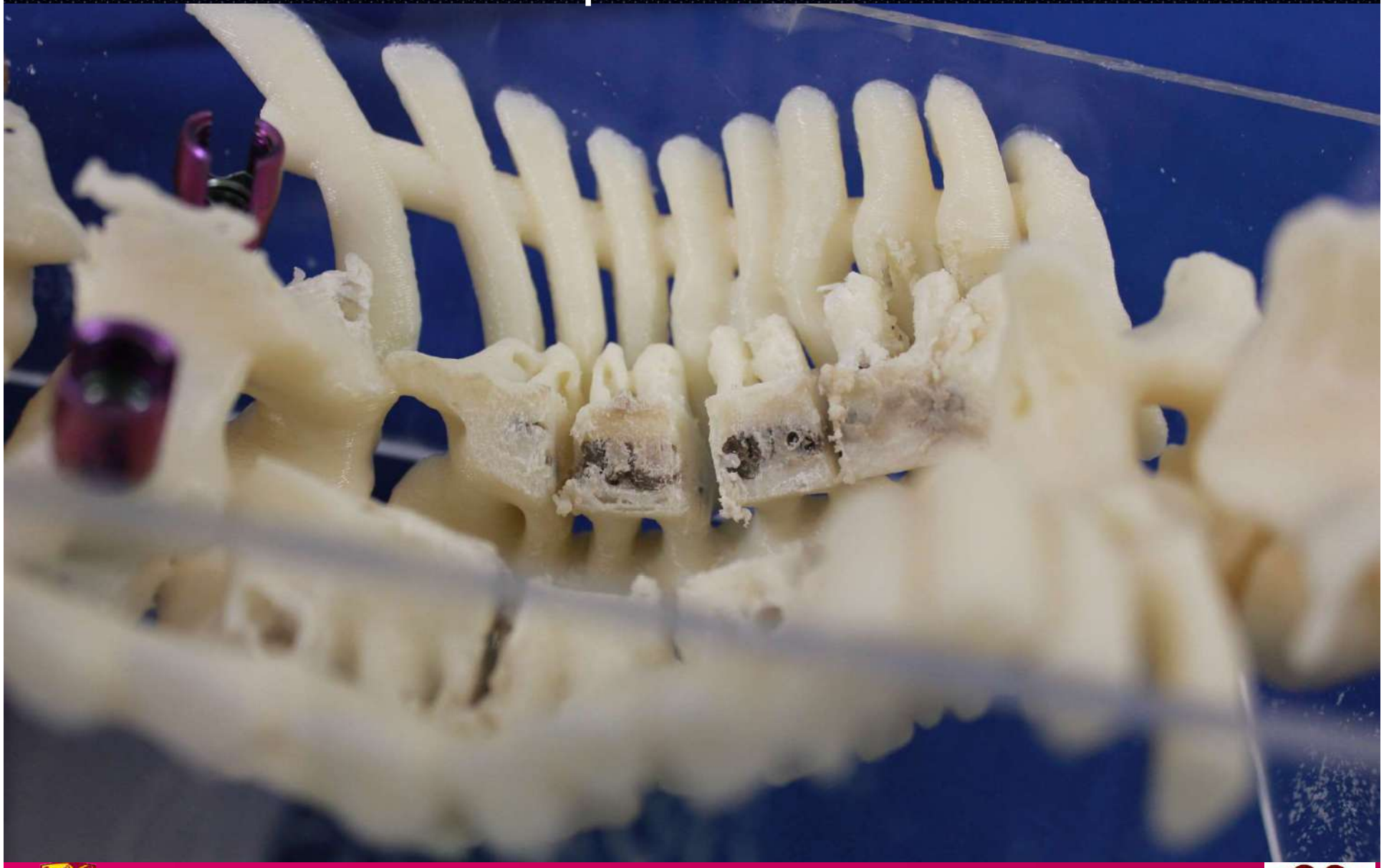
Department of O&T PWH CUHK

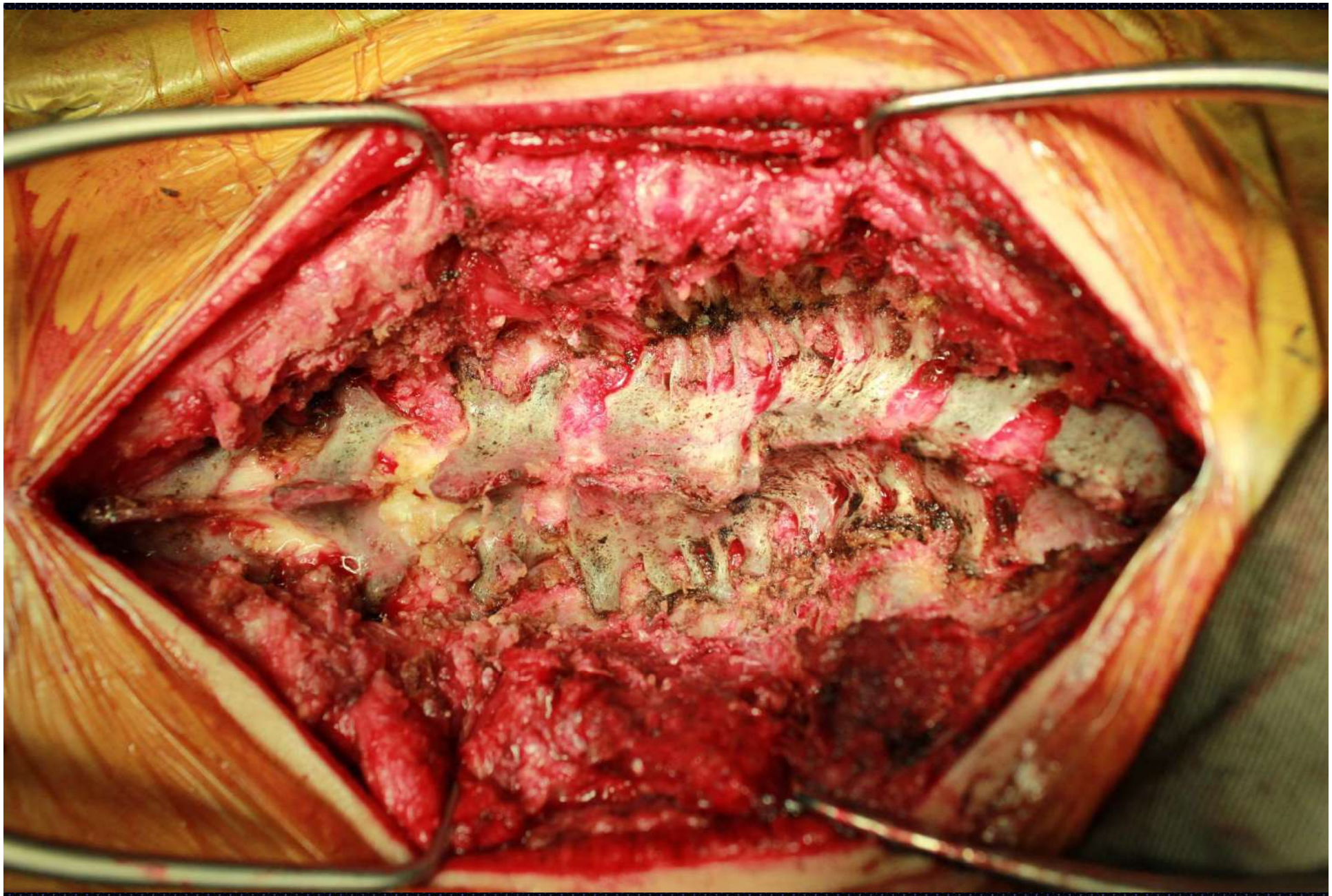
Simulate Navigation Guided Instrumentation according to plan

Simulate complete enbloc laminectomy

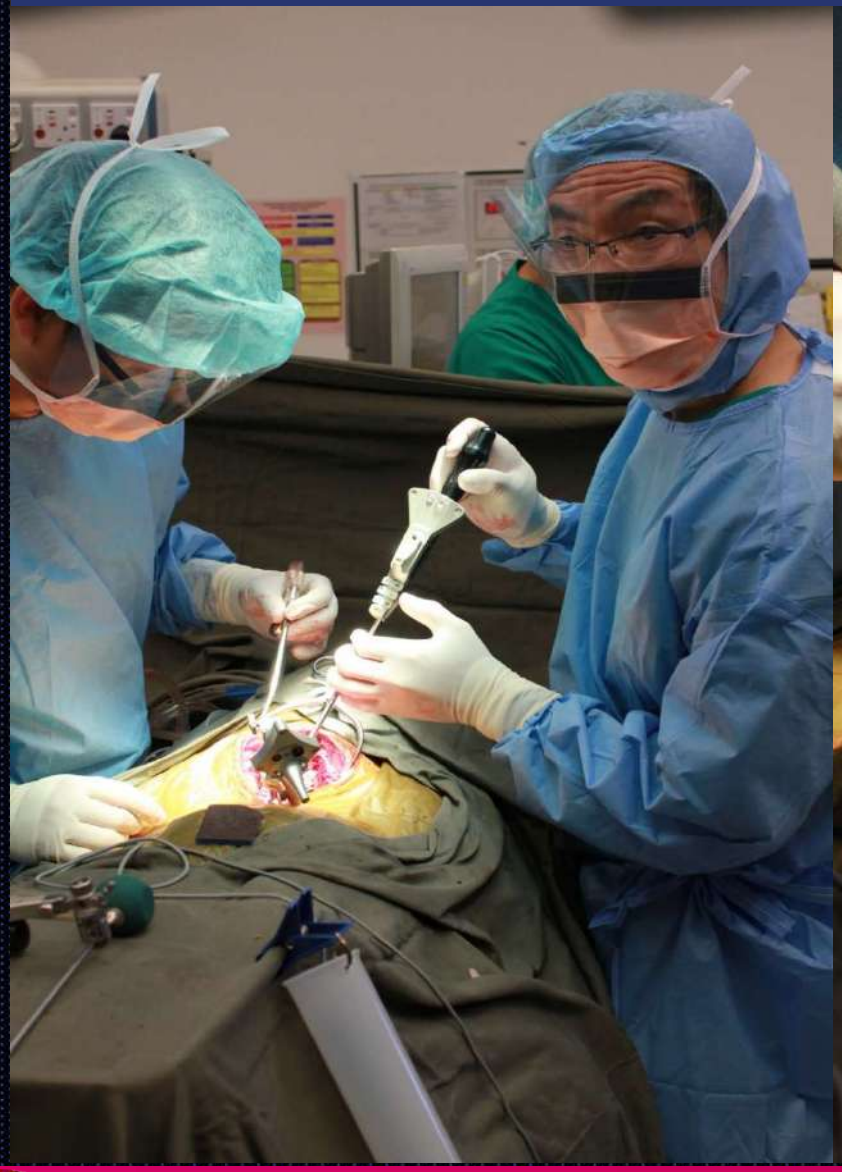


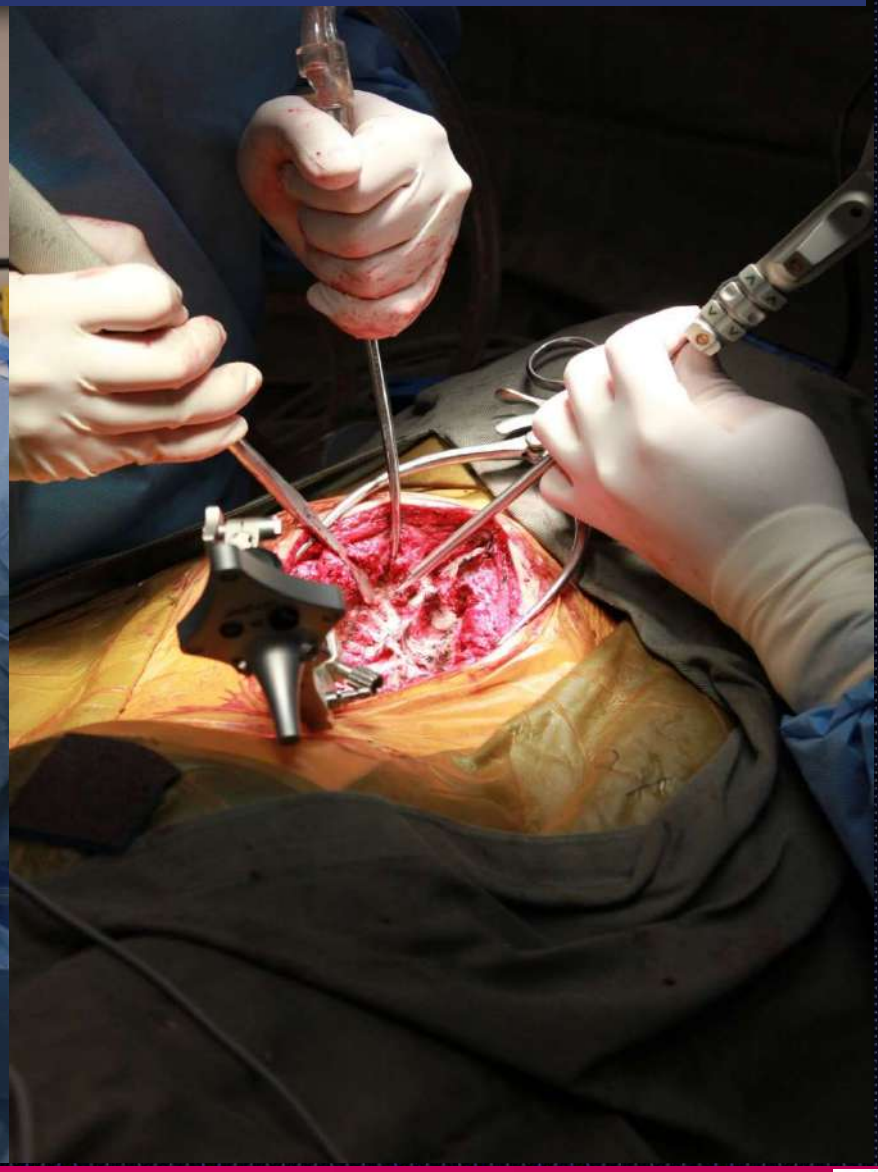
Simulate interpedicular osteotomies

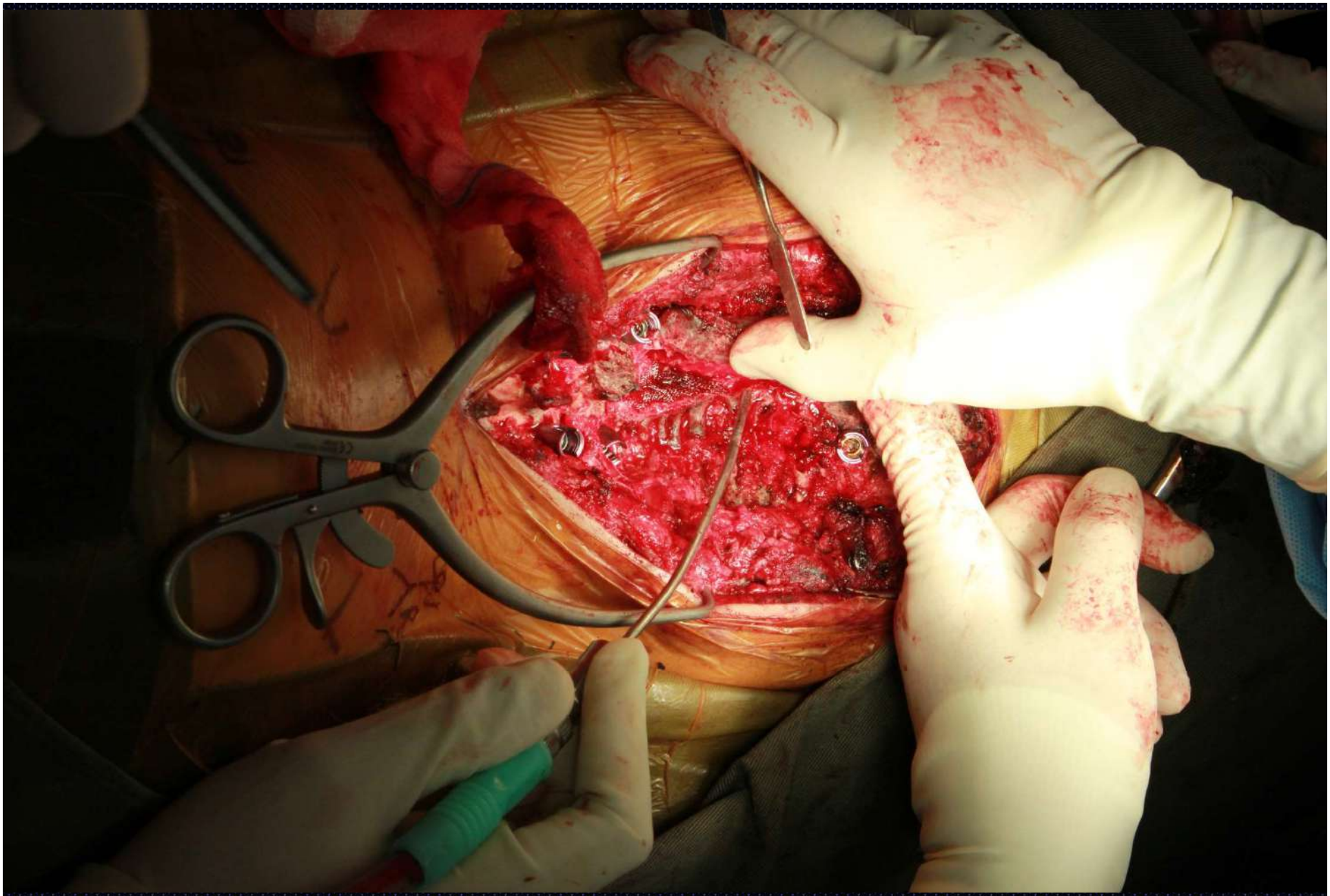


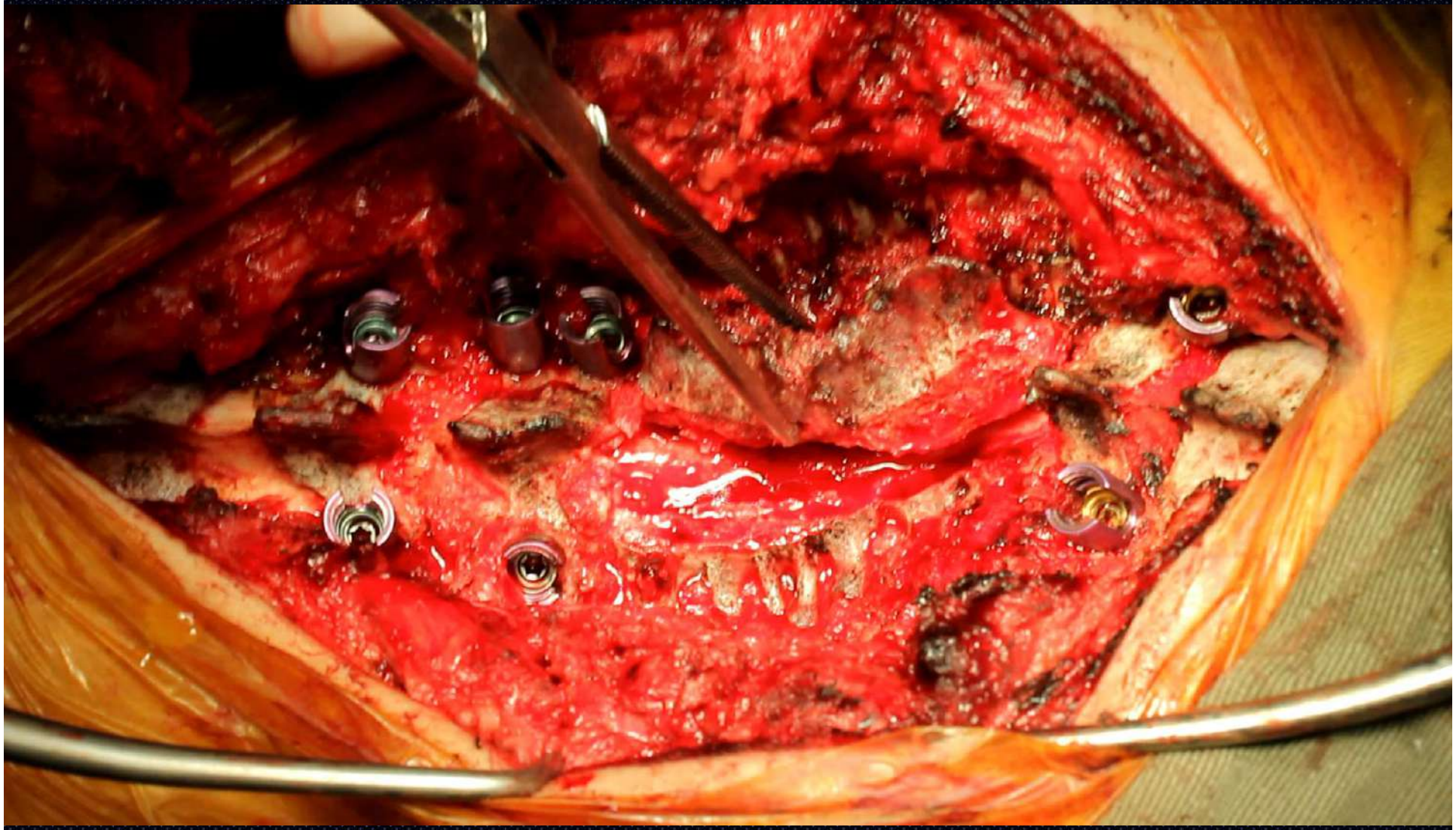


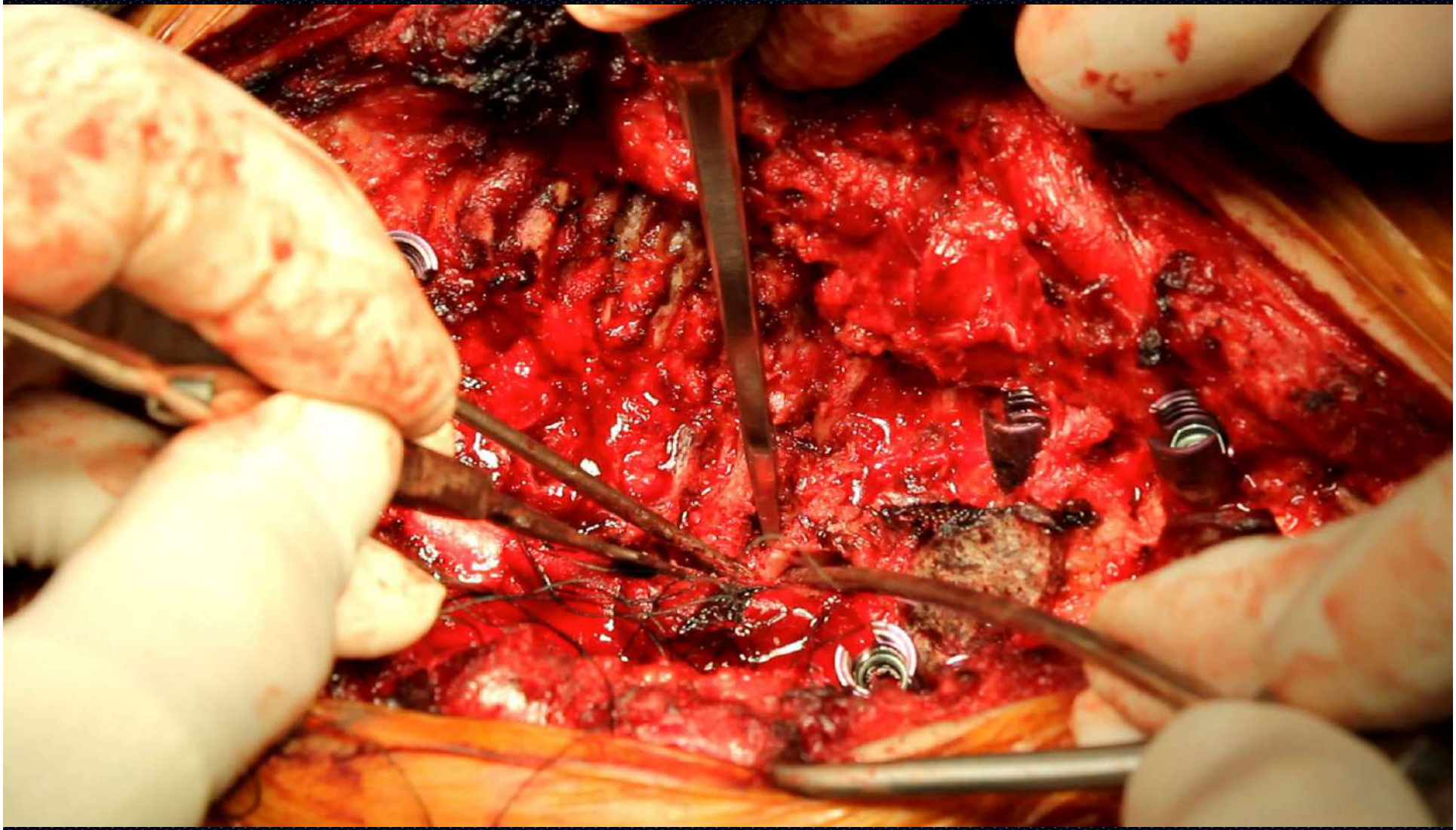
Navigation Guided instrumentation of pedicle screws



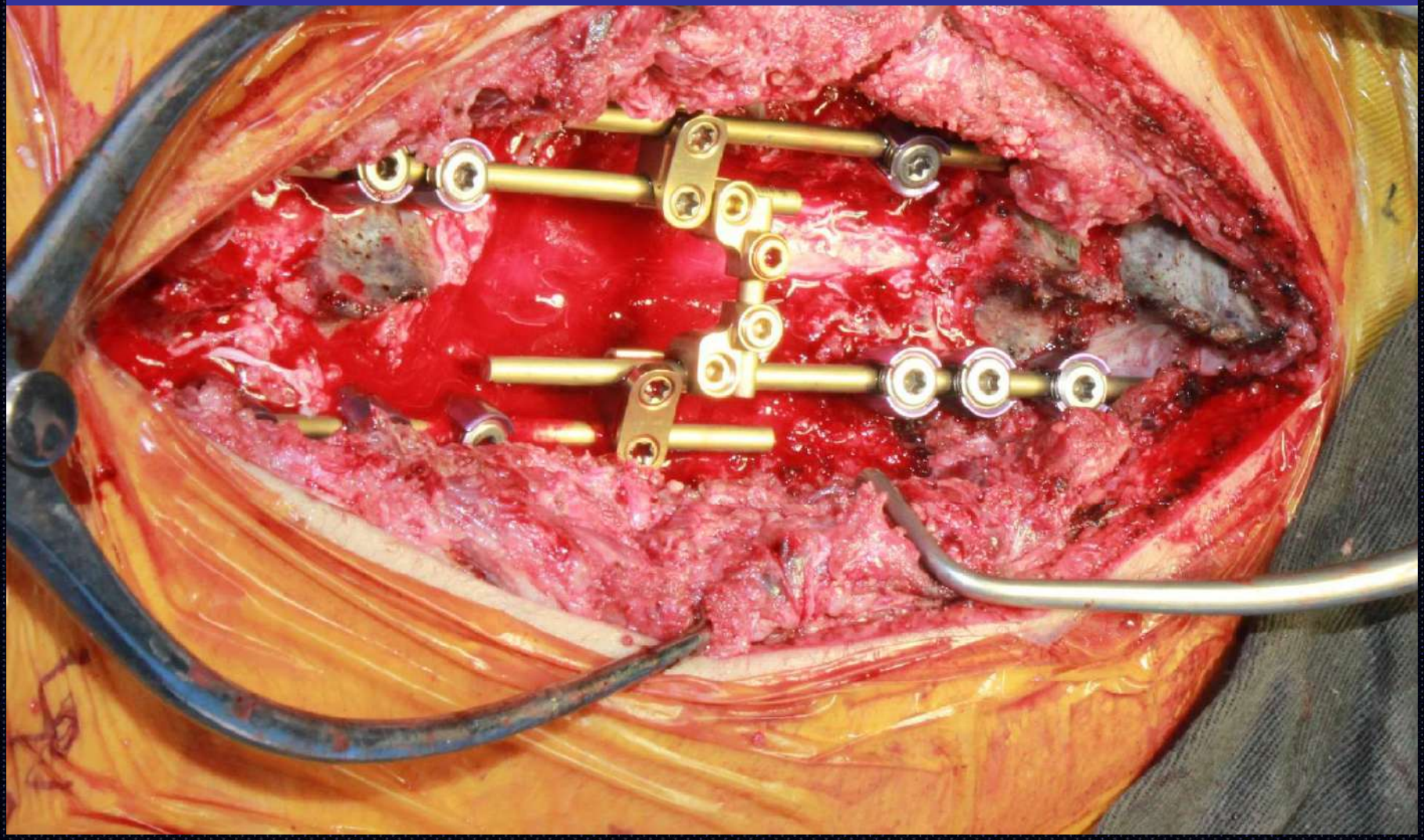








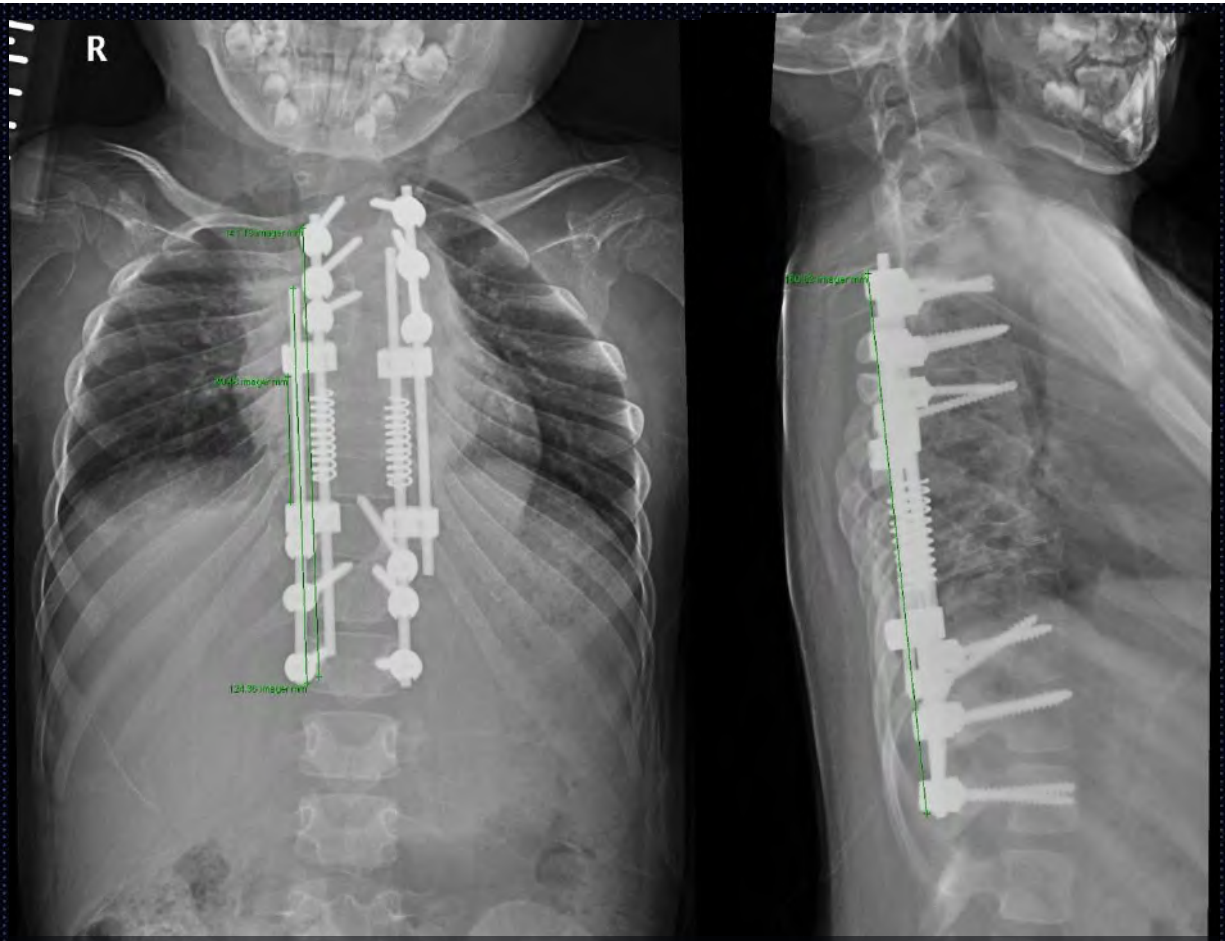
Pulled Lordosis out and fix the spine “ Synapse- off label”



Post ICU

- Very happy child and family
- First time able to lie flat on her back without being breathless

