Clinica Ortopedica e
Traumatologica
Università degli Studi di Pavia

Fondazione IRCCS Policlinico
San Matteo

Chairman: Prof. F.M. Benazzo

How to deal with hardware

F.M. Benazzo, S.M.P. Rossi, M Ghiara

Introduction

- Challenging scenario
- Can be straightforward or more challenging than a revision
- Careful pre-op planning to face any possible scenario
- Accurate imaging analysis

General rules

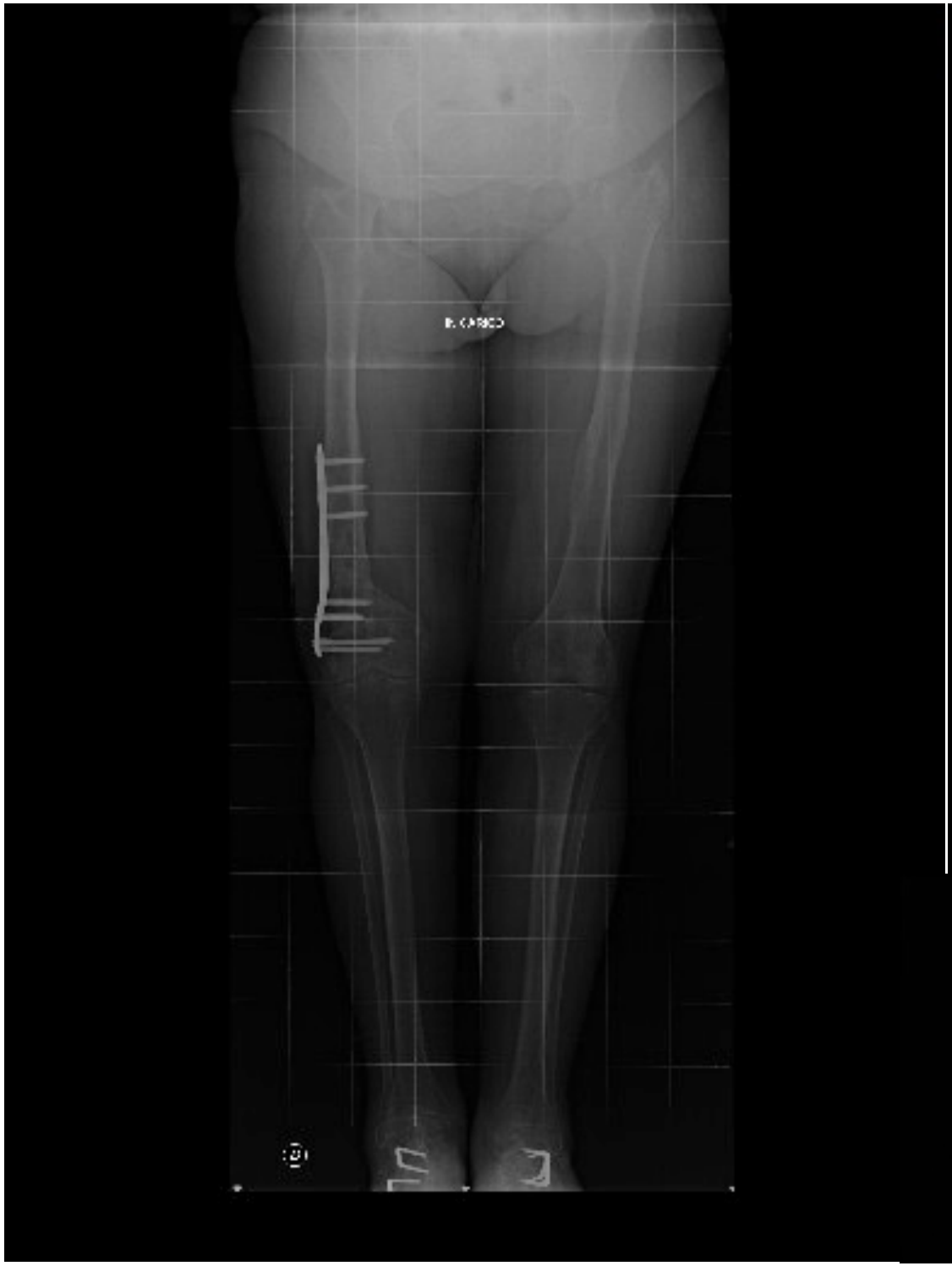
- TKA can be performed as a single staged procedure
- Hardware to be removed only if interferes with placement of arthroplasty components

General rules

2 stage surgery

- If different incisions for the 2 steps

- If hardware removal needed for correct planning (i.e. CT scan or other preop exams)

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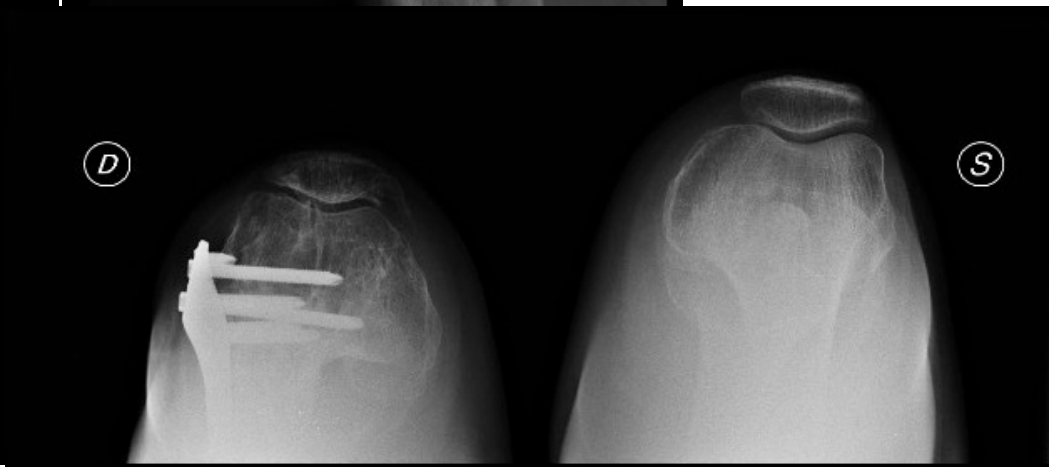
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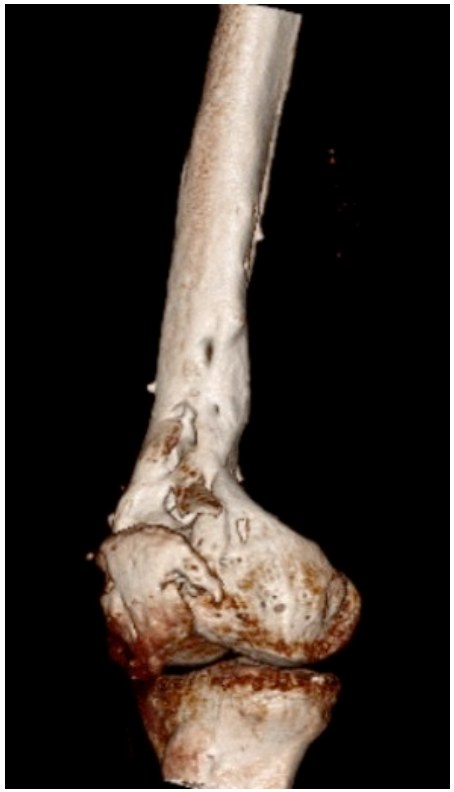

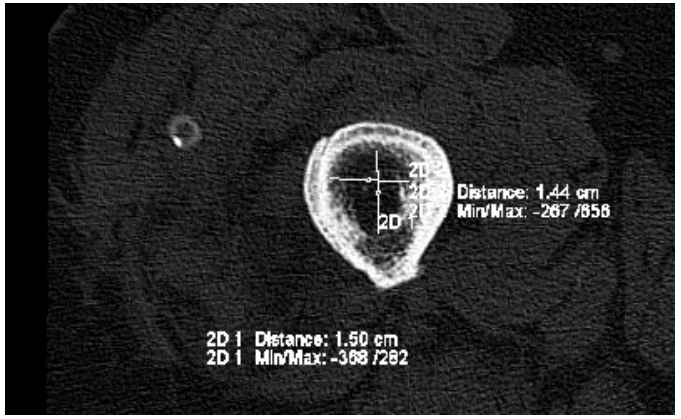
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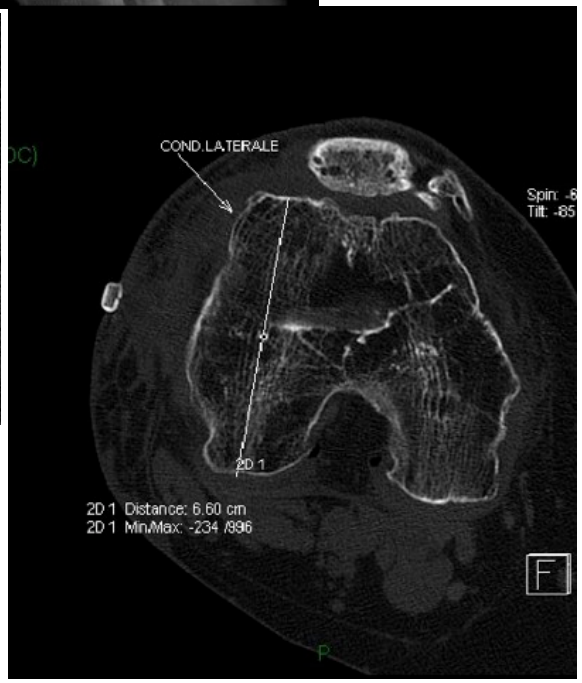
2D 1 Distance: 1.50 cm
2D 1 Min/Max: -368 /282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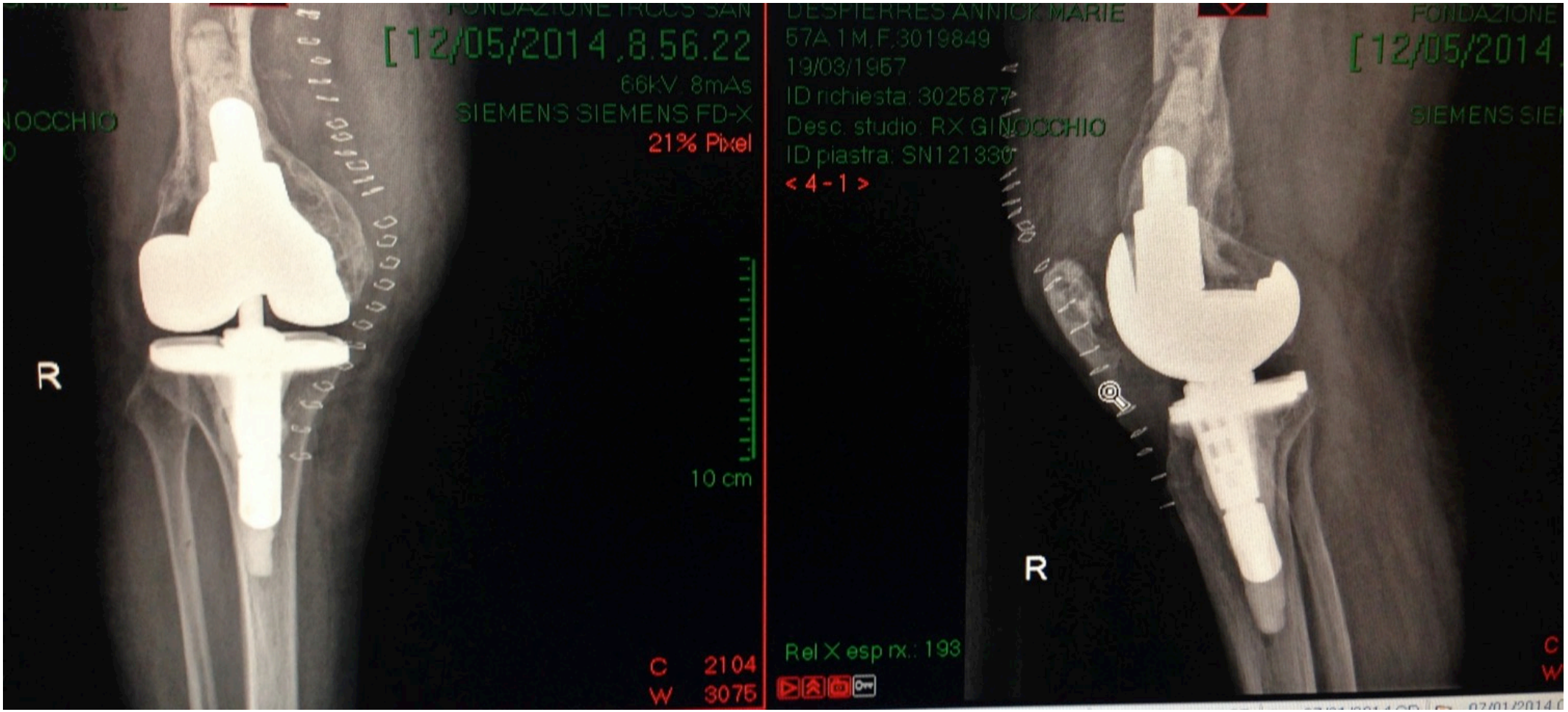
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General rules

