

Clinica Ortopedica e
Traumatologica
Università degli Studi di Pavia
Fondazione IRCCS Policlinico
San Matteo

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Risk of Infection

F.M. Benazzo



**5th Advanced Course on
Knee Surgery**



The presentation could finish here...

Knee Surg Sports Traumatol Arthrosc (2011) 19:2040–2044
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KNEE

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

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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 | 3.5 ± 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 | |

| Variable | Infected (<i>n</i> = 17) | Uninfected (<i>n</i> = 2,005) | <i>P</i> |
|---|------------------------------|-----------------------------------|----------|
| 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) | <i>P</i> |
|------------------|------------------------|----------|
| 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

Risk factors

Non arthroscopic VS Arthroscopic

ORIF VS HTO

Remnants VS non remnants

Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection

Chairmen:

Javad Parvizi MD, FRCS

Thorsten Gehrke MD



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/m²), 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 who 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

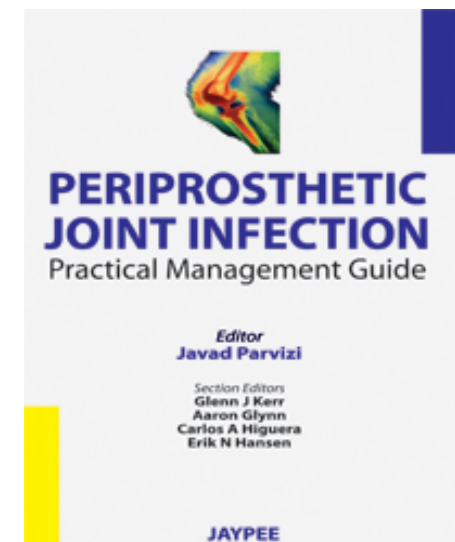
53% complication if prior infected tibial plateau fracture with 26% recurrence of infection

Laarson et al CORR, 2009

Beware

Patients with hardware in situ:

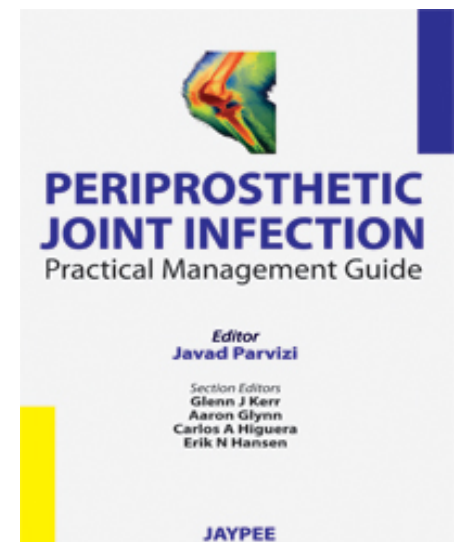
- Removal of hardware can leave a stress riser
- Augmented risk of infection if poor soft tissue quality



Recommendations

Patients with hardware in situ:

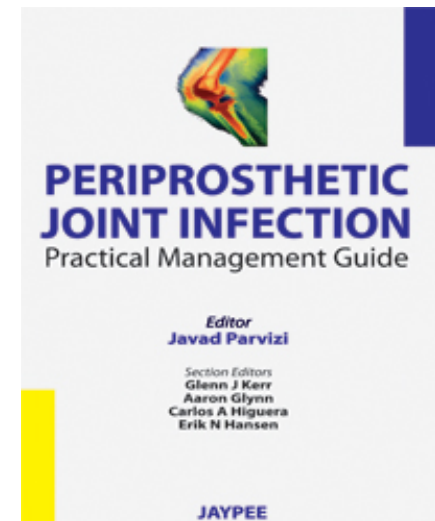
- Preoperative work up for infection recommended
- Remove only interfering hardware (unless suspicion of infection)



Recommendations

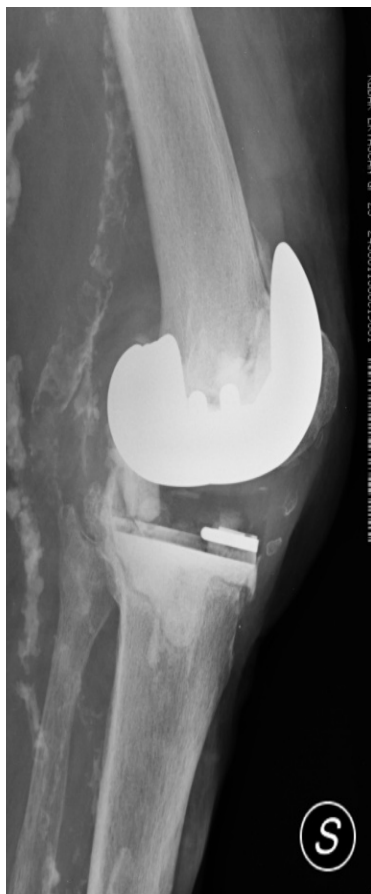
Patients with hardware in situ:

- Approach difficult cases as a staged procedure
- If suspicion of infection the use of a spacer should be considered



Which spacer ?

Hoffmann spacer



Which spacer ?

Static spacer



What else can we do?

- Non modifiable factors
- Modifiable factors
- Theater discipline
- Surgical discipline
- Nasal Carriers/Oral diseases

Non modifiable factors

1. Obesity
2. Diabetes
3. AR
4. Chronic Kidney disease
5. Endocarditis
6. Haemophilia
7. Tumor
8. Aging
9. Previous surgery on same site
- 10.....



(Non) modifiable factors

Obesity:

➔ BMI > 40

➔ odds ratio 9 (95% CI)



Malinzak, J. Arthroplasty 2009

Diabetes ➔ independent risk factor

⬆ ≈ 7 X risk of infection

Downsey,
Obese Diabetic Patients are at Substantial Risk for Deep Infection after Primary TKA
COOR 2009

Our experience

- From March 2004 to March 2013 44 chronic post-traumatic knees in 43 patients.
- 23 females and 20 males.
- Mean age 64 years (range 33-83 years)
 - ➔ Females mean age 68 years (range 41-83)
 - ➔ Males mean age 58 years (range 33-82)
- Left knee was treated in 26 cases, right knee in 18 cases.