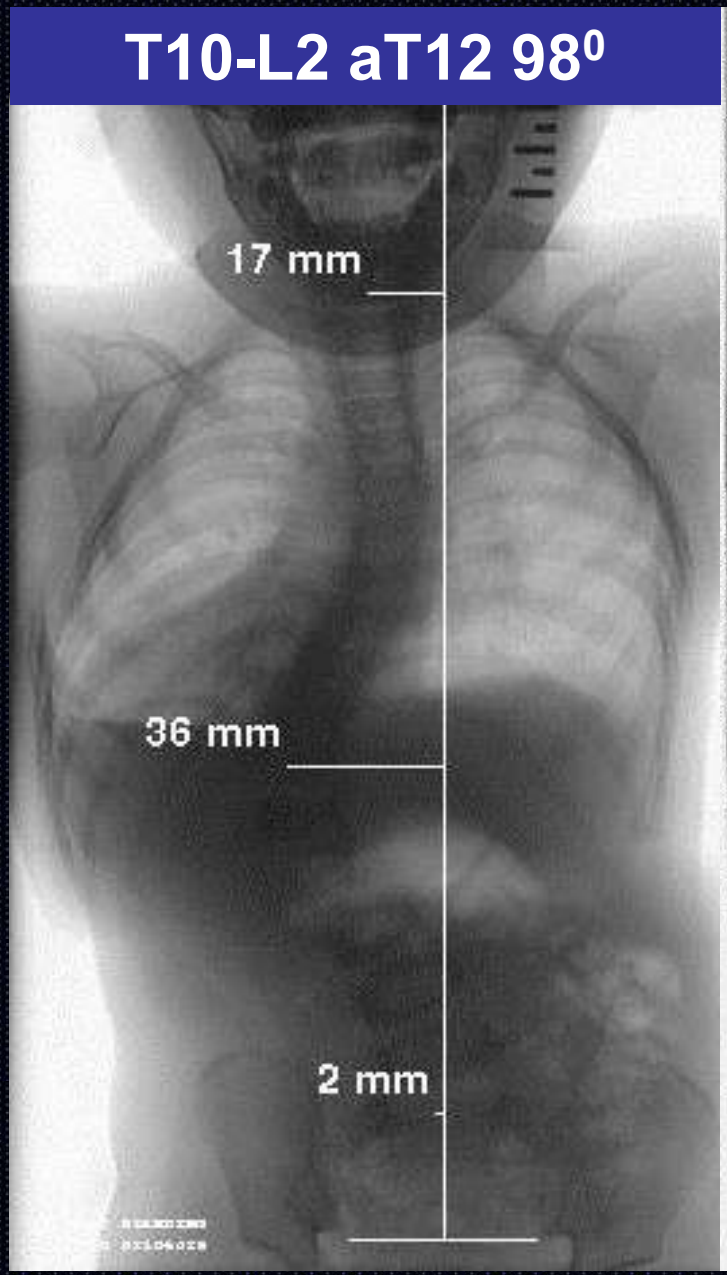
No Oxygen
Able to walk
Slower heart rate
Off Frusemide

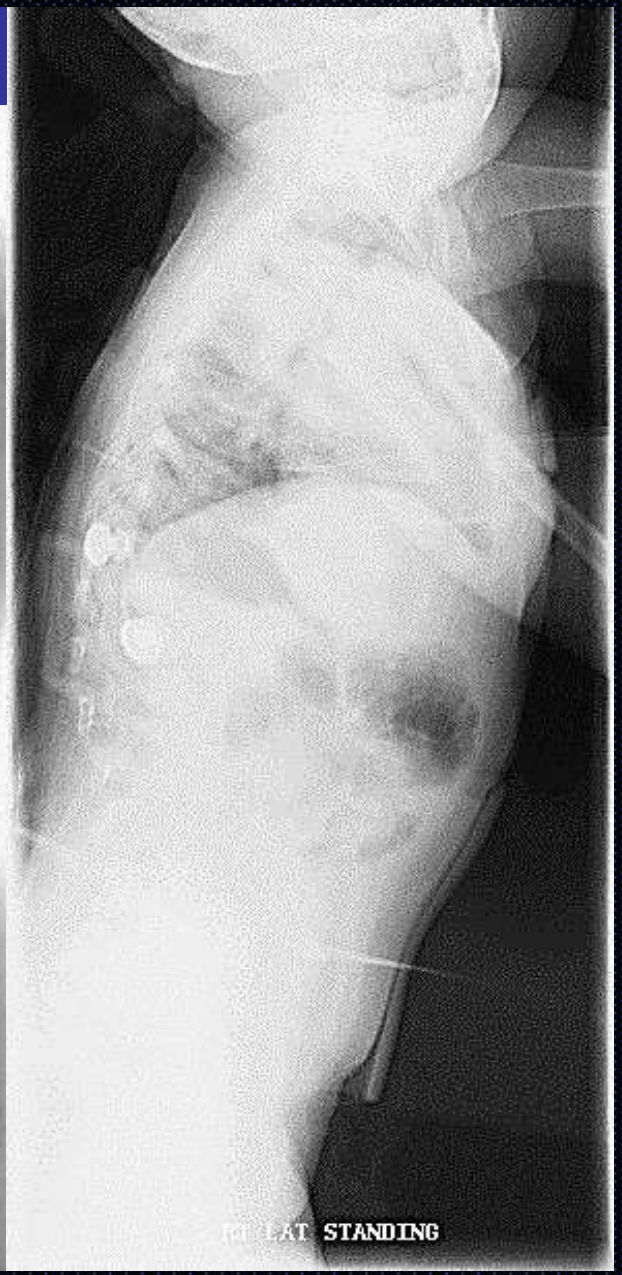


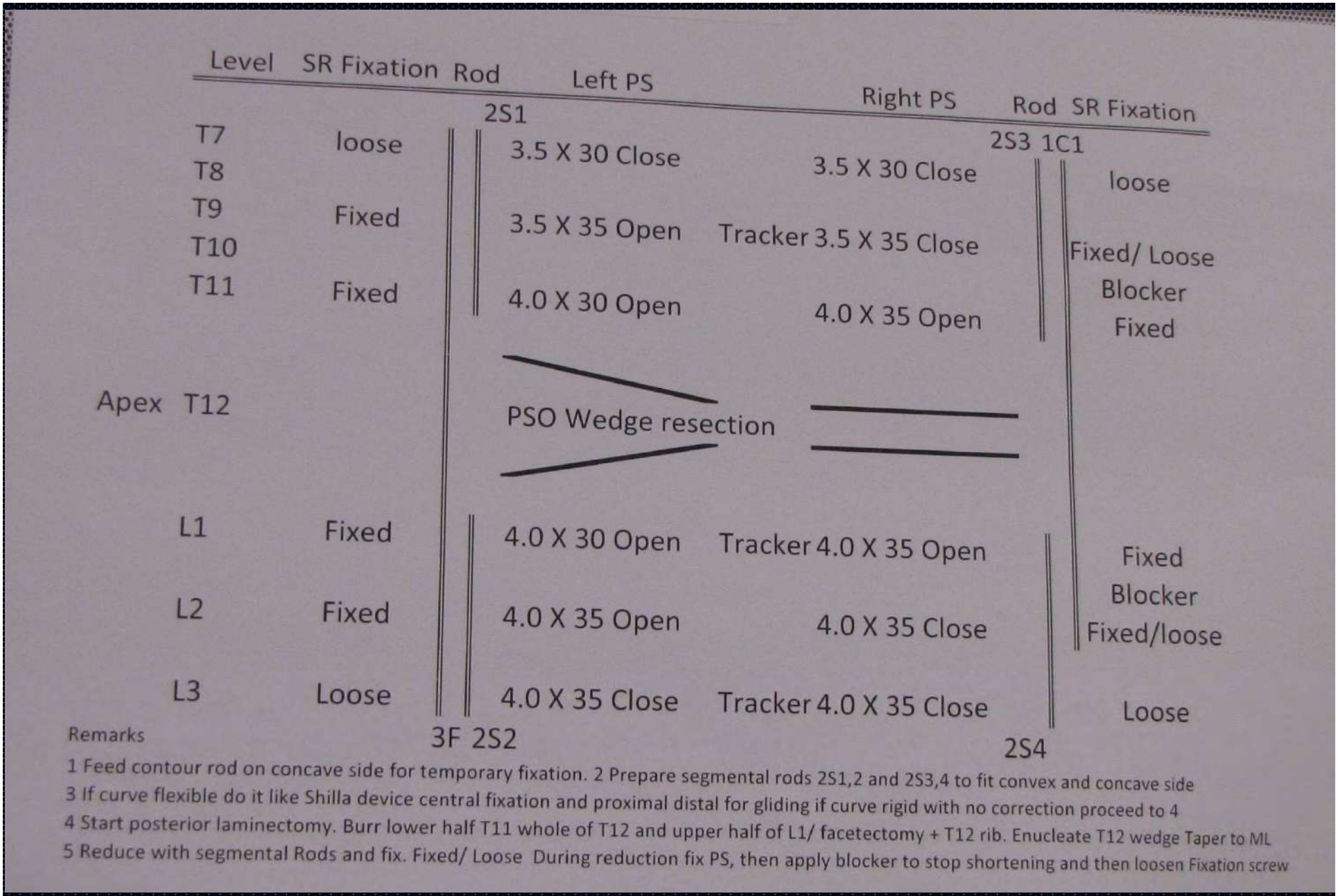
First Lengthening 6 months post initial surgery with Home made spring loaded distraction growing construct

F/5 Left TL scoliosis wedged vertebra L1

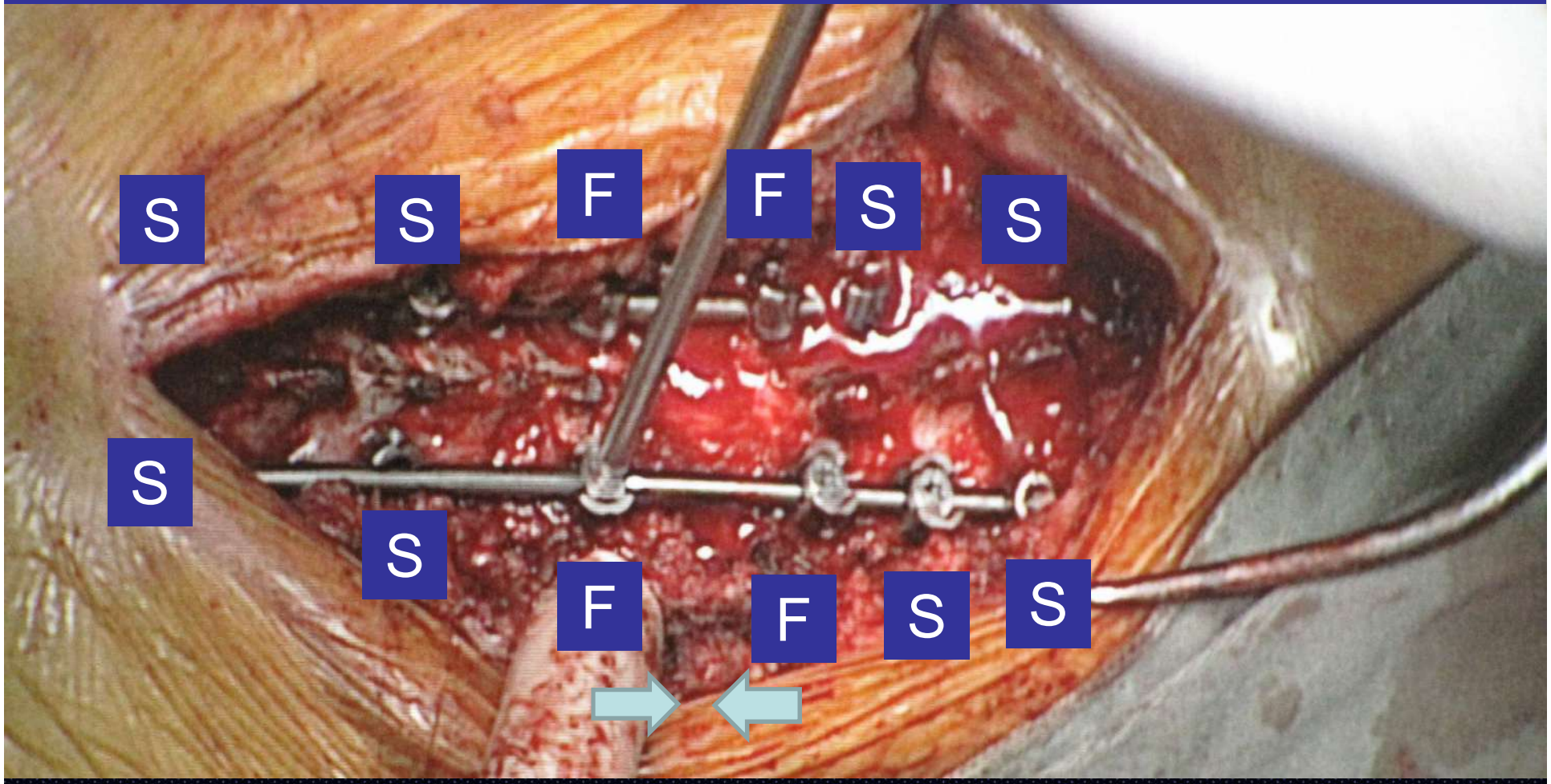
T10-L2 aT12 98^0

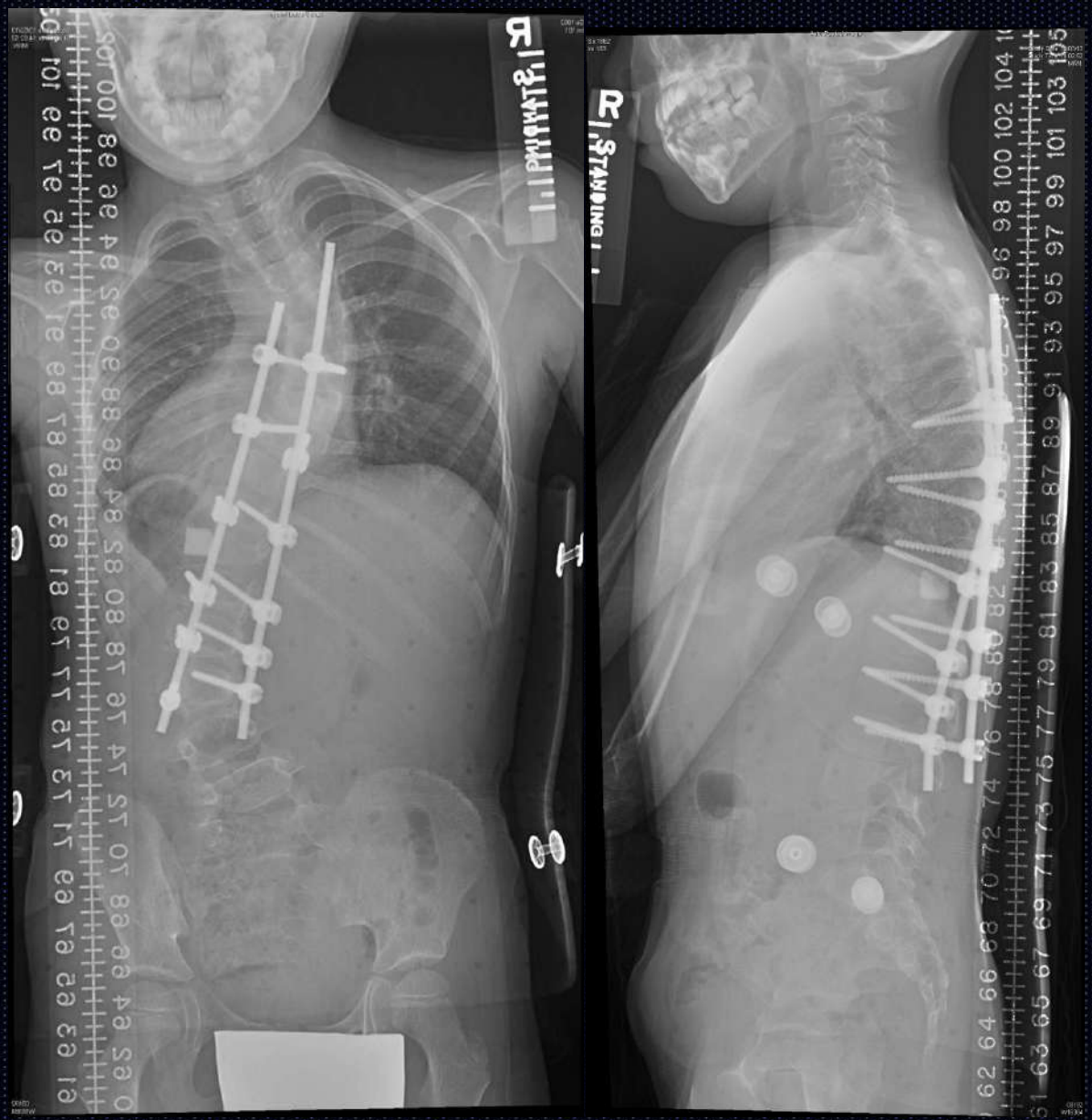




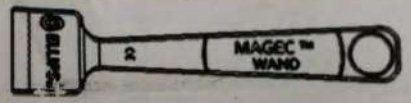

Level
SR Fixation
Rod
Left PS
Right PS
Rod
SR Fixation
2S1
2S3
1C1
T7
T8
T9
T10
T11
loose
Fixed
Fixed
3.5 X 30 Close
3.5 X 35 Open
4.0 X 30 Open
3.5 X 30 Close
Tracker
3.5 X 35 Close
4.0 X 35 Open
loose
Fixed/ Loose
Blocker
Fixed
Apex T12
PSO Wedge resection
L1
L2
L3
Fixed
Fixed
Loose
4.0 X 30 Open
4.0 X 35 Open
4.0 X 35 Close
Tracker
4.0 X 35 Close
4.0 X 35 Close
Fixed
Blocker
Fixed/loose
Loose
Remarks
3F 2S2
2S4
1 Feed contour rod on concave side for temporary fixation. 2 Prepare segmental rods 2S1,2 and 2S3,4 to fit convex and concave side
3 If curve flexible do it like Shilla device central fixation and proximal distal for gliding if curve rigid with no correction proceed to 4
4 Start posterior laminectomy. Burr lower half T11 whole of T12 and upper half of L1/ facetectomy + T12 rib. Enucleate T12 wedge Taper to ML
5 Reduce with segmental Rods and fix. Fixed/ Loose During reduction fix PS, then apply blocker to stop shortening and then loosen Fixation screw

Shilla Construct apical T12 hemi-resection Fusion- 4 Sliding screws Above + Below





MAGEC WAND™ (MAGNET LOCATOR)



REF **Model:** MML-001 **Description:** MAGEC WAND™ (MAGNET LOCATOR)

LOT **Lot Number:** 121128-03

Date of Manufacturing: 2012-11

0.3 mm / 360°

Contents are non-sterile

NON-STERILE

no sterilization

Manufactured by: Ellipse Technologies, Inc.

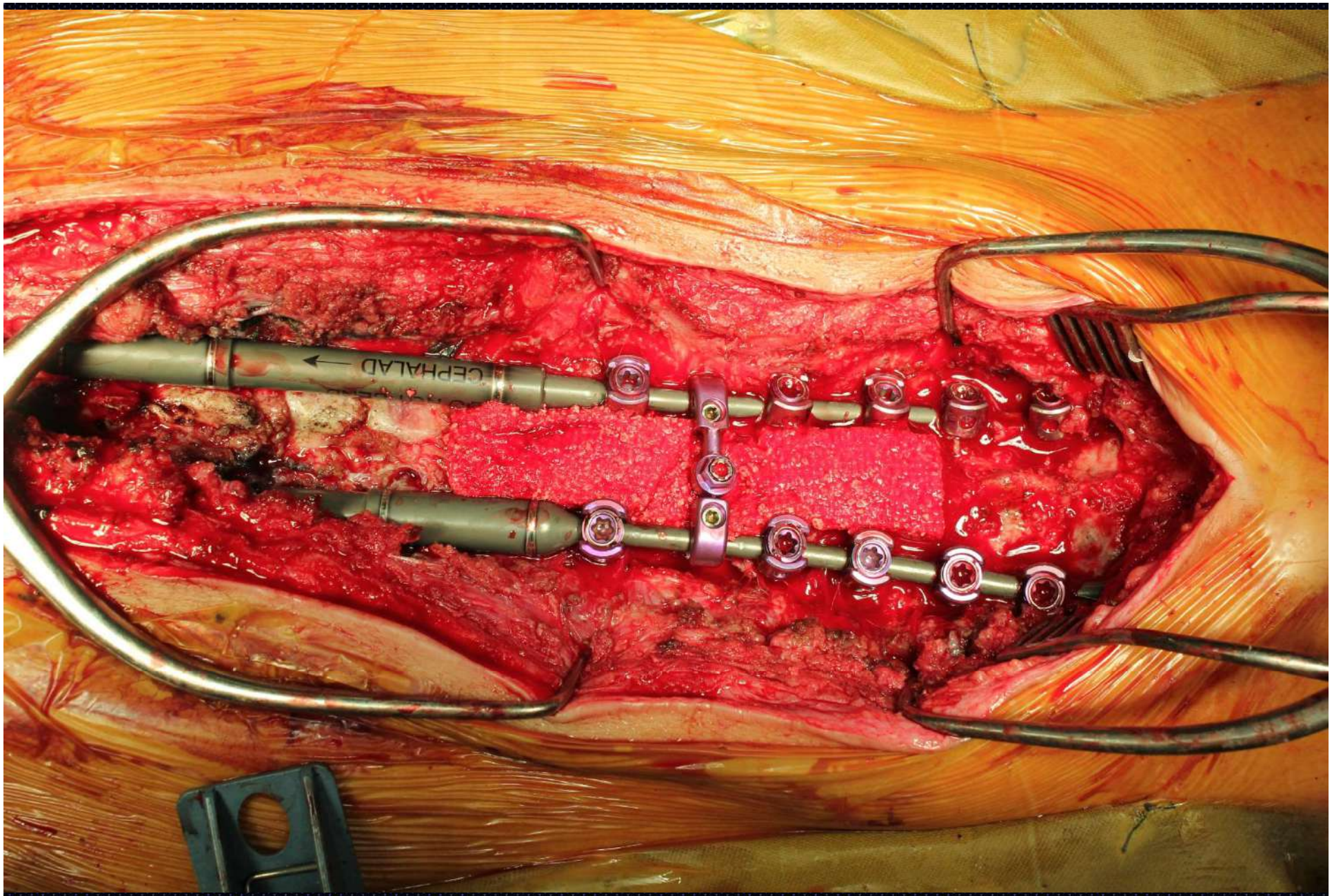
13900 Alton Parkway, Suite123, Irvine, CA 92618 USA

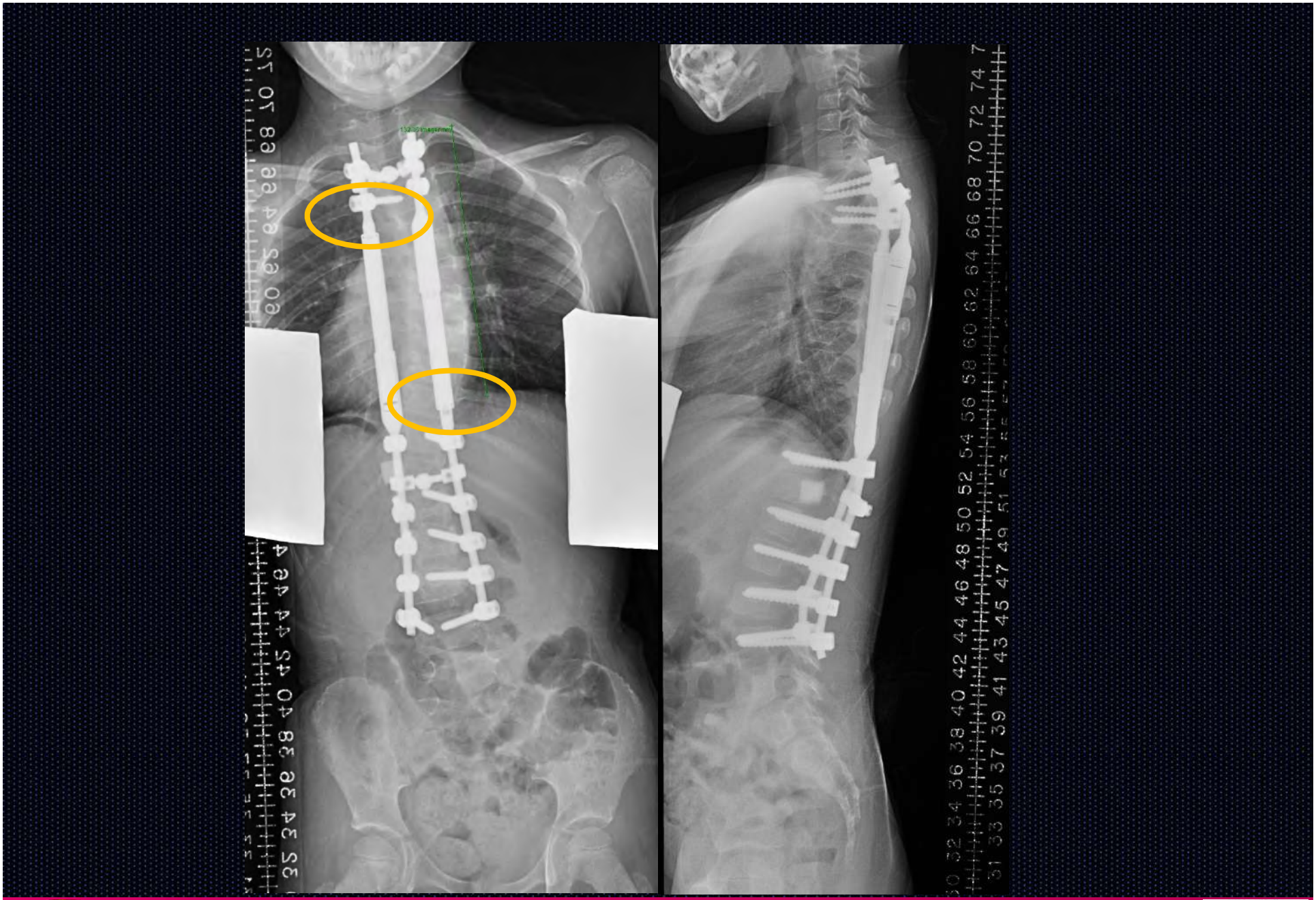
(949) 837-3600

CE

Refer to ERC OPERATOR'S MANUAL R_x **Only**

LC0029-B


CEPHALAD



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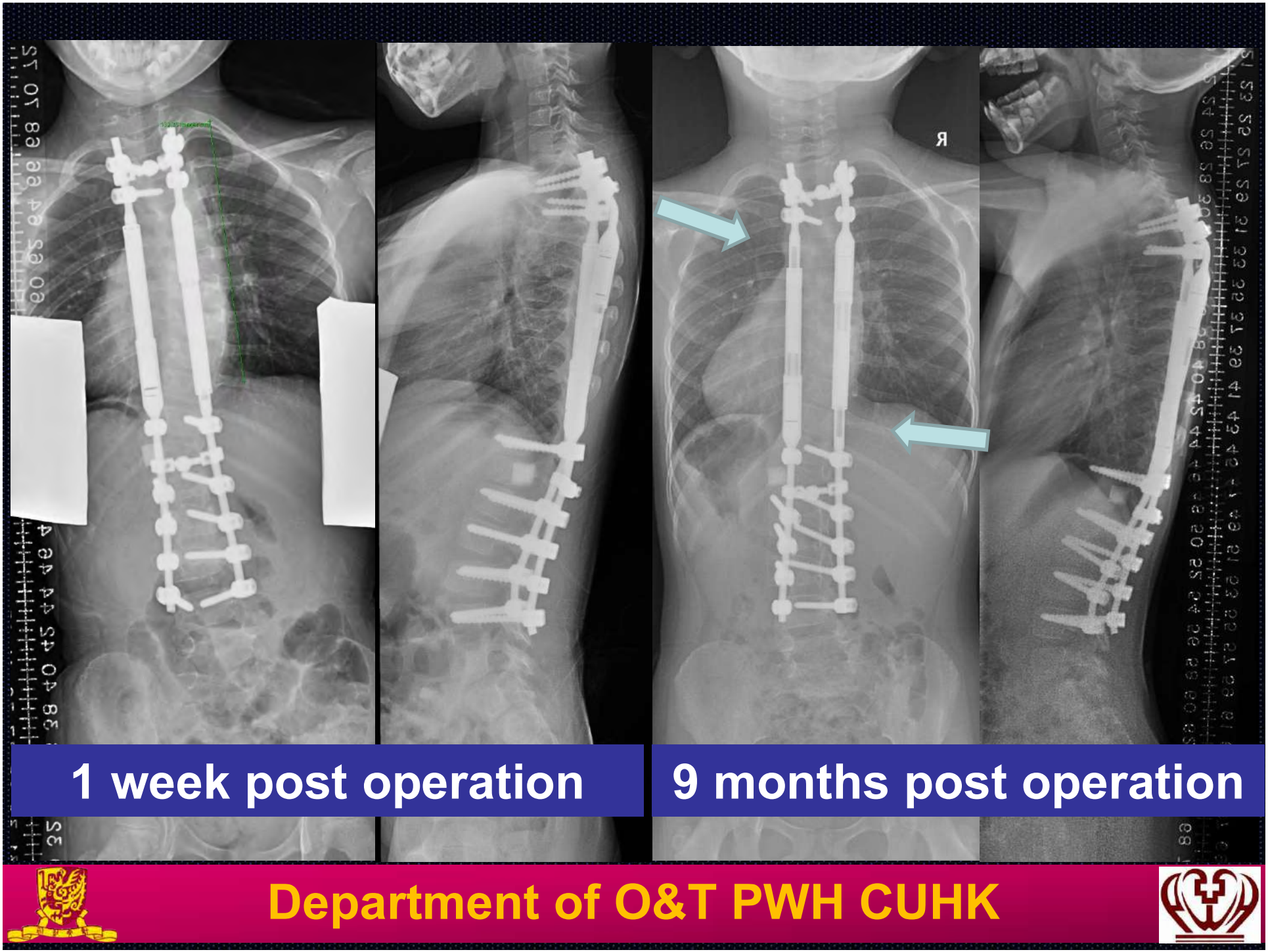
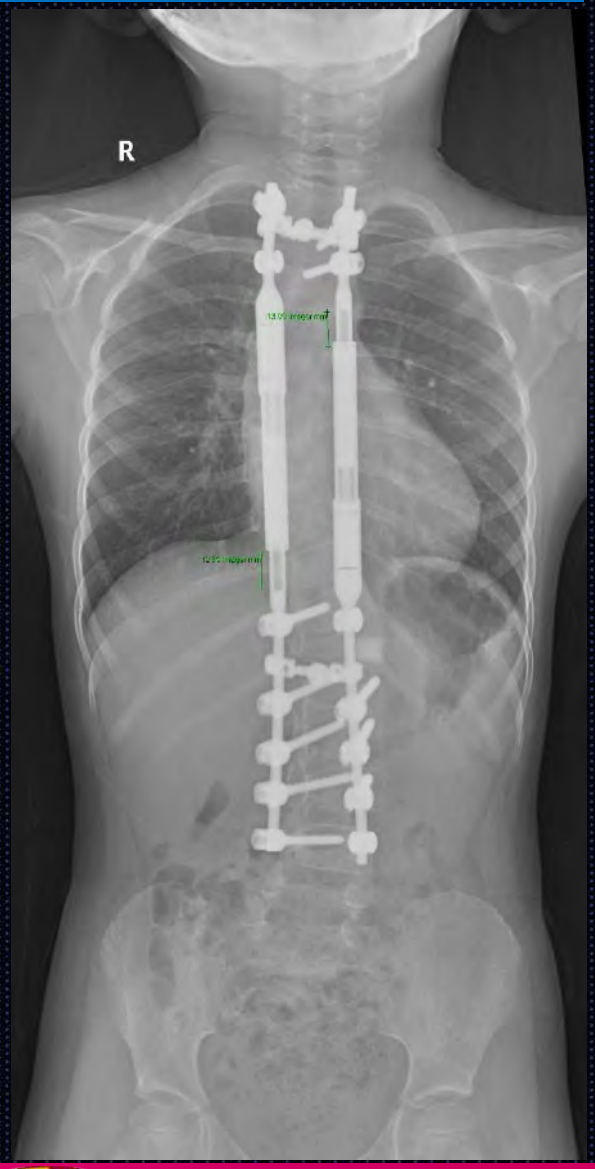
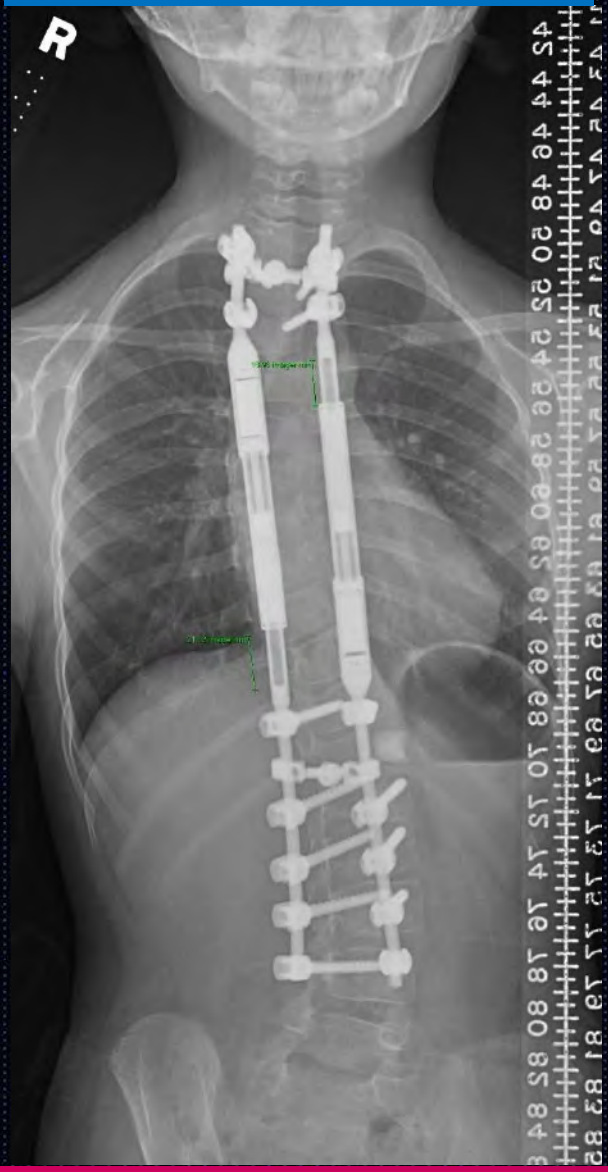
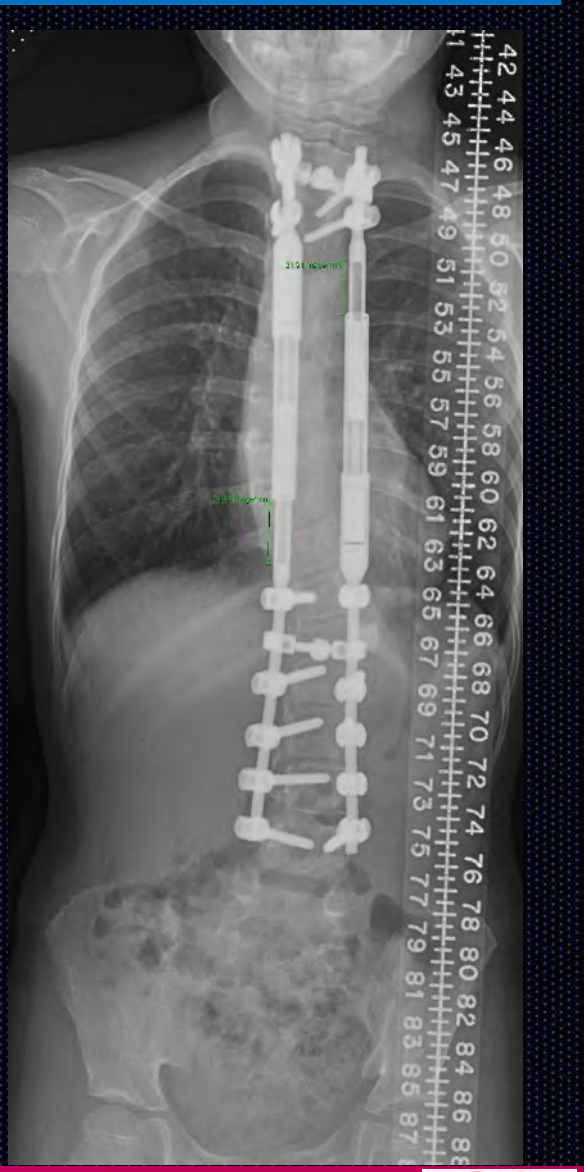