- If previous site infection:

- Remove all hardware

- Plan a 2 stage surgery

General rules

2 stage surgery

1st stage

- Remove hardware
- extensive debridement
- Bone cuts
- Spacer (antibiotic loaded)

2nd stage

- Wound and soft tissue healed
- 3-6 weeks

Surgical strategy

Approach

- Often the biggest challenge involves dealing with previous incisions

- Wound healing problems should be anticipated

- Strategies to manage stiff knee must be well known

➔ Extended exposures

Approach

1. Standard approach (standard parapatellar, subvastus, midvastus, Mini-Trivector)
2. Quad tendon snip
3. Lateral approach
4. TT osteotomy
5. 1+5

Approach

Stiff knee

- Extensile approach/previous scars
- Tibial tubercle osteotomy
- Release of the condylar recesses
- Extensive arthrolysis of the suprapatellar pouch and gutters

Hardware removal

- More commonly periarticular plates and screws→ need for hardware removal at least at the intercondylar area or under tibial plate

- Stress risers

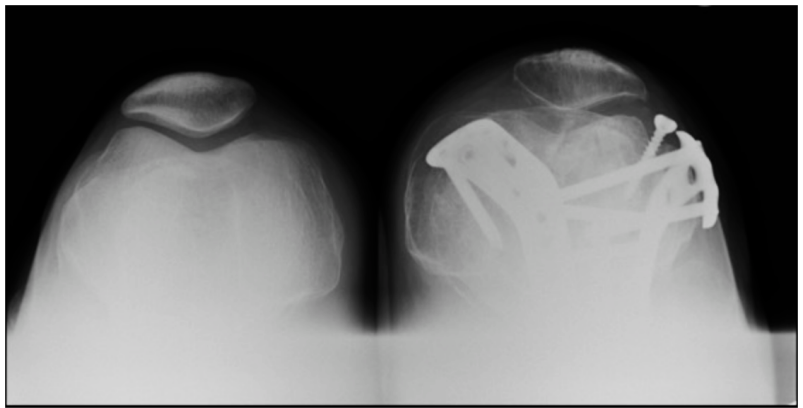
→addressed by augmenting area with substitutes, grafts or augments (cones)

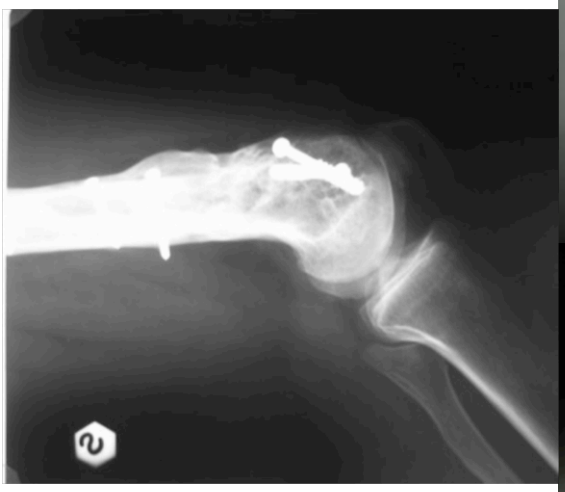
→bypassed with long stems or short fully cemented stems

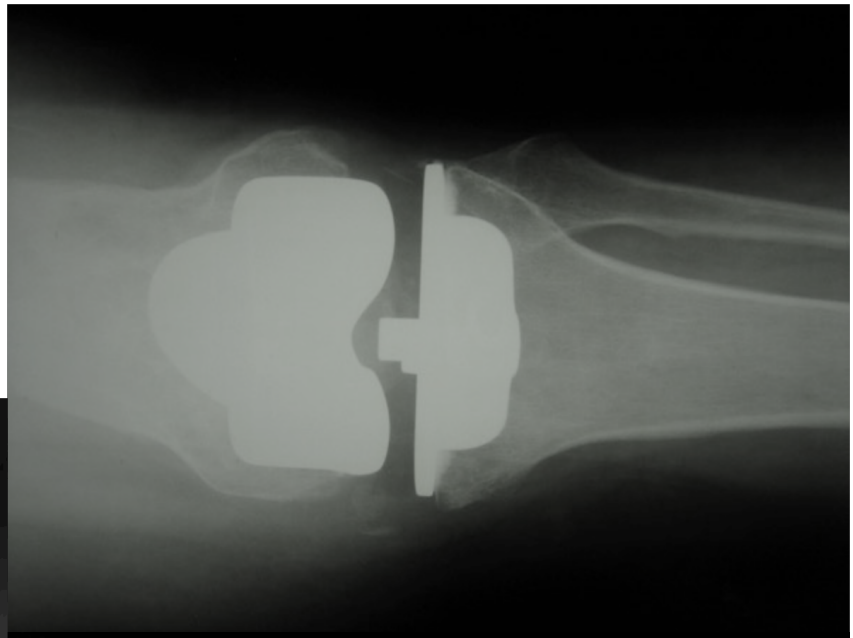
Hardware removal

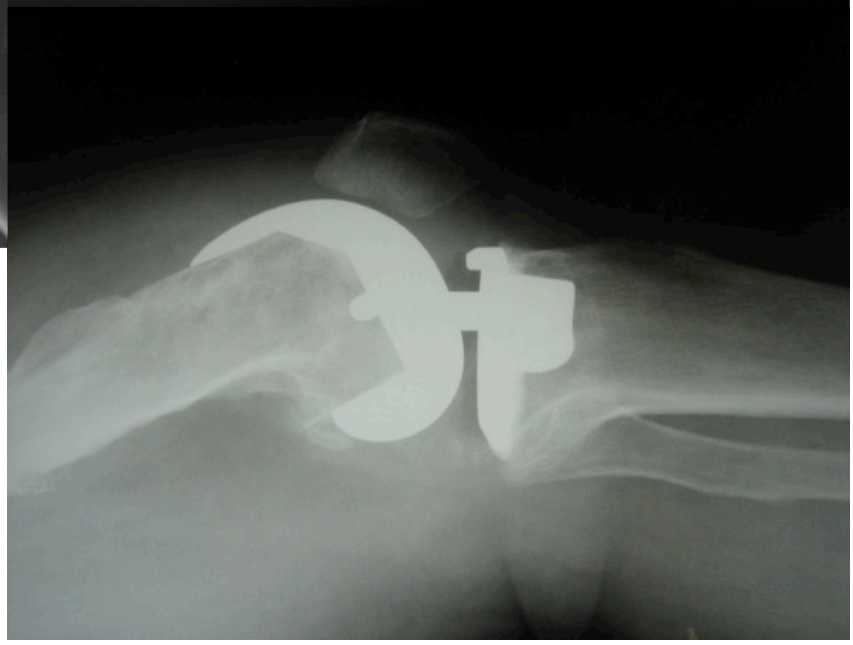
- Very often difficult to remove
- Specific instruments
- Remove only if necessary and what is necessary
- If doesn't affect the implantation, leave it alone

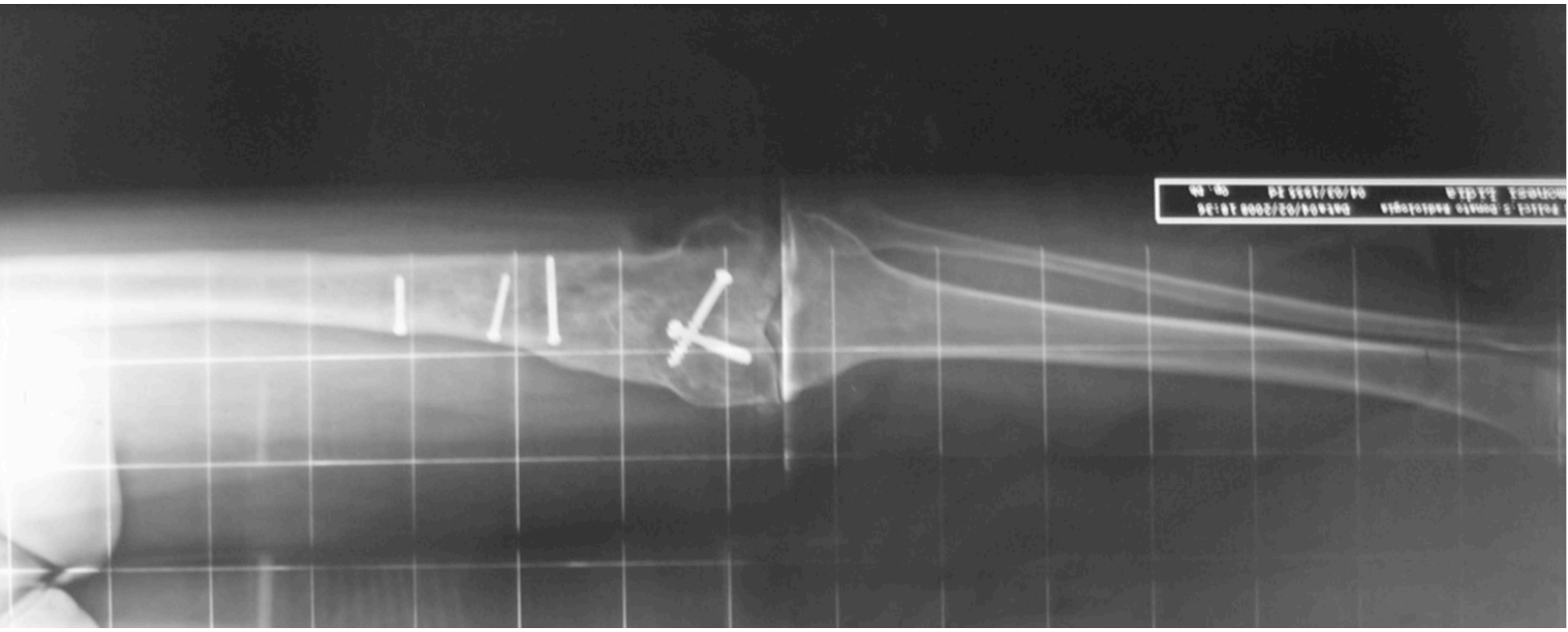
It can become the longest and most demanding part of the surgery