Our experience

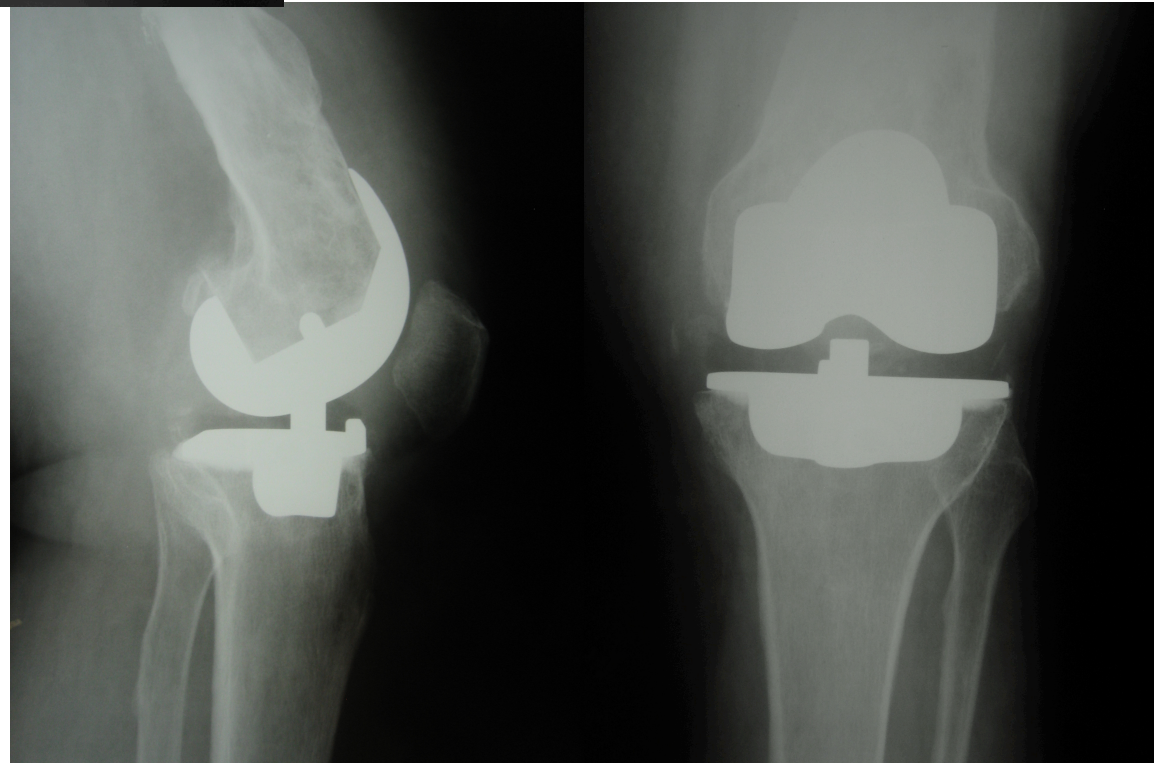
The trauma around the knee involved:

- Only tibia in 27 cases (5 fractures of medial plateau, 11 fractures of the lateral plateau and 11 complex fractures of proximal tibia)
- only the femur in 7 cases (1 only intra-articular fracture, 1 only extra-articular fracture and 5 complex metaphyseal fractures)
- 7 fractures involving both tibia and femur
- 1 patellar fracture
- 2 dislocations of the knee with patellar fracture

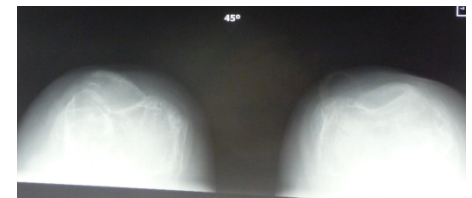
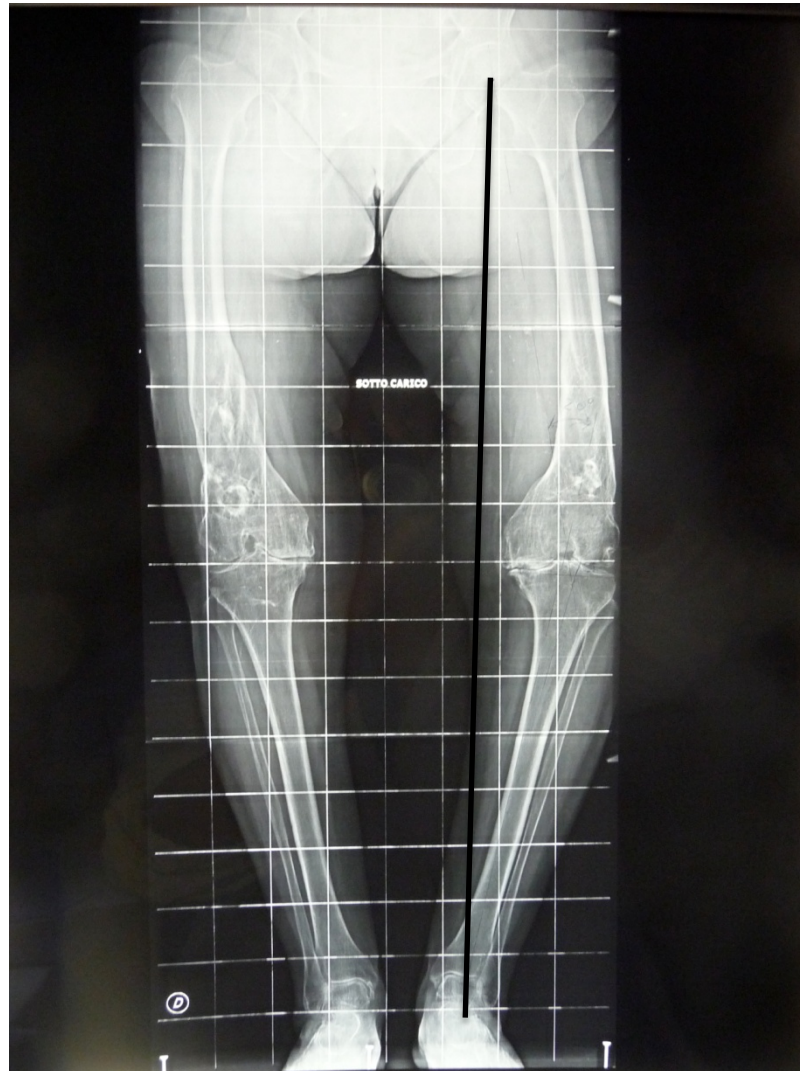
Our experience

- PS design in 22 cases
- CCK design in 21 cases
- RHK in 1 case
- In 10 cases we had to remove fixation devices during the arthroplasty implant;
- In 2 cases of osteomyelitis following ORIF we had to implant an antibiotic spacer for 6 months before the final implant.