1 week post operation
9 months post operation
Department of O&T PWH CUHK

8m post op	16m post op	22m post op
		

Date	Age	Time PO second opn Magec Rod (M)	Planned Distracted length dL (mm)	Right Rod actual (mm)	Distracted and actual Difference (mm)	Left Rod actual (mm)	Distracted and actual Difference (mm)
17/04/2014	7y 9m	10	20	12.4	7.6	13.1	6.9
15/10/2014	8Y 2m	16	32	21	11	16.9	15.1
1/4/2015	8Y8m	22	44	26.6	17.4	24.5	19.5

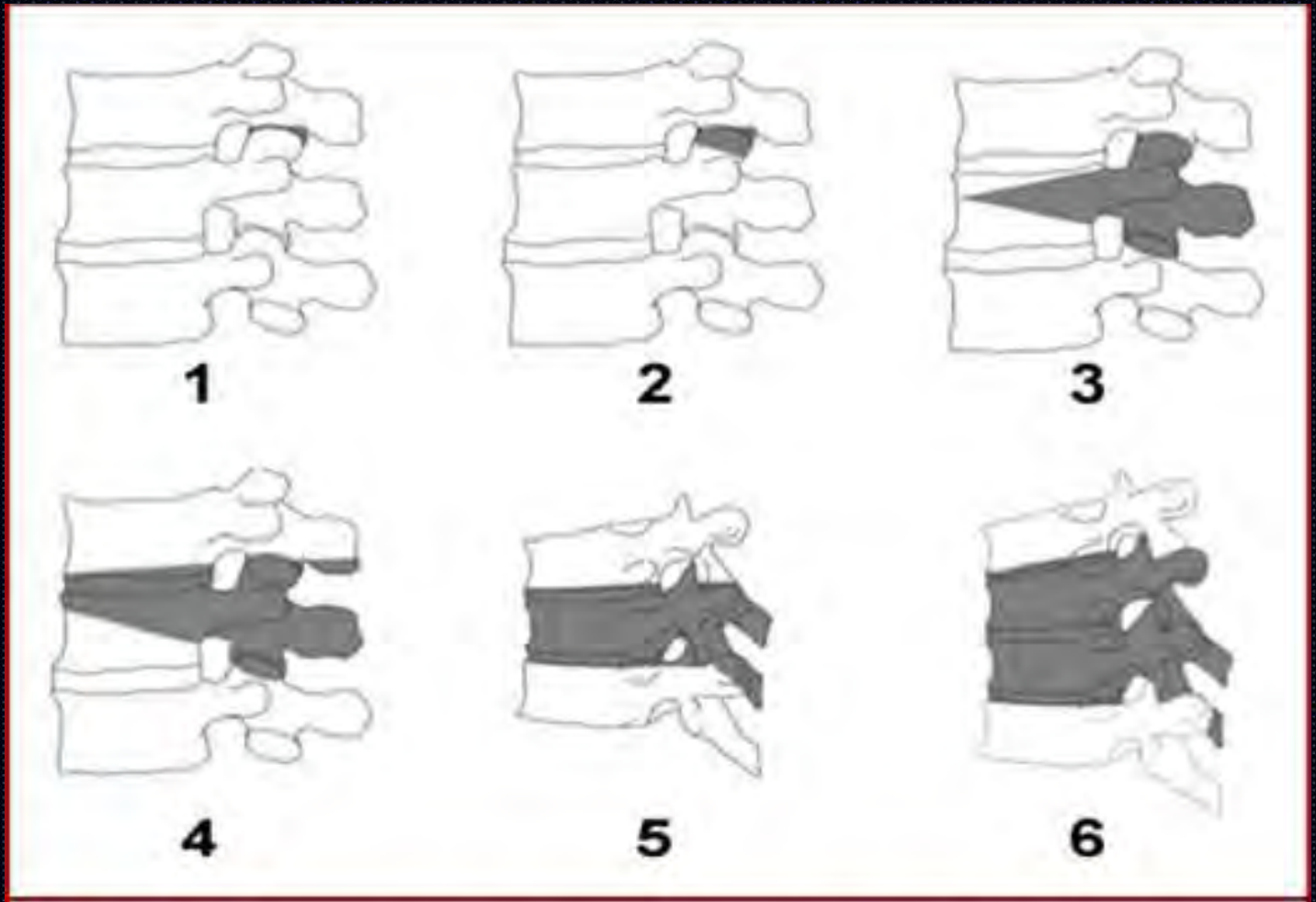
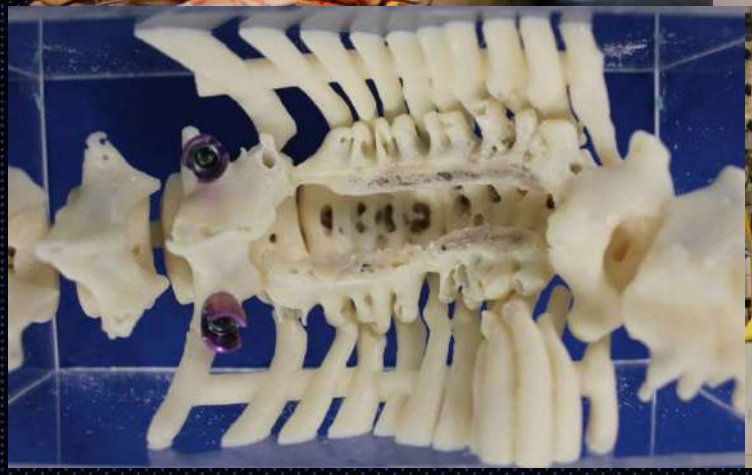


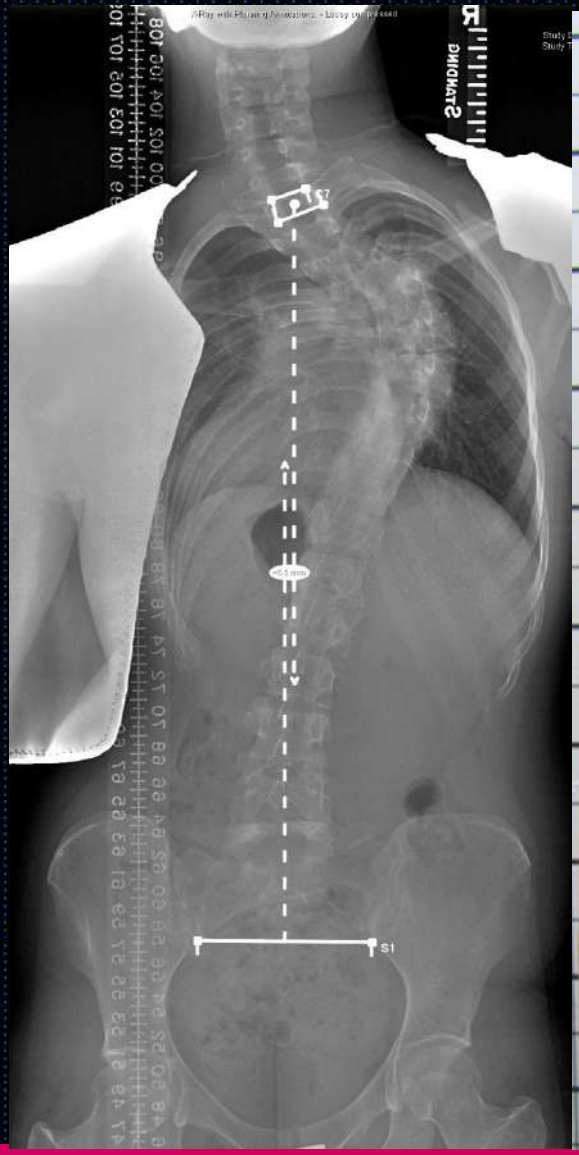
FIGURE 1. *Osteotomy classification: grades 1 to 6 according to the anatomic resection.*

Schwab etal Neurosurgery vol 74 No. 1 Jan 2014

Navigation, 3D simulation, Cell saver, Transamine infusion mimimises complications in Three Column Osteotomy (3CO)



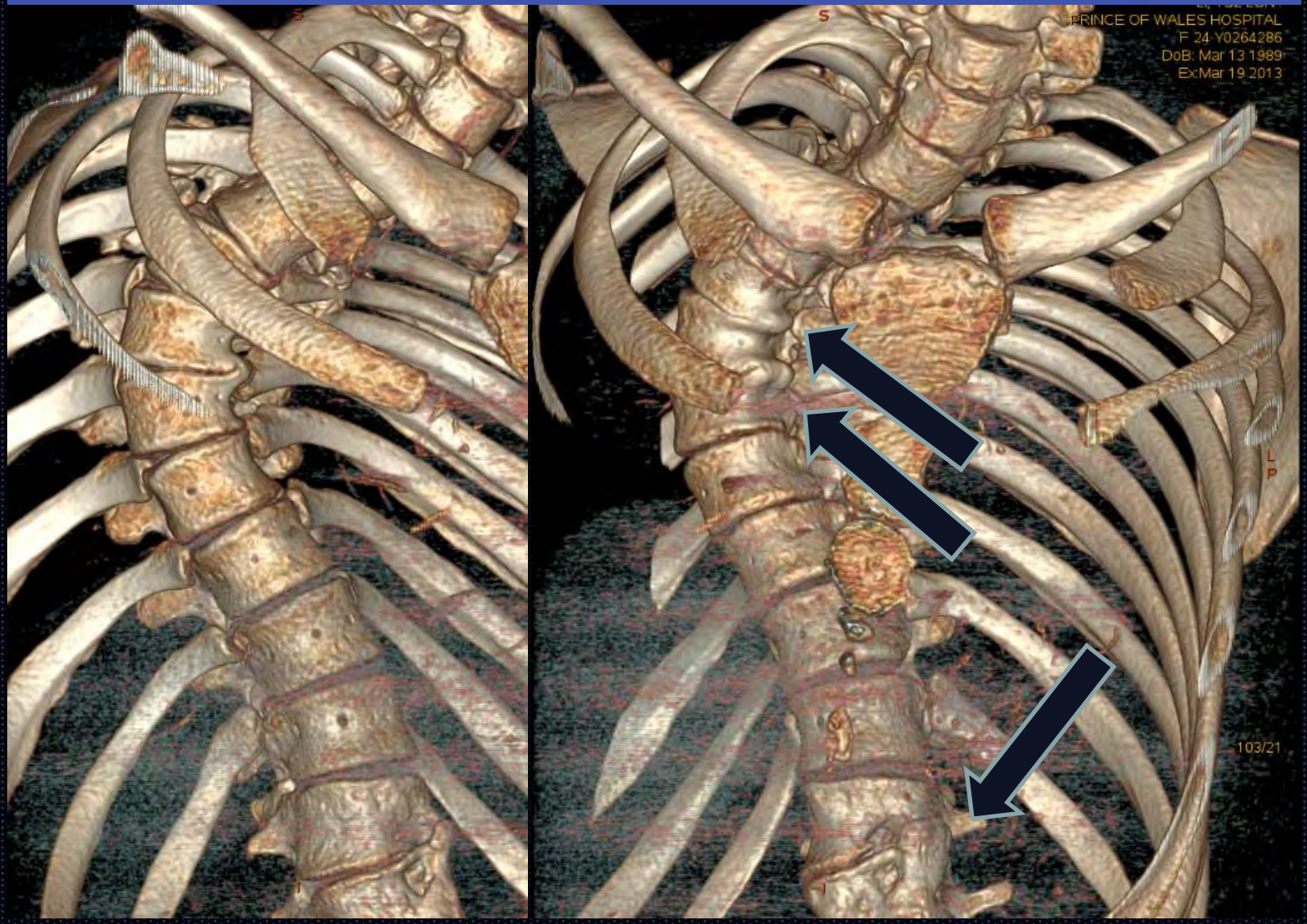
LTL Idiopathic Scoliosis turned Rigid



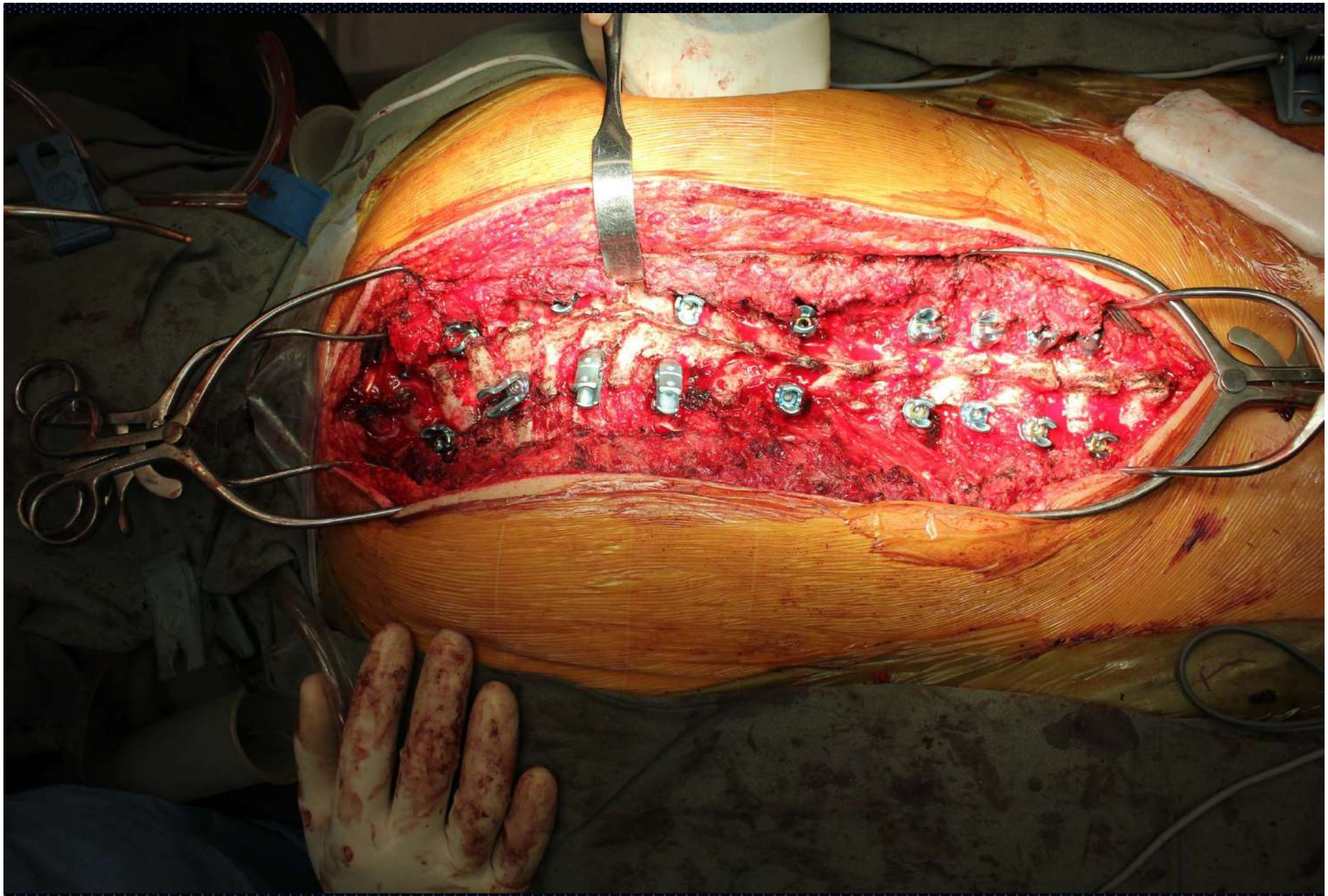

R
STANDING


10
70

CT confirmed fusion of concave vertebrae at two levels



Surgical plan T2-L3 PISF, T6,7,8 Costo-transversectomy Right T7 Convex PSO

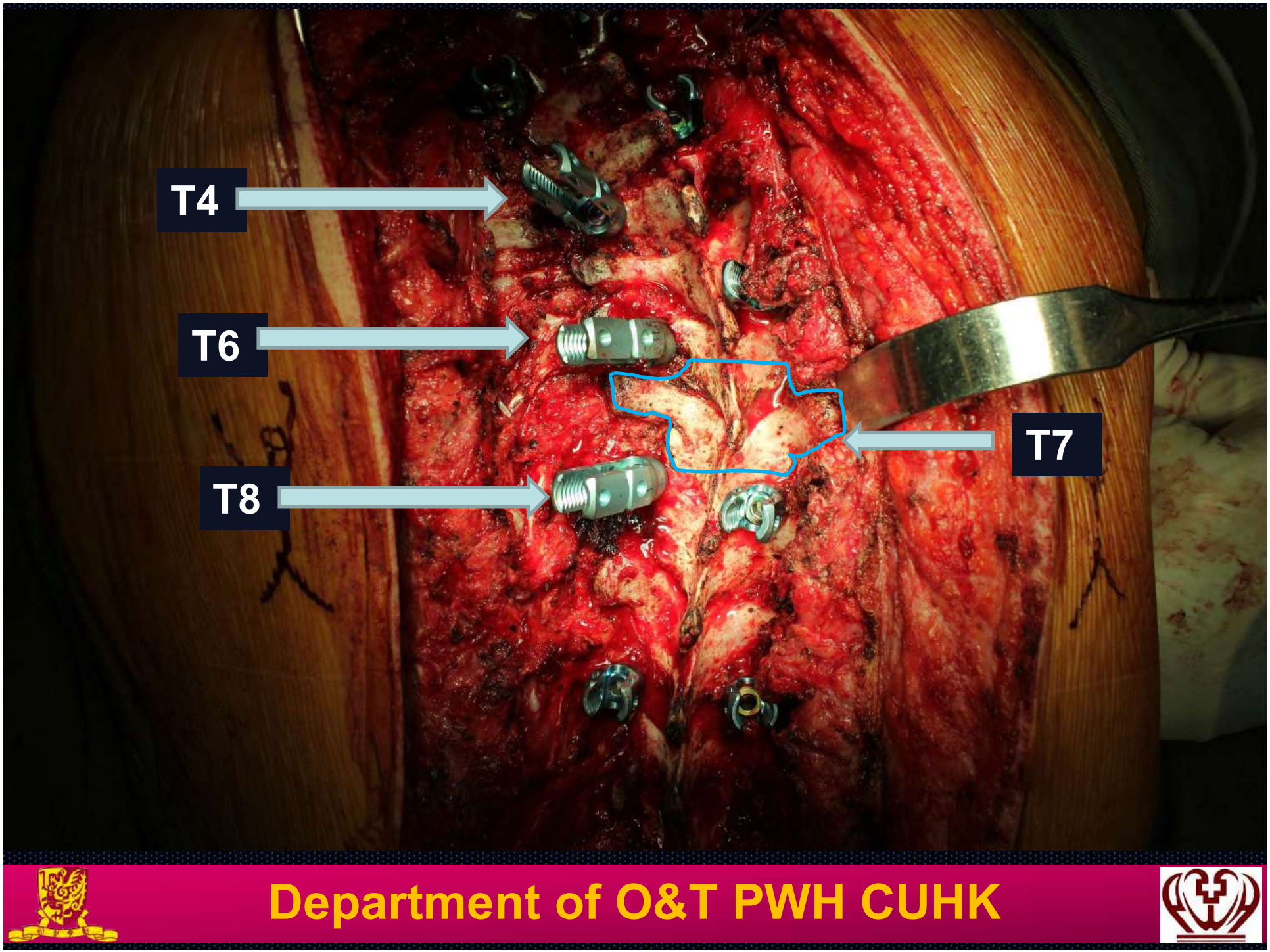


Instrumentation time 76 minutes 18 PS

Fixation sequence:

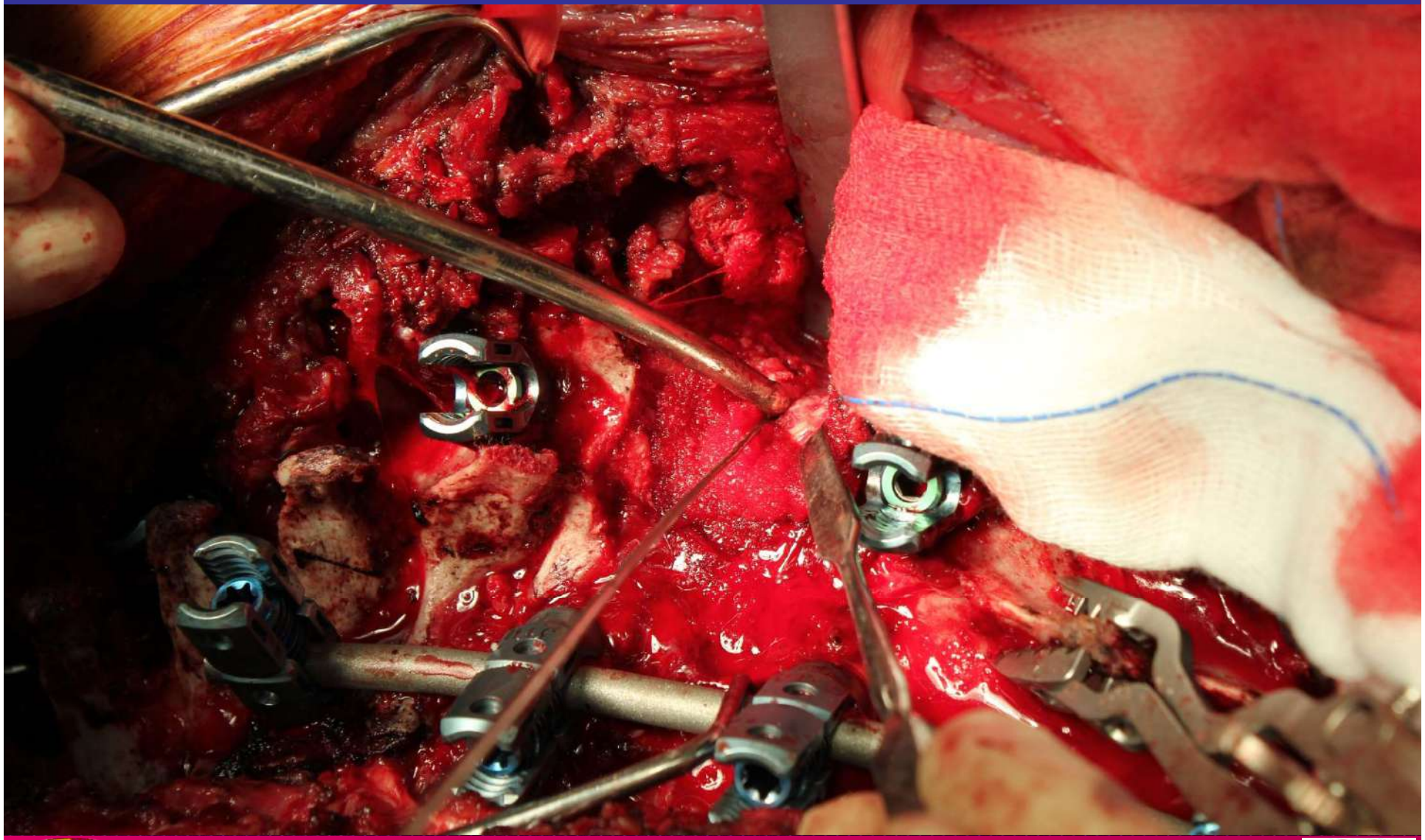
Level	time	Left	Time	right
T2	1417	P5.5x35	1415	P4.5x35
T4	1430	R5.5x30	1426	P5.5x35
T6	1437	R5.5x40	1442	P5.5x40
T8	1446	R5.5x45	1450	P5.5x40
T10	1456	P6.5x45	1458	P7.5x45
T12	1503	P7.5x40	1506	P7.5x40
L1	1511	P6.5x35	1515	P7.5x40
L2	1517	P7.5x45	1519	P6.5x40
L3	1525	P7.5x45	1528	P7.5x45

P=poly, R Reduction screws

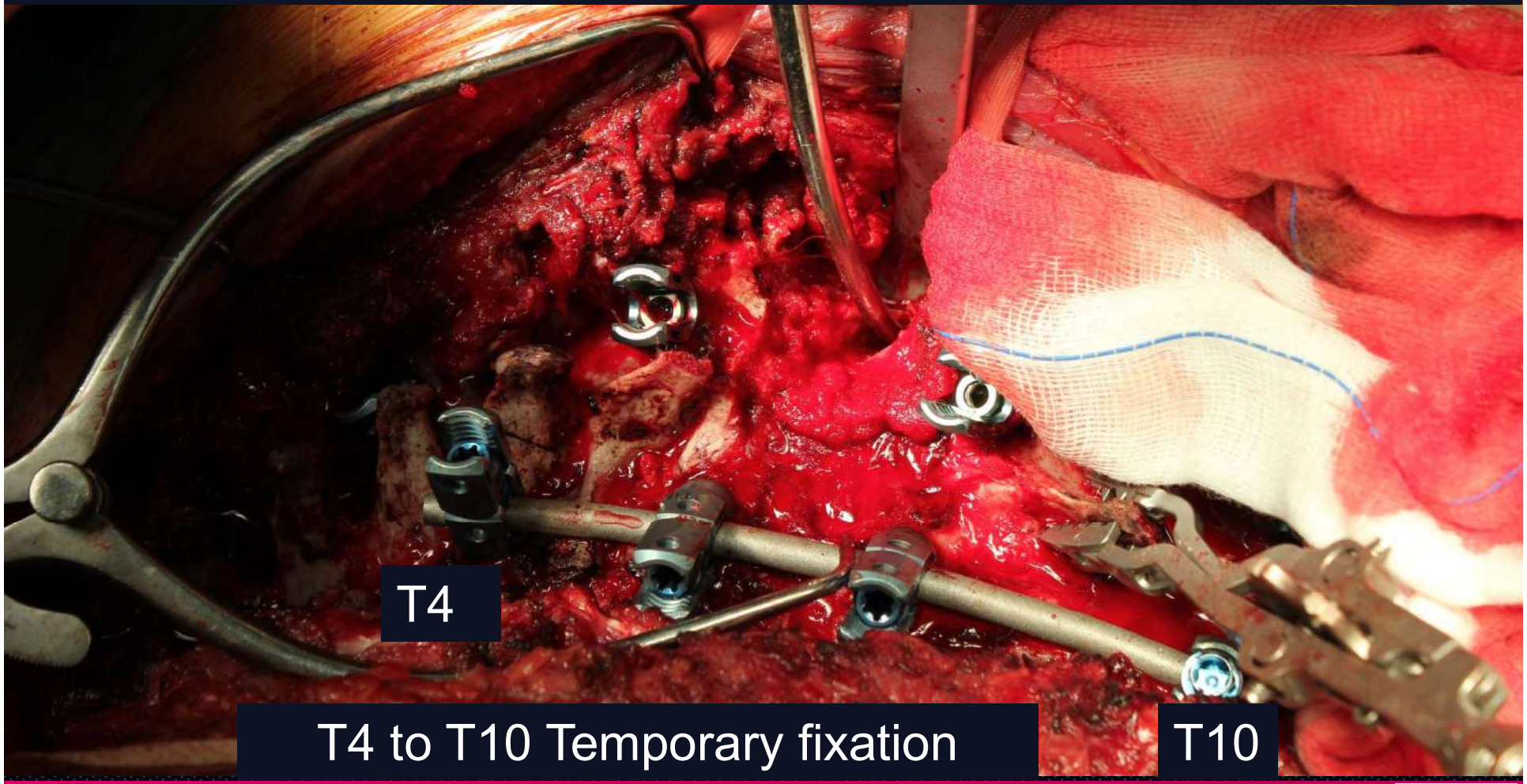

T4
T6
T7
T8

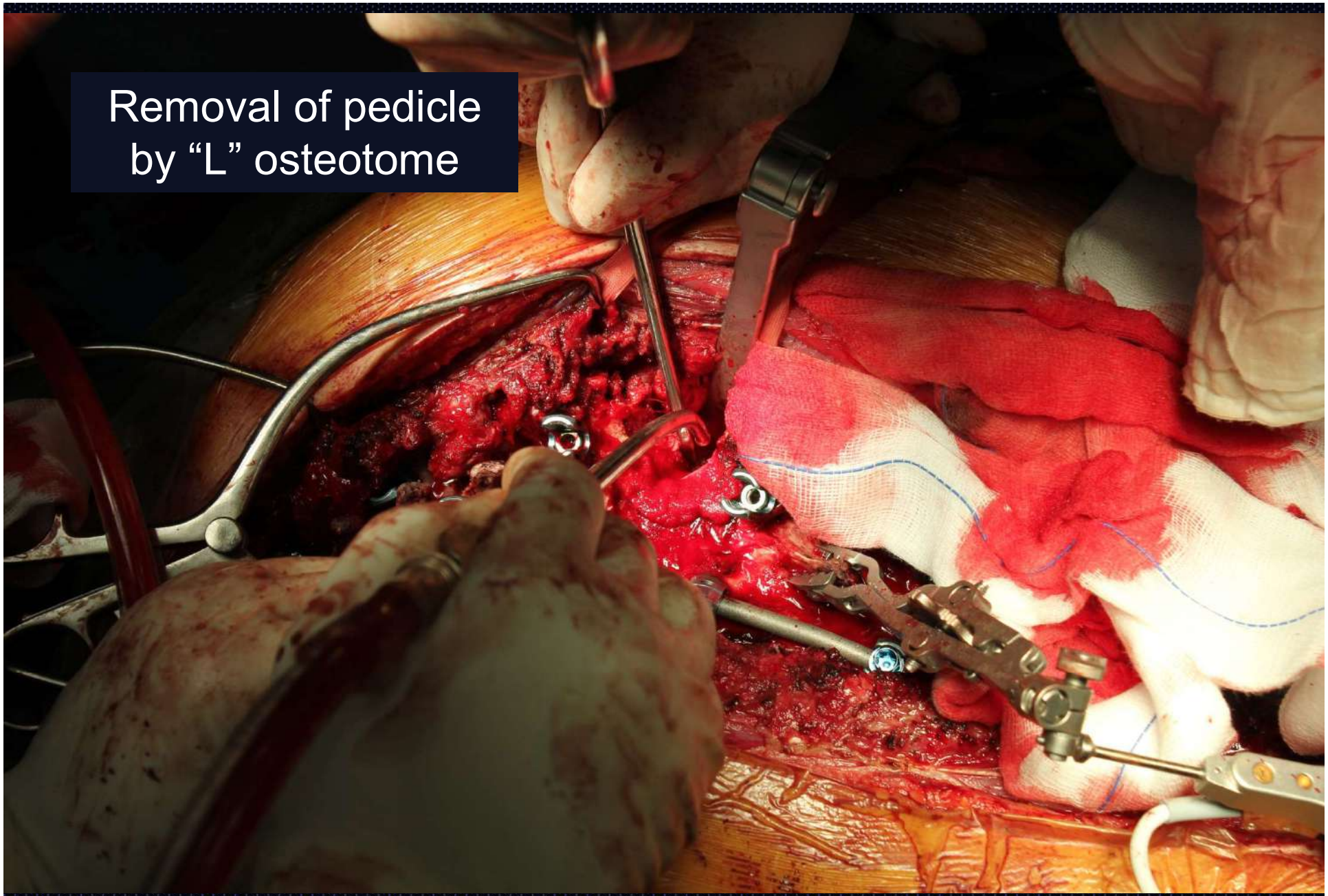
Exposure of Right T7 Costo-transverse joint

T7 Pedicle track located with path finder under navigation, K –wire placed in pedicle tract