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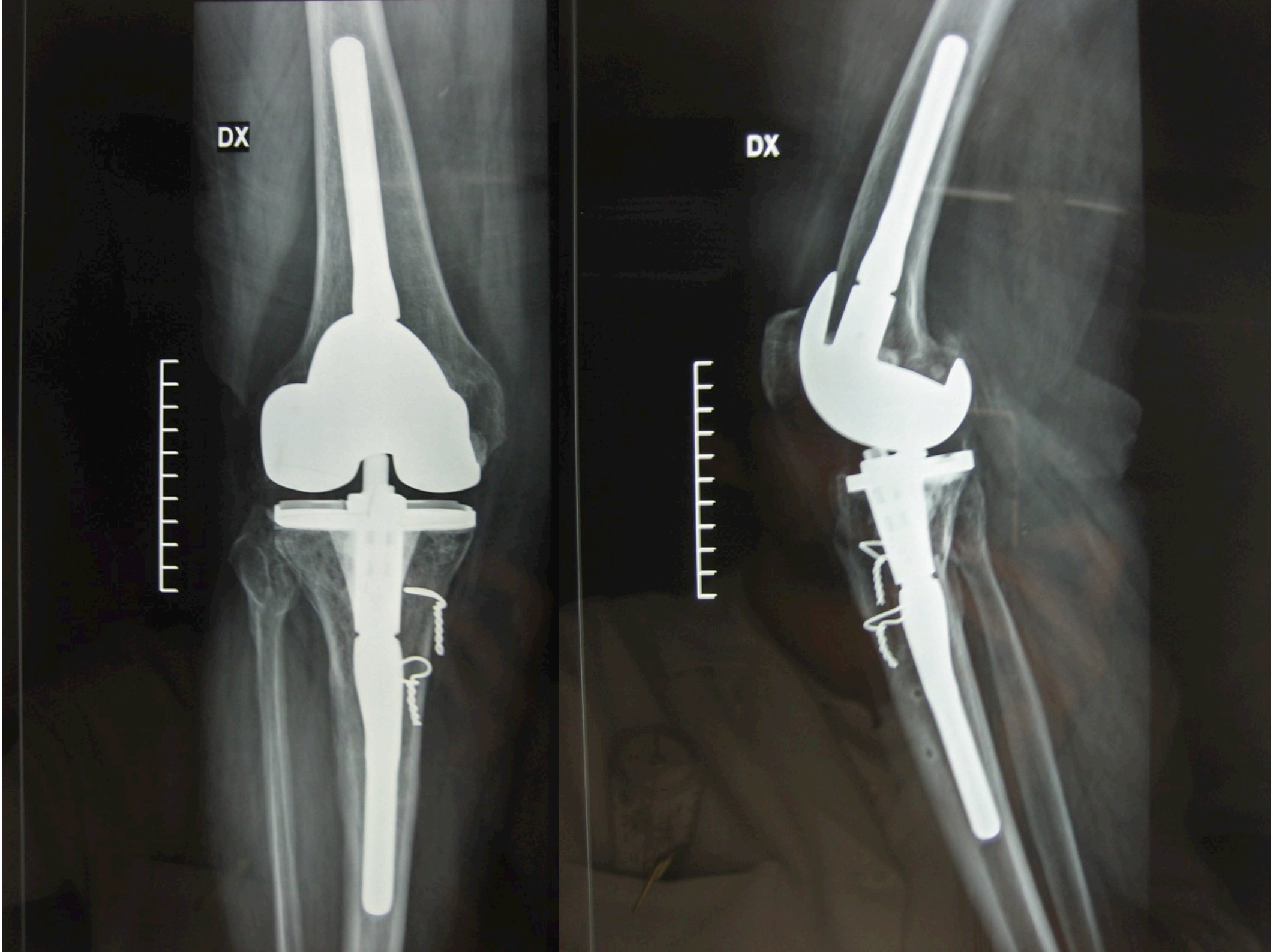
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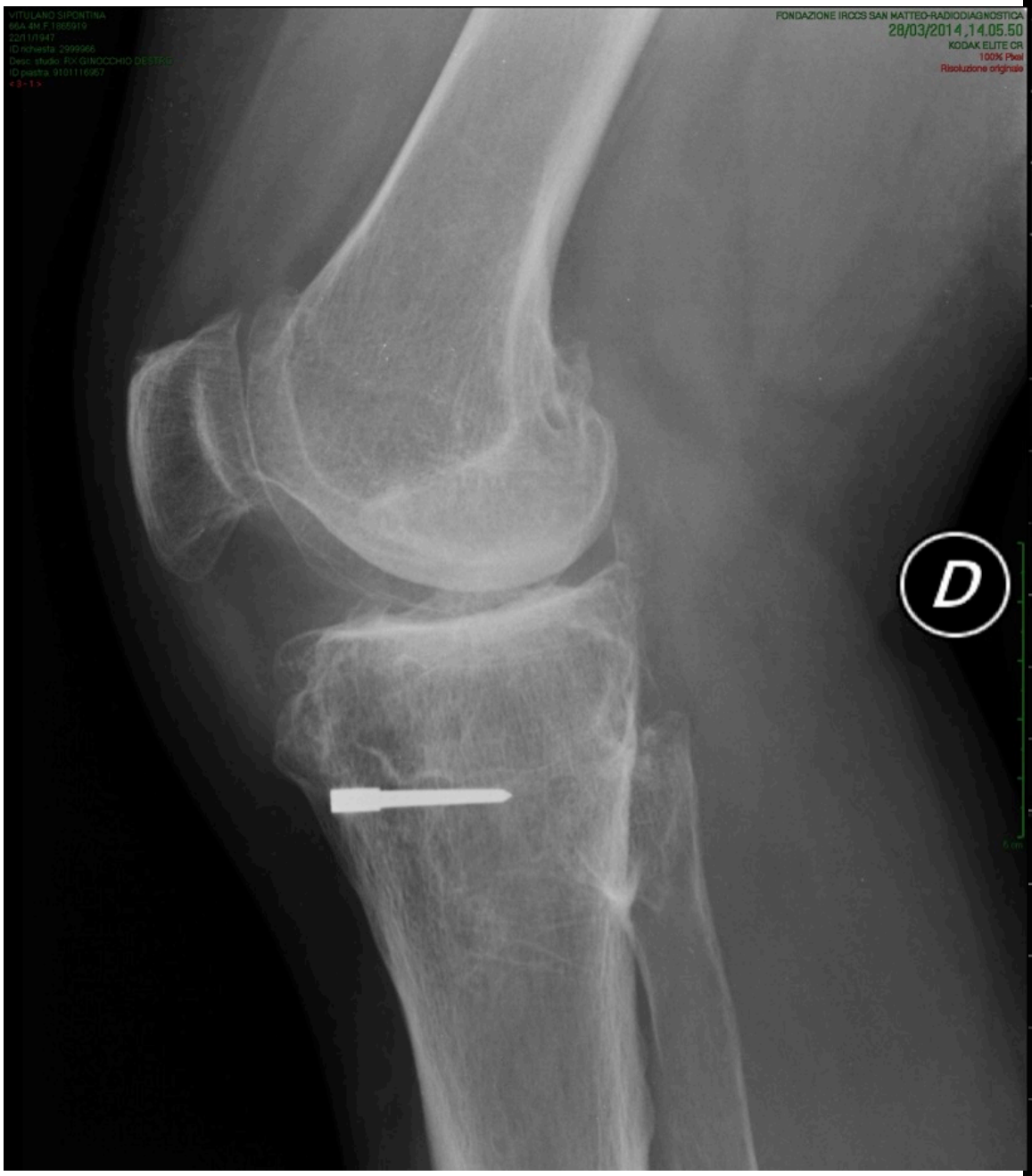
Hardware removal

IM hardware:

- Does not allow the use of IM alignment guides:

➔Hardware removal or…

- Navigation
- Short rods or extramedullary jigs
- Patients Specific Instruments
- FuZion
- Tibial tray with no keel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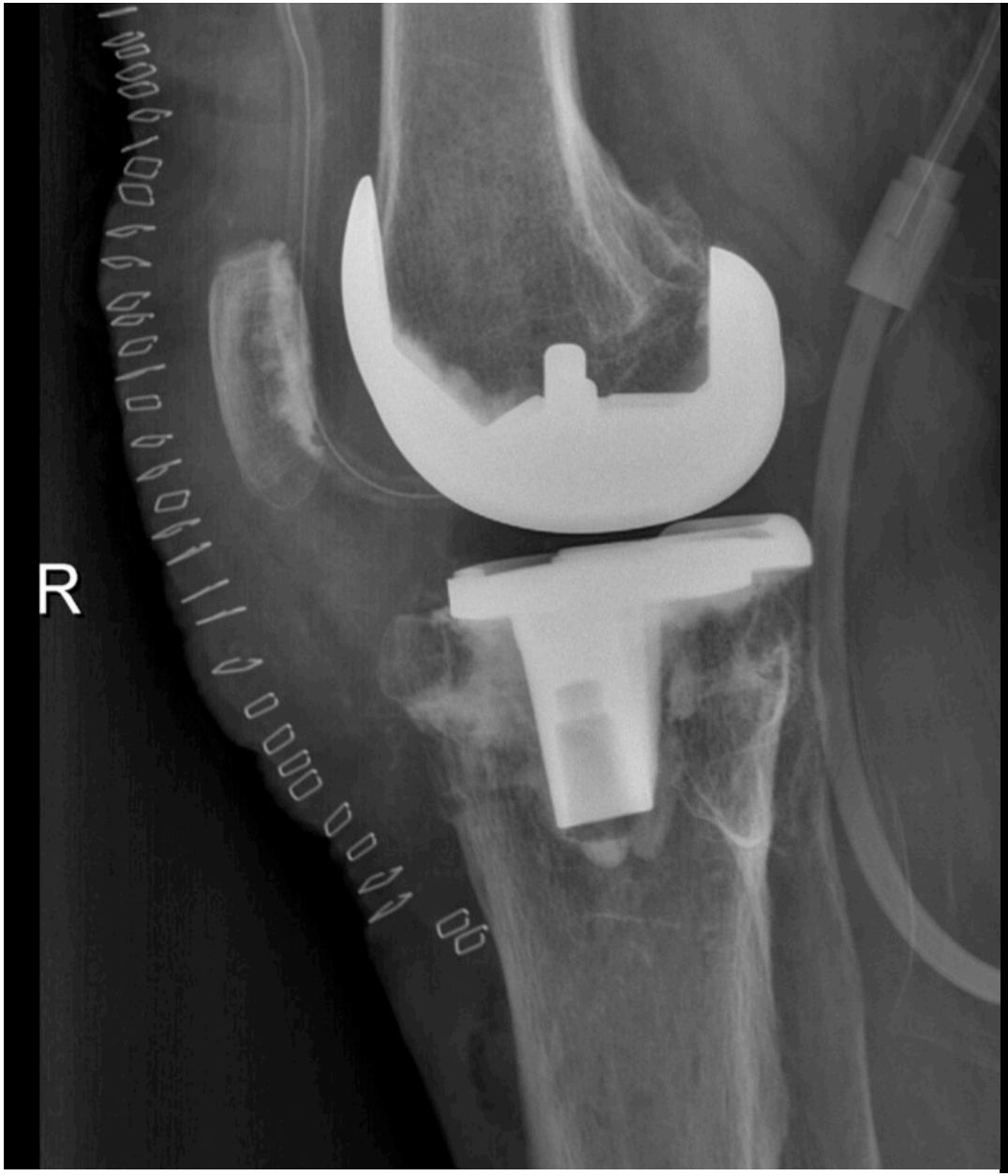
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Surgical strategy: Knee Arthroplasty options

- Uni- knee arthroplasty: only one tibio-femoral compartment involved
- PCL-sparing TKA: when PCL spared
- PCL-sacrificing: when PCL disrupted/arthrofibrosis
- Varus-valgus constrained/rotating platform hinge TKA: collateral stability major issue

Cementless mobile bearing decrease wear and loosening failures[1]

[1] Buechel FF, J Arthroplasty, 2002.

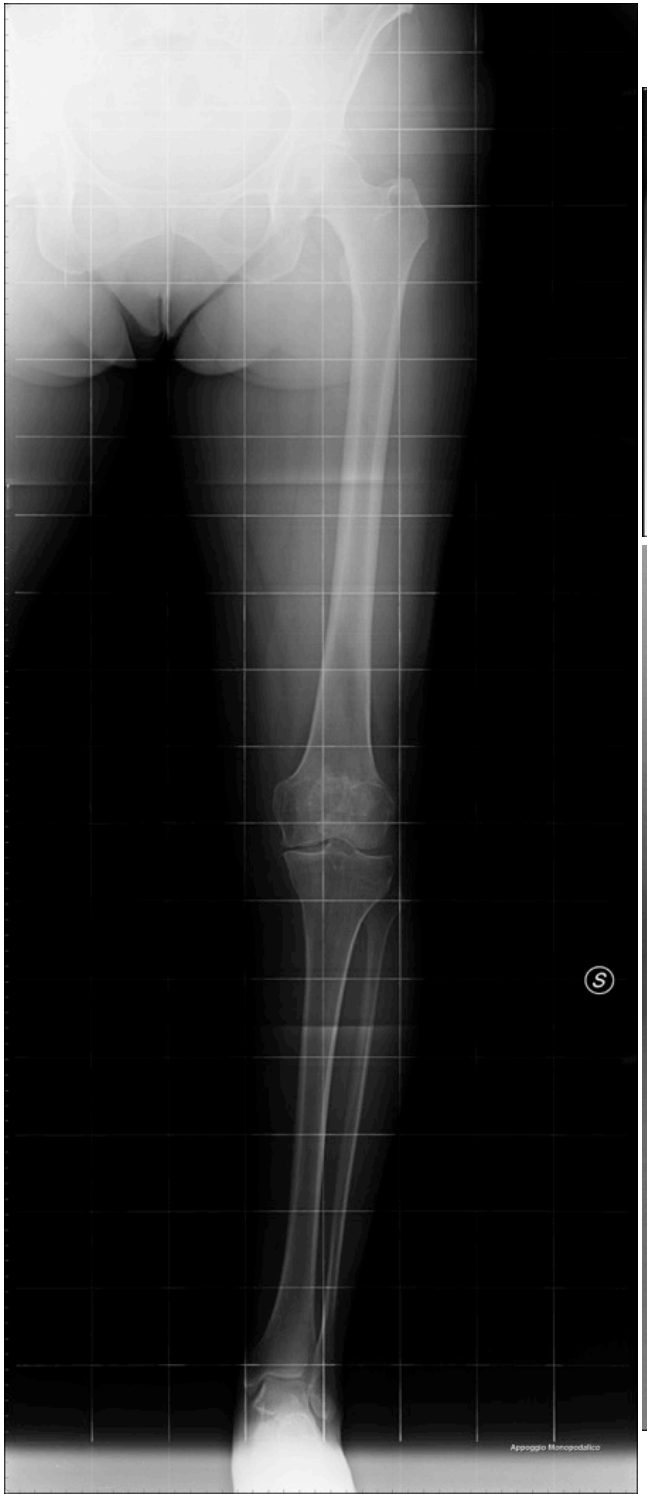
Arthroplasty options

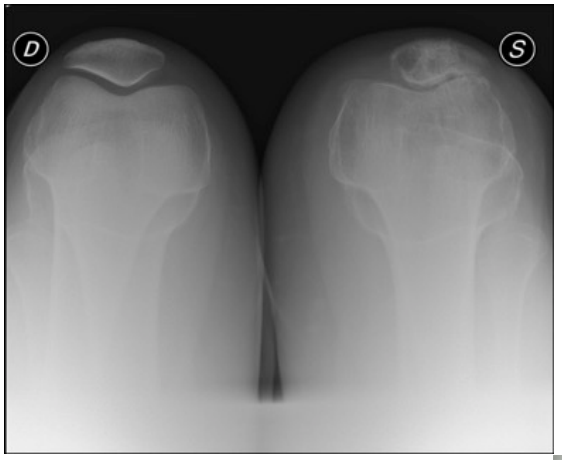
- Only one compartment involved
- Correctable deformity
- Good ligaments