Case example



Case example

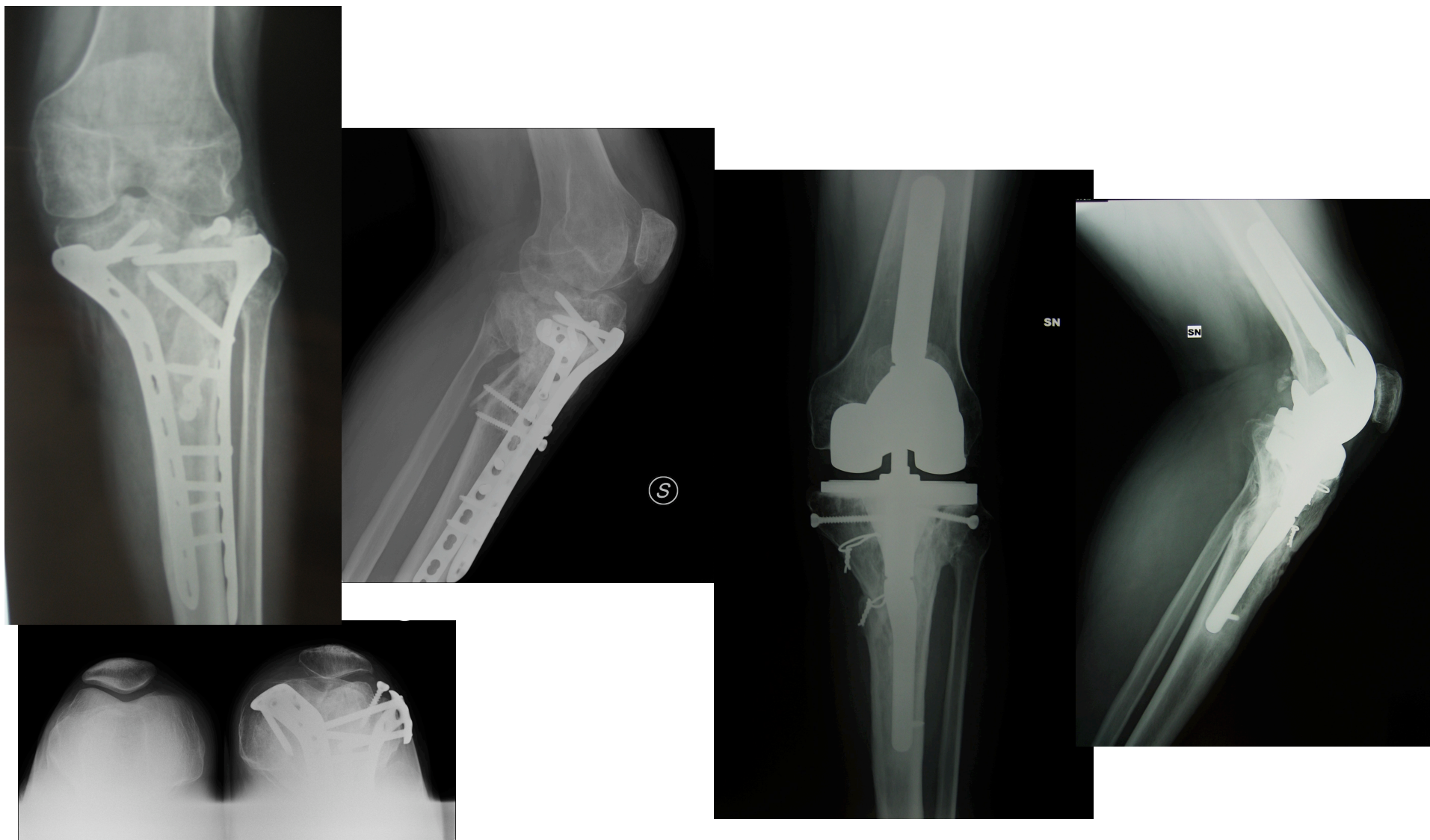




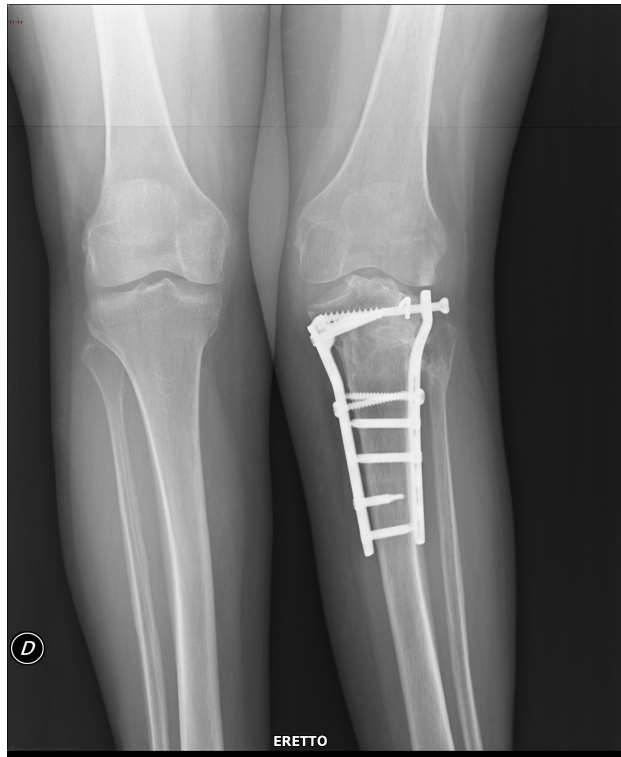
