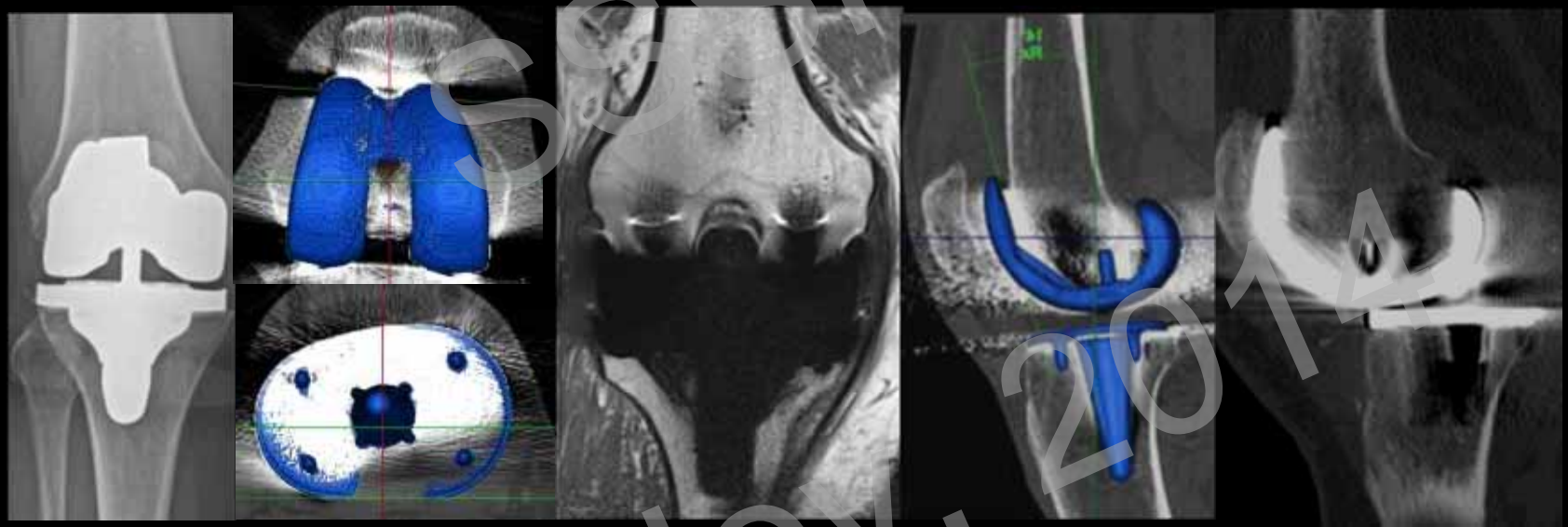
Knee Prosthesis

Postoperative Imaging



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Anna Hirschmann, MD
Clinic of Radiology and Nuclear Medicine
University Hospital Basel

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Imaging Methods of TKA

Radiographs: ➡ size, position, osteolysis, fracture

- ap/lat WB and patella ax:

Detection of osteolysis:
Sensitivity 17-56% X-ray
>70% CT / MR

Important:
Comparison with pre- and early postoperative X-rays!