 ➔ Uni (or bi-uni, or bi-compartmental)

UNI

Bicompartmental





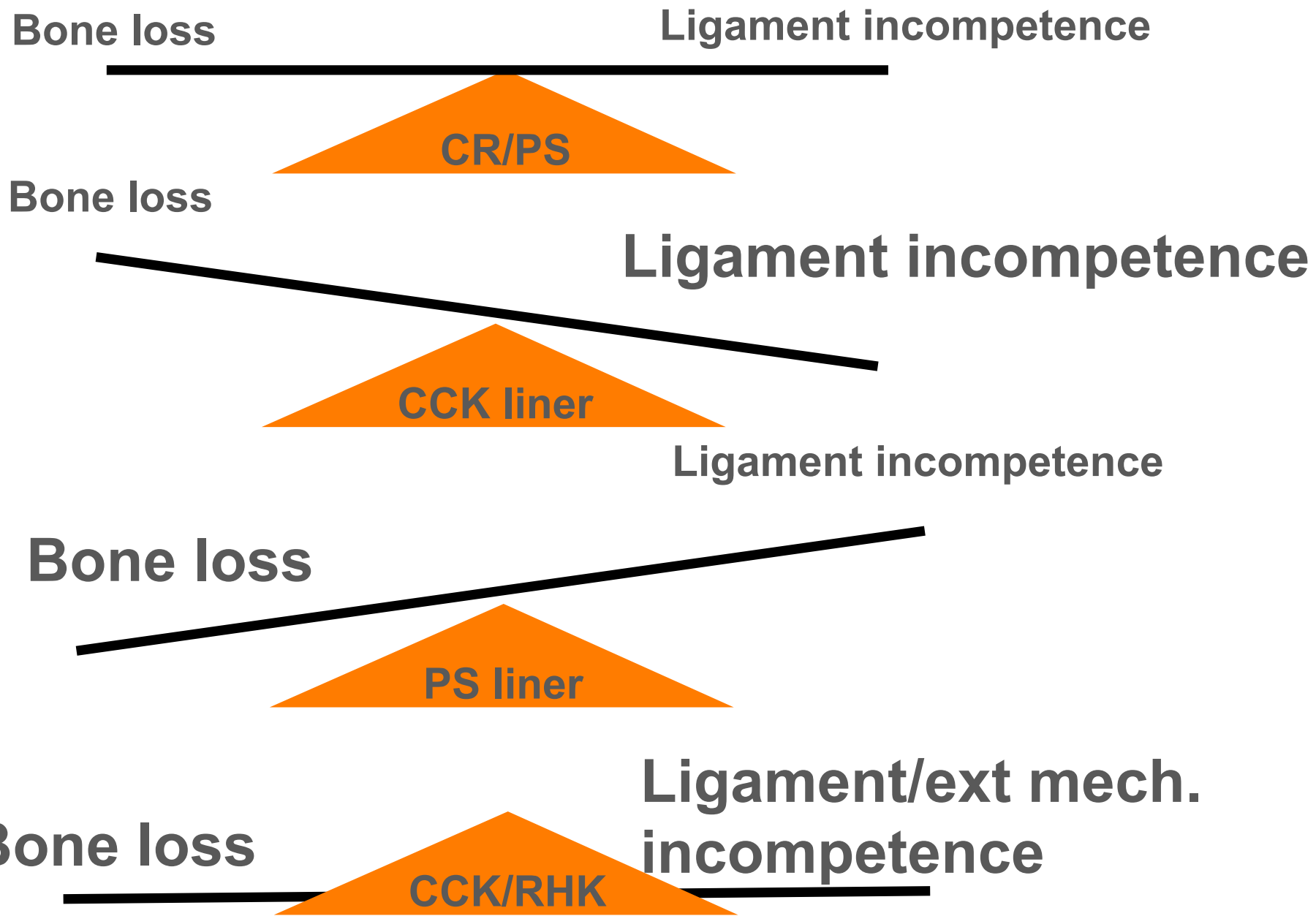
Arthroplasty options

- Articular crush/loss (articular deformities)

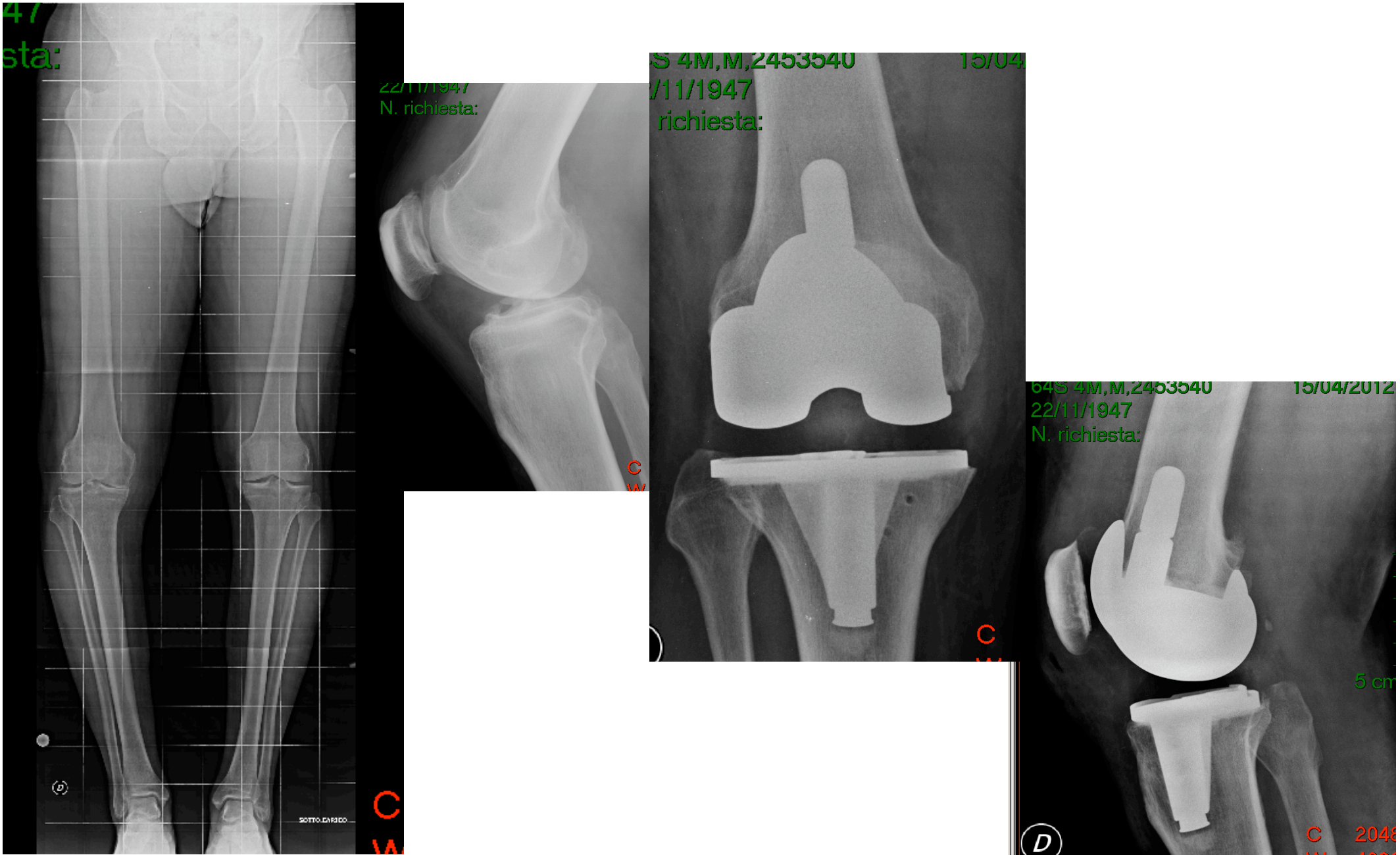
 ➔ TKA

- Bone reconstruction (augments, grafts)
- Different level of load distribution (stems)
- Different level of constraint
- Bone resection strategy

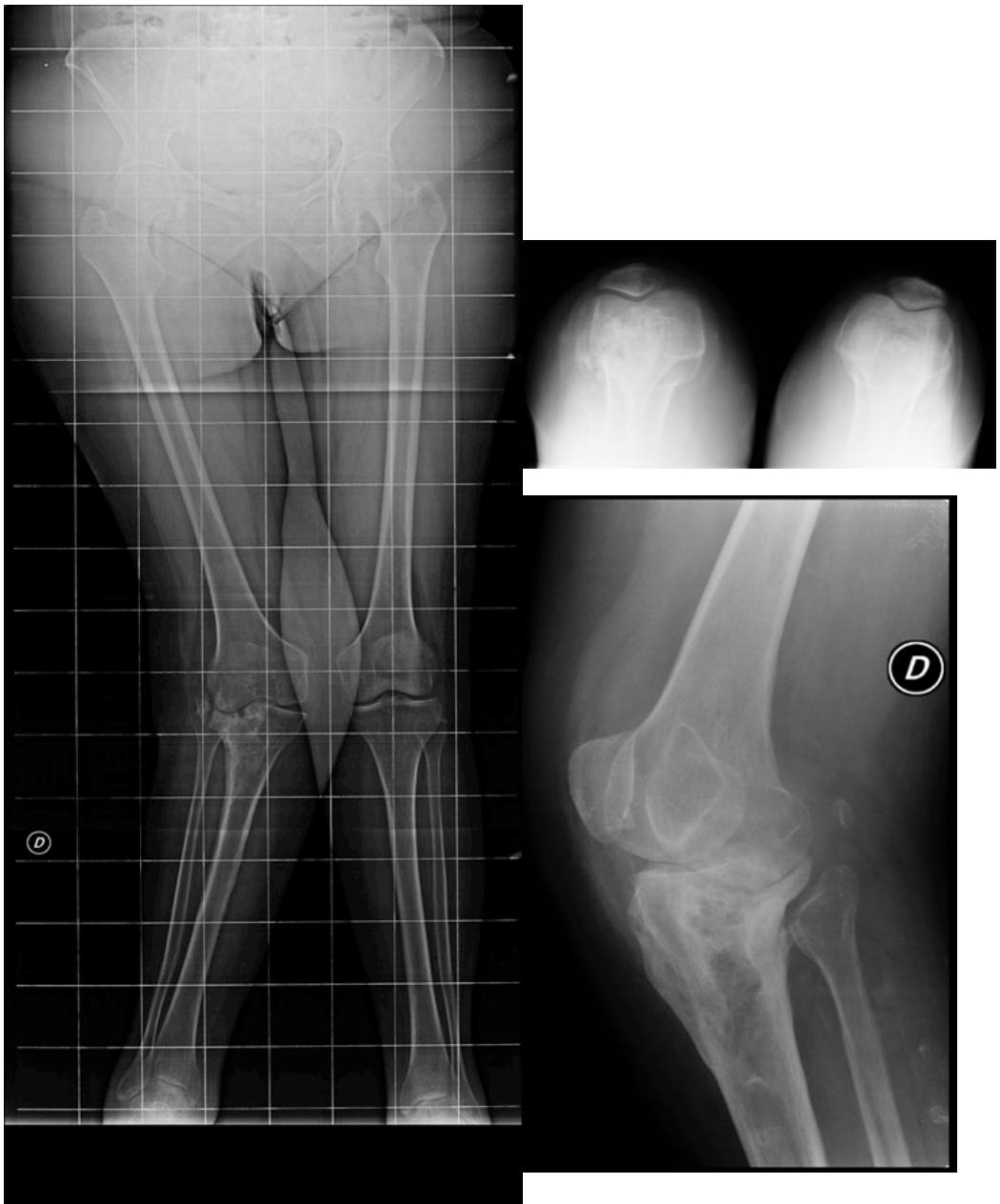
Level of constraint



TKA/Level of constraint



TKA/Level of constraint



TKA/Level of constraint

TKA/Level of constraint

TKA/Level of constraint

literature

Knee Surg Sports Traumatol Arthrosc (2011) 19:2040–2044
DOI 10.1007/s00167-011-1525-x

KNEE

Previous fracture surgery is a major risk factor of infection after total knee arthroplasty

Gen Suzuki · Shu Saito · Takao Ishii · Sayaka Motojima · Yasuaki Tokuhashi · Junnosuke Ryu

This study identified previous history of fracture and remnants of internal fixation as major risk factors of infection after TKA.