Case example



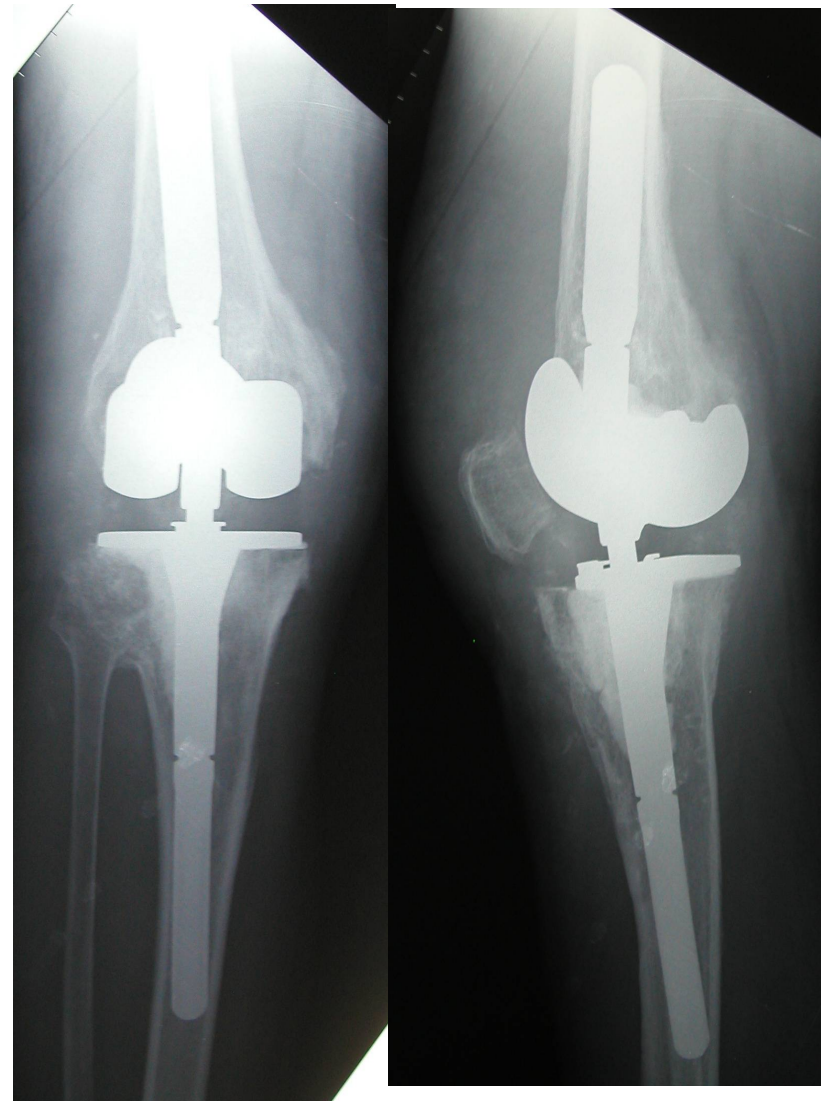
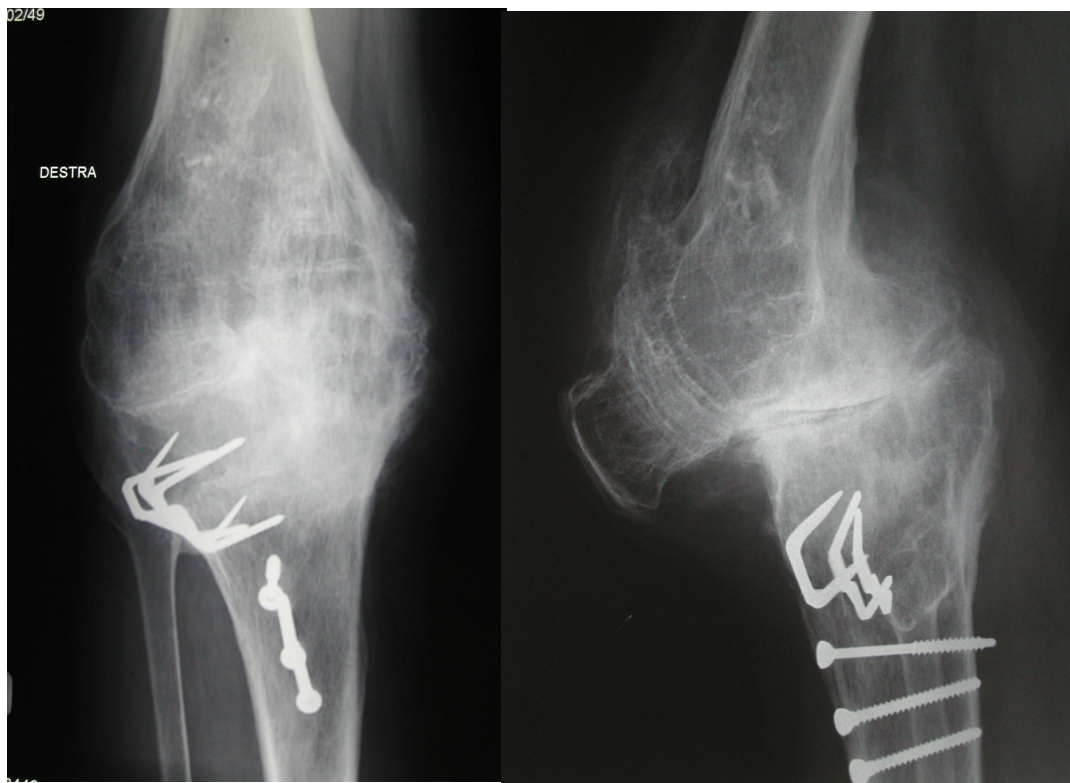
Case example