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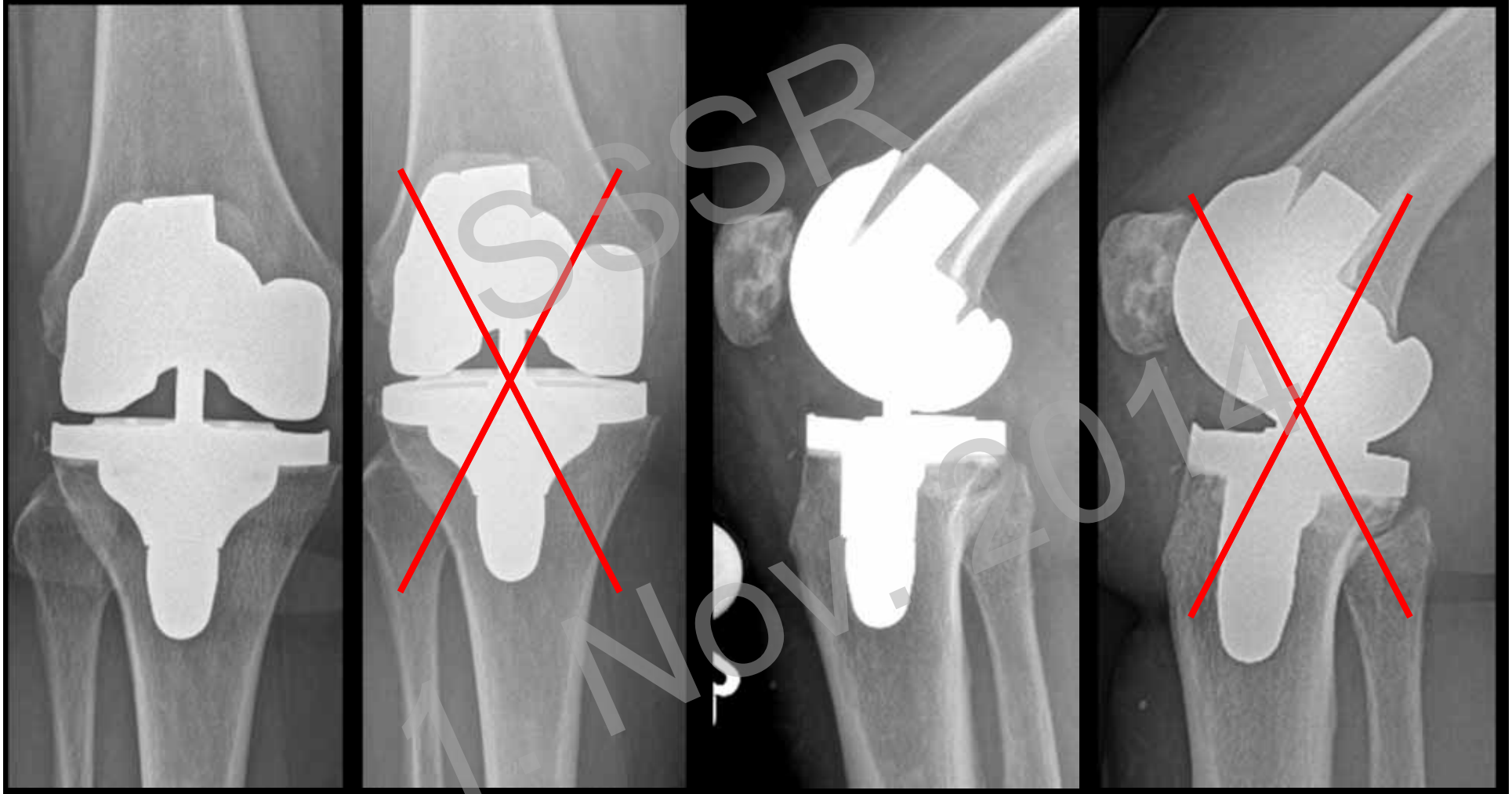
Solomon LB et al. J Arthroplasty 2012

Imaging Methods of TKA - Quality



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Imaging Methods of TKA

Radiographs:

- Full-leg ap WB:
  - ➡ mechanical alignment
- Varus/valgus ± ap stress views:
  - ➡ flexion/extension gap/ ap translation