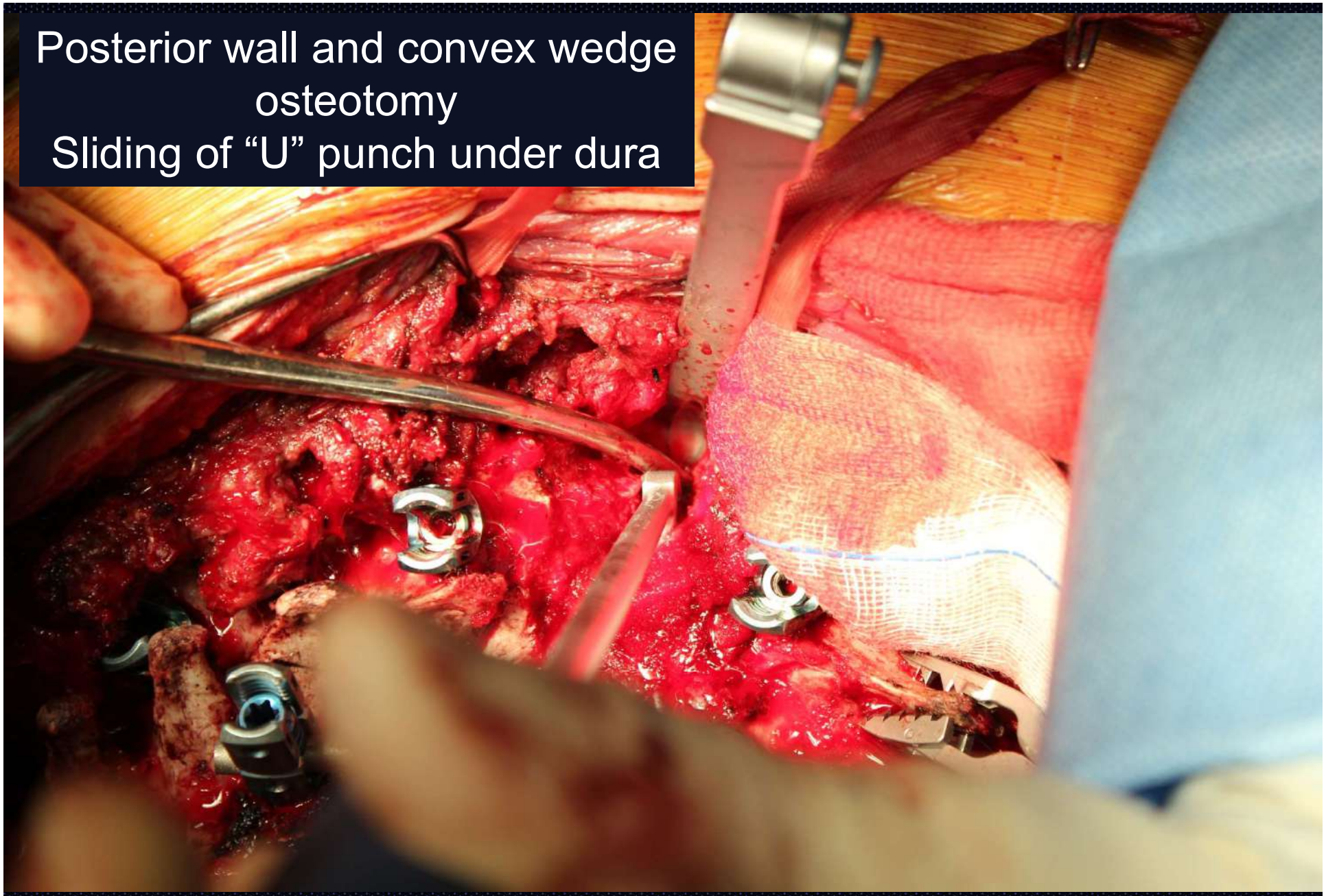


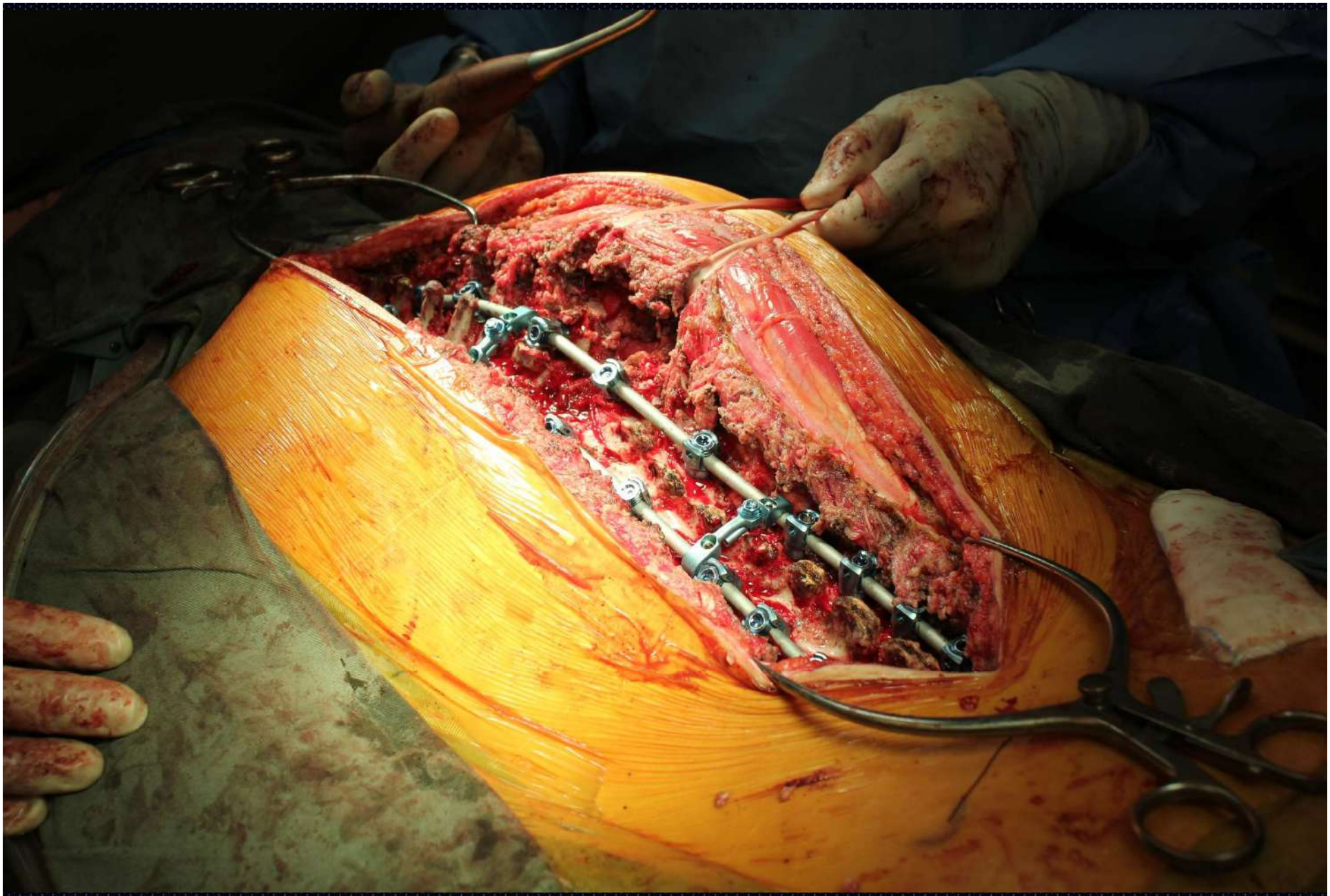
Extra-Pleural plane approached along T7 Rib Bed and segmental resection of 5cm segment of rib from T6,7,8 to gain access to anterior body. Dissection along medial pedicle and lateral wall of the vertebra

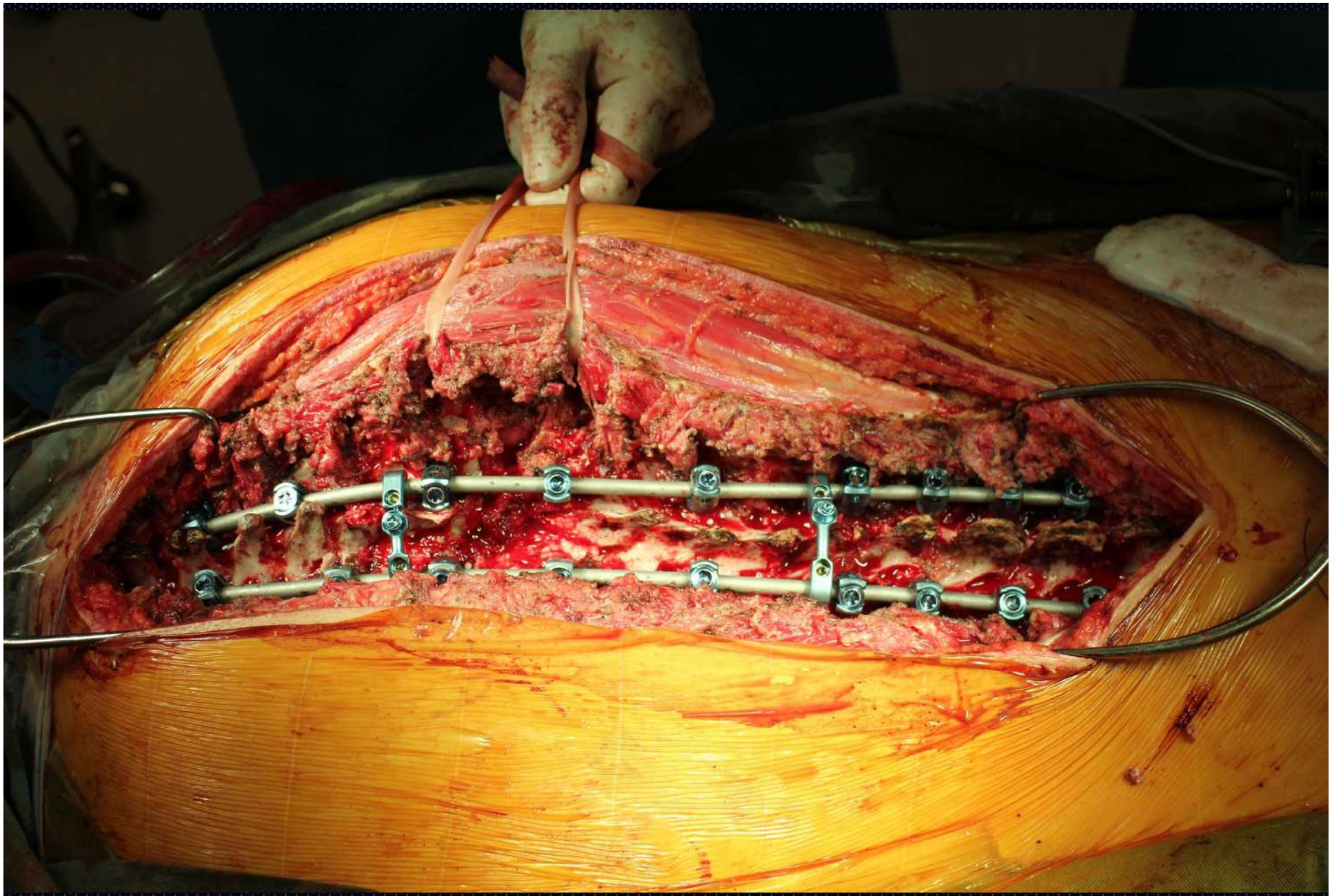



Removal of pedicle
by “L” osteotome

Posterior wall and convex wedge osteotomy
Sliding of “U” punch under dura

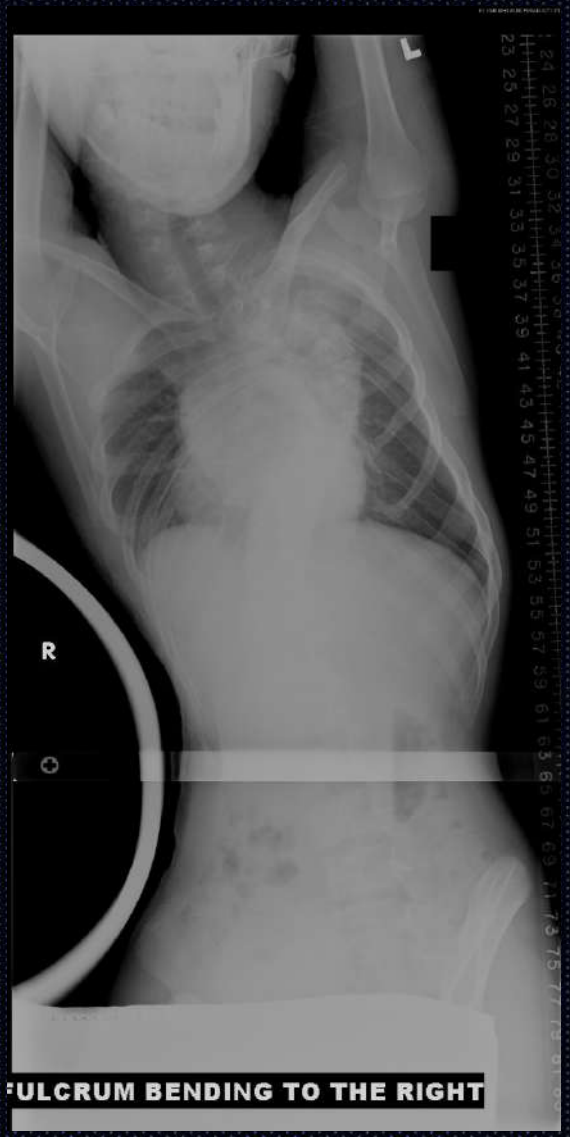


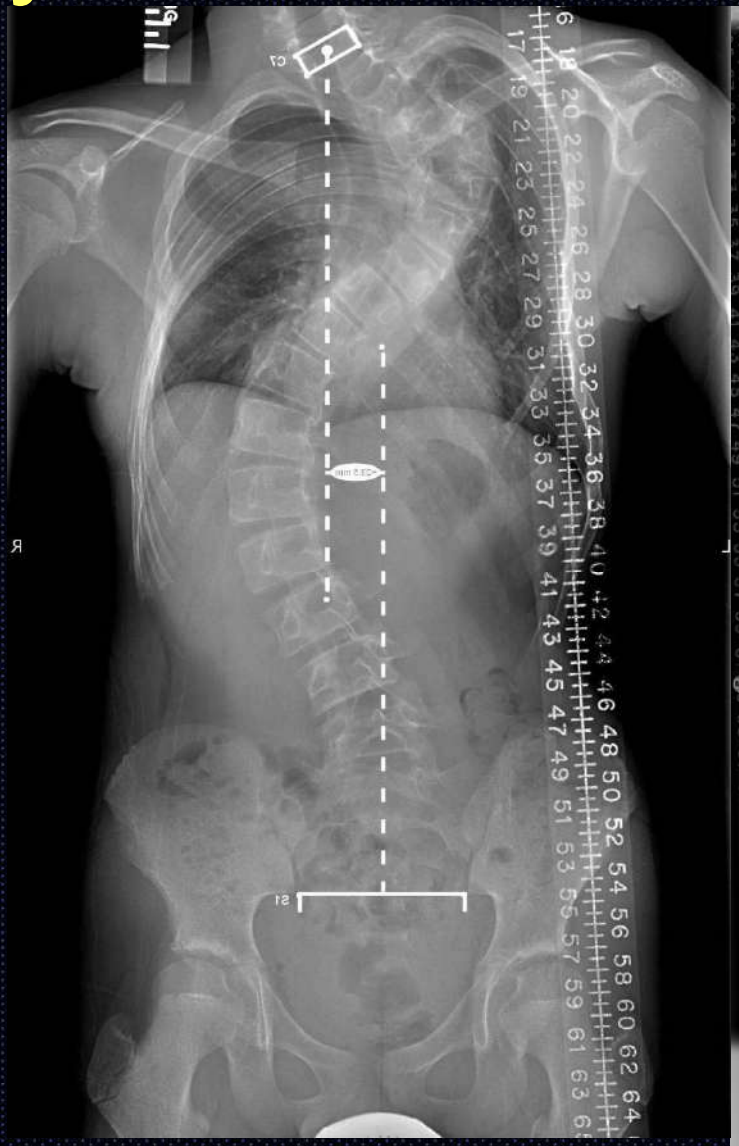


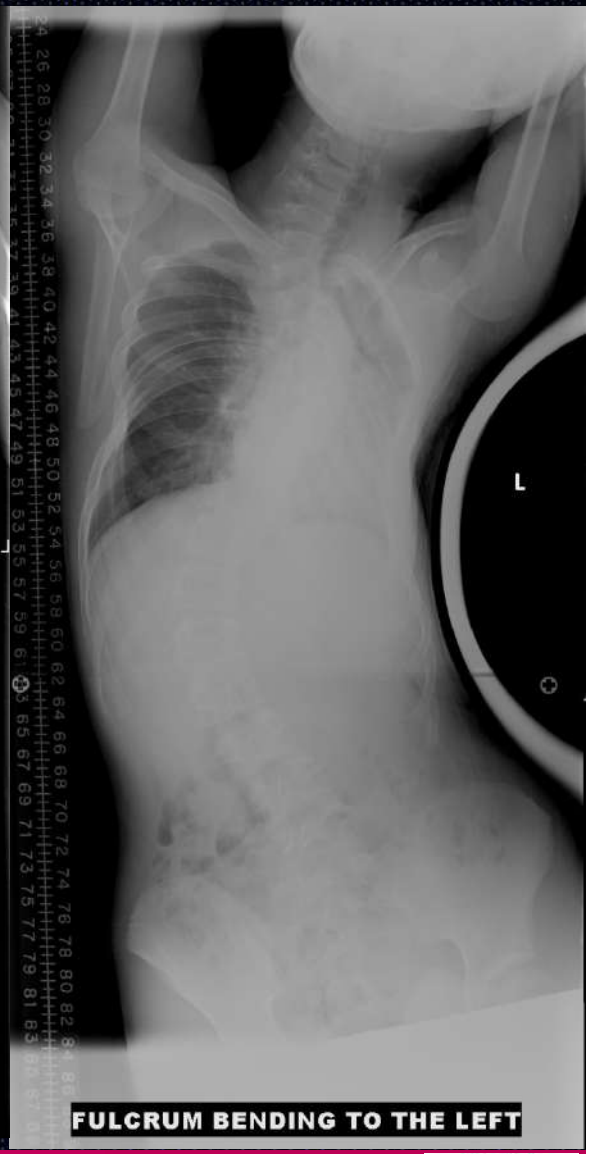


STAND
S1
R
STANDING

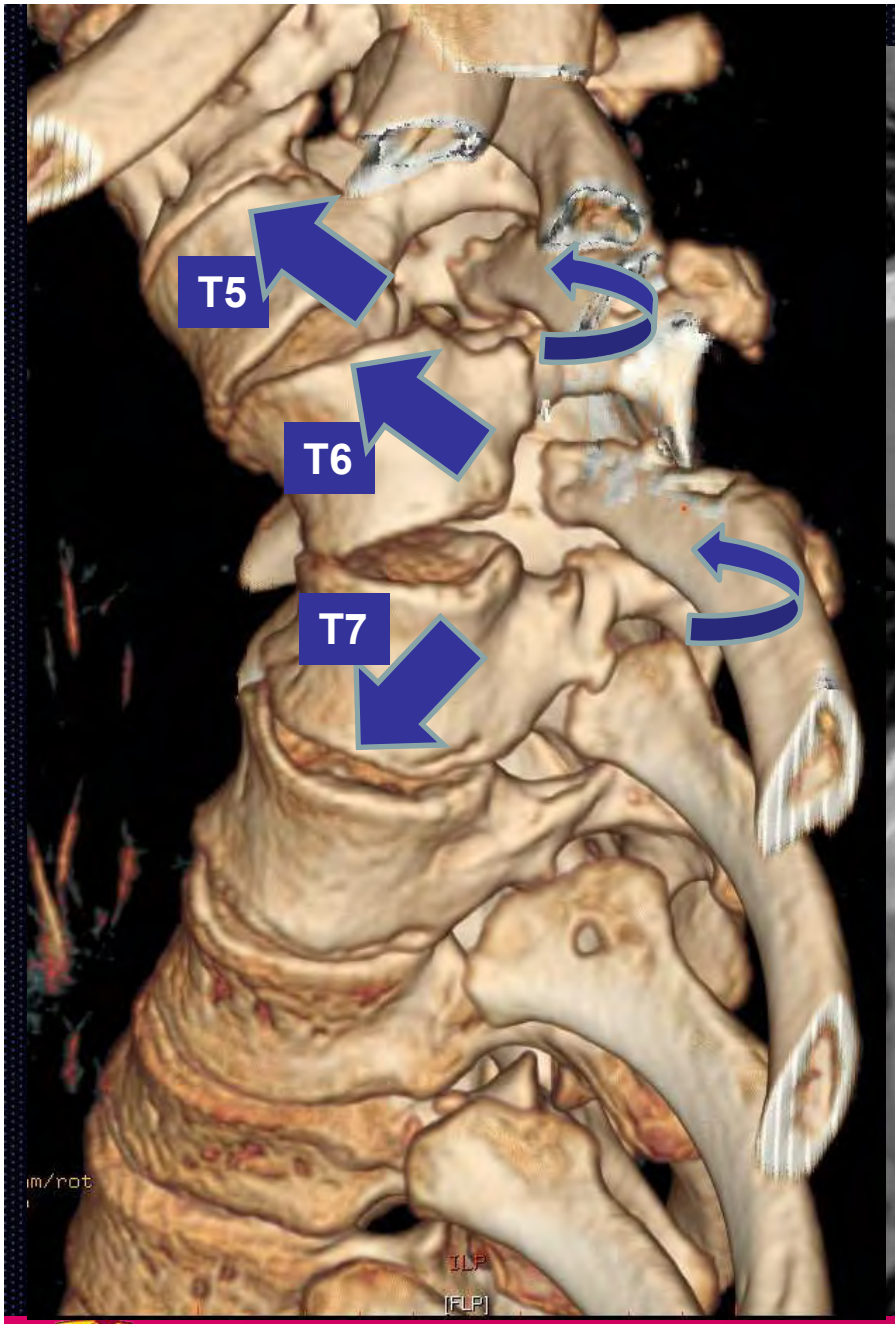
Severe Syndromic Scoliosis NF

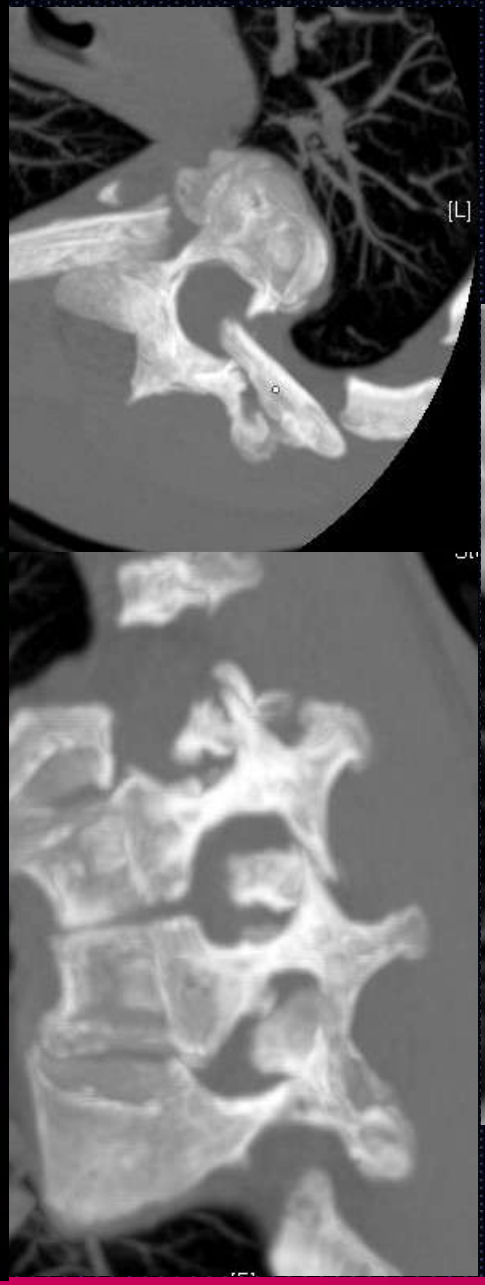






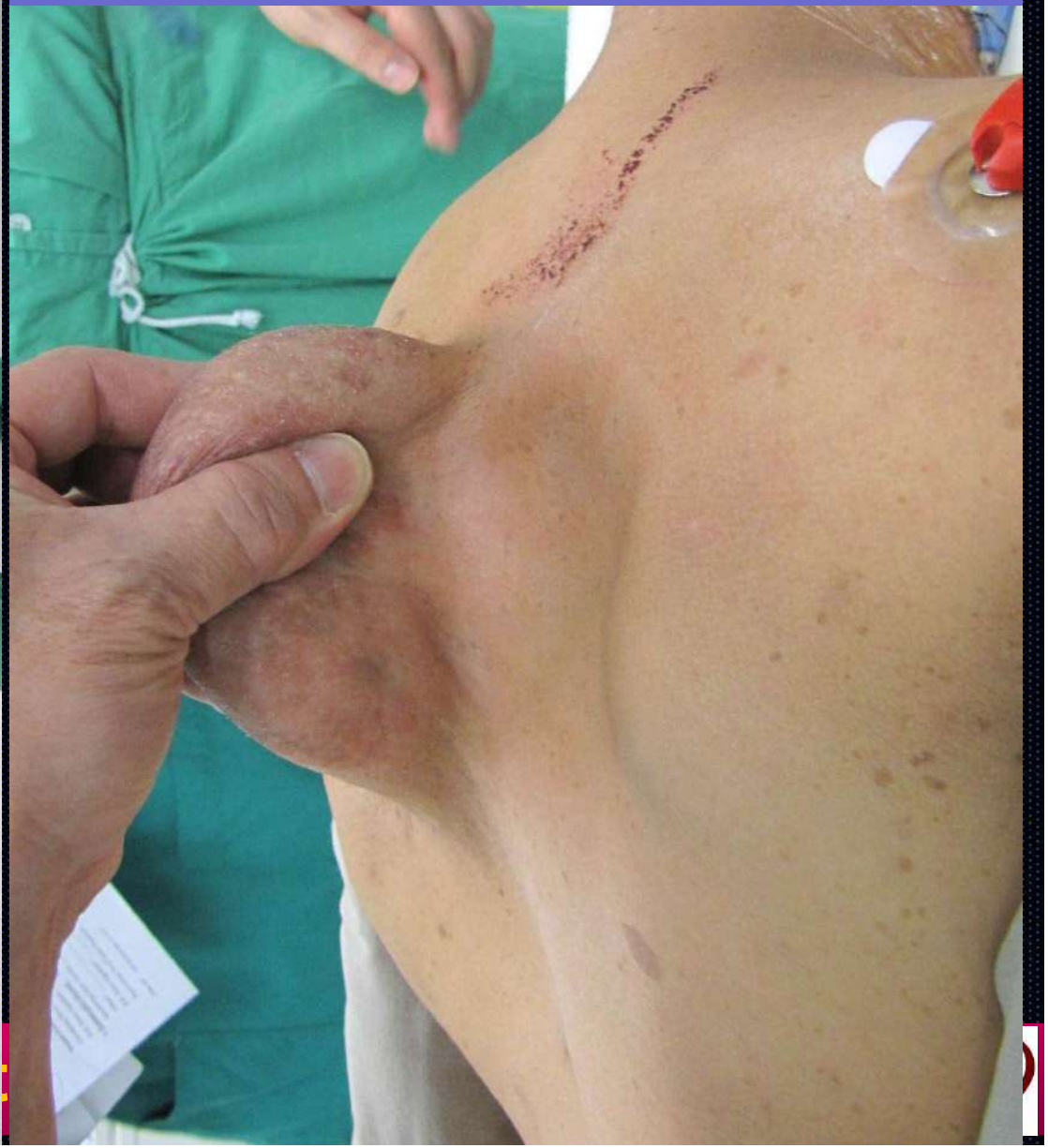
Apical Rib penetration to spine



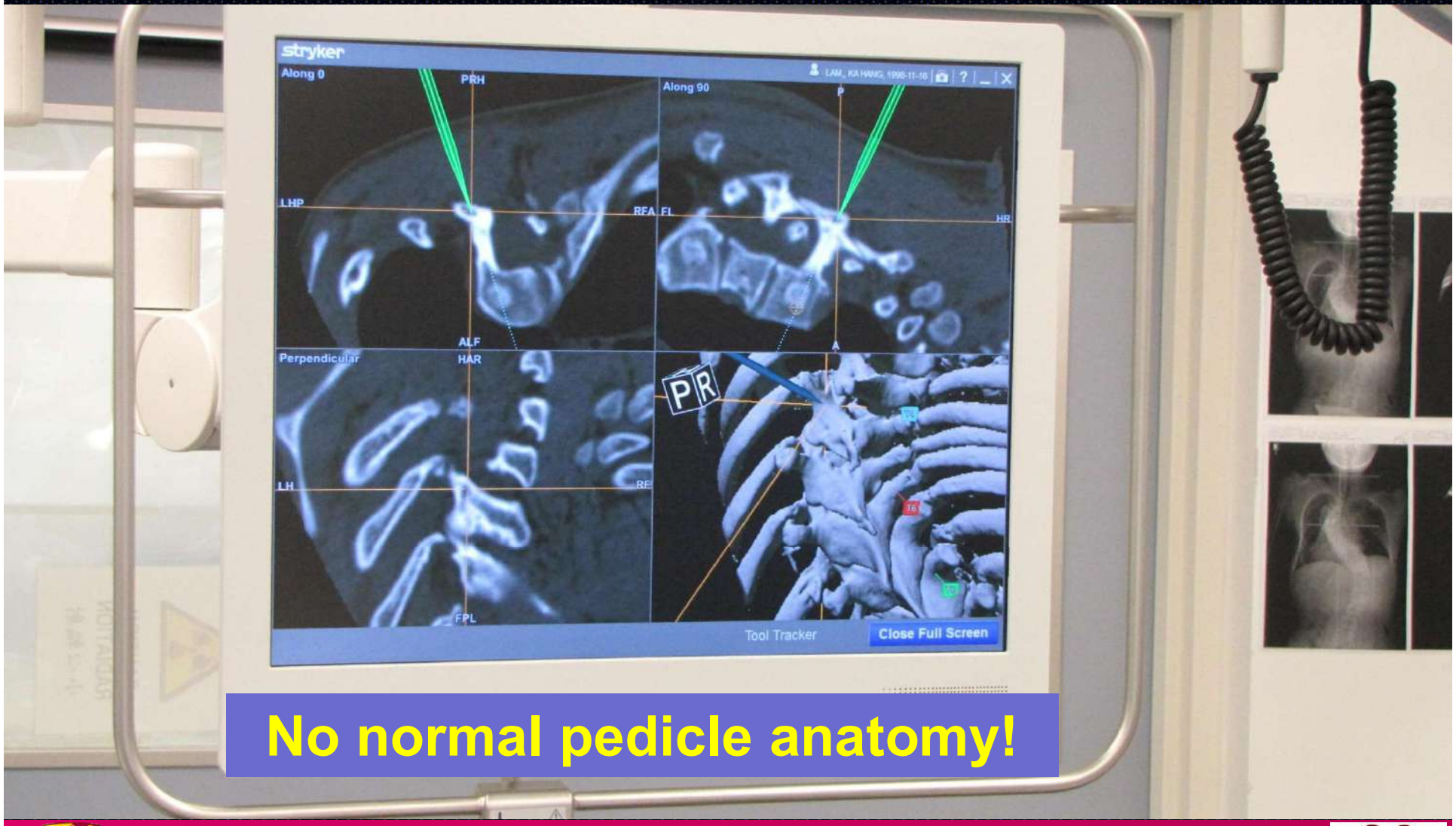


- Surgical Plan
- Navigation guided instrumentation
- Costo-transversectomy and T6 PSO