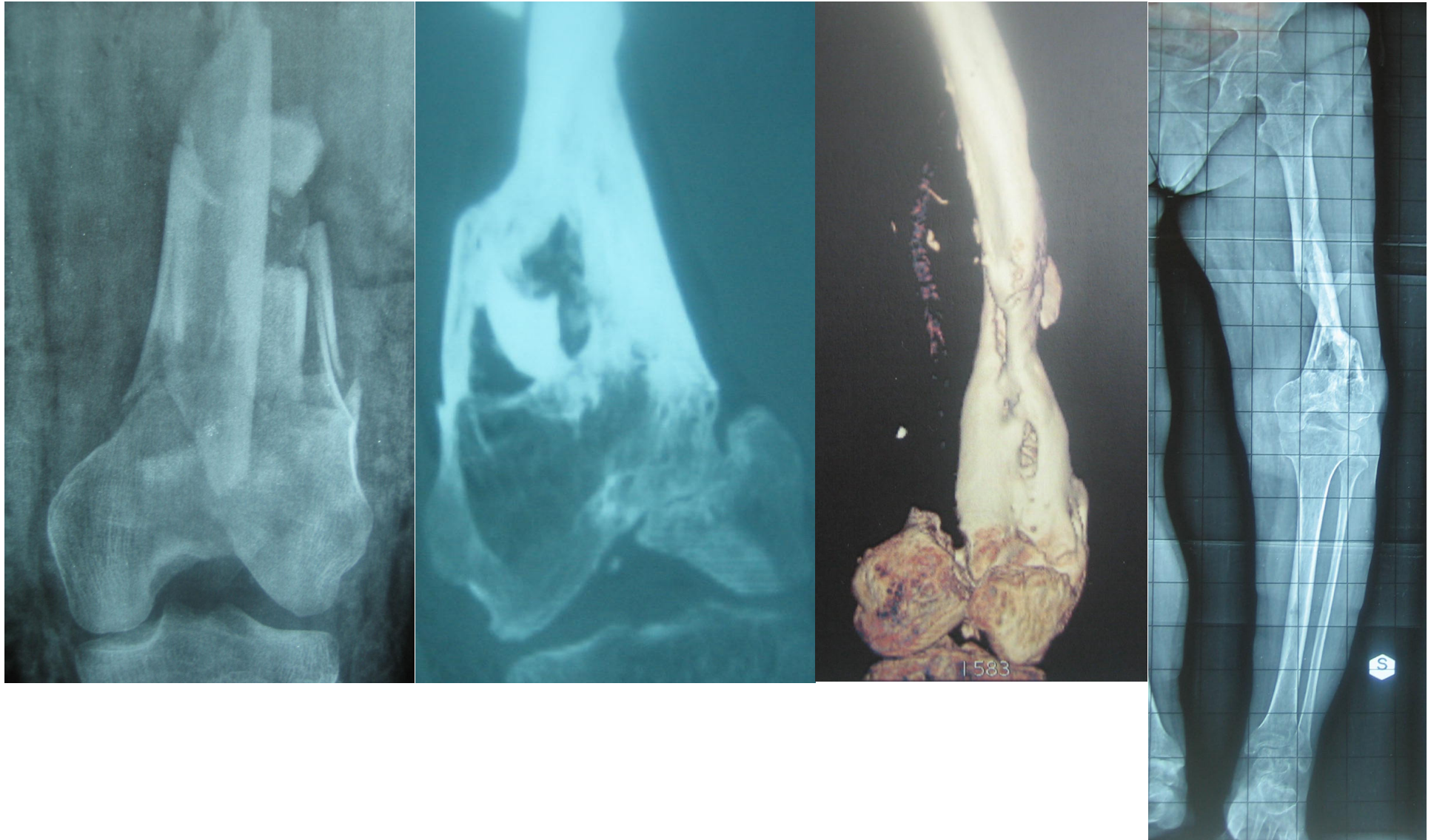
Case example



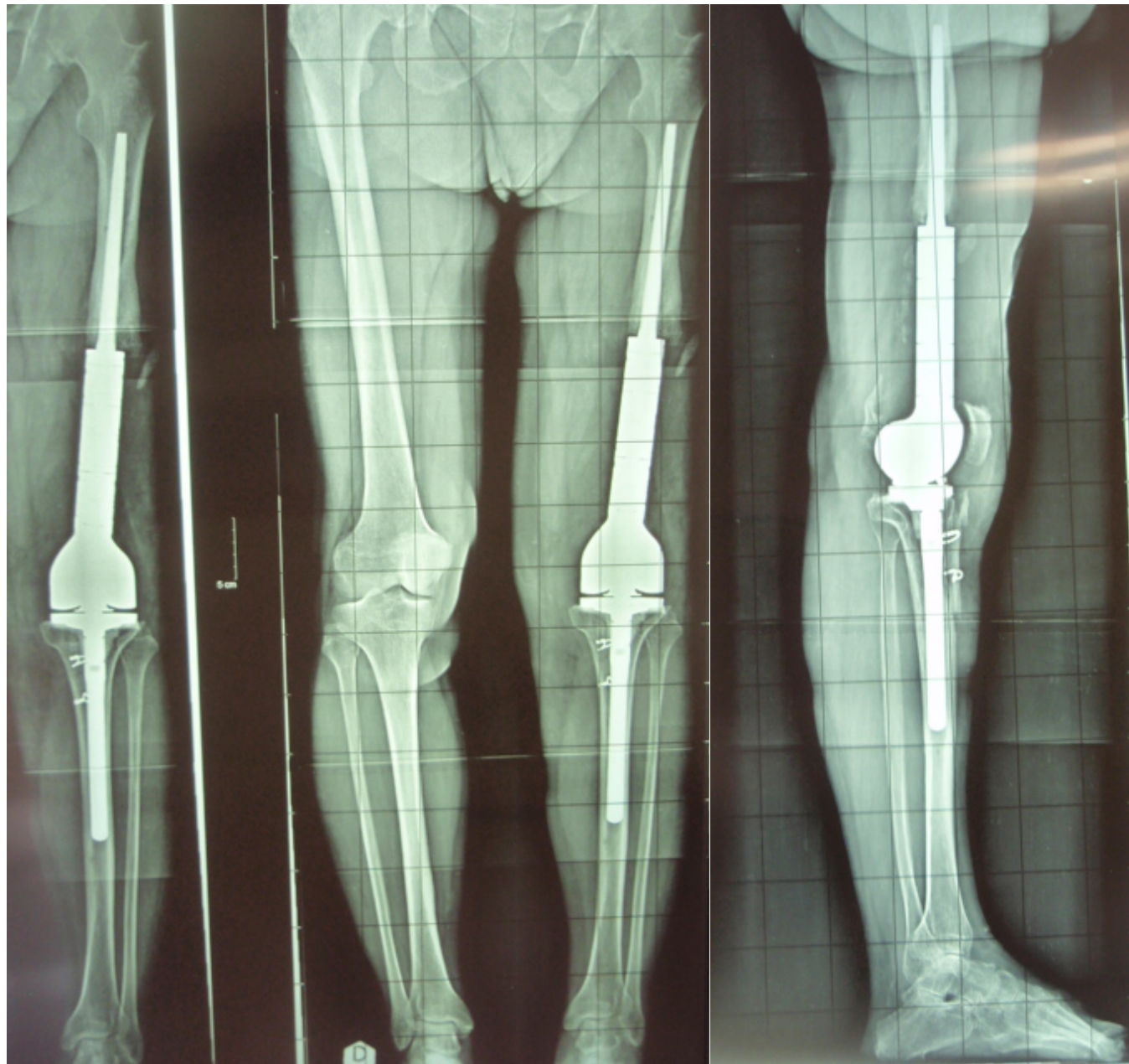
Case example



Case example



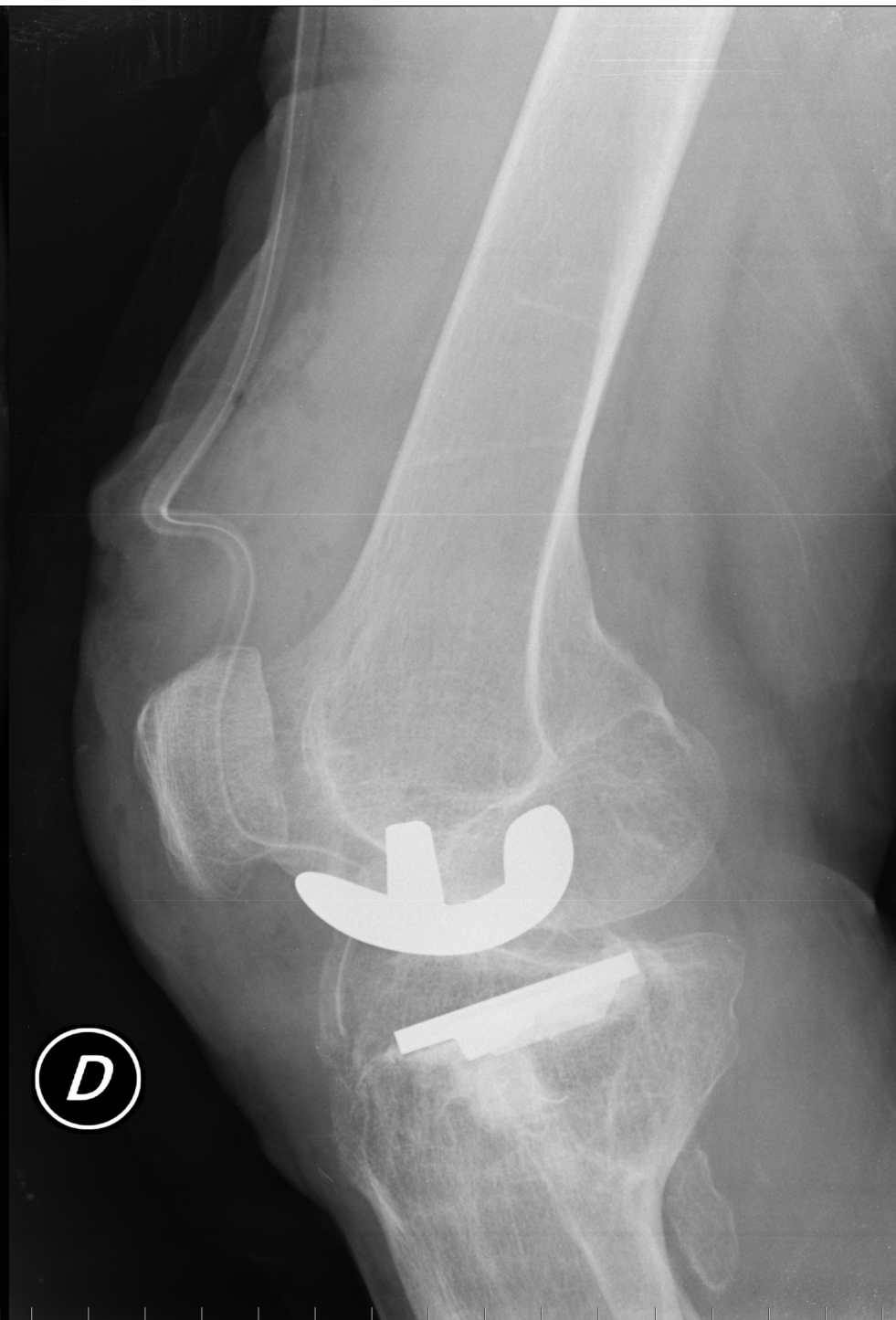
Case example



Case example