Variable	Infected ($n = 17$)	Uninfected ($n = 2,005$)	P
Age	69.5 ± 7.1	70.7 ± 8.5	n.s.
BMI	27.4 ± 5.5	25.6 ± 4.1	n.s.
CRP (mg/dl)	0.6 ± 1.2	0.7 ± 1.6	n.s.
ESR (mm/hr)	19.8 ± 15.7	29.8 ± 24.4	n.s.
TP (g/dl)	6.9 ± 0.5	7.0 ± 0.5	n.s.
Duration of surgery (min)			
Bilateral	135.9 ± 34.6	123.1 ± 28.3	n.s.
Lateral	102.7 ± 26.9	93.8 ± 33.7	n.s.
Operative blood loss (ml)			
Bilateral	89.4 ± 68.0	140.2 ± 120.2	n.s.
Lateral	52.0 ± 60.3	83.8 ± 94.2	n.s.
Total blood loss (ml)			
Bilateral	445.4 ± 258.2	427.0 ± 259.1	n.s.
Lateral	307.6 ± 234.6	224.2 ± 195.4	n.s.
Duration of surgical drain (day)	3 8 ± 1.2	35 ± 1 1	n s
Duration of antibiotic prophylaxis (day)	5.6 ± 3.1	5.6 ± 3.5	n.s.
Gender			
Male	8 (3.1%)	244	<0.05
Female	9 (0.5%)	1,761	
Primary diagnoses			
OA	14 (0.9%)	1,616	n.s.
RA	3 (0.8)	389	
Smoking			
(+)	5 (3.0%)	189	<0.05
(−)	12 (0.7%)	1,816	
Diabetes mellitus			
(+)	3 (1.1%)	273	n.s.
(−)	14 (0.8%)	1,732	
Steroid therapy			
(+)	2 (0.7%)	301	n.s.
(−)	15 (0.9%)	1,704	
DMARDs therapy			
(+)	3 (1.0%)	304	n.s.
(−)	14 (0.8%)	1,701	
Previous operation around the knee joint			
(+)	7 (2.8%)	240	<0.05
(−)	10 (0.6%)	1,765	
(1) Arthroscopic surgery			
(+)	2 (1.1%)	180	n.s.
(−)	15 (0.8%)	1,825	
(2) Non-arthroscopic surgery			
(+)	6 (8.5%)	65	<0.05
(−)	11 (0.6%)	1,940	
HTO			
(+)	1 (4.3%)	22	n.s.
(−)	16 (0.8%)	1,983	
ORIF			
(+)	4 (21.1%)	15	<0.05
(−)	13 (0.6%)	1,990	
Remnants of previous internal fixation material			
(+)	5 (25.0%)	15	<0.05
(−)	12 (0.6%)	1,990	
Bone graft			
(+)	0	103	n.s.
(−)	17 (0.9%)	1,902	
Pattela replacement			
(+)	5 (0.8%)	658	n.s.
(−)	12 (0.9%)	1,347	
Bone cement			
(+)	17 (0.9%)	1,941	n.s.
(−)	0	64	

Table 2 Risk factors of infection of TKA

Risk factor	OR (CI_{95})	P
Gender (male)	6.2 (2.1–18.0)	0.001
Previous ORIF	7.9 (1.1–57.1)	0.041
Remnants of PIFM	26.0 (4.5–151.0)	<0.001
BMI	1.2 (1.0–1.3)	0.007

PIFM previous internal fixation materials, *BMI* body mass index, *OR* odds ratio, *CI 95* 95% confidence interval

Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection

Chairmen:

Thorsten Gehrke MD

Javad Parvizi MD, FRCS

Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection

Consensus: The risk factors for SSI or PJI include history of previous surgery, poorly controlled diabetes mellitus (glucose> 200 mg/L or HbA1C>7%), malnutrition, morbid obesity (BMI>40 Kg/m^2), active liver disease, chronic renal disease, excessive smoking (>one pack per day), excessive alcohol consumption (>40 units per week), intravenous drug abuse, recent hospitalization, extended stay in a rehabilitation facility, male gender, diagnosis of post-traumatic arthritis, inflammatory arthropathy, prior surgical procedure in the affected joint, and severe immunodeficiency.

Delegate Vote: Agree: 94%, Disagree: 4%, Abstain: 2% (Strong Consensus)

Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection

History of Previous Surgery

The local wound environment may be compromised in patients who have undergone previous operative procedures, which may contribute to the development of an SSI or PJI following TJA.[10] Peersman et al. matched infected and non-infected patients that underwent total knee arthroplasty (TKA) and reported that a history of prior open surgical procedures was a significant risk factor ($p<0.0001$) for developing PJI following TKA.[11] Although not much literature has been presented correlating history of prior surgery and development of PJI, we recommend that a patient's previous surgical history be documented, along with proper evaluation of the local wound environment. An appropriate infection workup, as discussed elsewhere in this document, should be undertaken in all patients who have had previous surgery at the site of an upcoming arthroplasty. This will allow for any necessary modification of the operative approach and technique to minimize risk of developing infection.[10]

Hanssen AD, Osmon DR, Nelson CL.
Prevention of deep periprosthetic joint infection. Instr Course Lect. 1997;46:555-567.

Peersman G, Laskin R, Davis J, Peterson M.
Infection in total knee replacement: a retrospective review of 6489 total knee replacements. Clin Orthop Relat Res. 2001(392):15-23.

Beware

21% reoperation rate if previous tibial plateau fracture

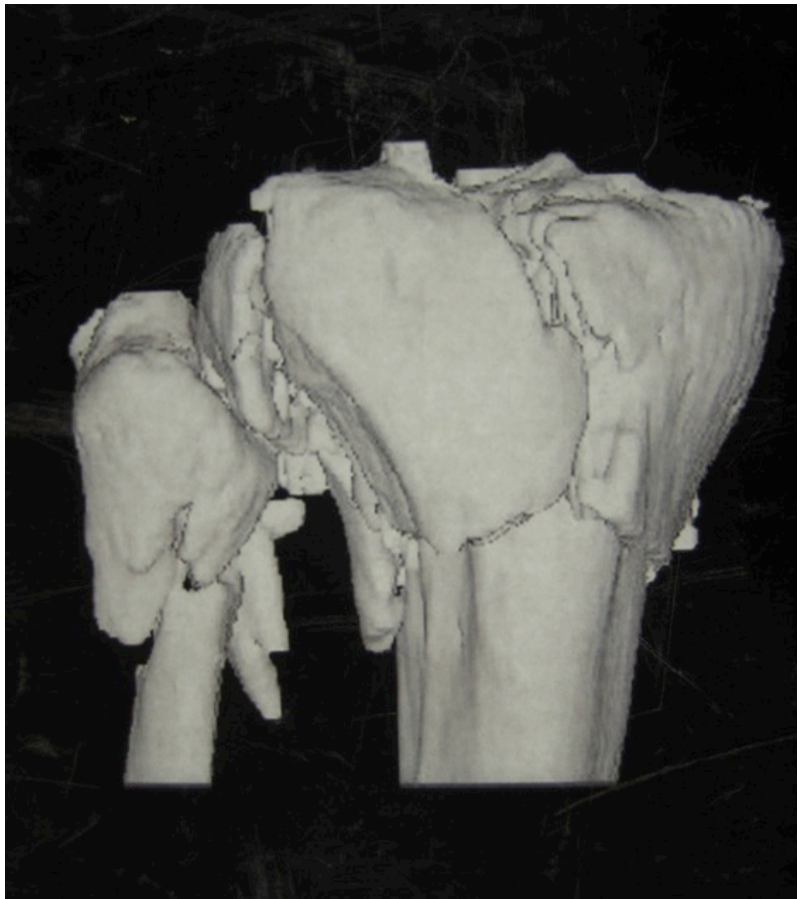
Weiss, Parvizi et al JBJS 2003

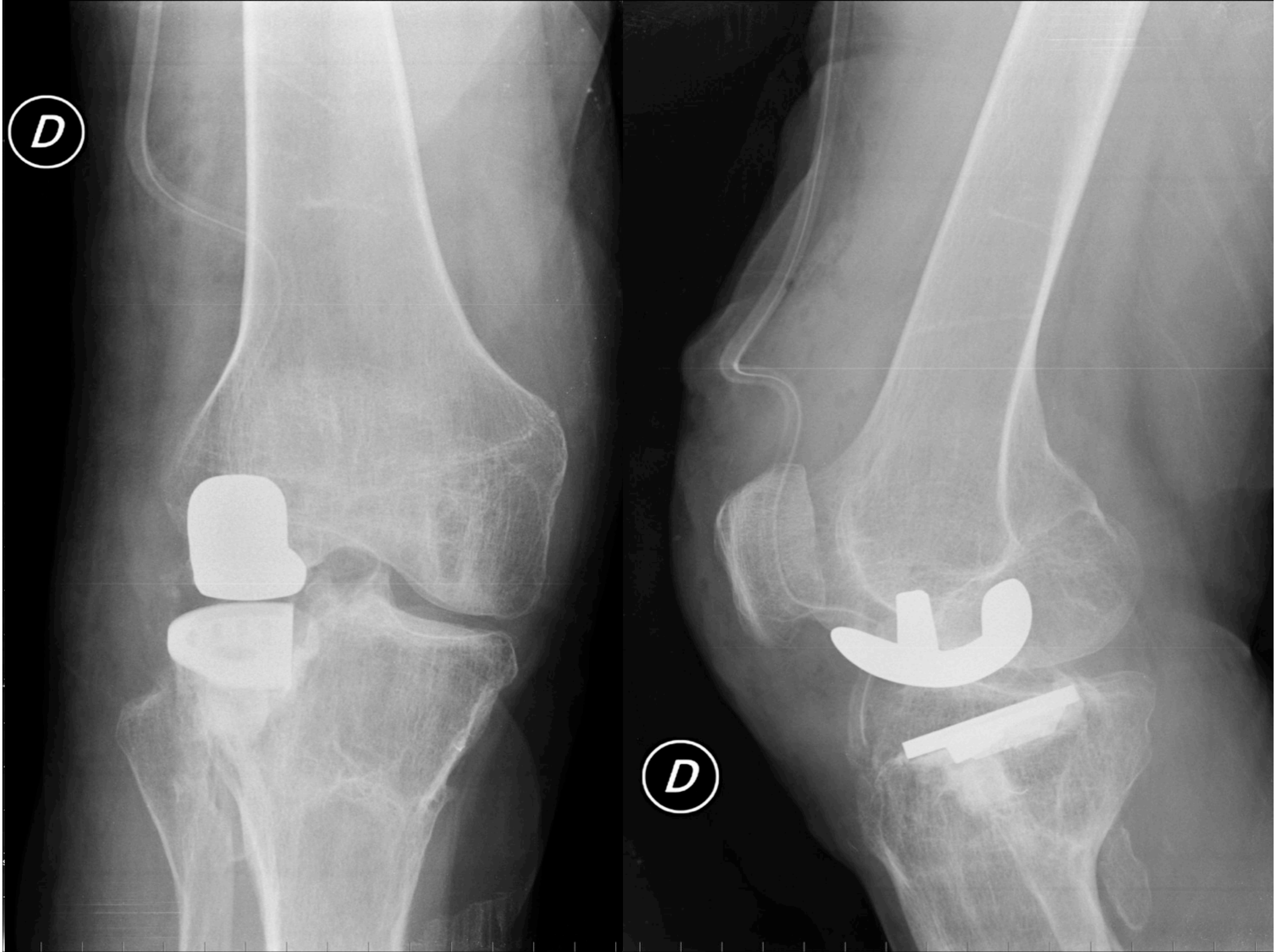
53% complication if prior infected tibial plateau fracture with 26% recurrence of infection

Laarson et al CORR, 2009

Case

- B.F., f, 53 y
- 6 years before motorcycle accident→tibial plateau fracture → fixation → non-union, 1 year later 2nd surgery with bone graft