Excision of 10cm neurofibroma

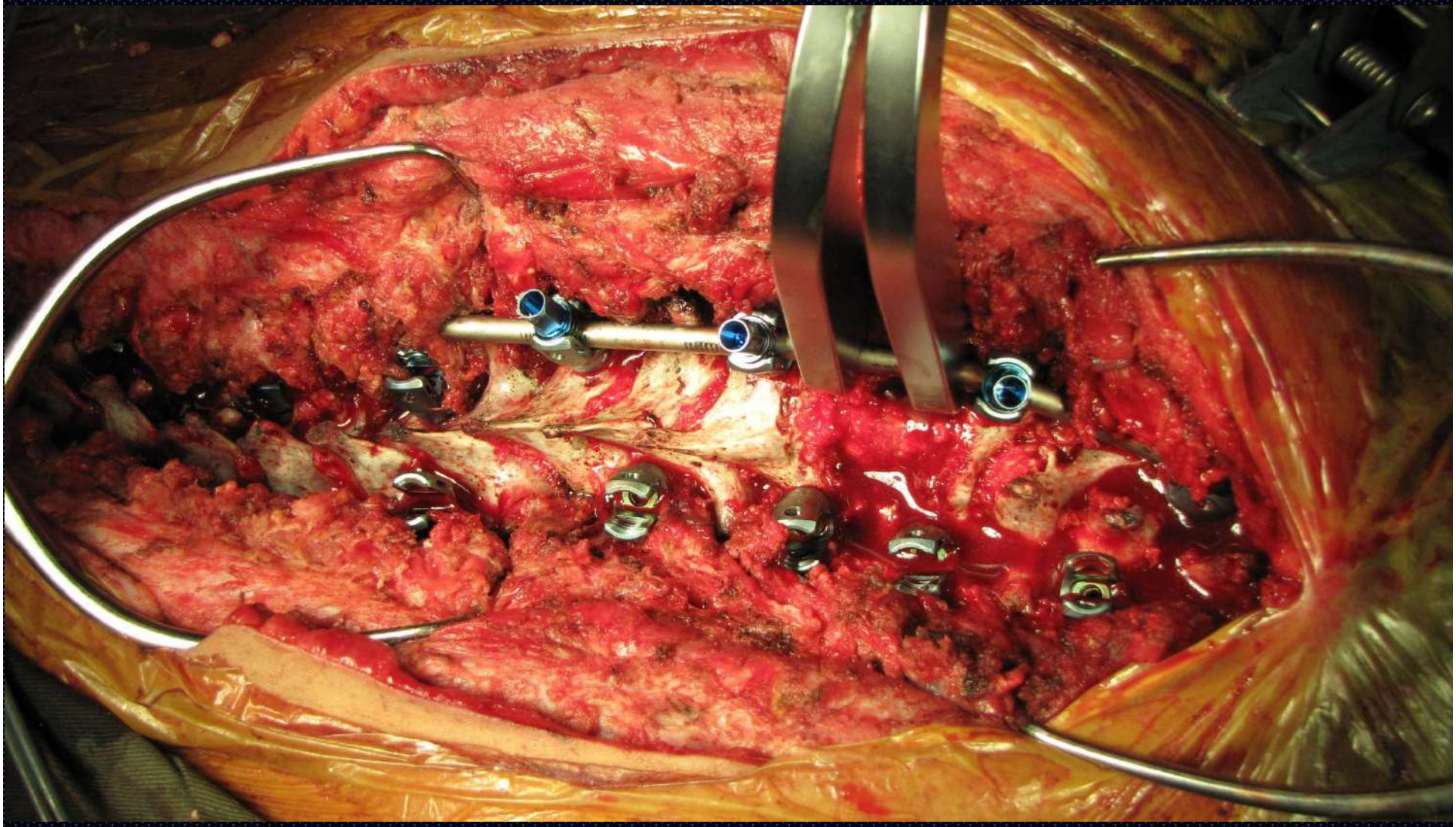


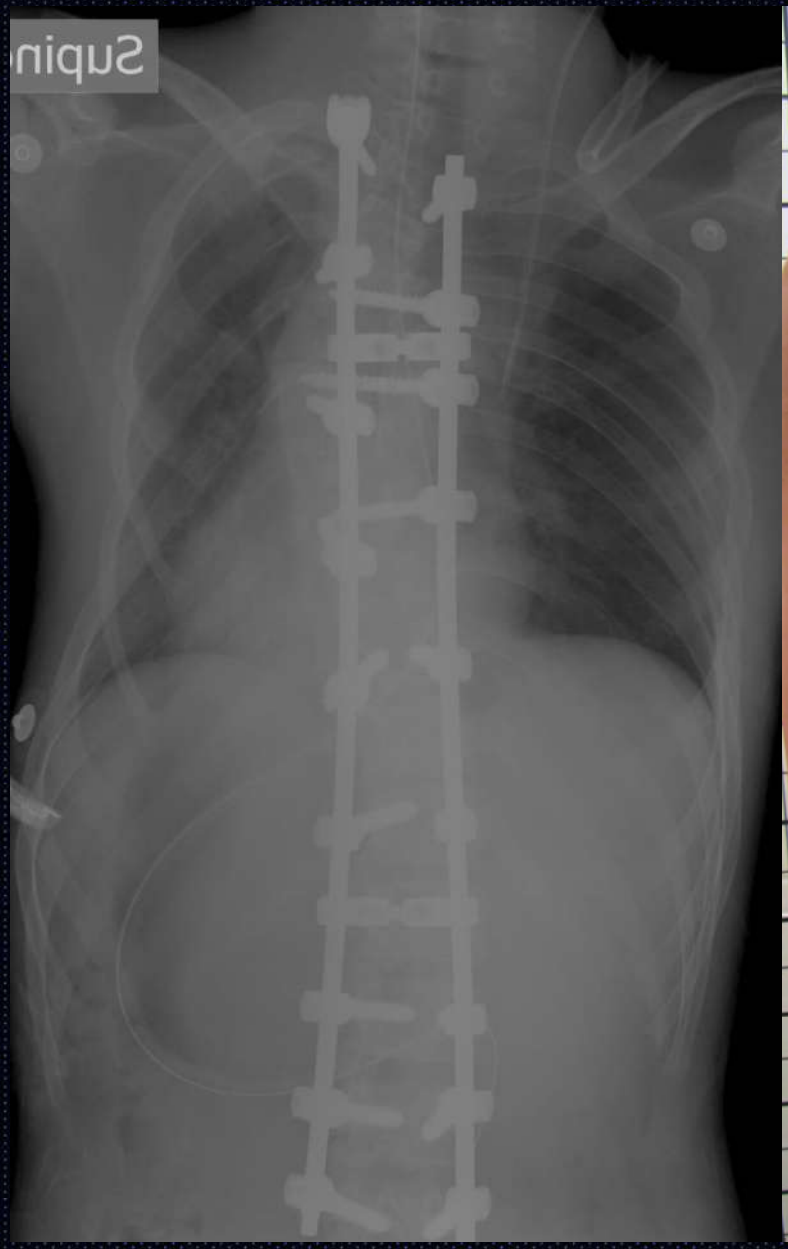
Navigation Guided Instrumentation



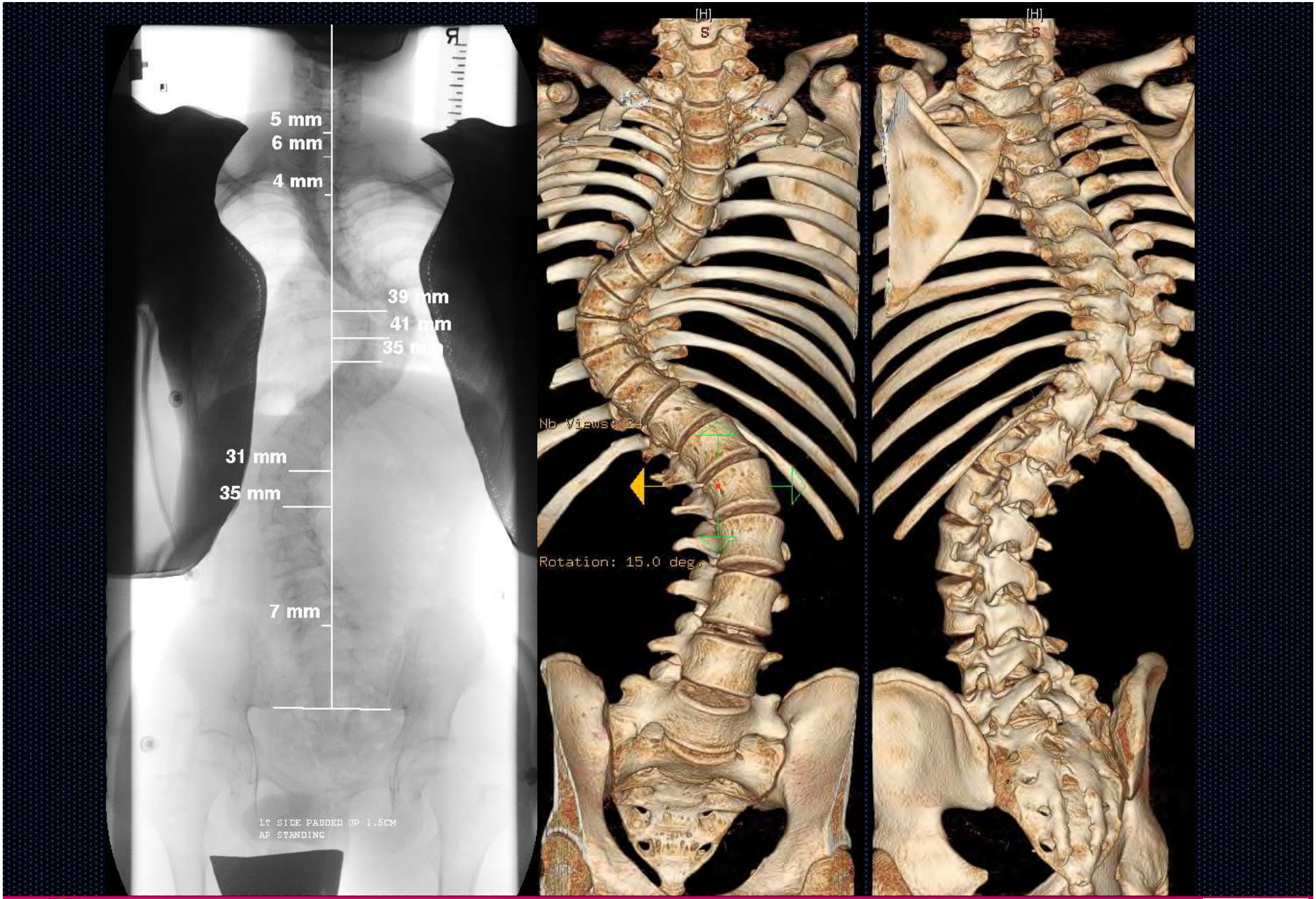
No normal pedicle anatomy!

PSO Rod Contouring correction under SSEP




Supin

Severe AIS Kypho-scoliosis Hunchback



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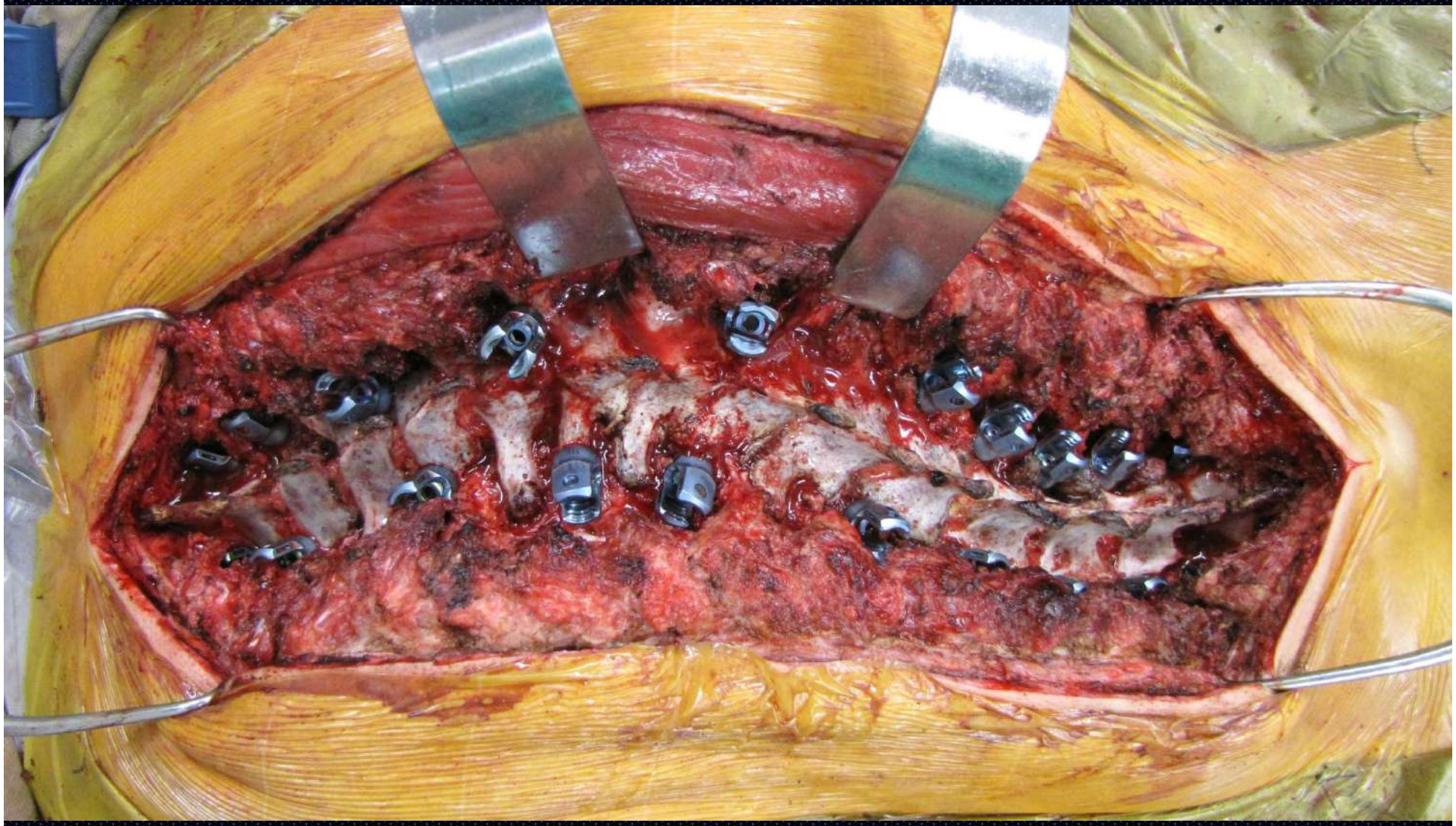
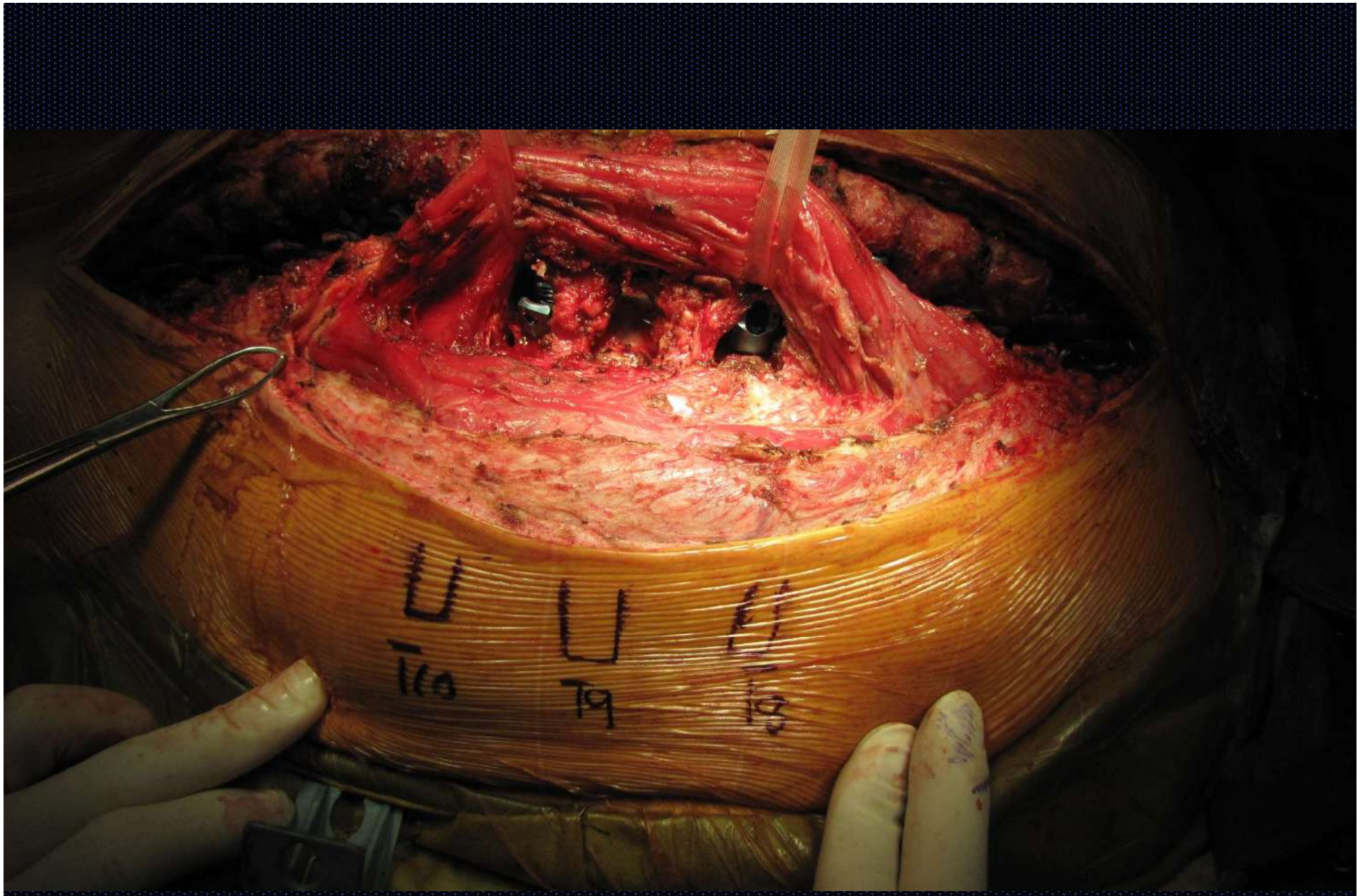
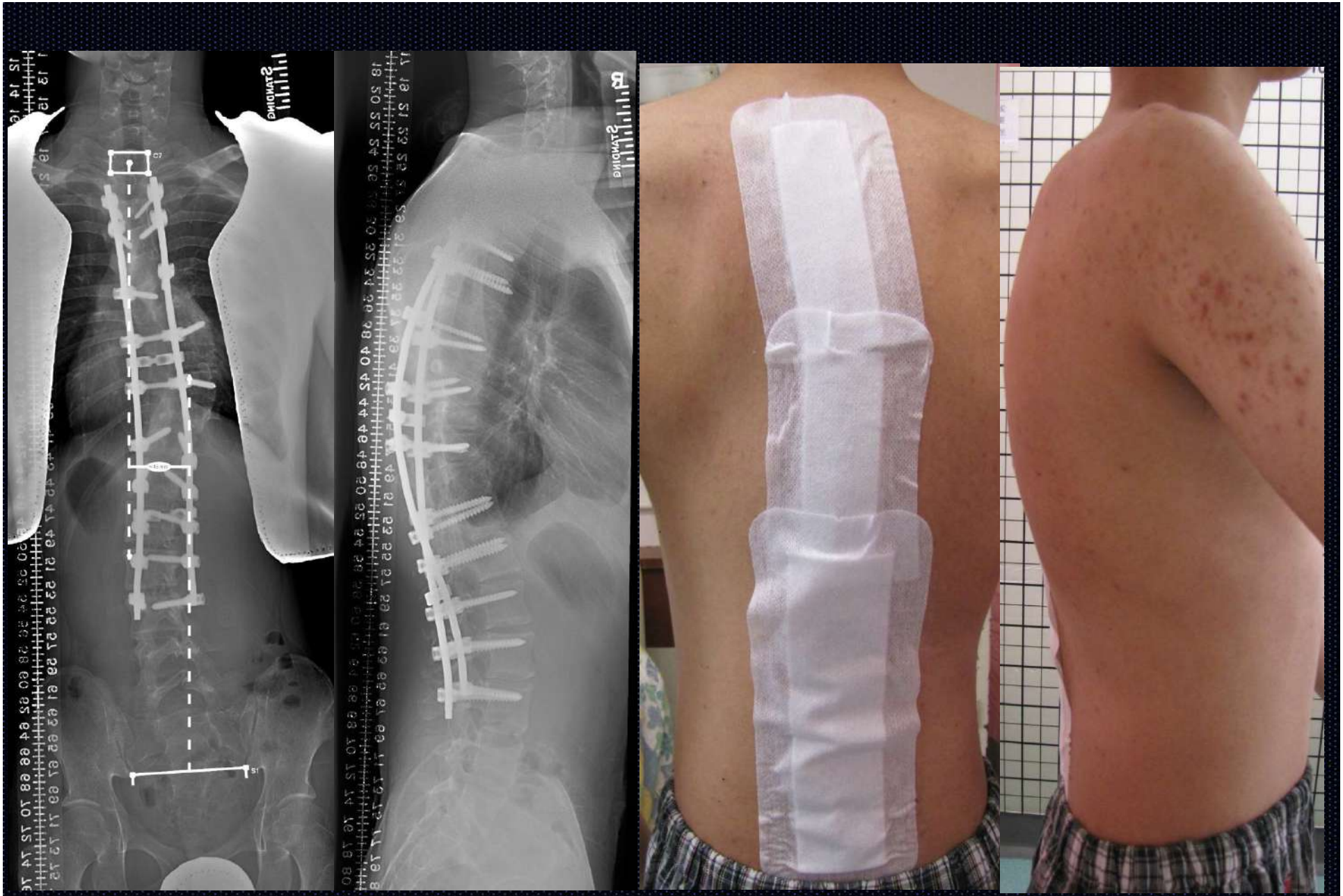
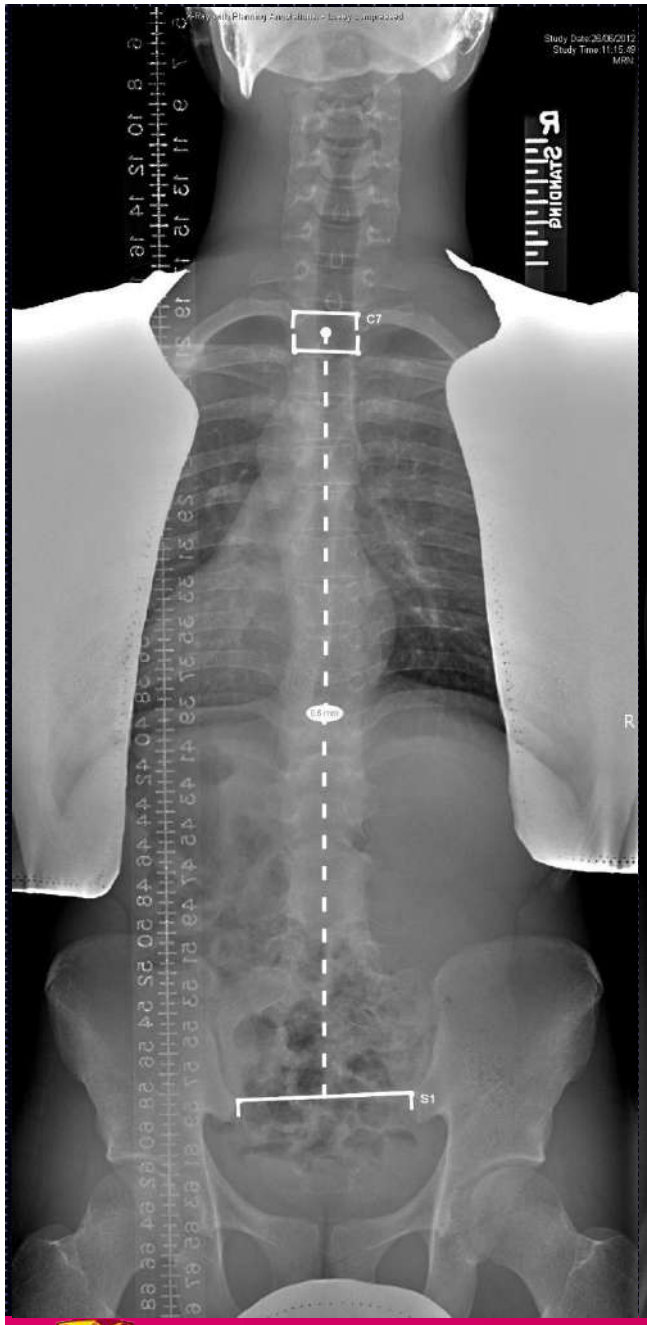
Intra-op positioning

Rib Excision and costotransversectomy T 9 Convex PSO




T10
T9
T8

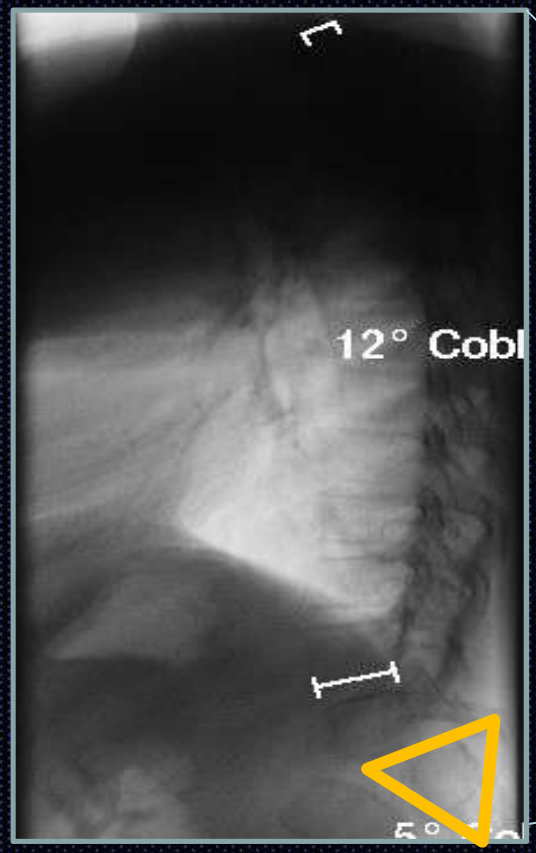


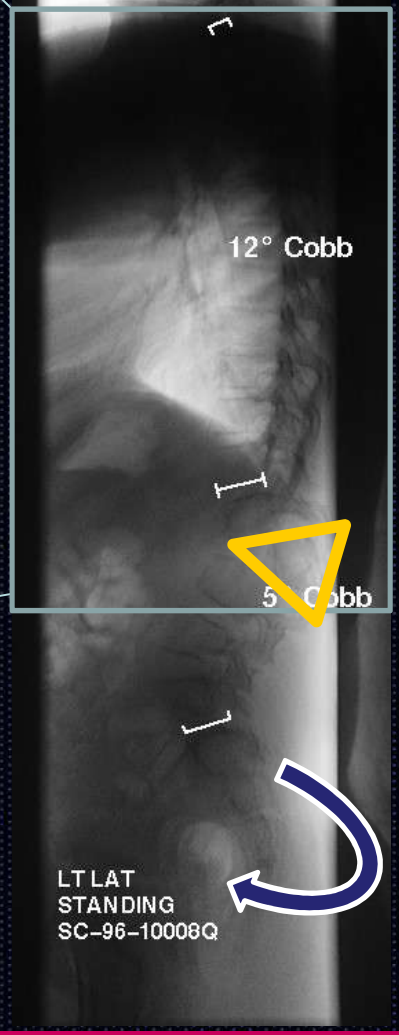


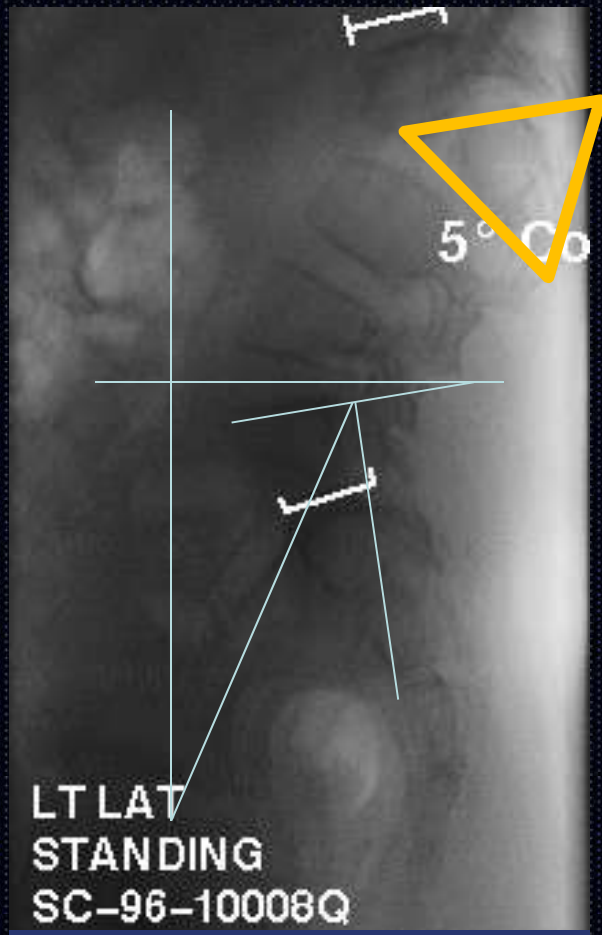
- Age 17 +1
- L2-4 Kyphosis
- Apex L2,3 Congenital fused vertebrae
- Difficult to image with X-rays

Congenital dislocation

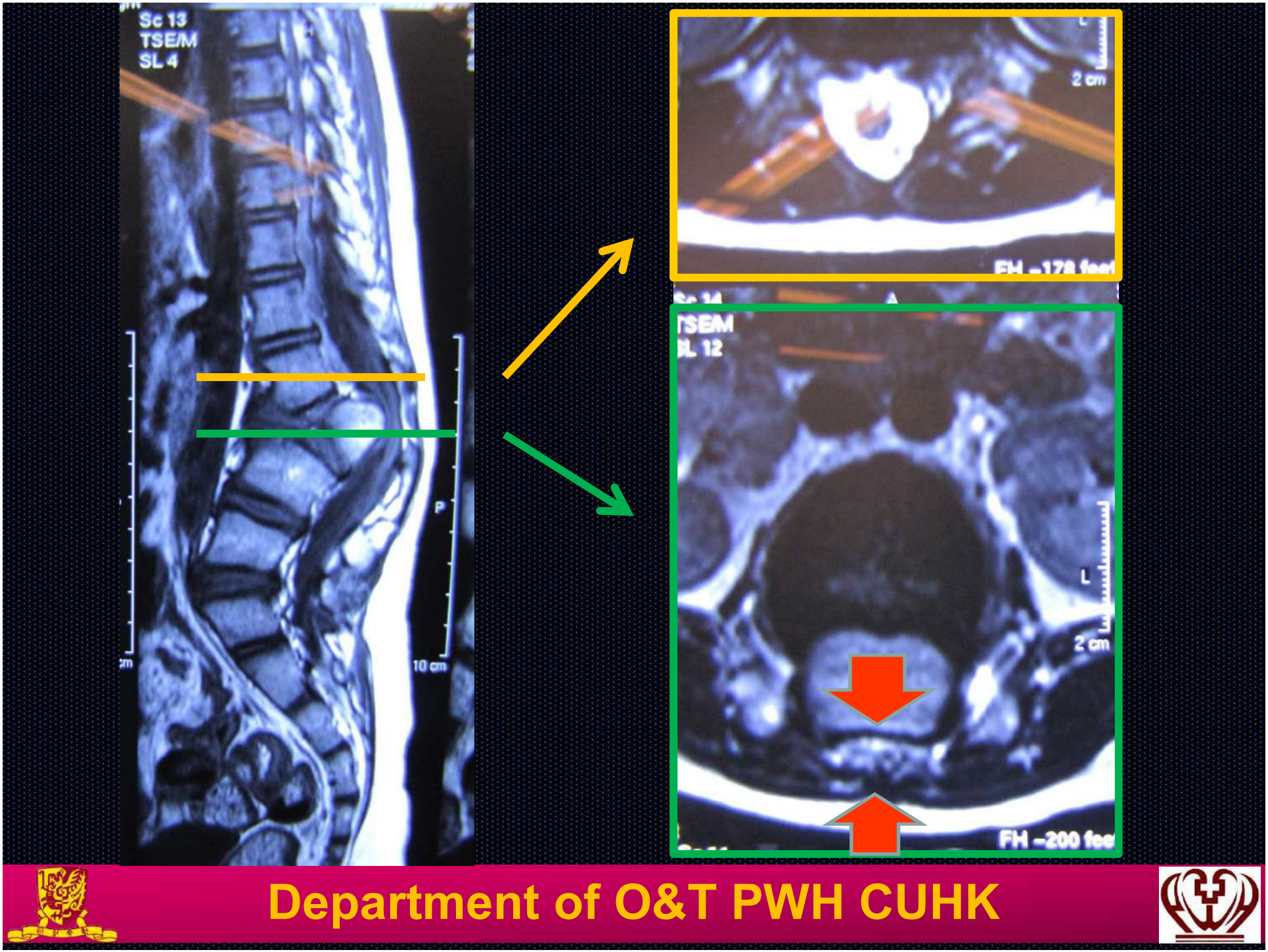
Zeller , Ghannem , Dubousset . Spine 1996