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

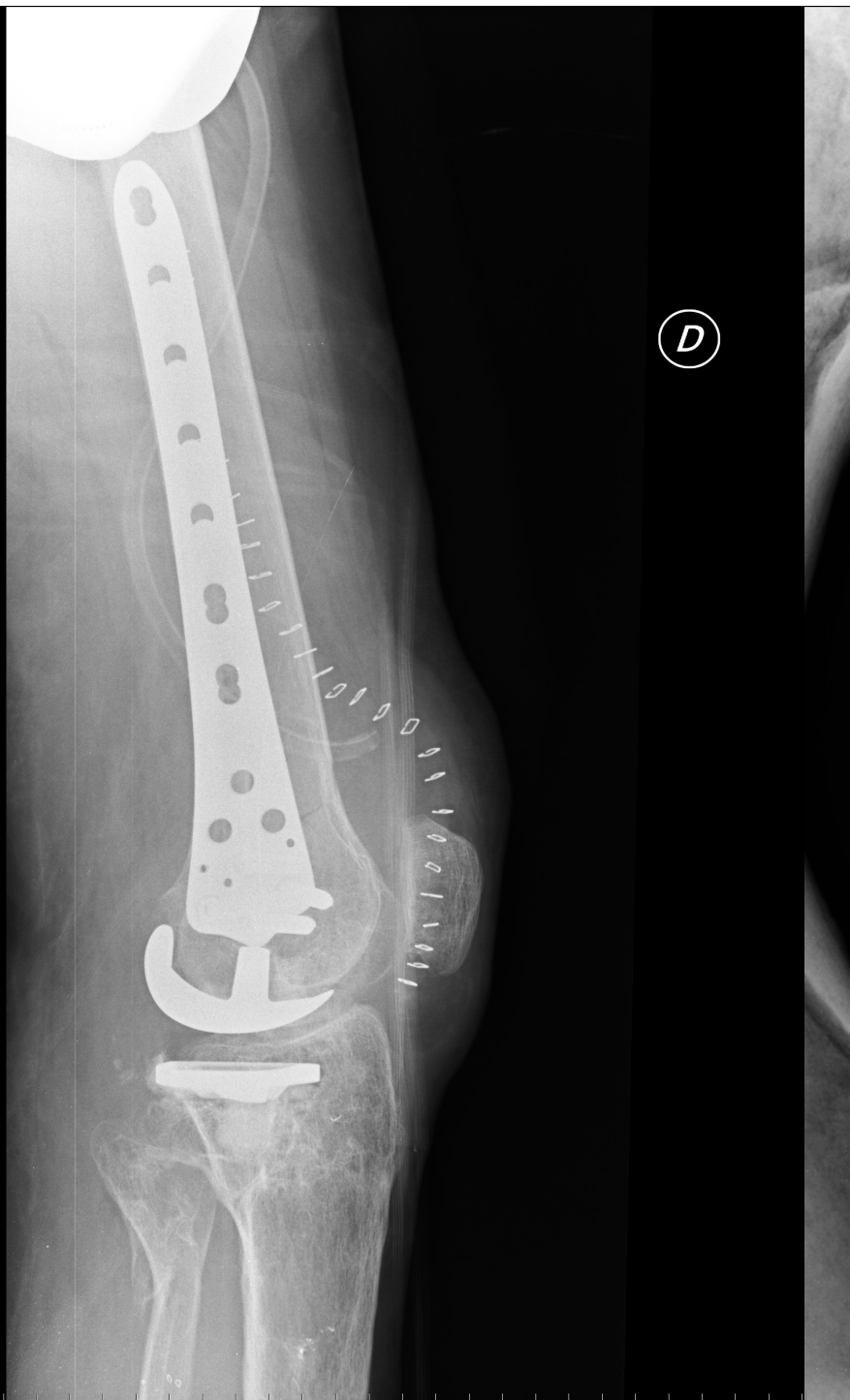




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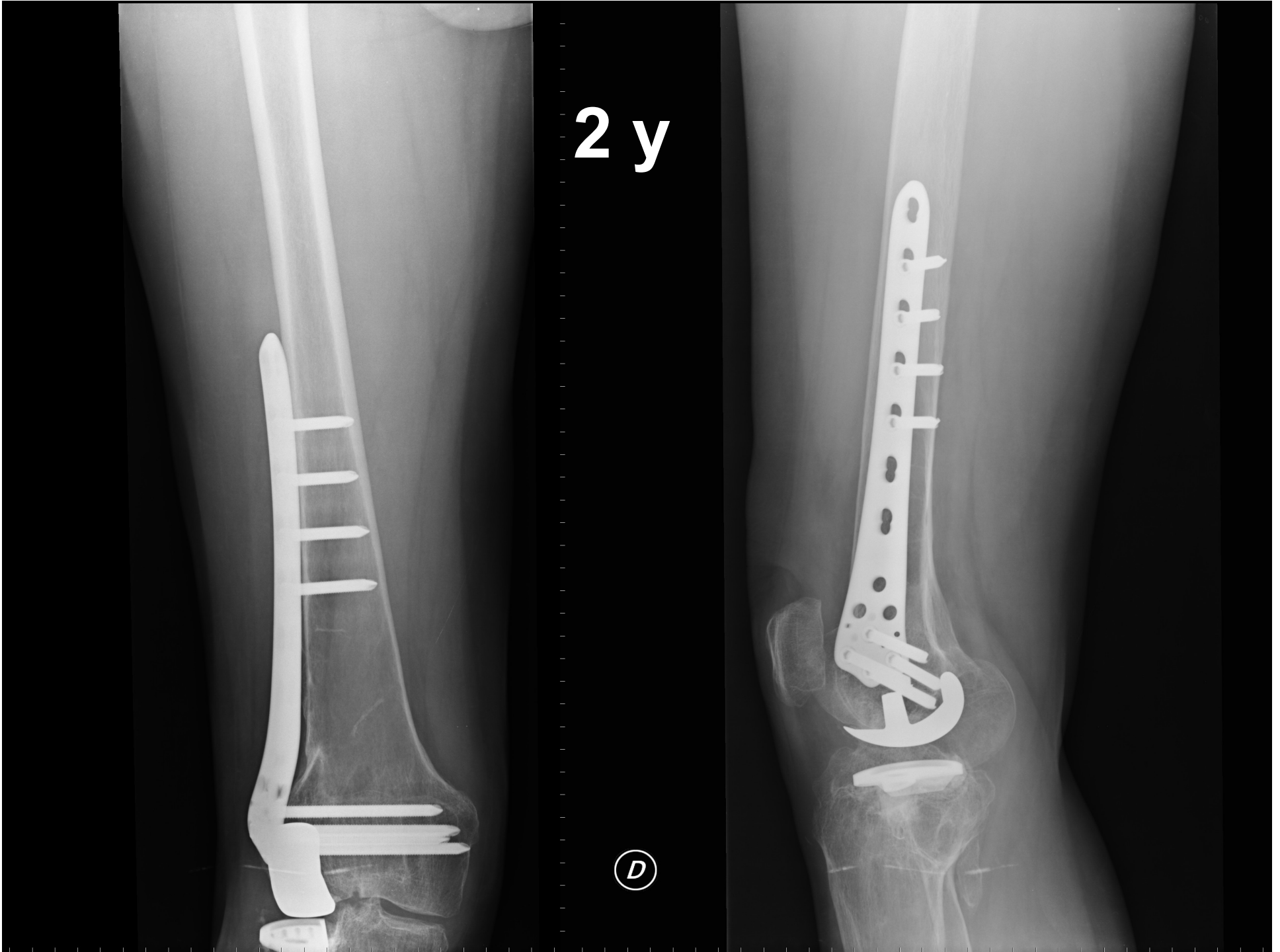