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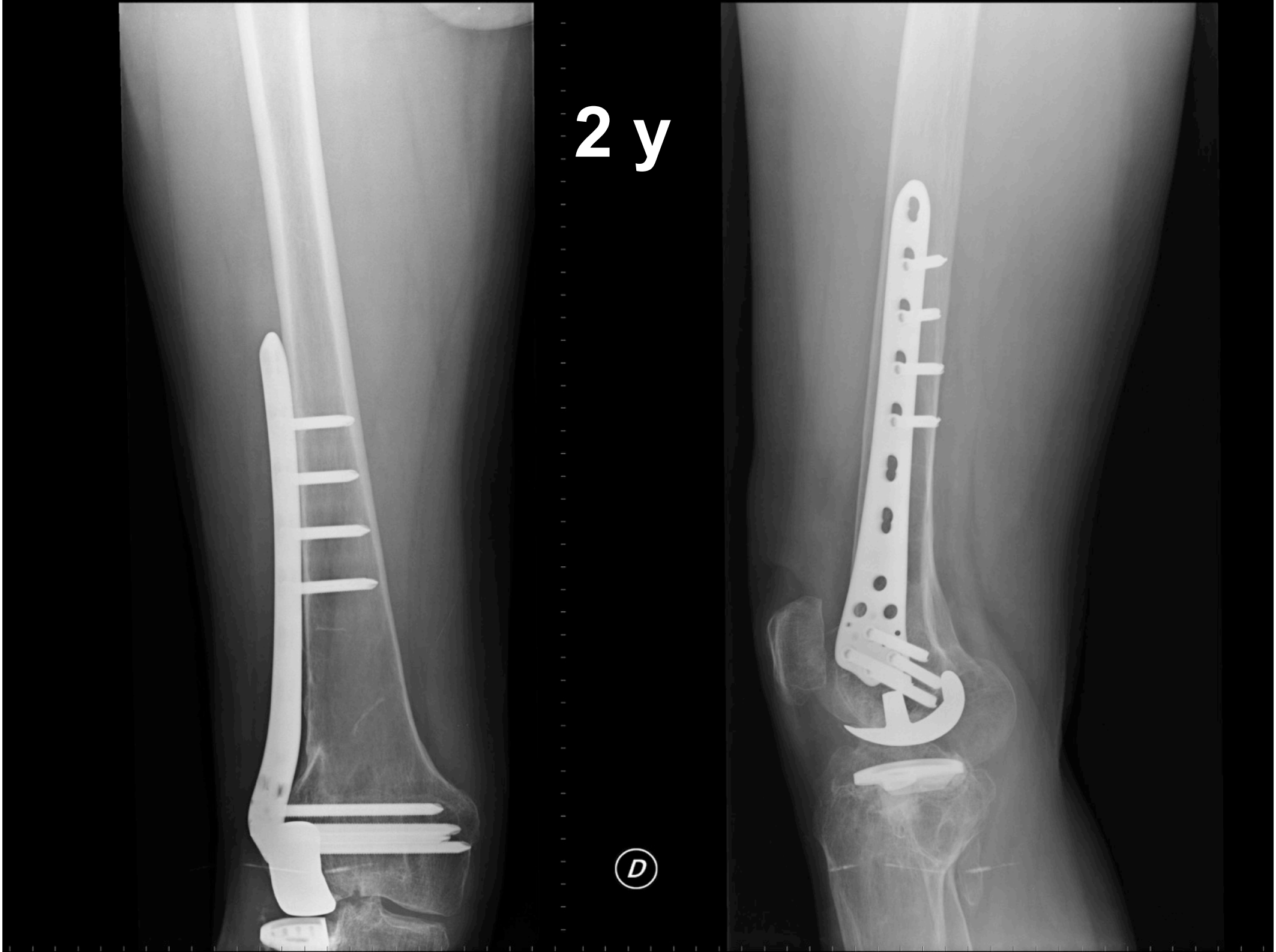
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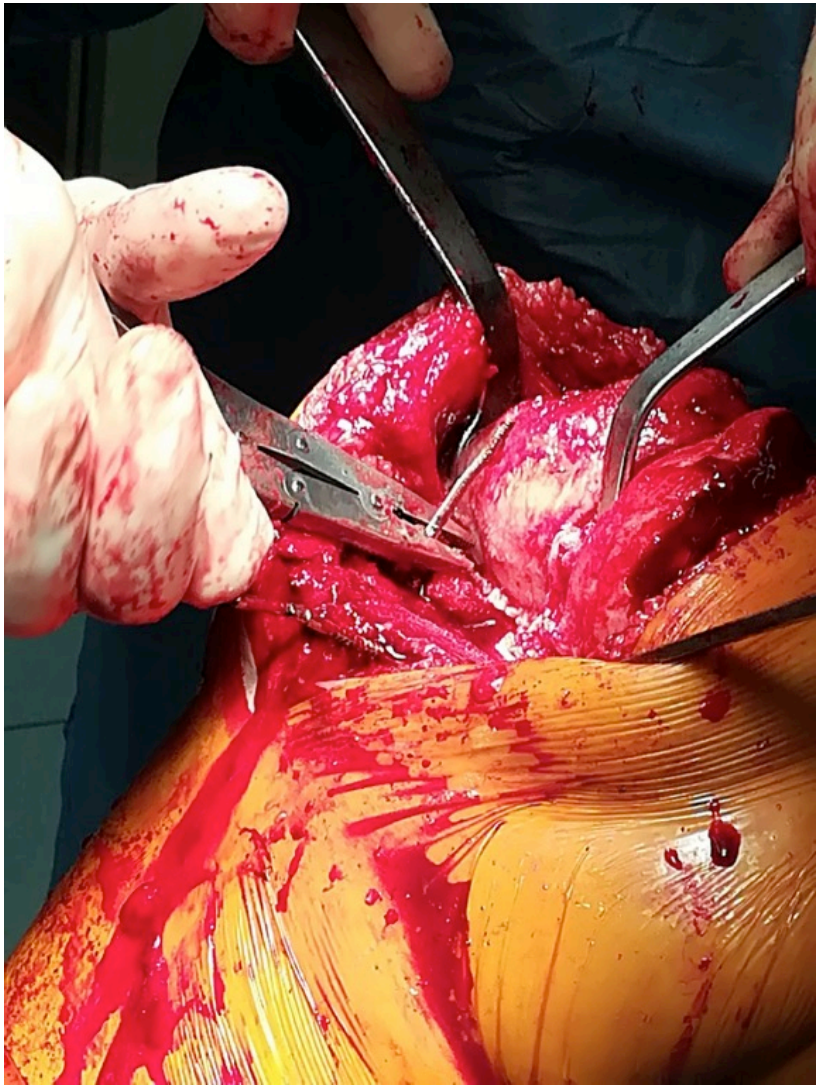
Case

Men 69 years old

6 months earlier TKA

Case

- Hardware removal more complicated then expected
- Bone loss

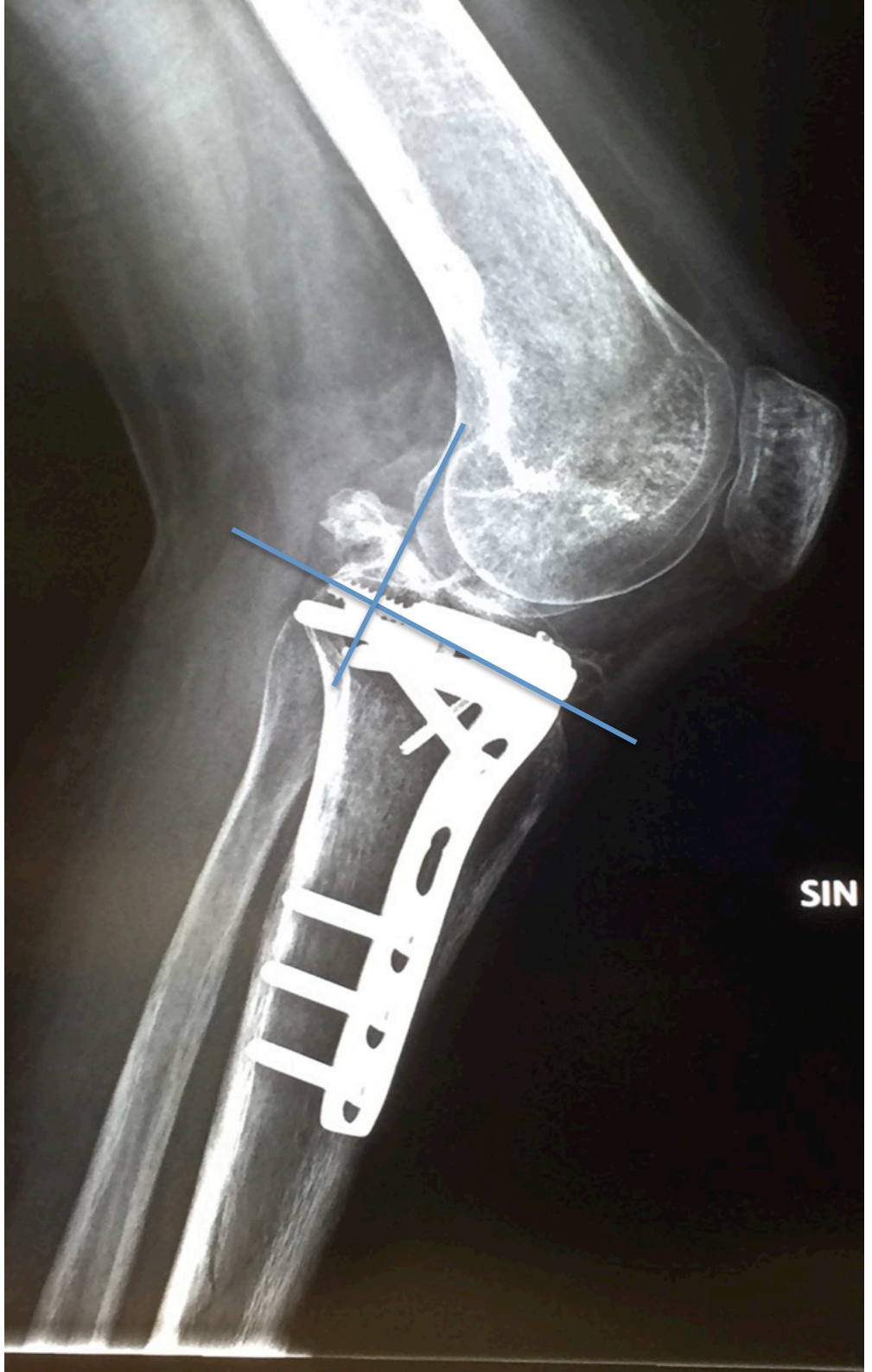


Case

Case

- Girl, 17 years old
- Trauma during skiing training race
- Tibial plateau fracture and posterior knee dislocation:
    - Ex Fix
    - Misdiagnosed damage of popliteal artery
    - Acute compartment syndrome: fasciotomies
    - ORIF