+++PT, --- SS,
Pelvic retroversion


Sc 13
TSE/M
SL 4
10 cm
2 cm
TSE/M
SL 12
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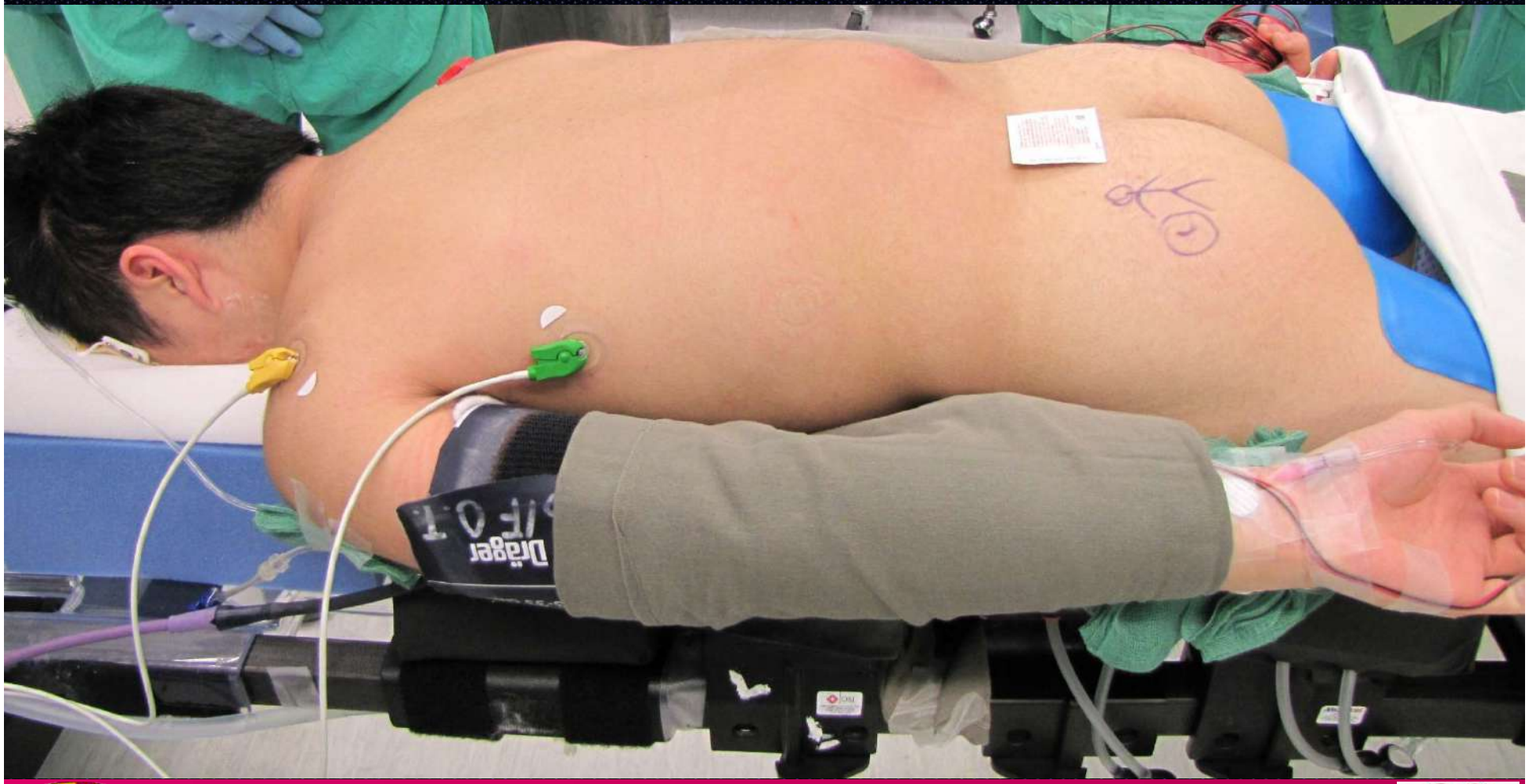
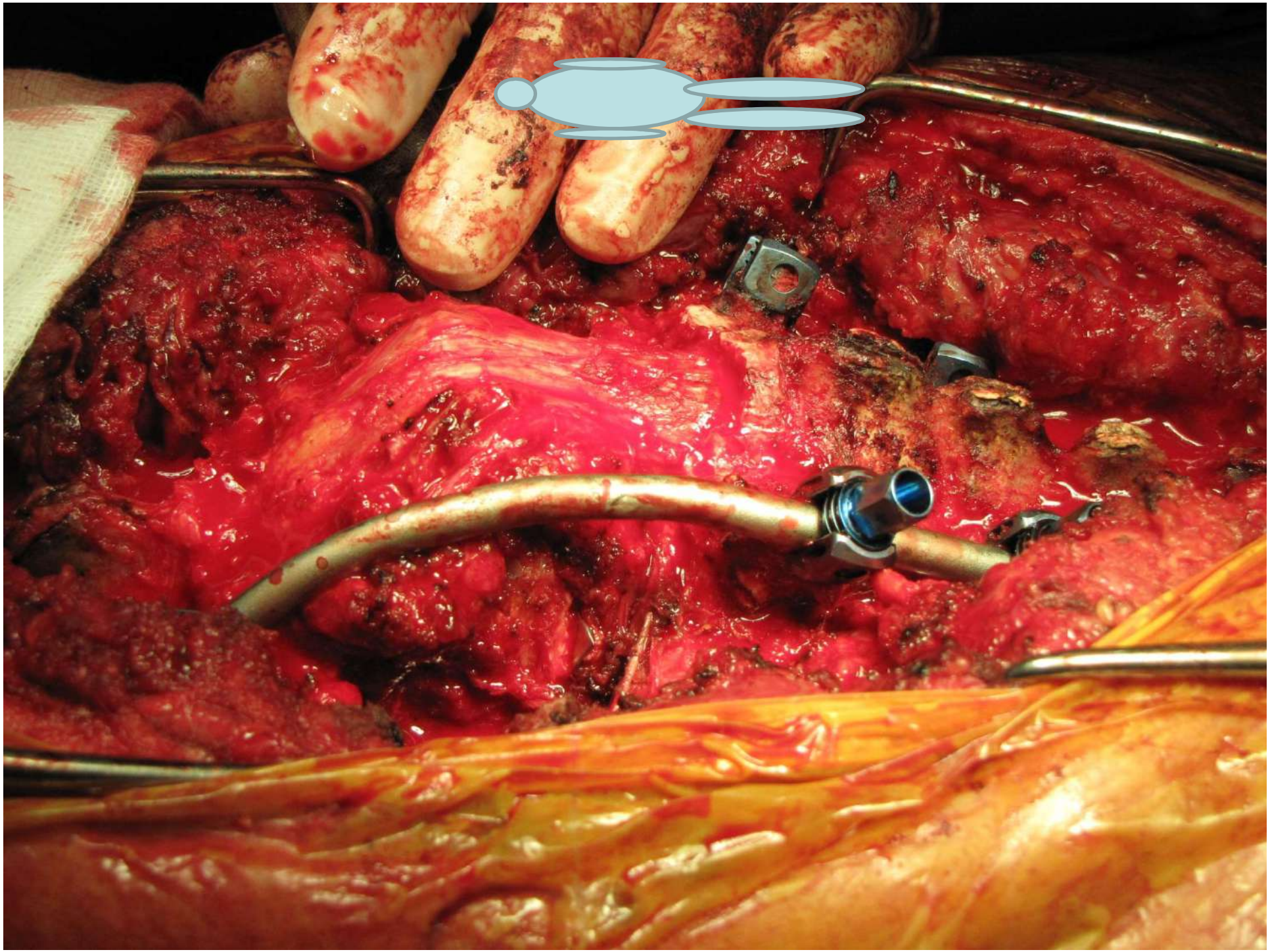
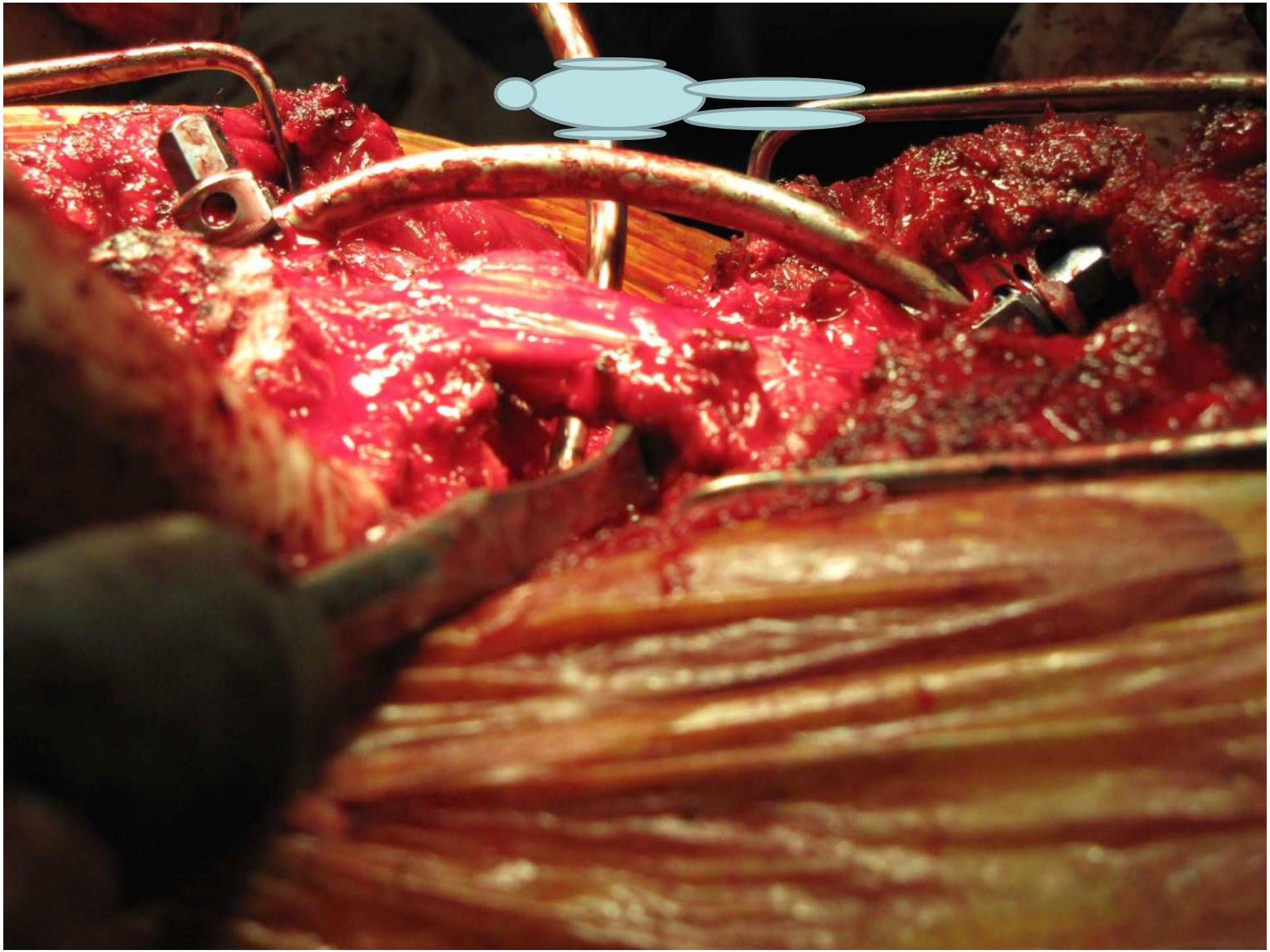
FH -200 fee

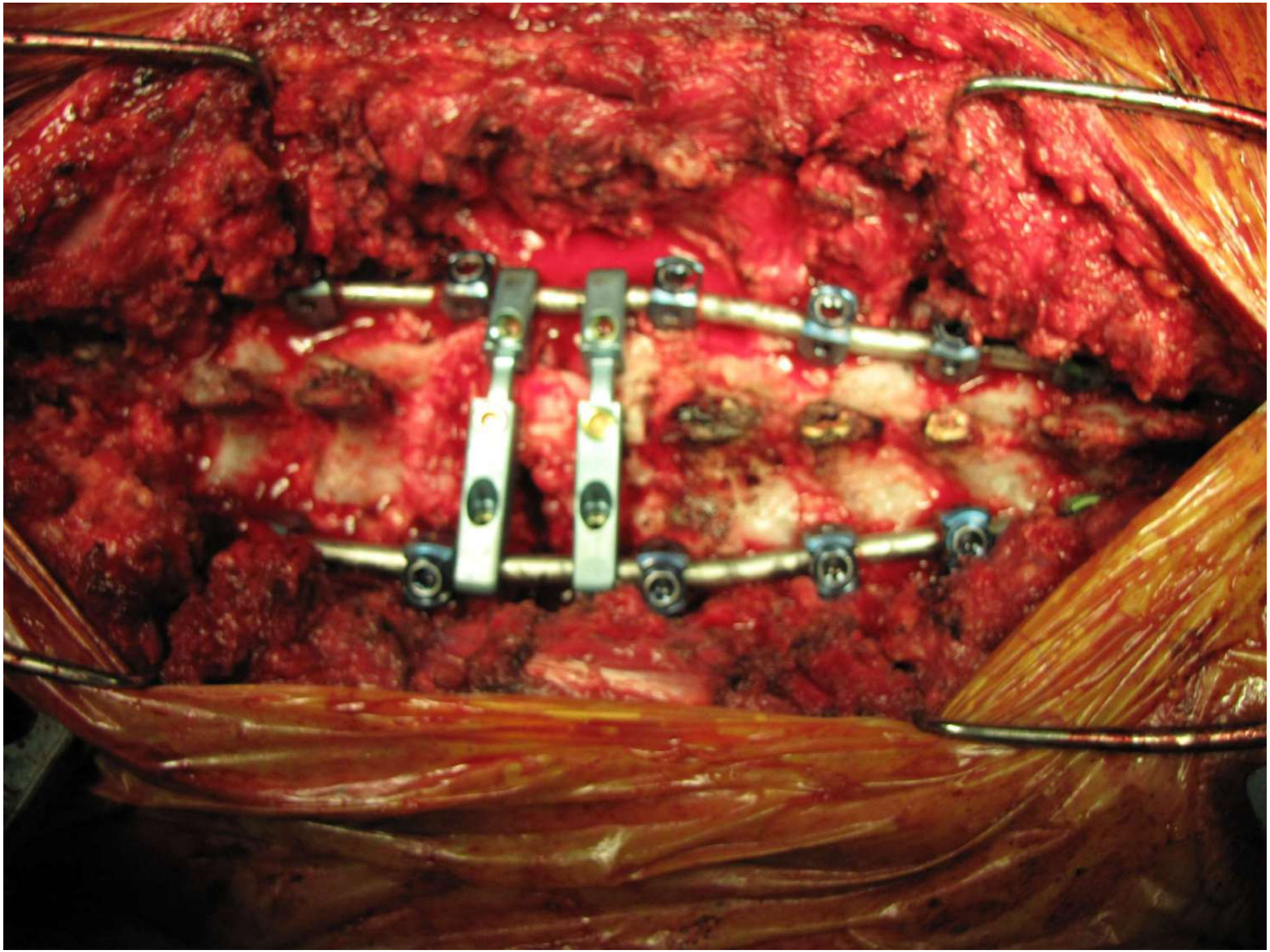

GIORDANO

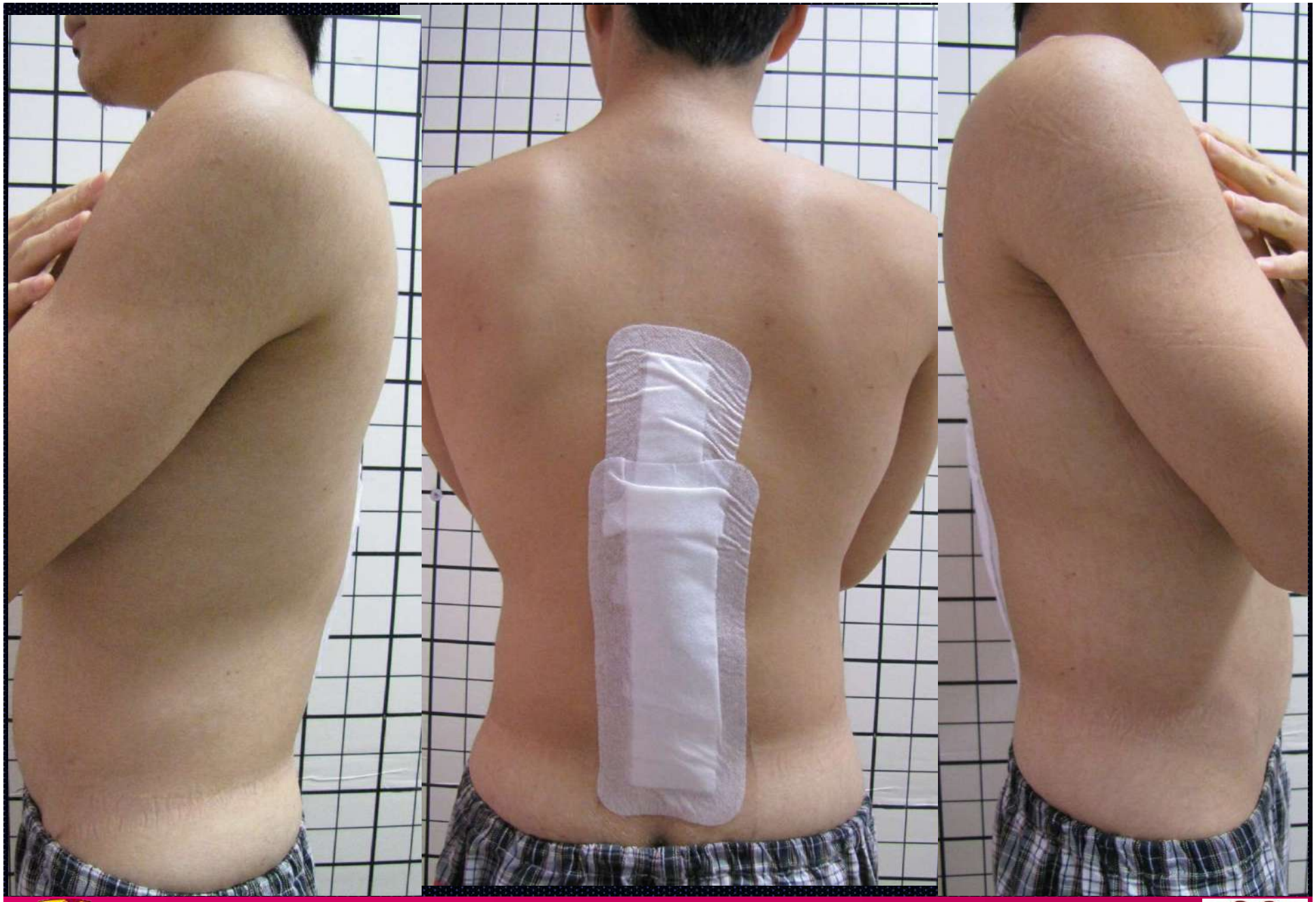
One stage L2,3 Total vertebrectomy T10- L5 fusion











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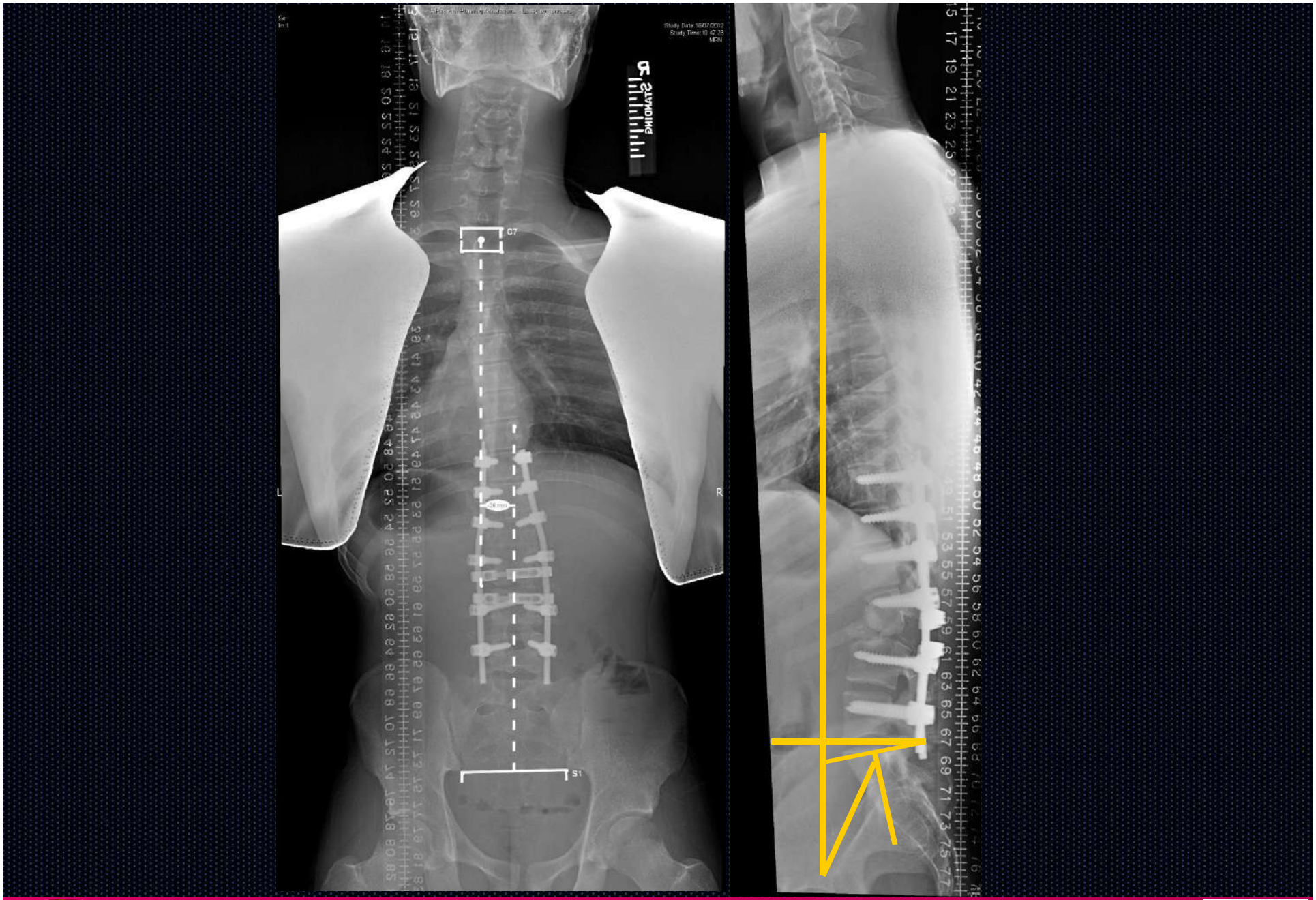
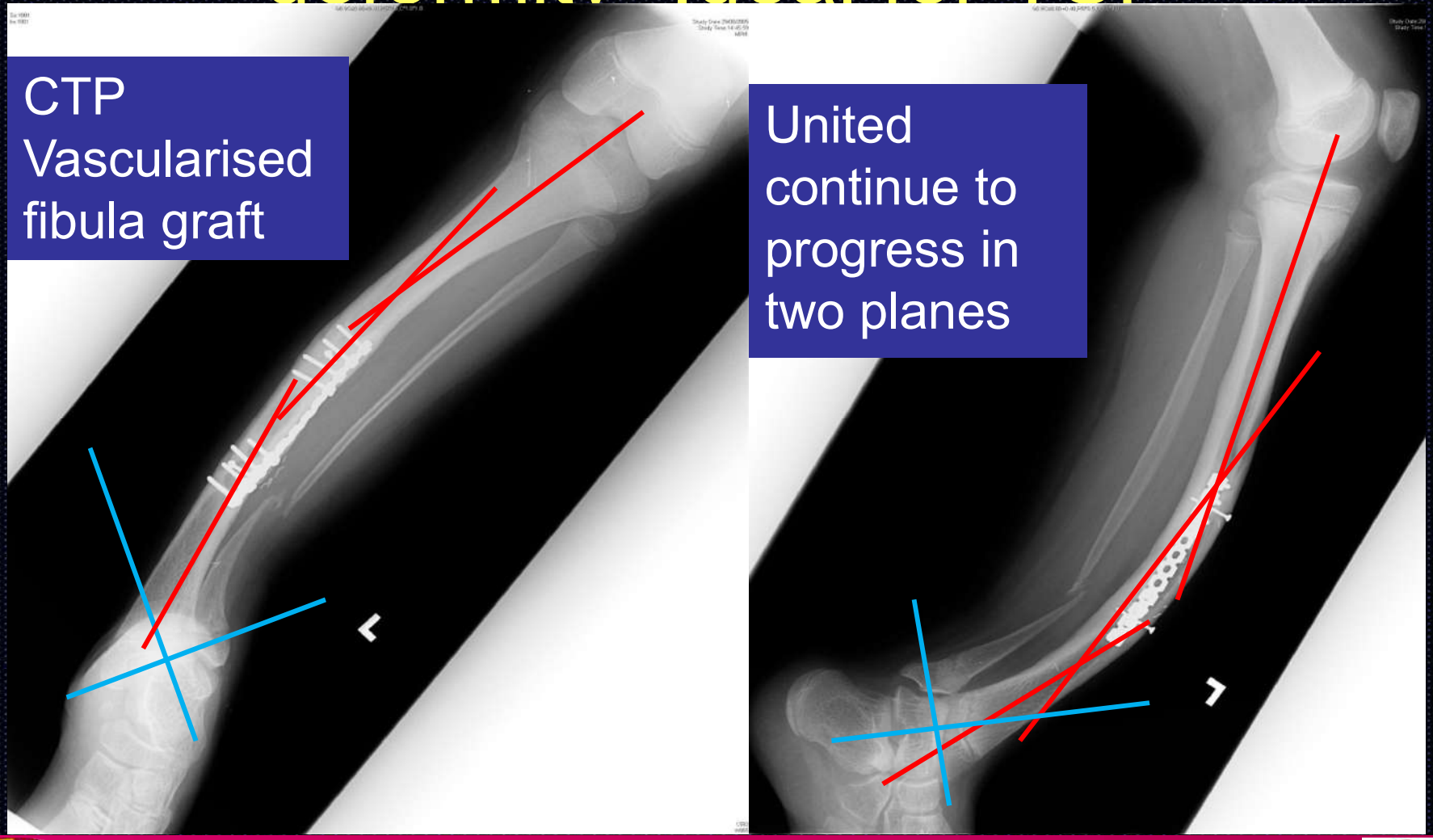

C7
S1

Conclusion

- New era in surgical strategy
- Adapt to new technologies
  - 3D image processing, computer navigation
- Adopt pharmacological agents
  - Transamine infusion
- Develop safe surgical techniques
  - 3d Simulation Spinal osteotomies PSO, VCR

Taylor Spatial Frame

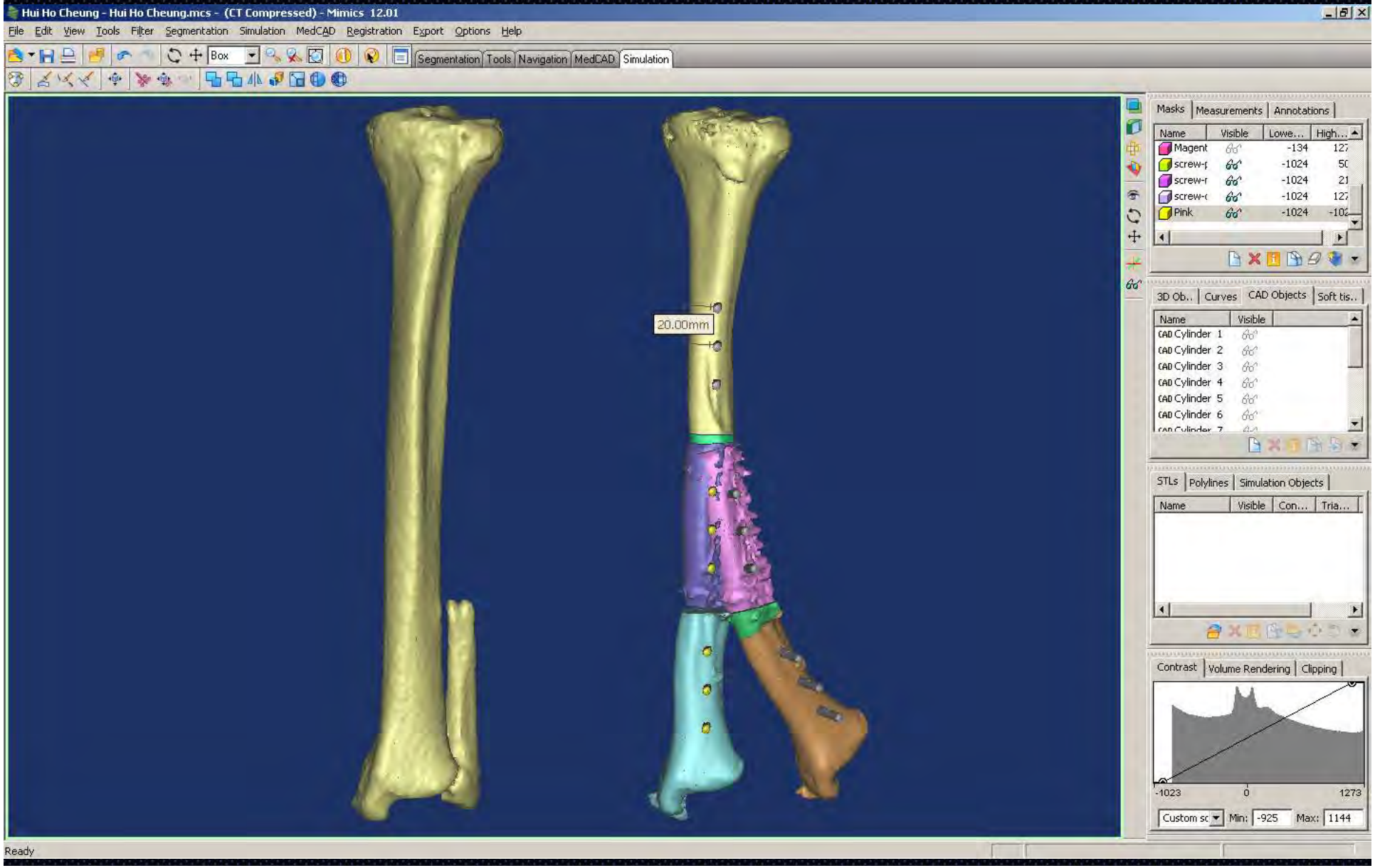
Complex multiple levels and planes deformity- Ideal for TSF

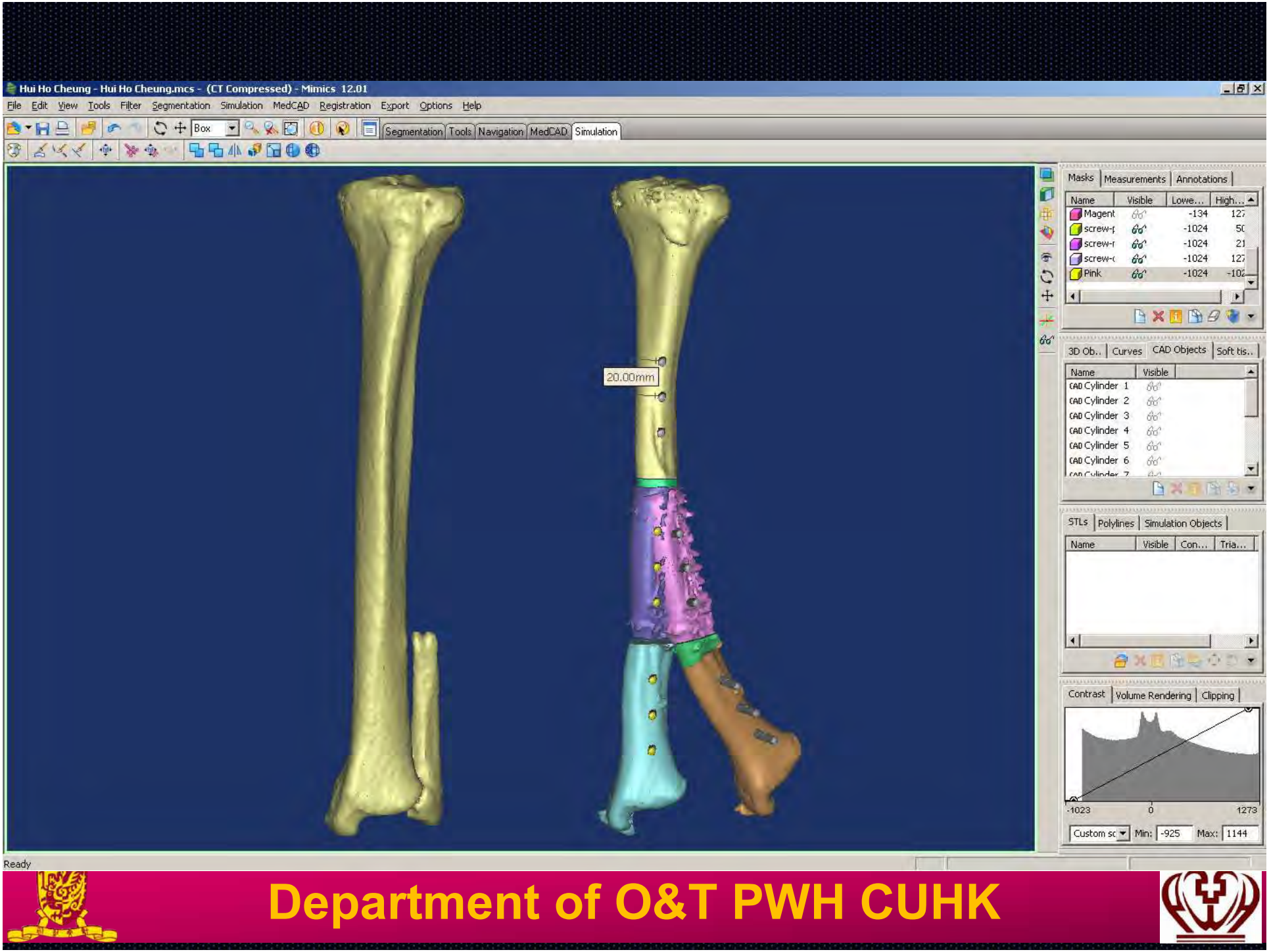


Reduce Number of planes and deformity if possible

Previous vascularised fibula graft at age 6 progressive valgus ankle deformity

Pre operative CT Mimics planning

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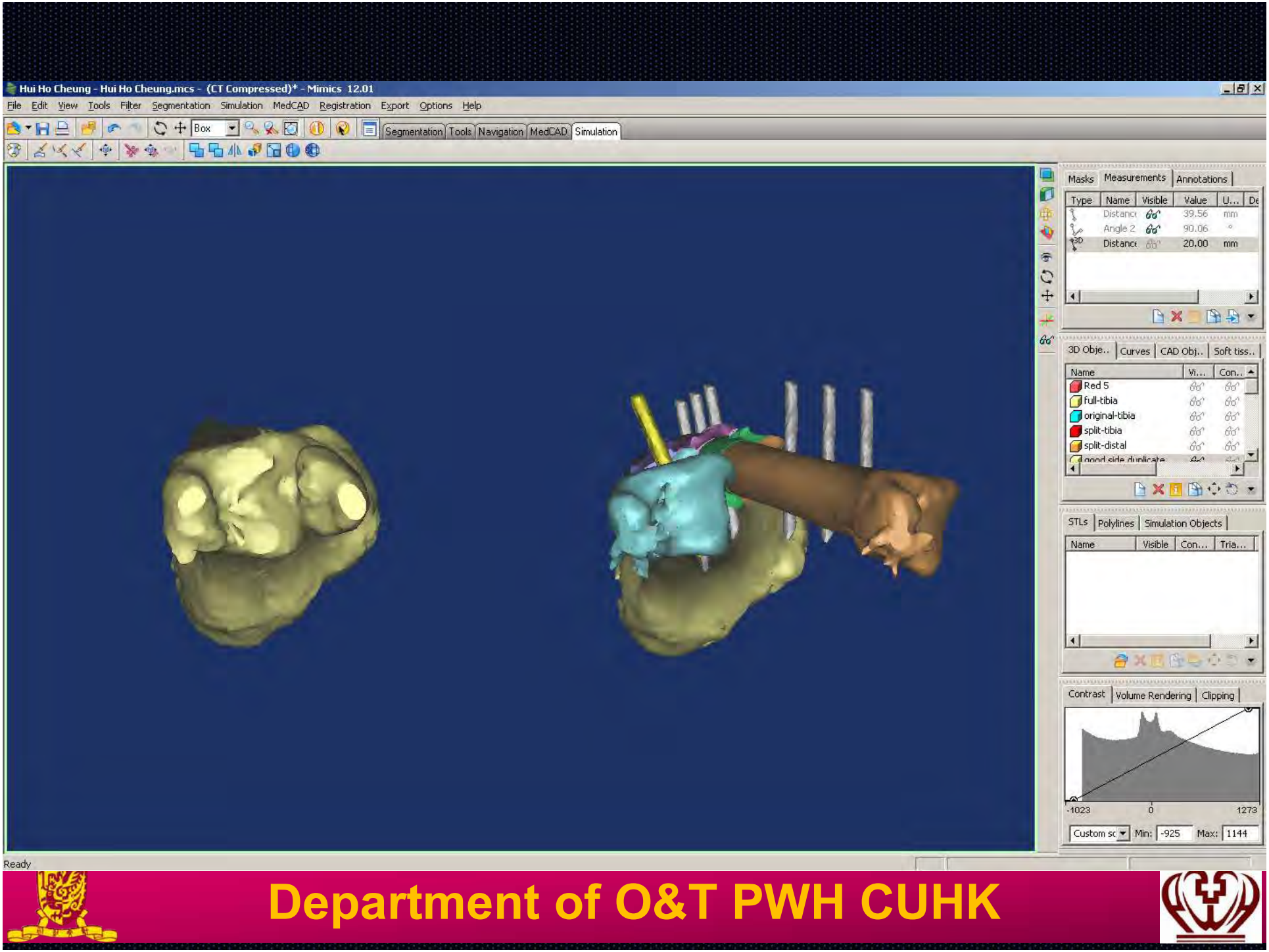
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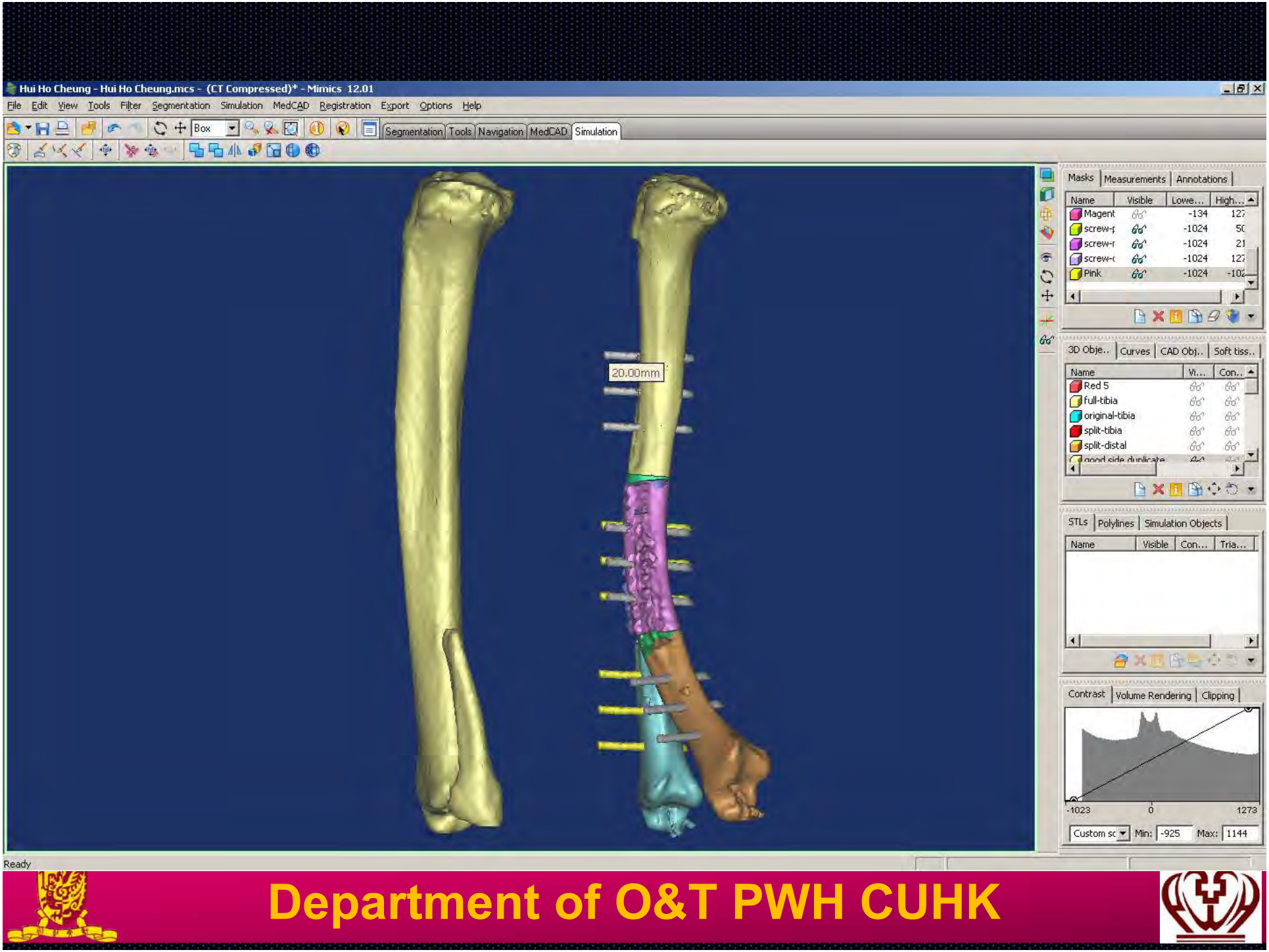