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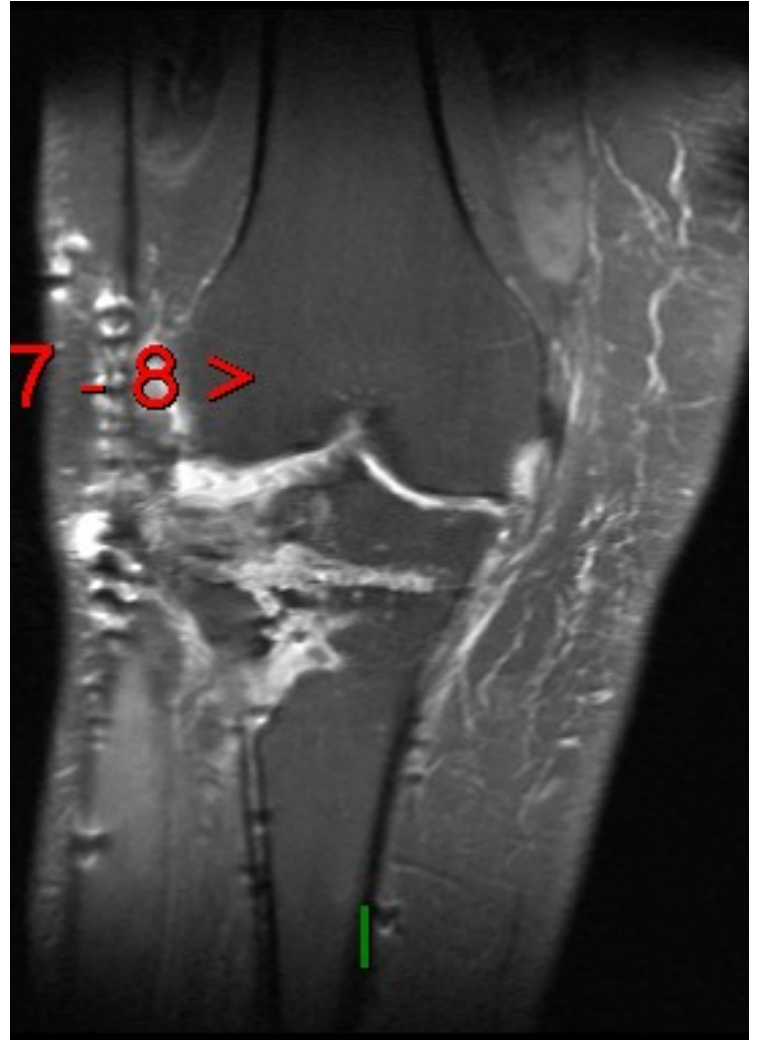


2 y

(D)









Case example

- Female
- 64 years
- Previous lateral tibial plateau synthesis, complicated by infection