- Fixed flexion contracture – on crutches
- Equinus foot
- Hyperalgesia of the foot (untouchable)
- Assonotmesis SPN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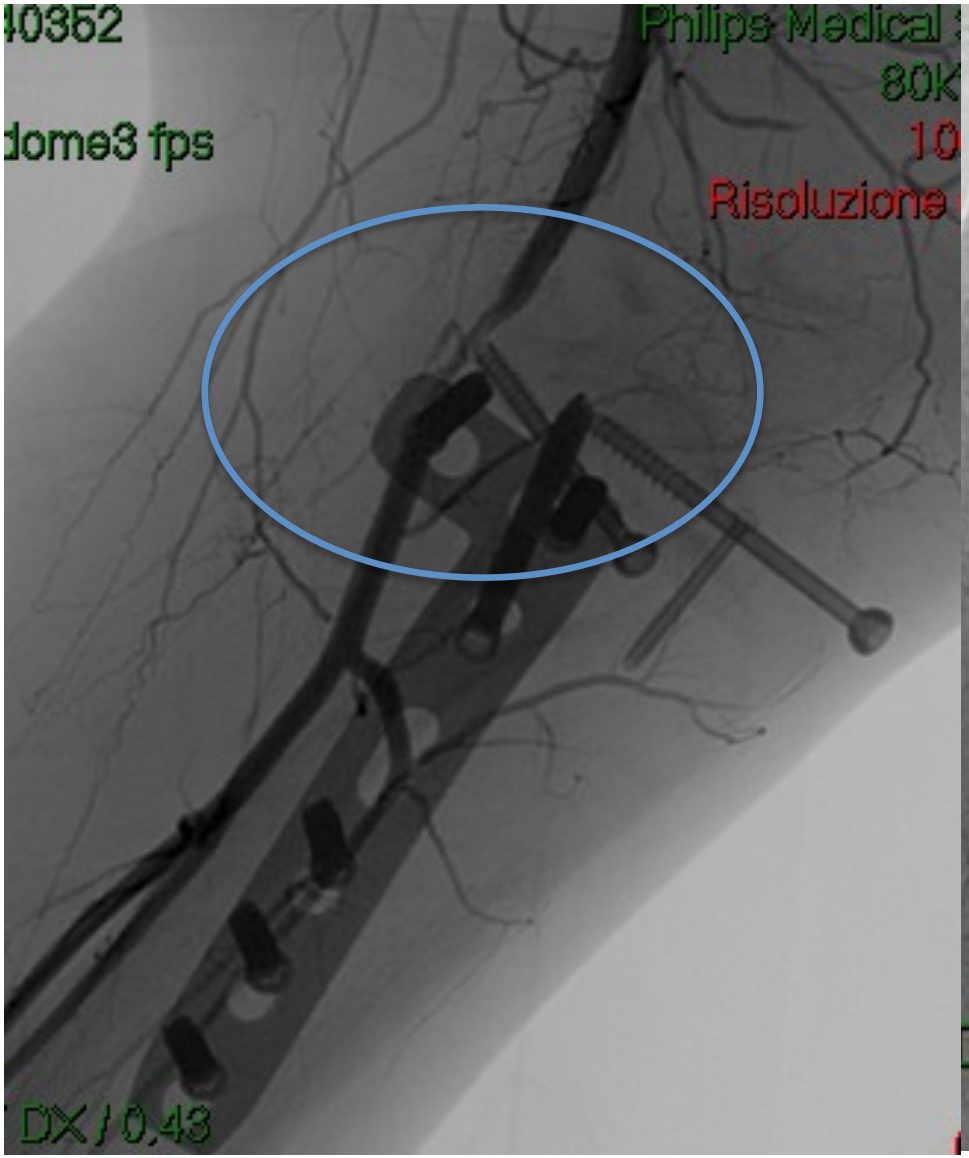
Preop Study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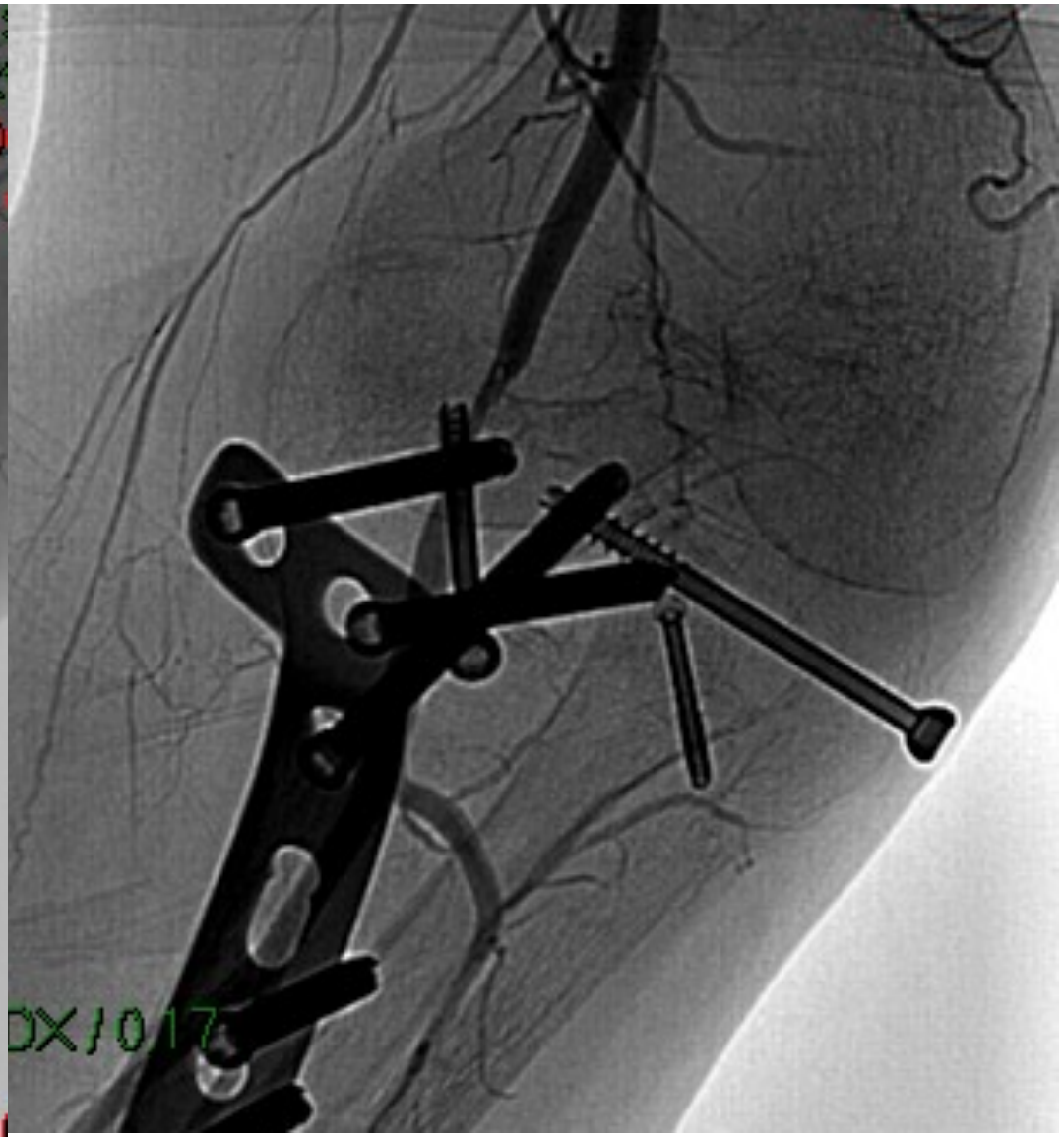
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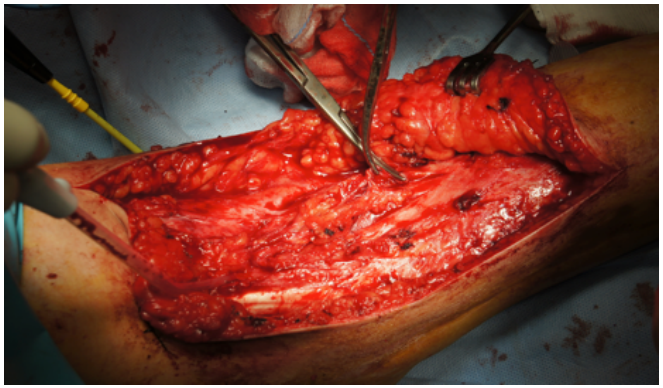
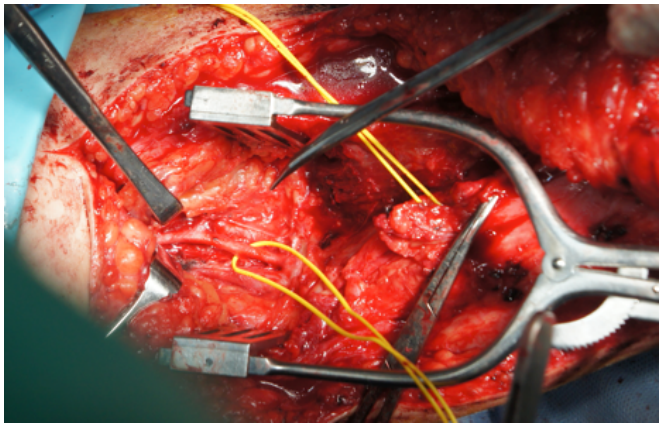
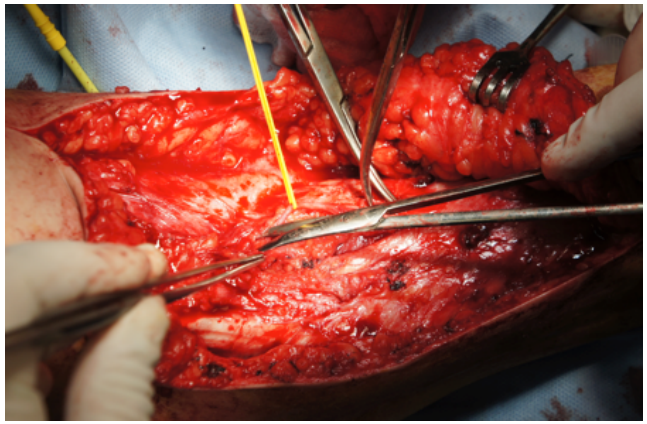
1st surgical step



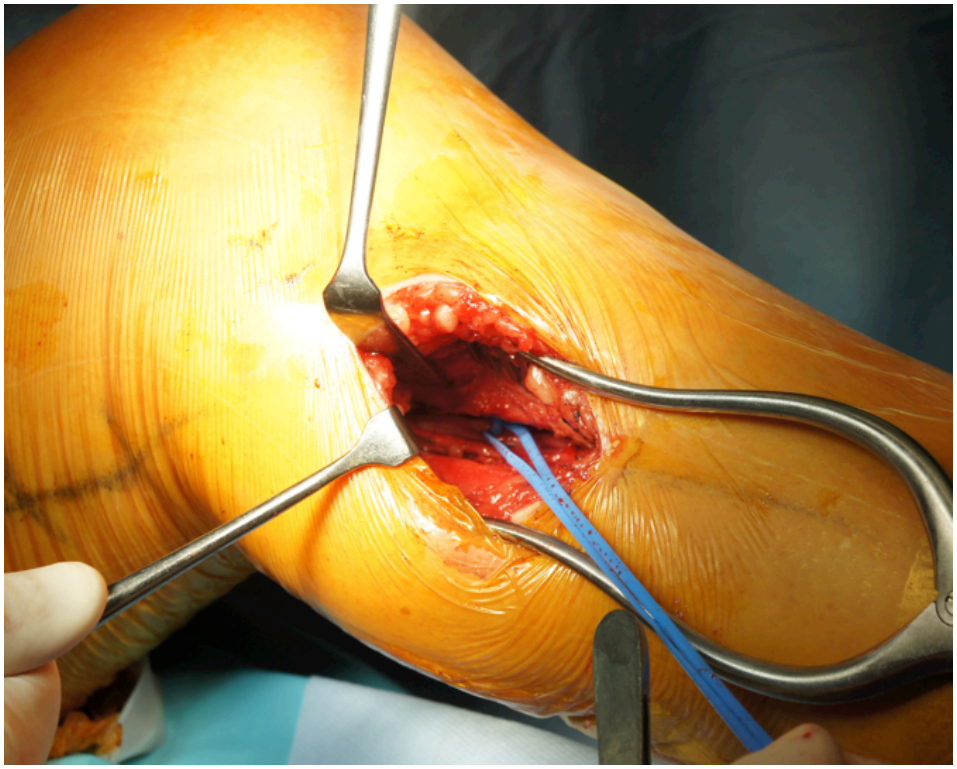


- Trickey approach
- Exploration and release of the Popliteal and bone spur removal
- Neurolysis of S.P.N.
- Lengthening of hamstrings, calves, and achilles tendon
- Plaster cast in extension

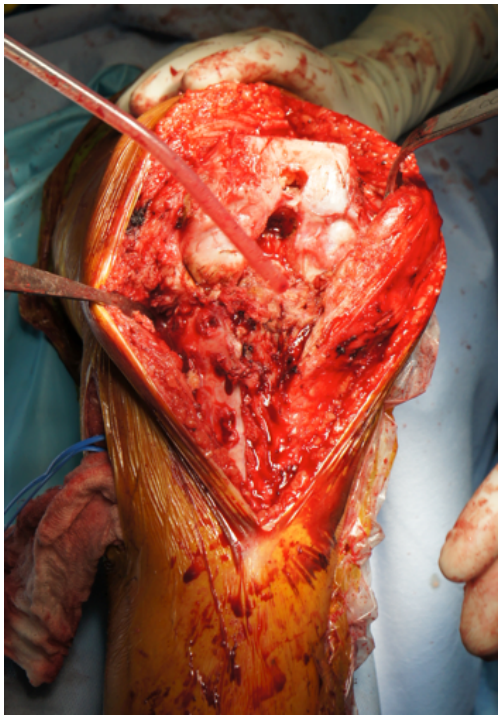


2nd surgical step (4 months later)

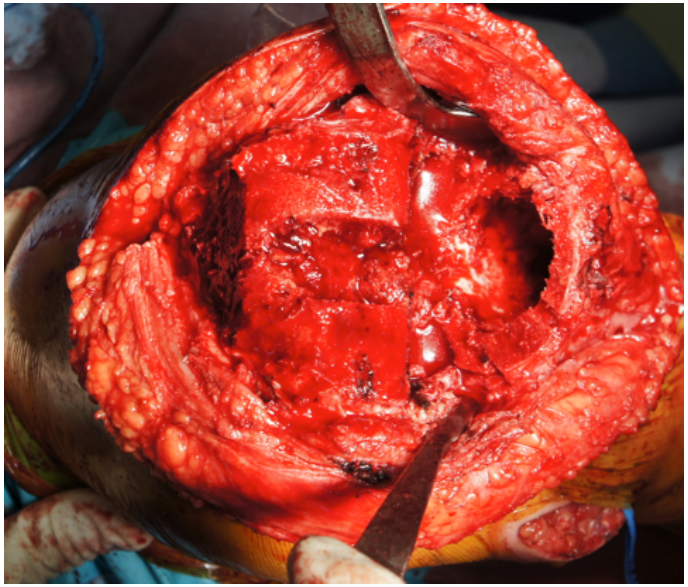
- Removal of hardware with isolation of the artery (postero-medial approach)