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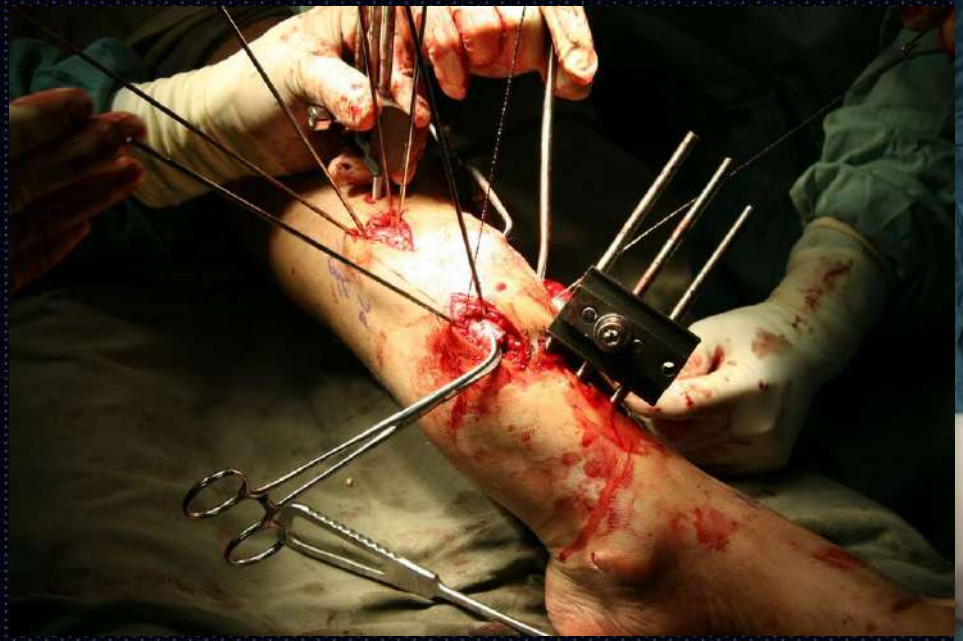
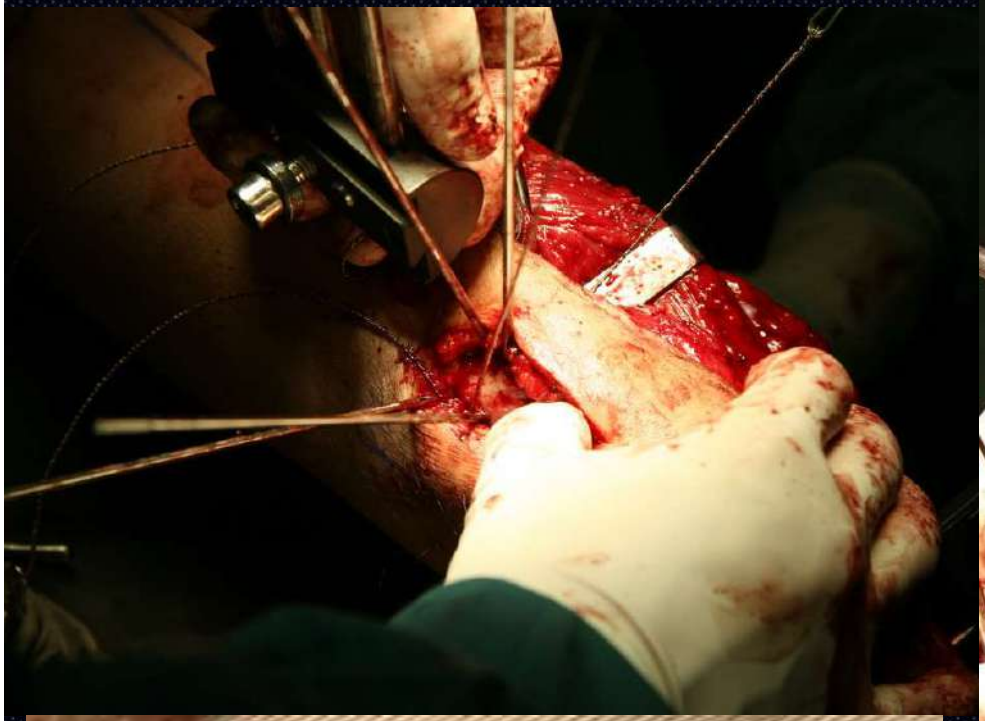
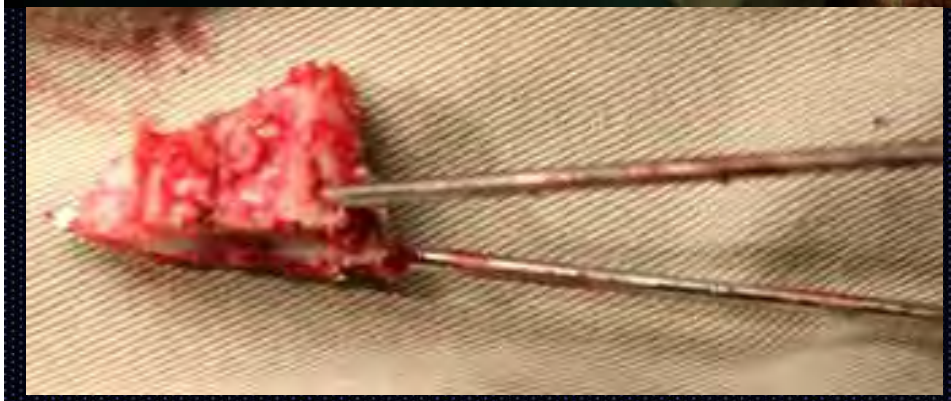
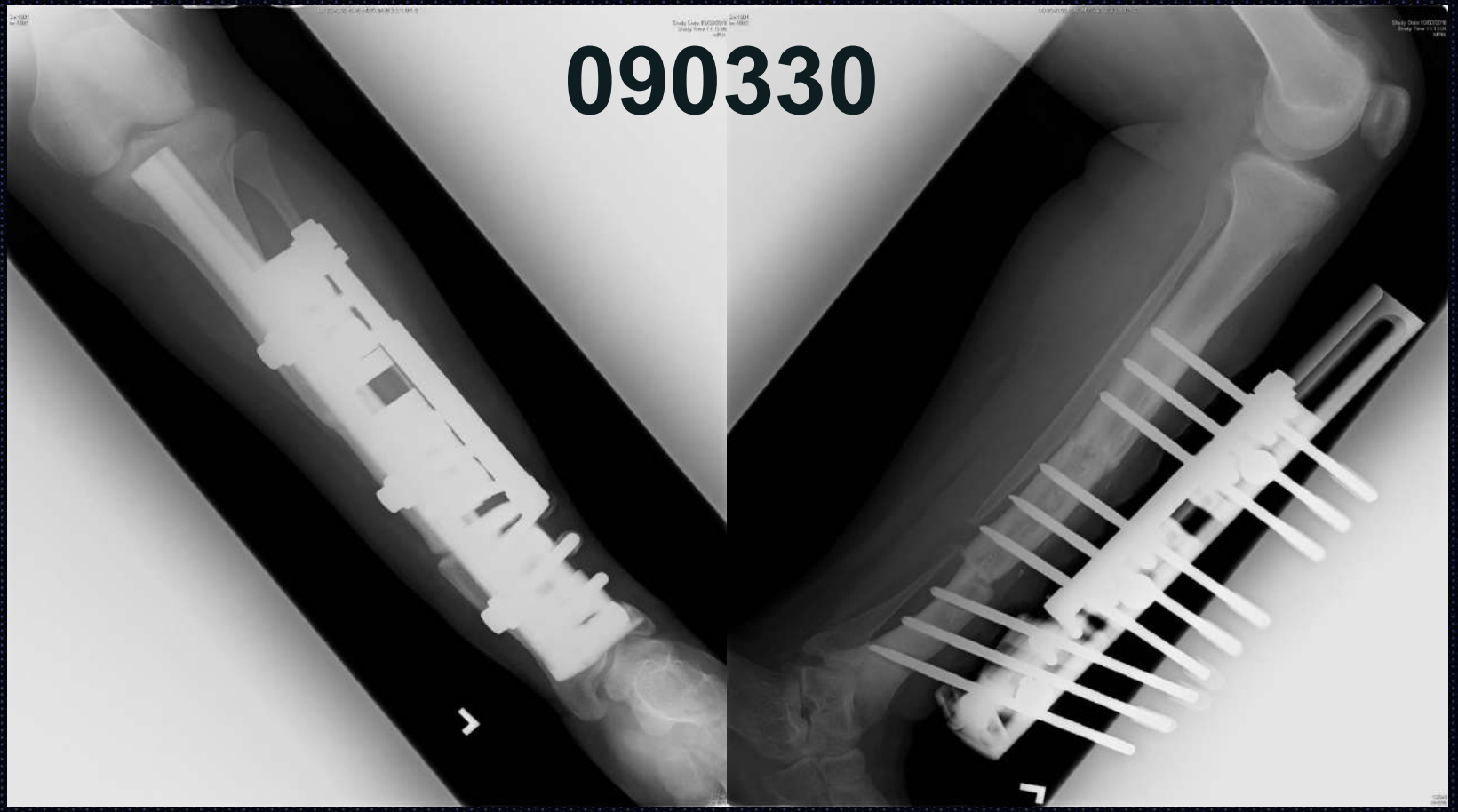






Open Excision multiple osteotomies and 6 axes realignment

Further reduction of complexity



Revised to TSF Sheffield clamp

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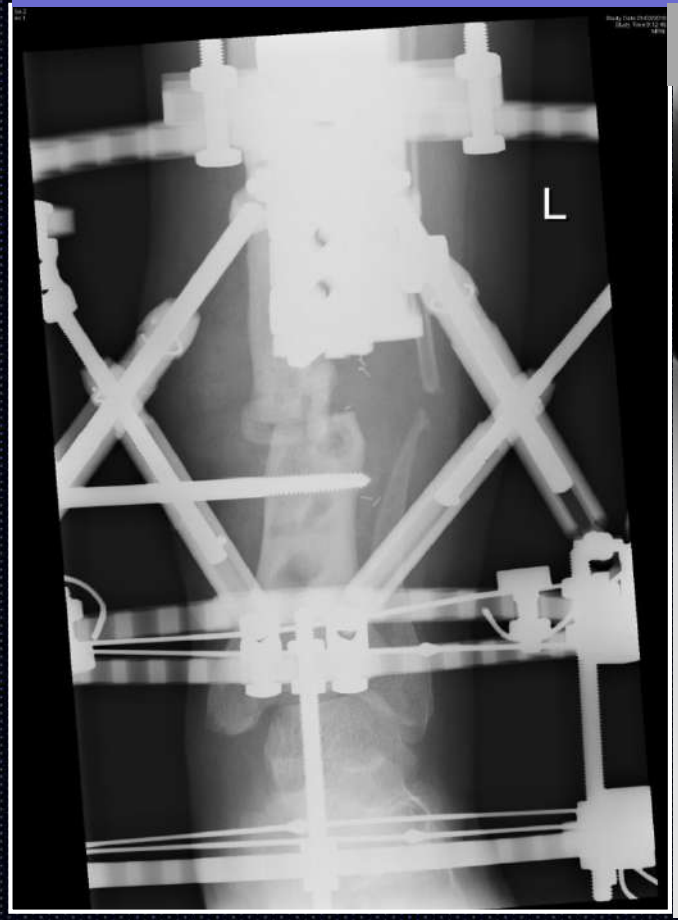
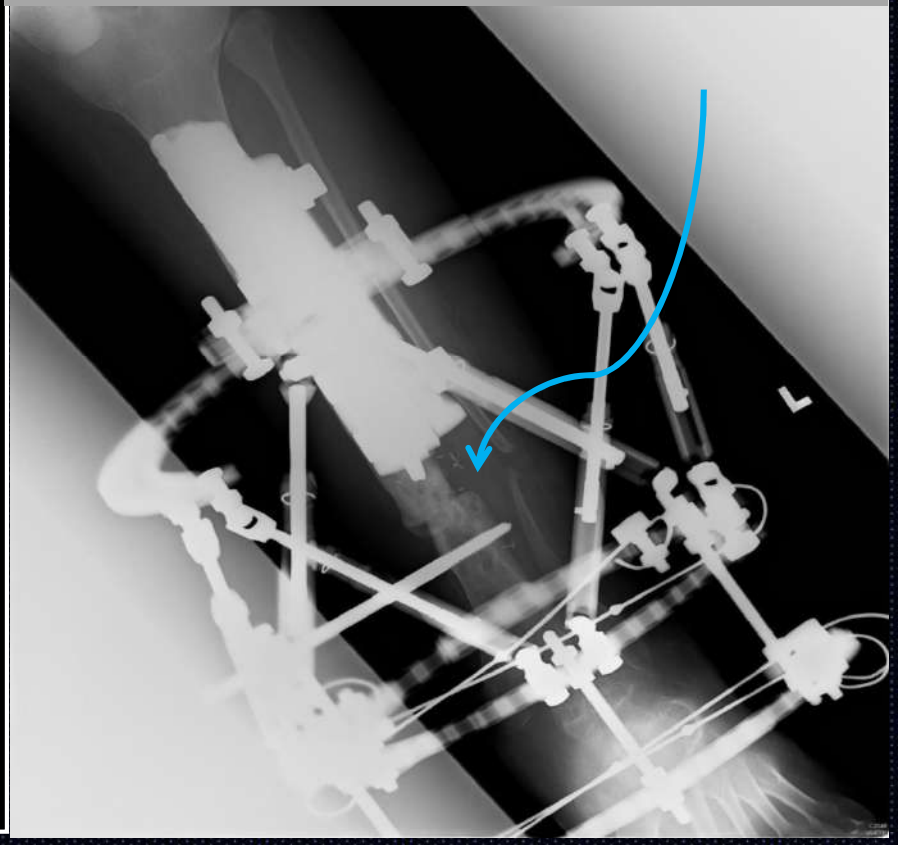
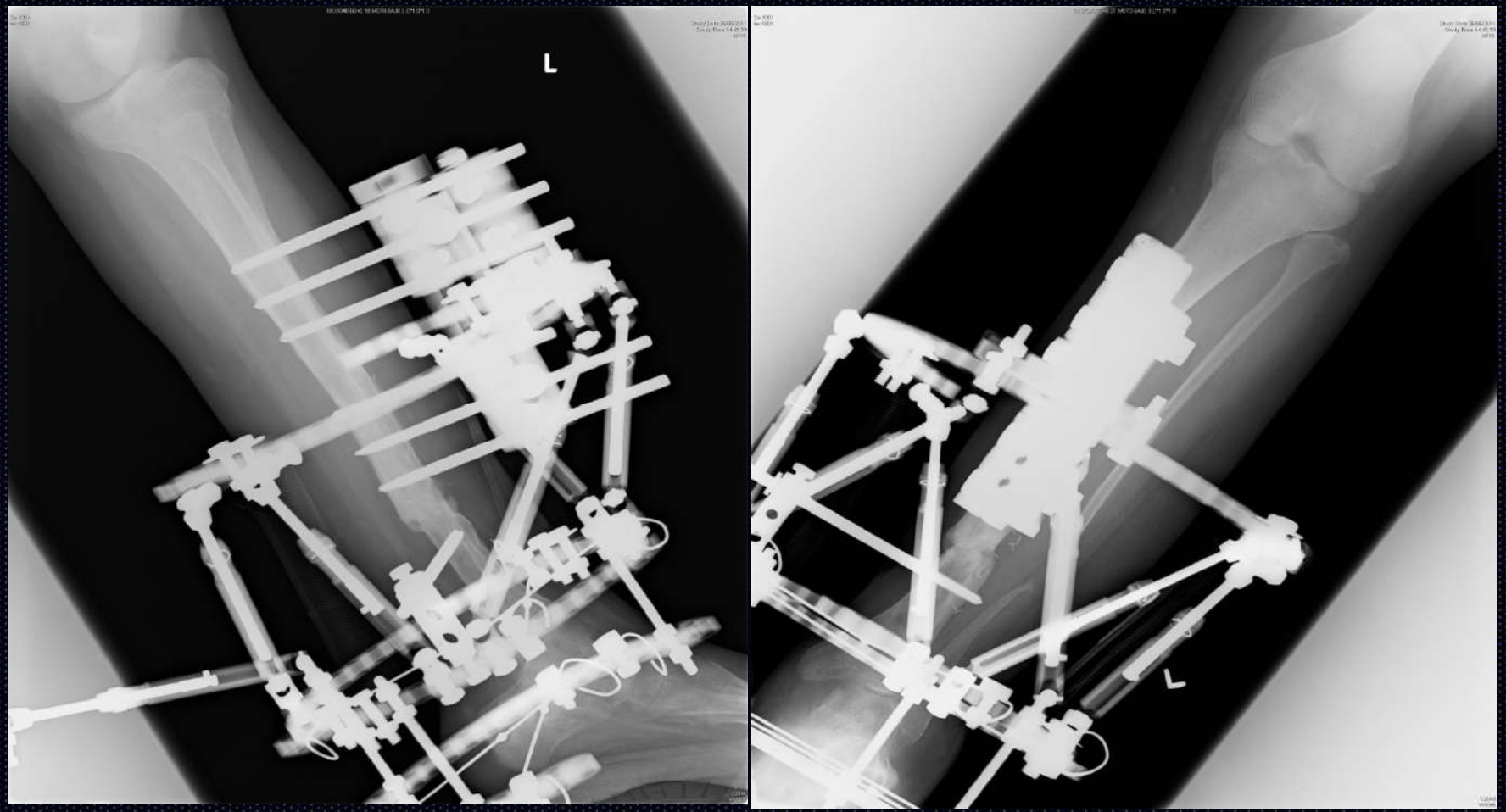
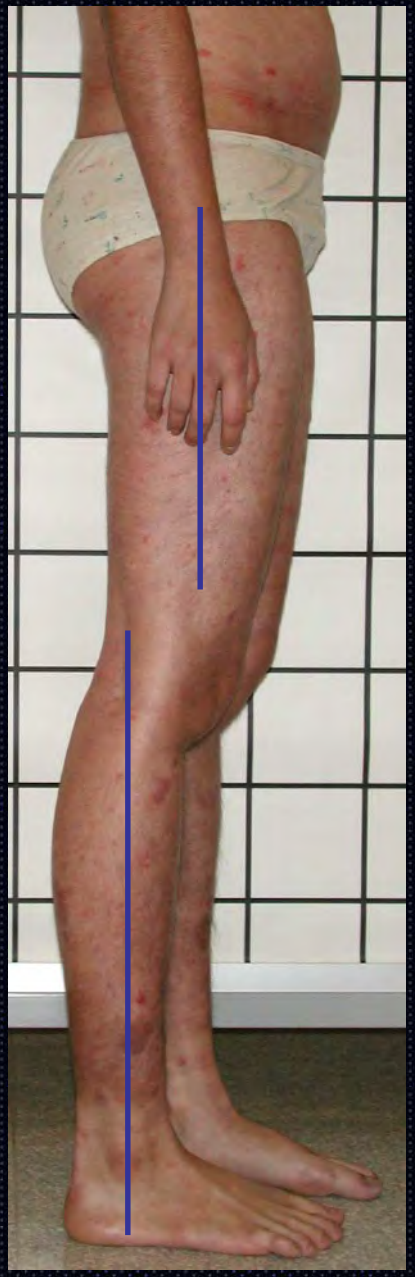
	Still non union 

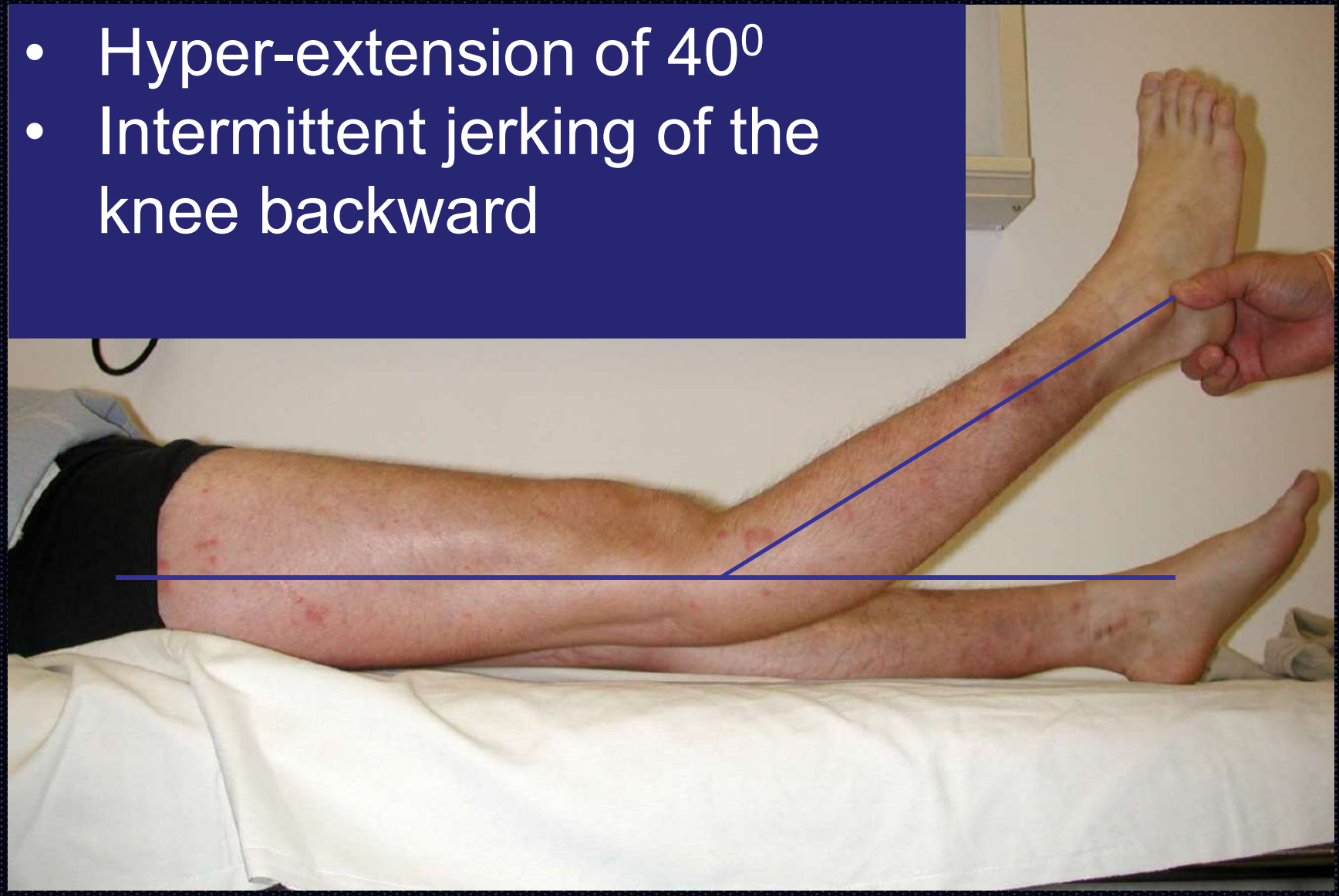
Healed with Lipus



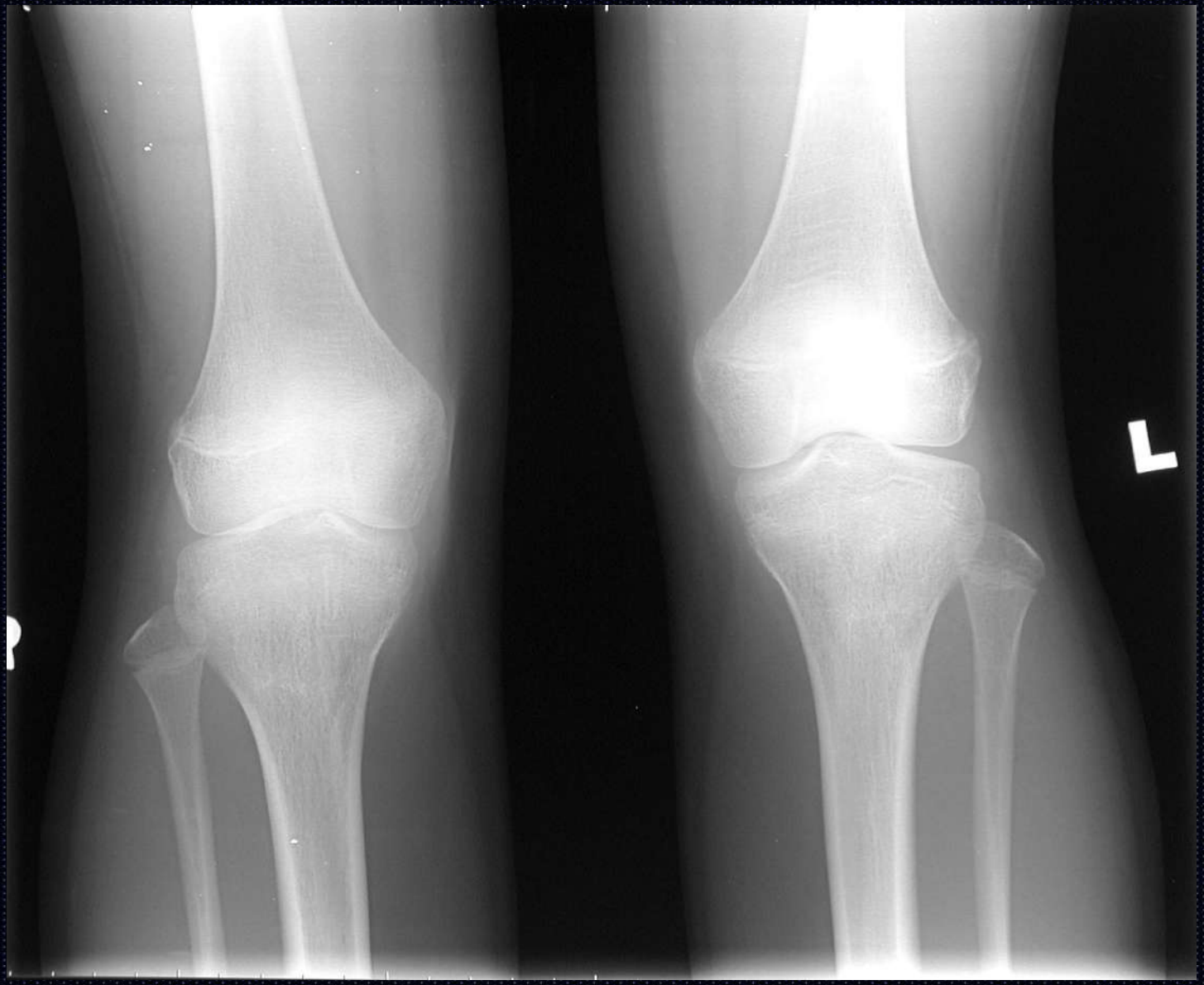


- Severe Psoriasis since infancy
- Note the extensive Striae associated with long term steroid and Neotigason use
- The anterior and distal translation of the femur

- Hyper-extension of 40^0
- Intermittent jerking of the knee backward



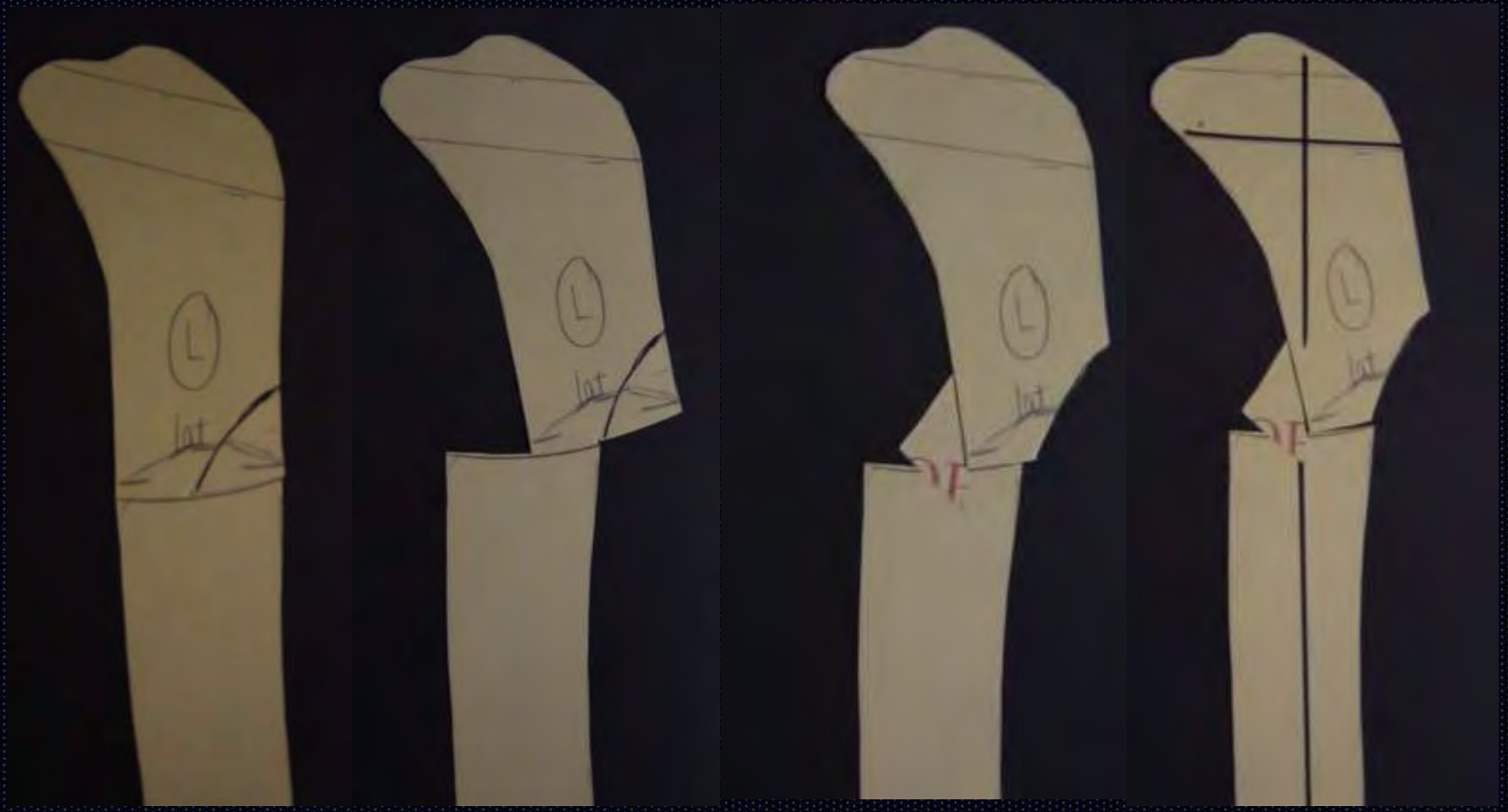
- Limited Knee Flexion
- Easy fatigue and knee instability particularly going down stairs and while standing in public transport.
- intermittent jerking of the knee backward