Case example

- Antibiotic spacer
- Antibiotic therapy



Case example

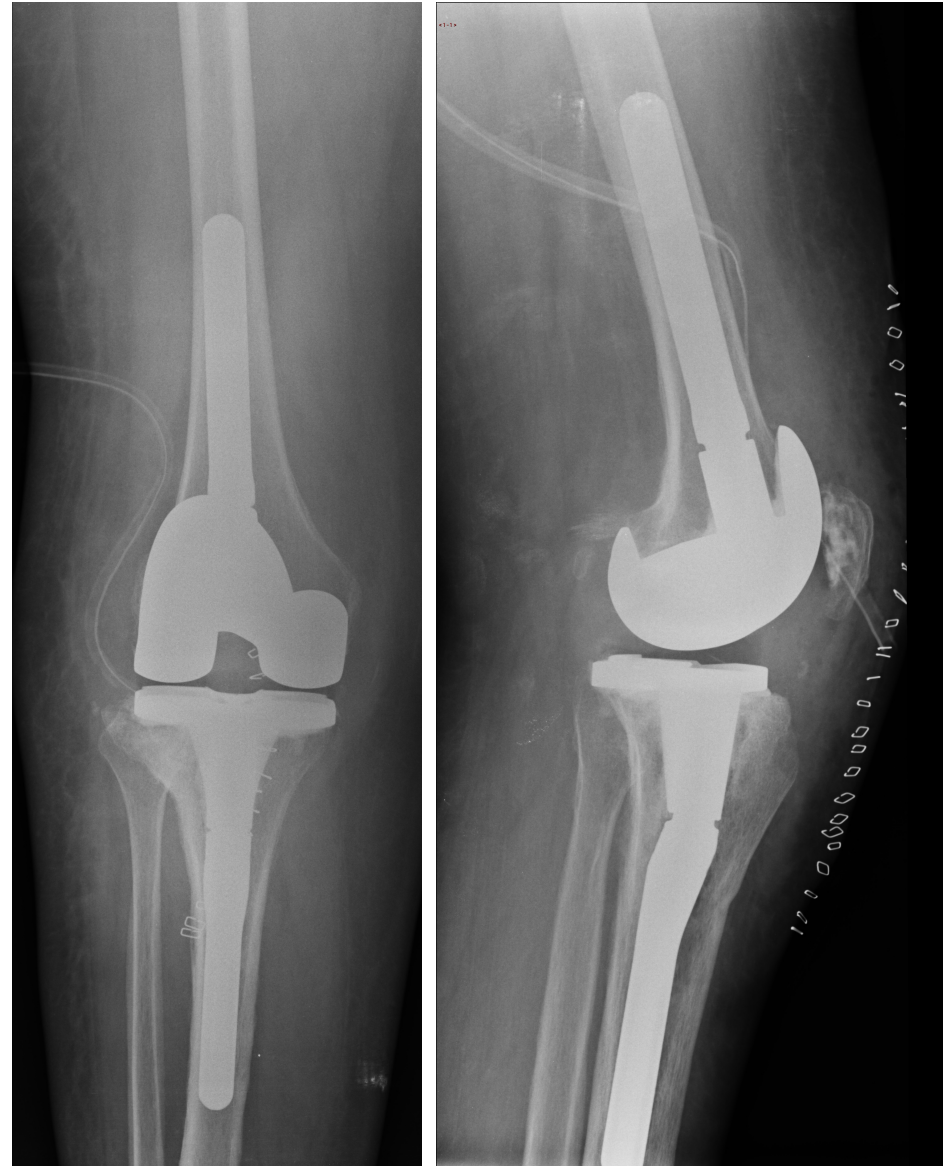
After six months:

- Normal CRP and ESR
- Good skin conditions



Case example

- LCCK
- Femur E
- Tibia 4
- Medial augment 5 mm
- Liner 10 mm
- Patella 26 mm
- Femoral stem 14X100 mm
- Tibial stem 12X100 mm

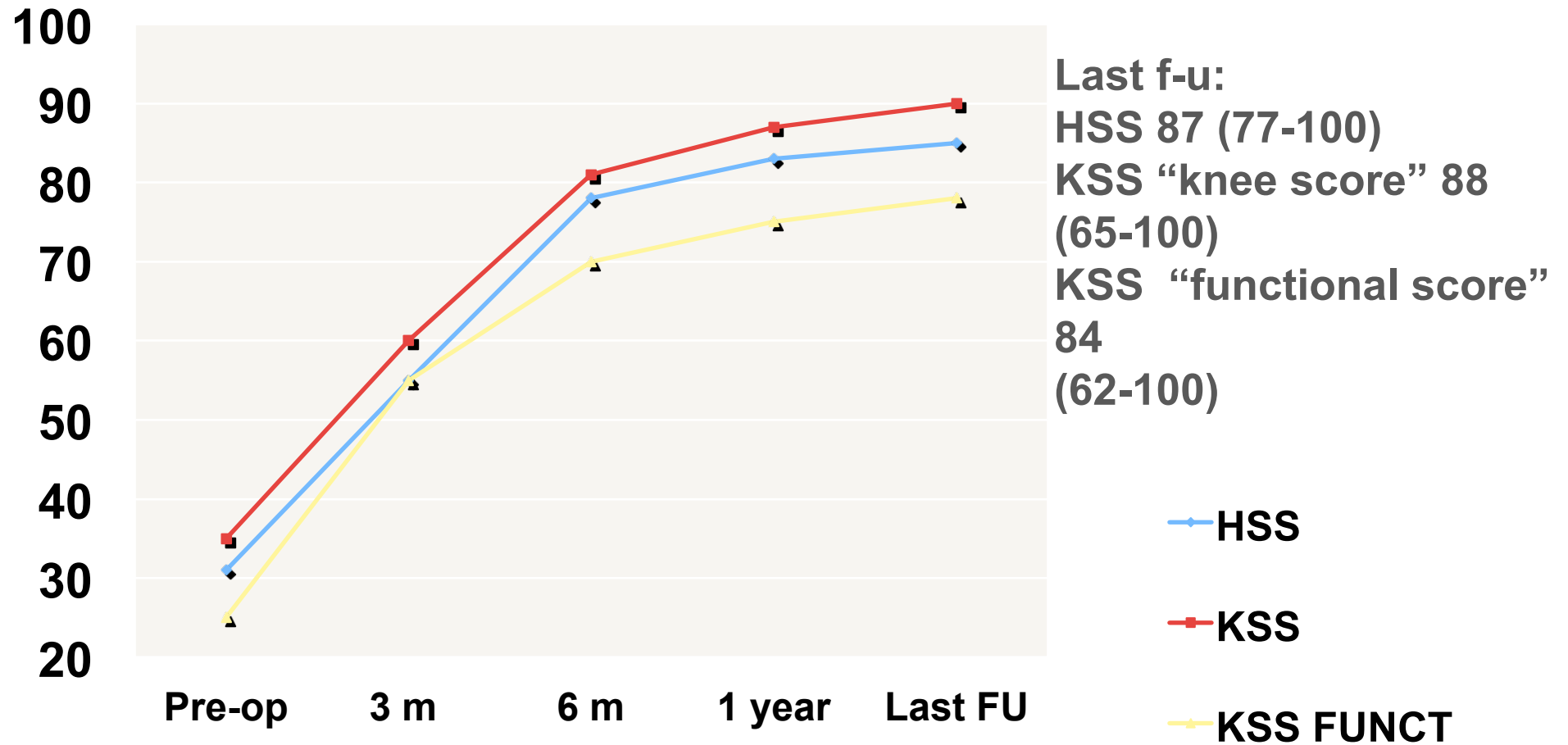


Case example

- F-u at 2 years



Our experience



Our experience

9 patients with a complication:

- infection (1 case)
- aseptic loosening (1 case)
- chronic persistent pain (1 case)
- stiffness (flexion less than 90 degrees, 2 cases)
- extension lag (4 cases).

A new operation was performed in three cases:

- aseptic loosening, treated with revision total knee revision and upgrading of the constraint;
- persistent pain, treated with arthroscopic debridement, patellar arthroplasty and lateral sagittal patellectomy;
- infection, treated by debridement, and removal of patellar implant

Conclusions

- The risk of infection after previous surgery is a real problem
- The risk of infection after previous surgery can be reduced if the rules are strictly followed (correct stratification of risk of the patient, correct discipline in pre and post-op, prevention of haematomas)
- Ask your infectiologist