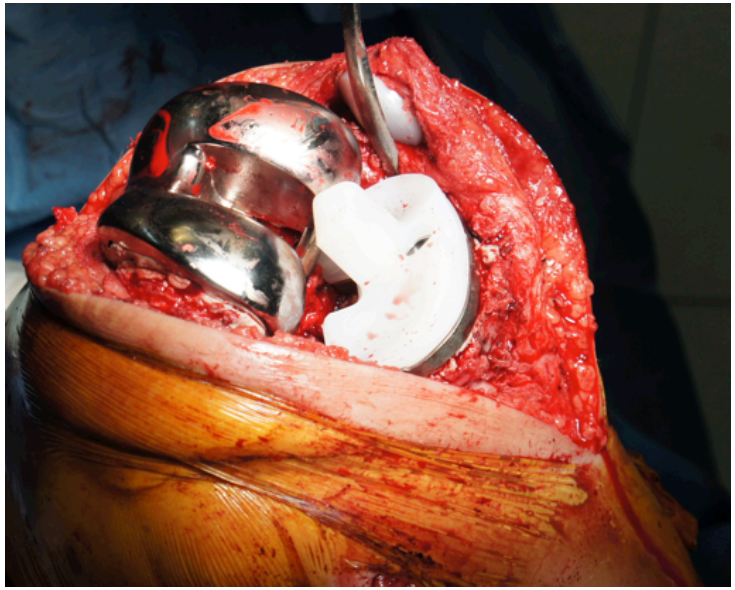


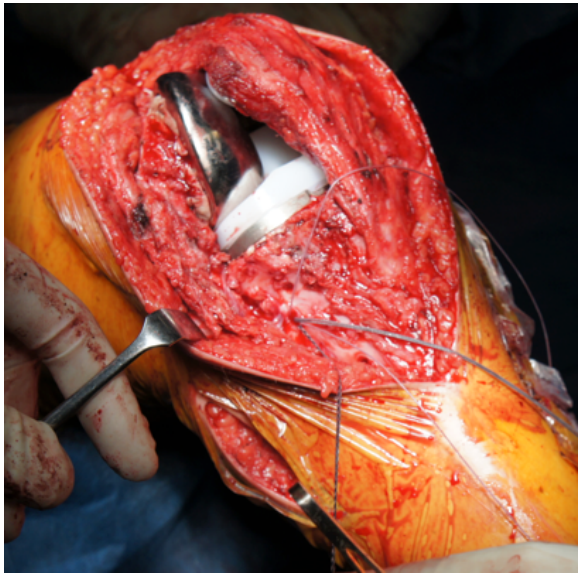
2°surgical step

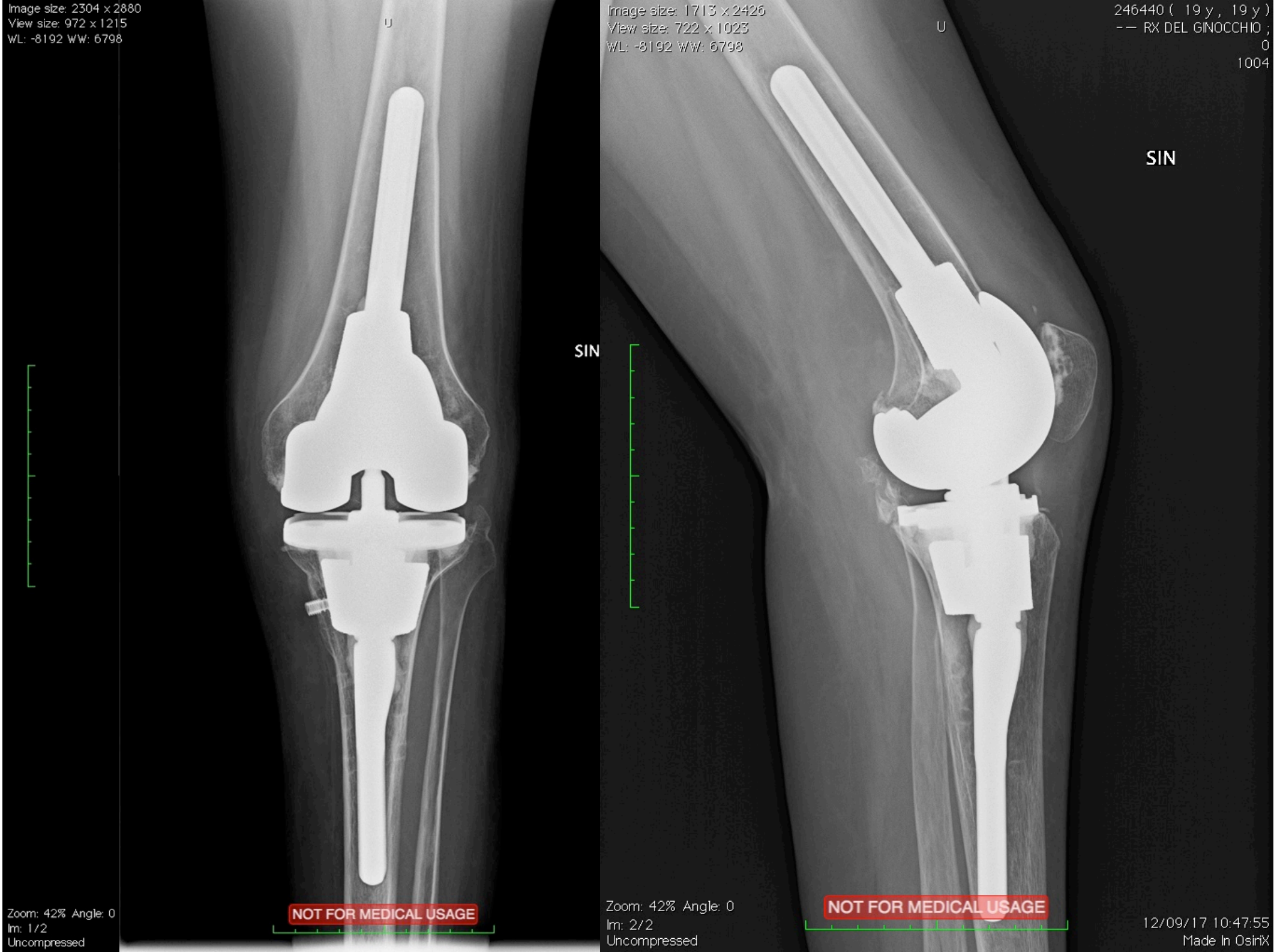


- TKR
- LCCK
- ritensioning of MCL with anchor





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Zoom: 42% Angle: 0
Im: 2/2
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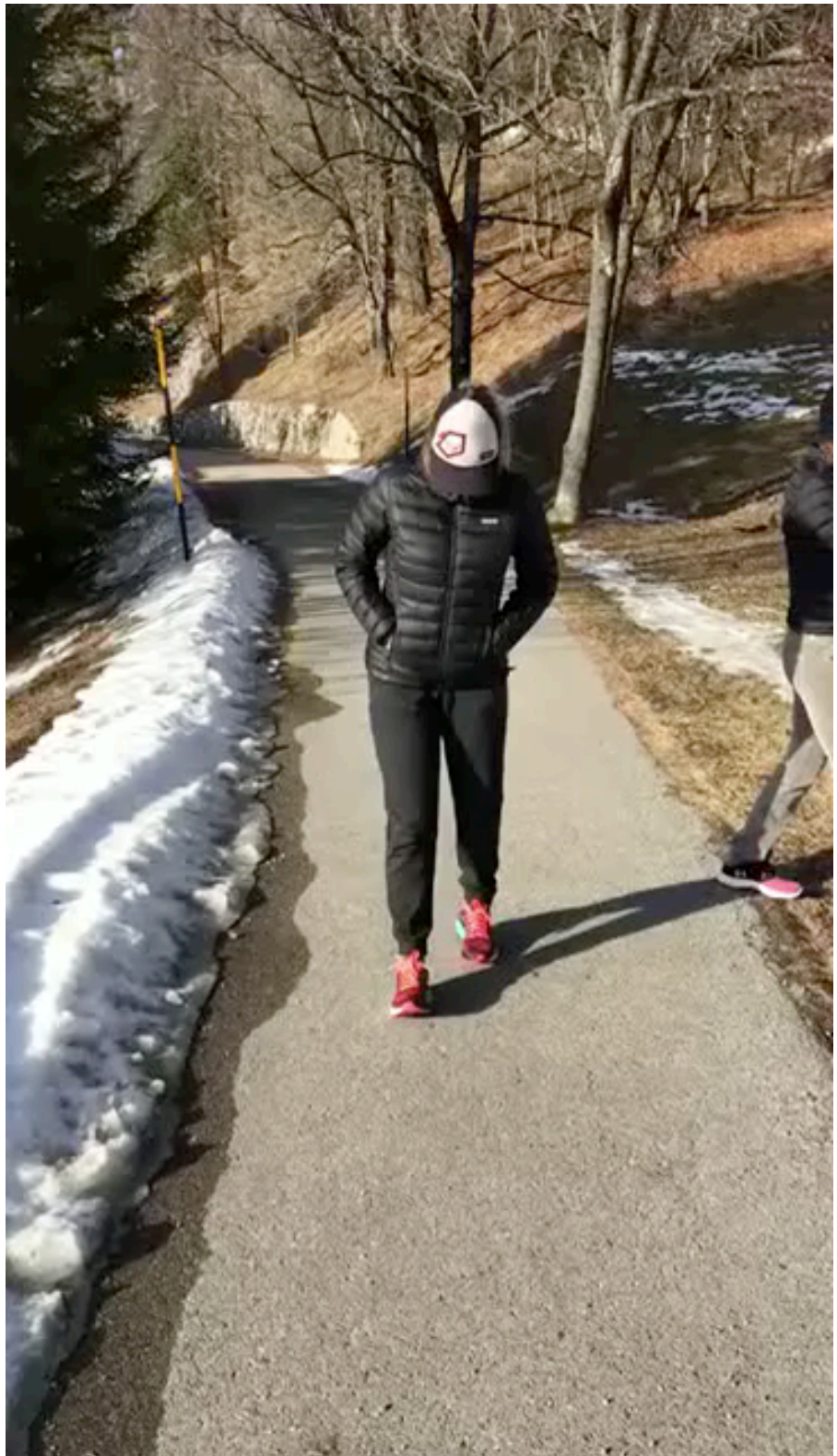
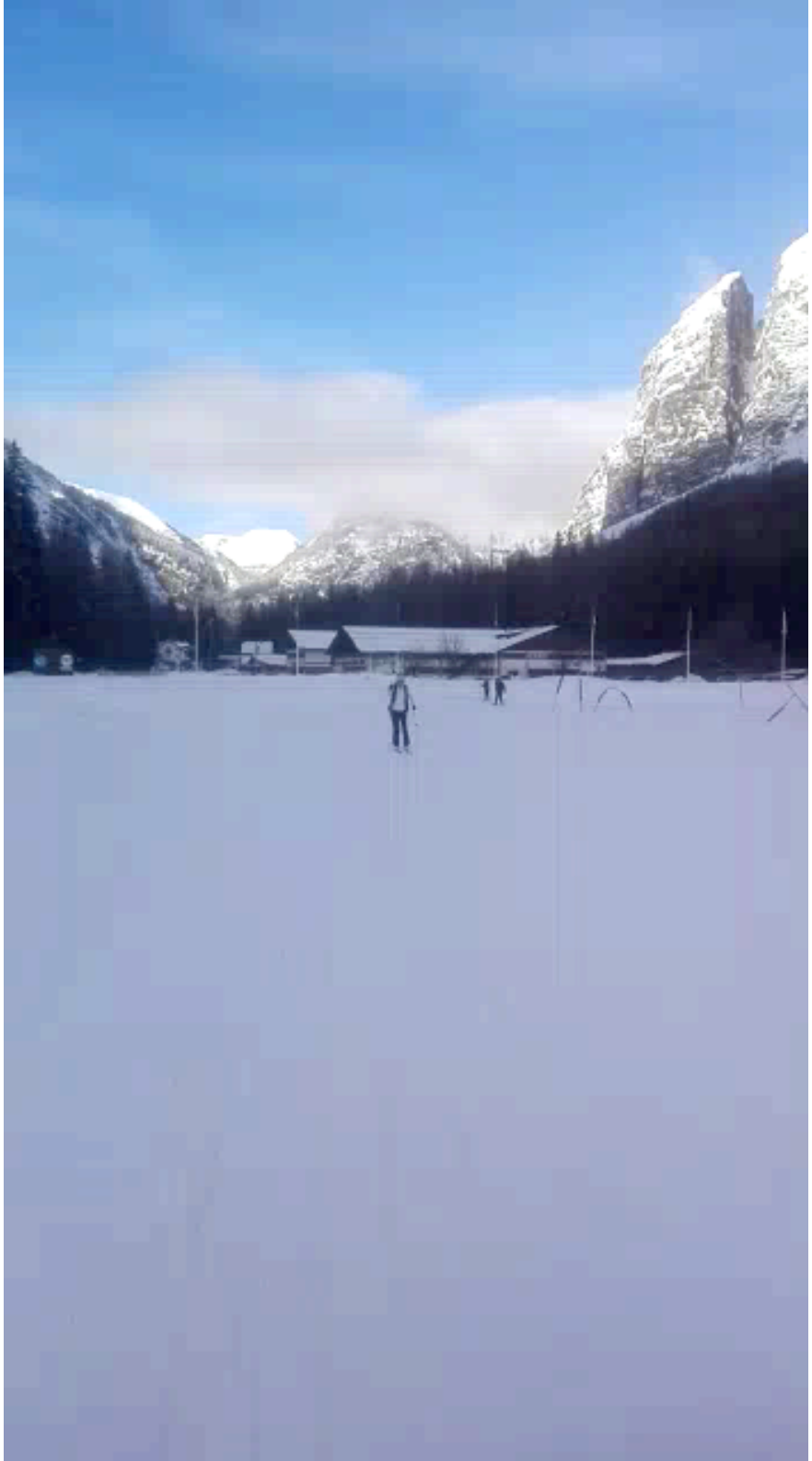
Made In OsiriX





Conclusions

- Case by case decision making
- Imaging→classification of defect→planning(s)
- Consider this surgery as revision cases (proper level of constraint, rebuilding devices)
- Consider the possible presence of an infection, and/or the increase chance of it after your surgery→advice the patient

Risk factors

Non arthroscopic VS Arthroscopic

ORIF VS HTO

Remnants VS non remnants

BI-UNI

Approach