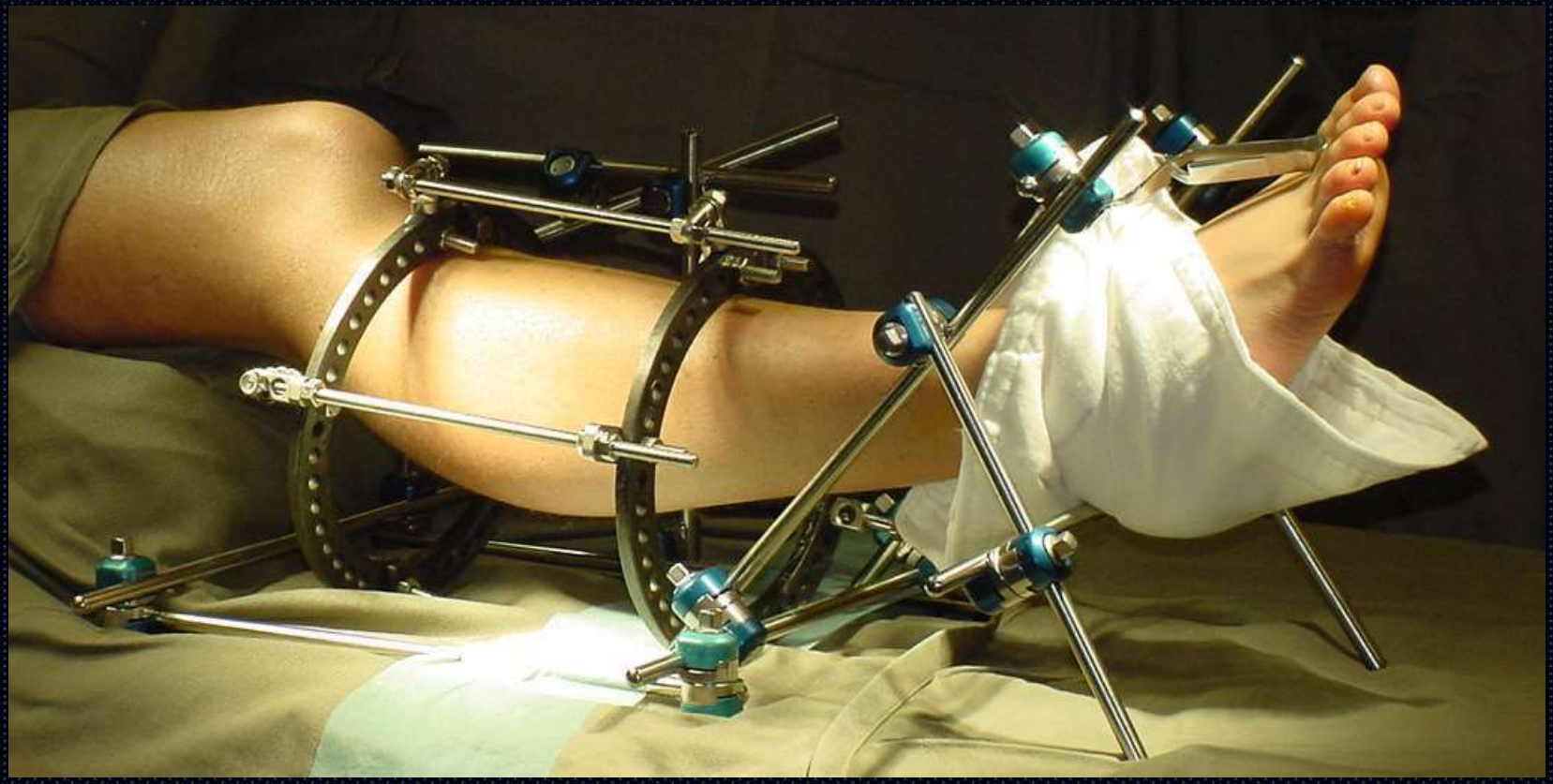
AP Knee: Overlapping of the joint lines

PPTA 110^0, Scarring of Anterior Proximal Tibial Epiphysis

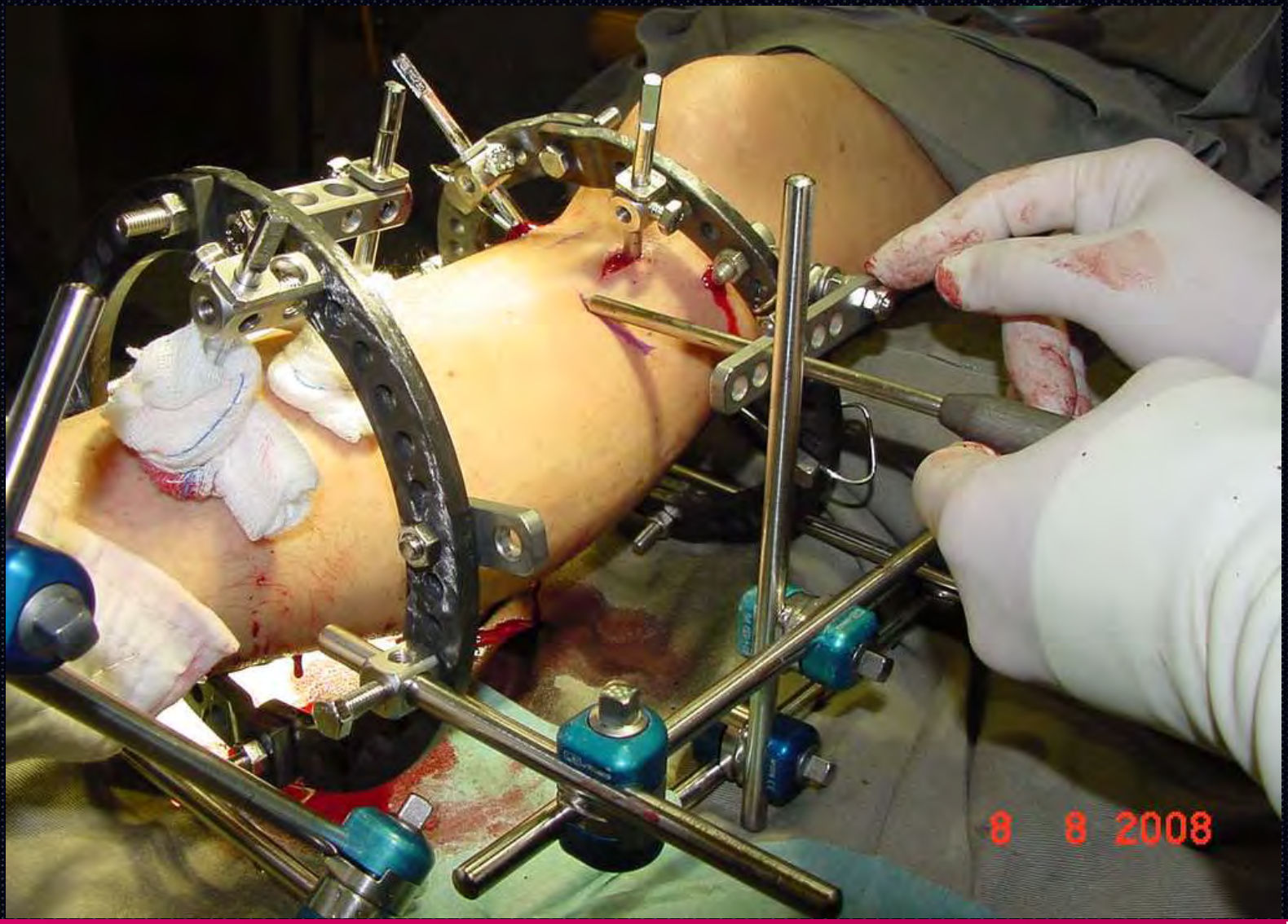
Planning of osteotomy



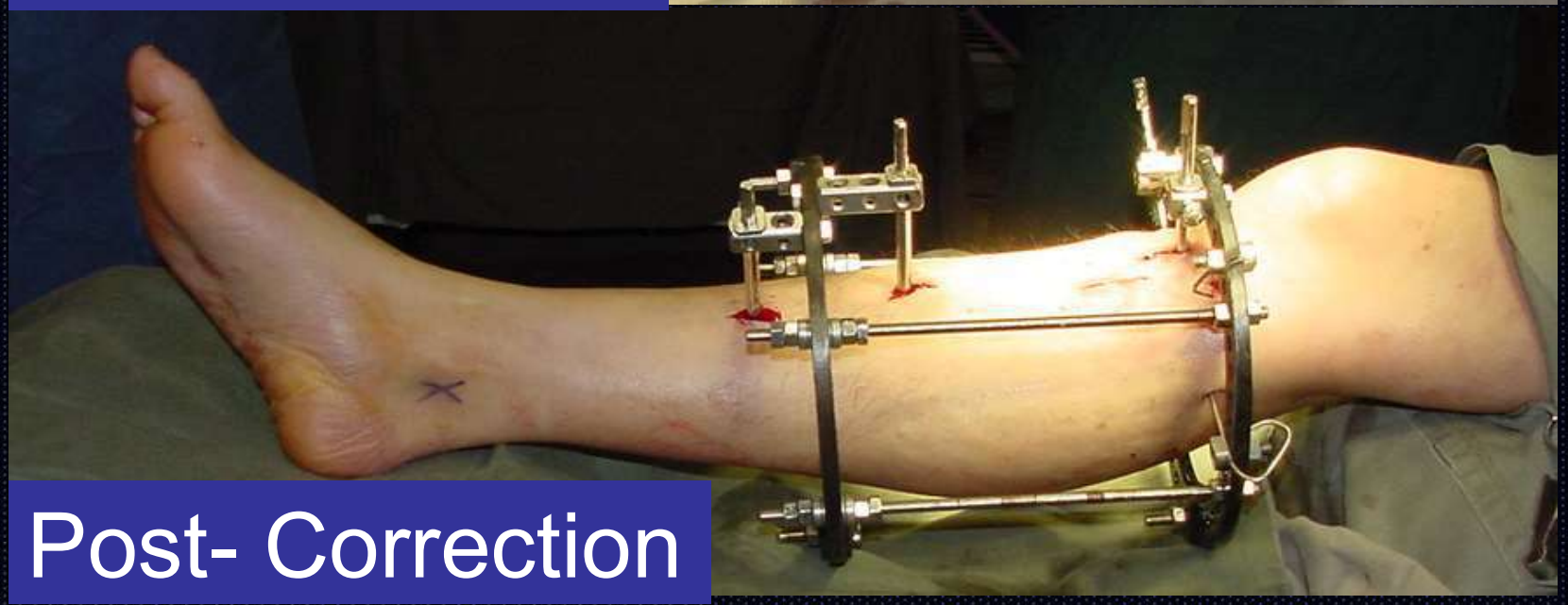
Limb positioned in Frame on Frame



Focal Dome Osteotomy

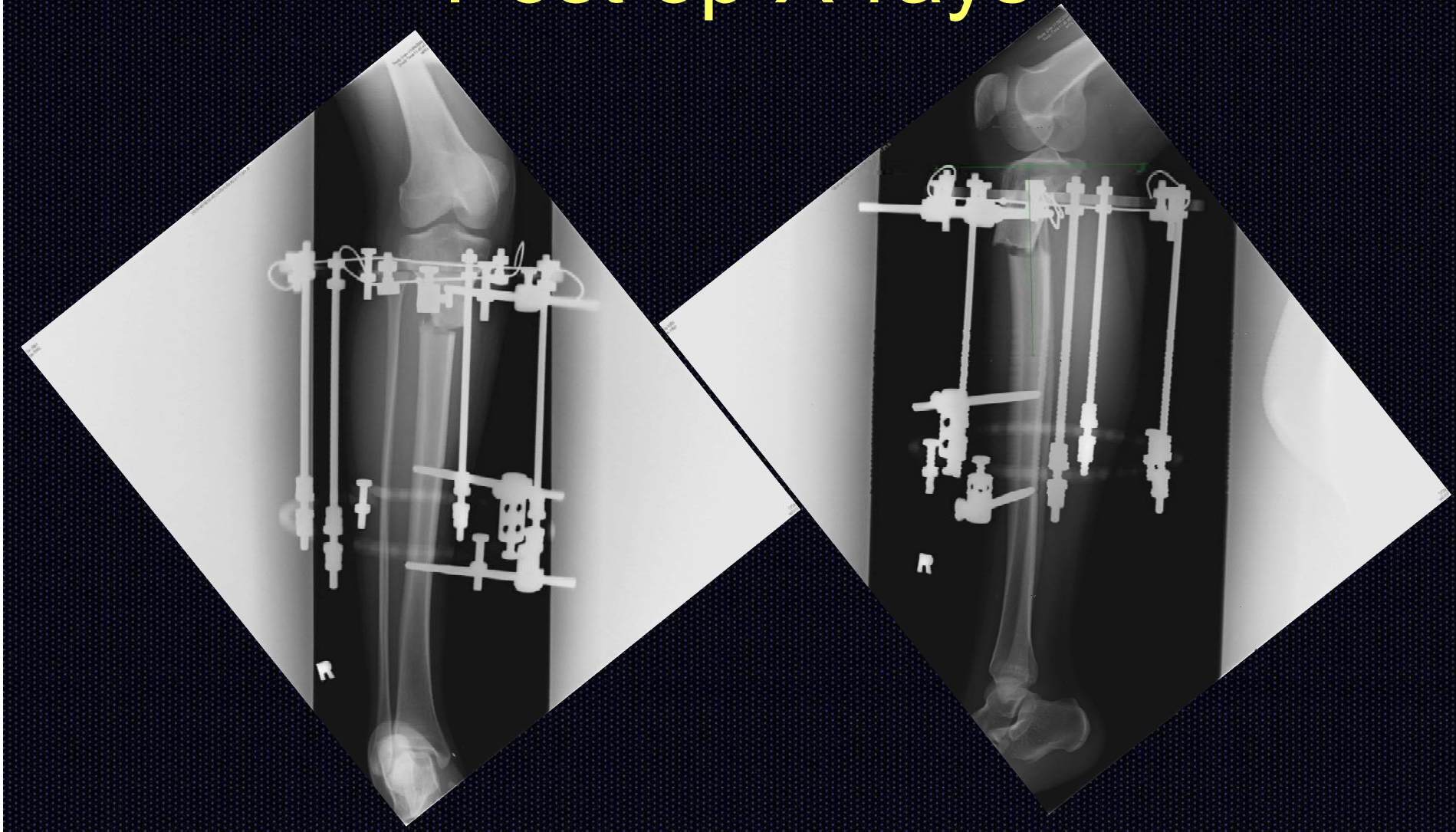


Pre- Correction

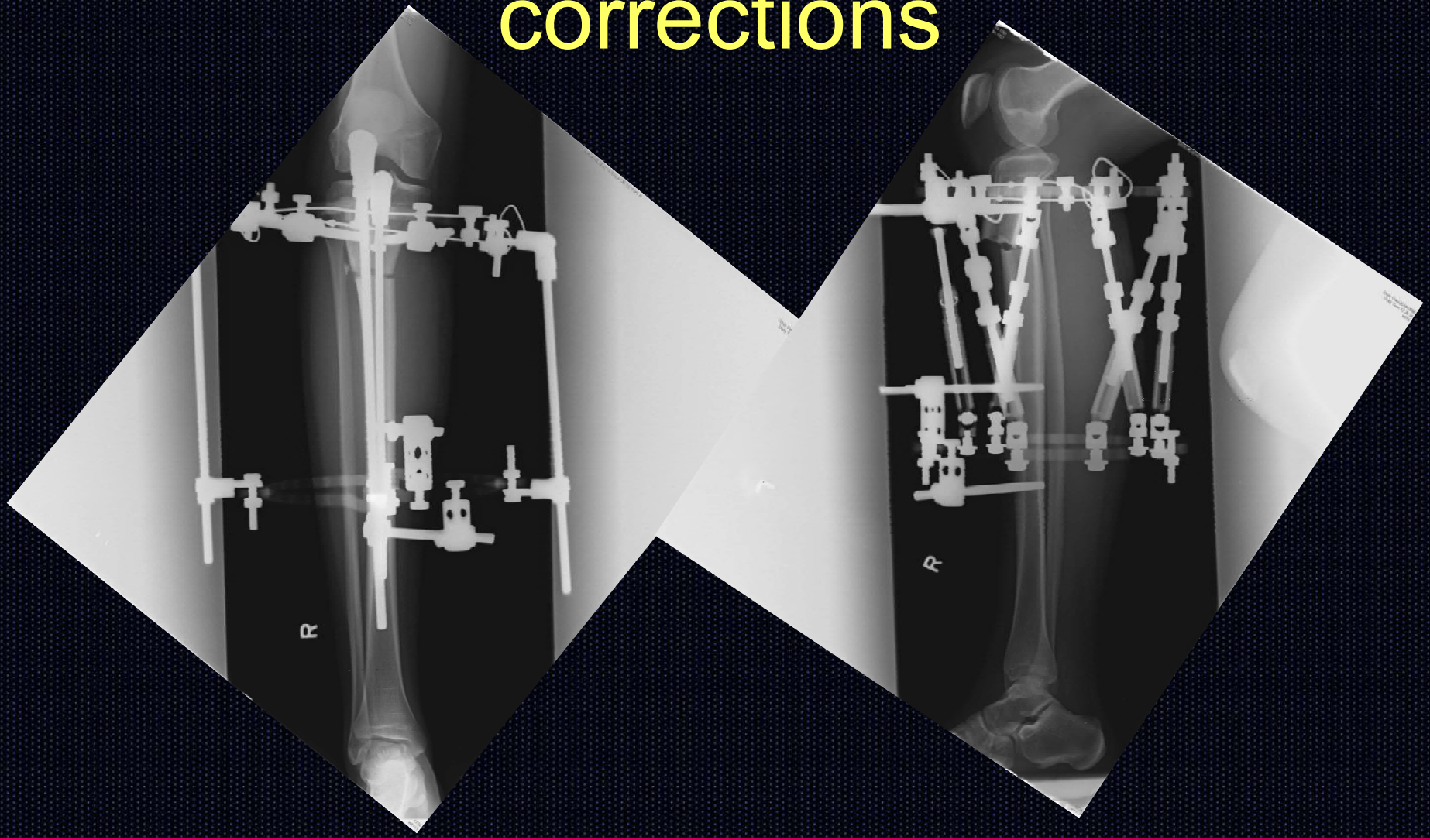


Post- Correction

Post op X-rays



Right Knee further post op corrections

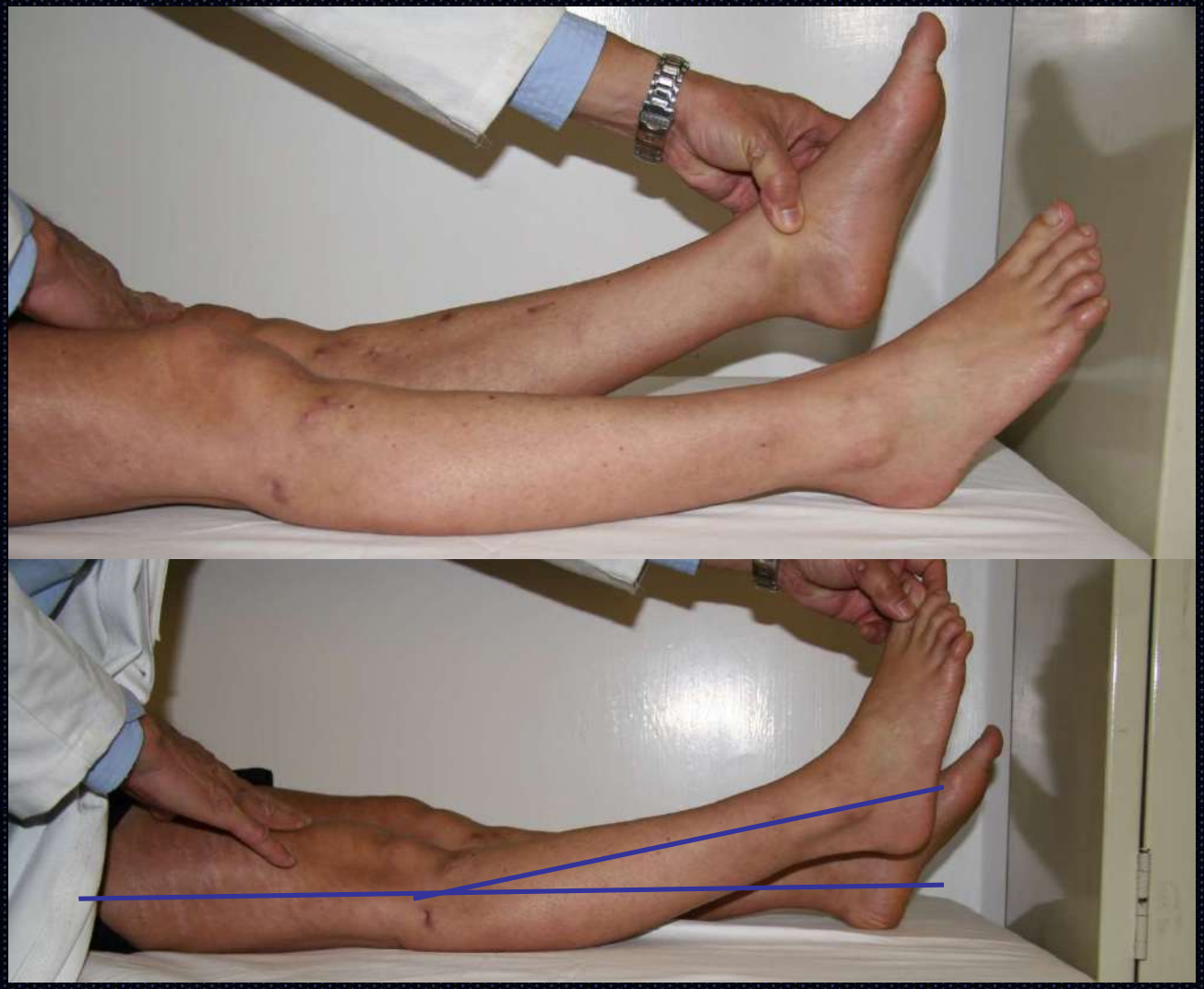


4.5 month post operation

- Dynamisation with calibrated loaded springs
- Compressive Stiffness of spring 3.65kg/mm

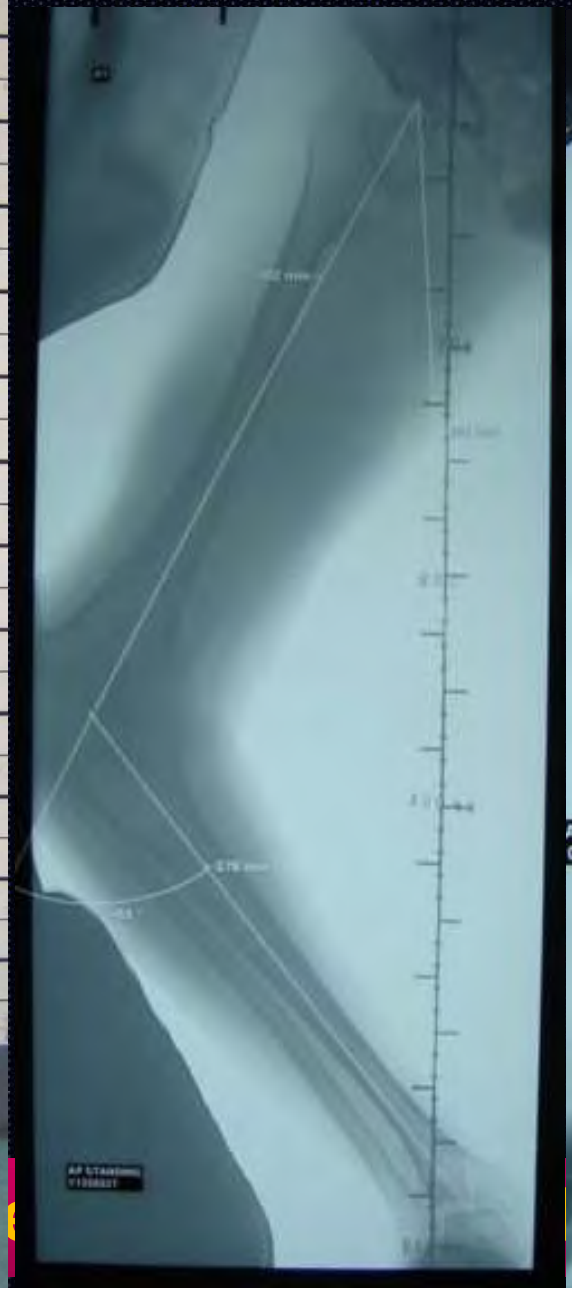
6 months post operation

Post op Hyper-extension 16^0

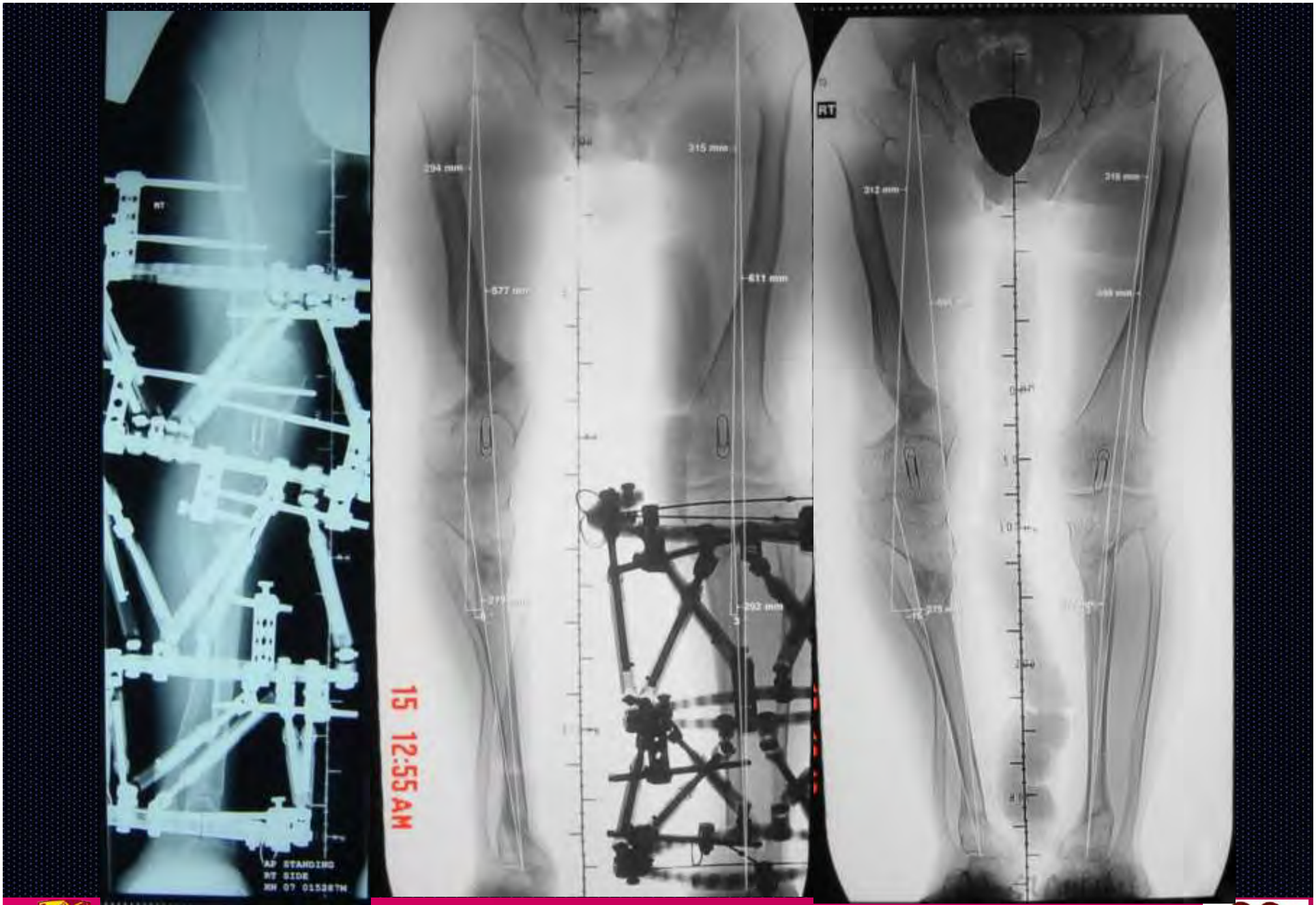


Post Op Standing alignment

This is what happen with growth in these patients



Two Stage Correction TSF


AP STANDING
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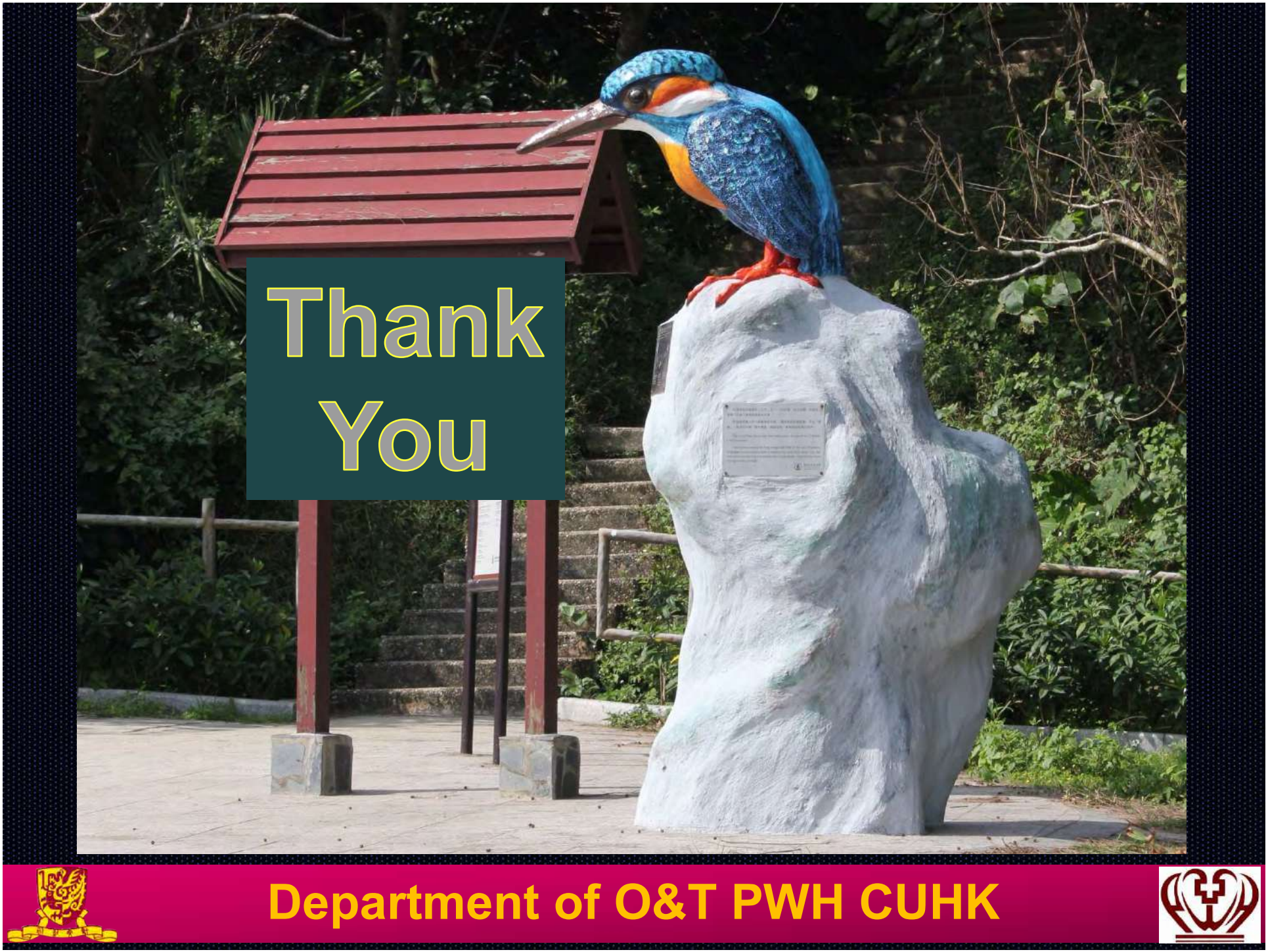
292 mm
15 12:55 AM
RT
312 mm


Thank
You

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- *JOHN A. HERRING, MD, HUI TAEK KIM, MD, AND RICHARD BROWNE, PHD. Legg-Calvé-Perthes Disease PART II: PROSPECTIVE MULTICENTER STUDY OF THE EFFECT OF TREATMENT ON OUTCOME. THE JOURNAL OF BONE & JOINT SURGERY · JBJS.ORG*
- *VOLUME 86-A · NUMBER 10 · OCTOBER 2004.*
- *M. Kamegaya, T. Saisu, N. Ochiai, J. Hisamitsu, H. Moriya. A paired study of Perthes' disease comparing conservative and surgical treatment. J Bone Joint Surg [Br] 2004;86-B:1176-81.*

Reference Perthes 2

- *STUART L. WEINSTEIN, Long-Term Follow-up of Pediatric Orthopaedic Conditions. NATURAL HISTORY AND OUTCOMES OF TREATMENT*†. The Journal of Bone and Joint Surgery. VOL. 82-A, NO. 7, JULY 2000.*
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Thank You
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