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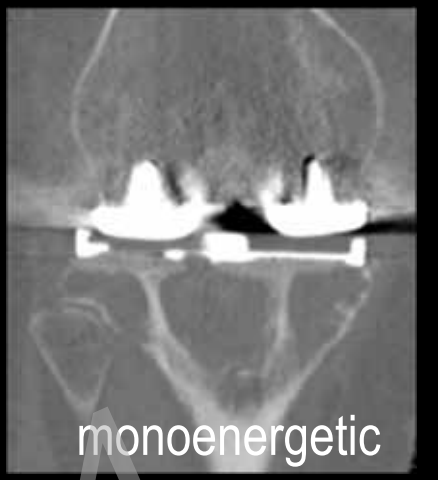
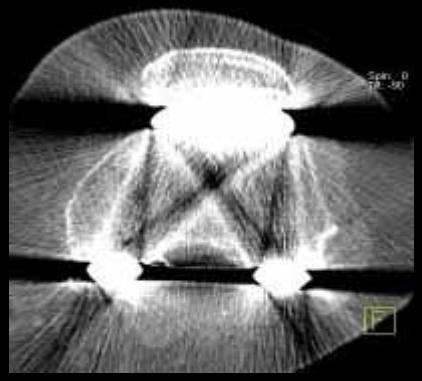
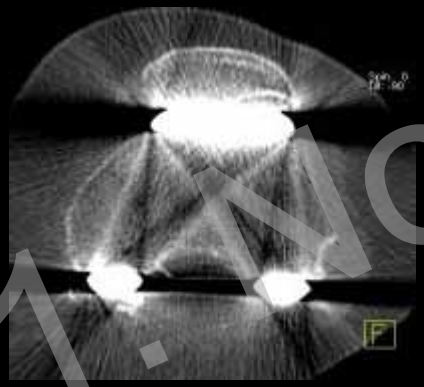
Imaging Methods of TKA

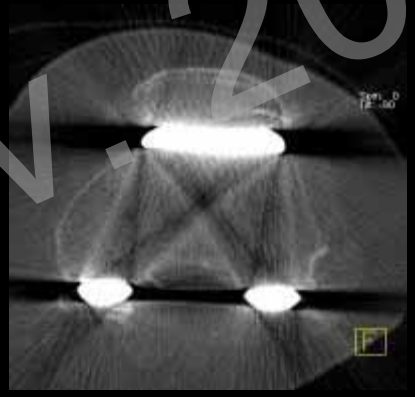
CT: ➡ Osteolysis, position

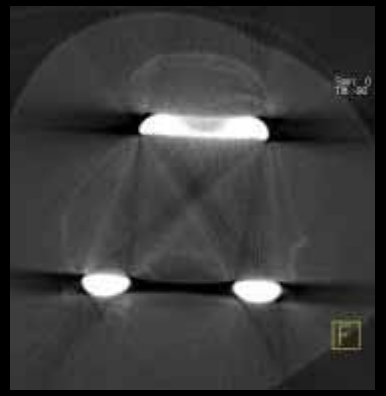
- Metal artifact reduced algorhythm (DECT)
- Extended scale (max WL/WW)




1200HU


4000 HU


6500 HU


14000 HU

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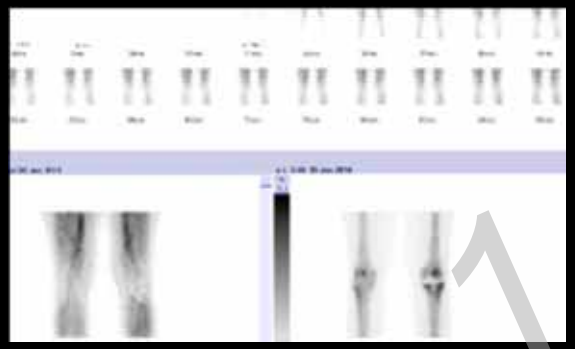
Imaging Methods of TKA - optional

MR: ➡ osteolysis, edema, soft tissue

- Metal artifact reduced sequences (VAT, HBW, SEMAC)

SPECT/CT:

- Bone tracer uptake: loosening, infection
- Marked increase BTU < 1 y po

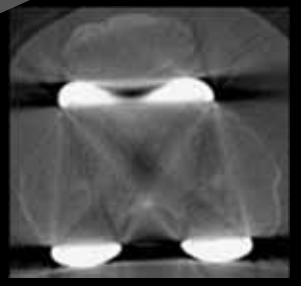


Triple phase knee

Whole body

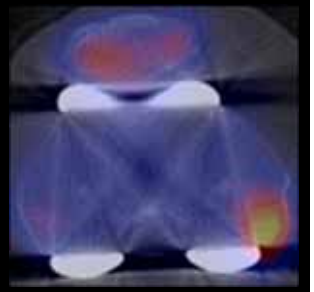
SPECT

+



CT

=



SPECT/CT

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SPECT/CT Imaging

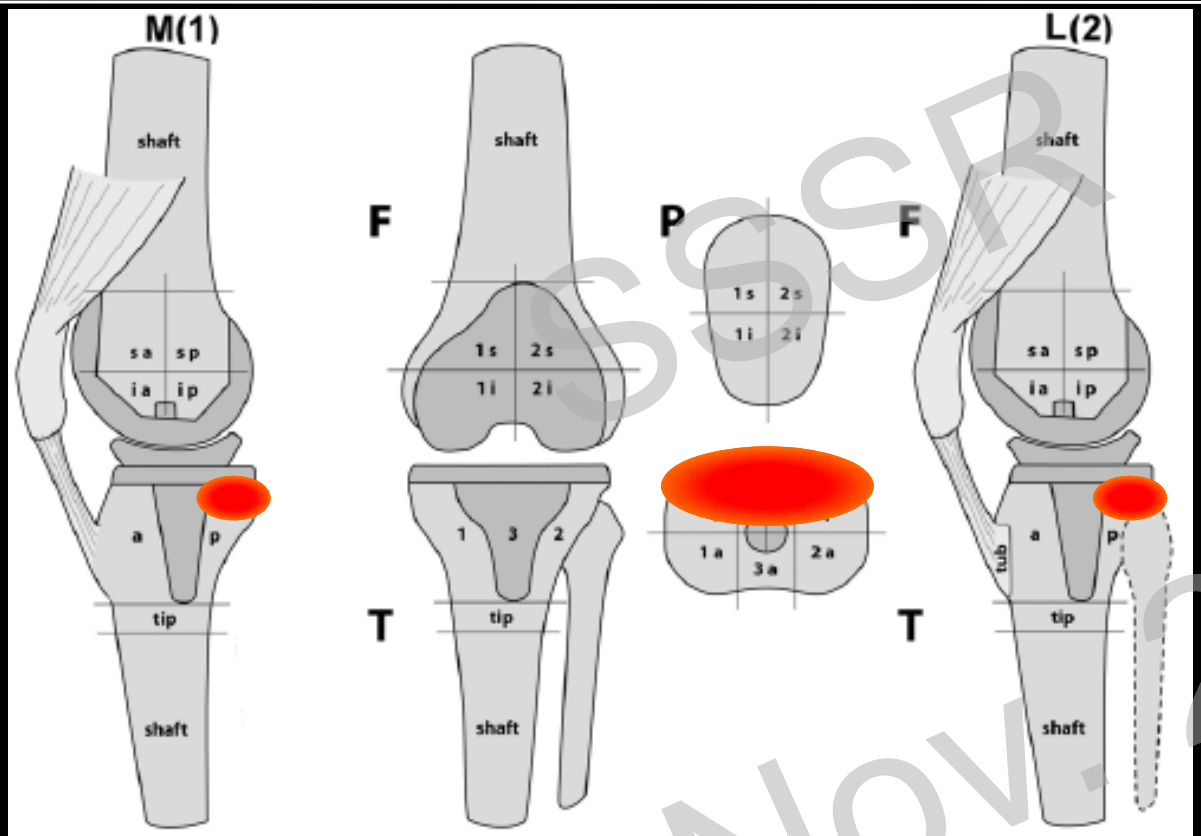

Figure 1 The previously published and used SPECT/CT classification system. (Reprint permission from Journal KSSTA, Springer).

Normal BTU
due to remodeling!

Higher tibial slope = ⬆ BTU

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SPECT/CT Imaging

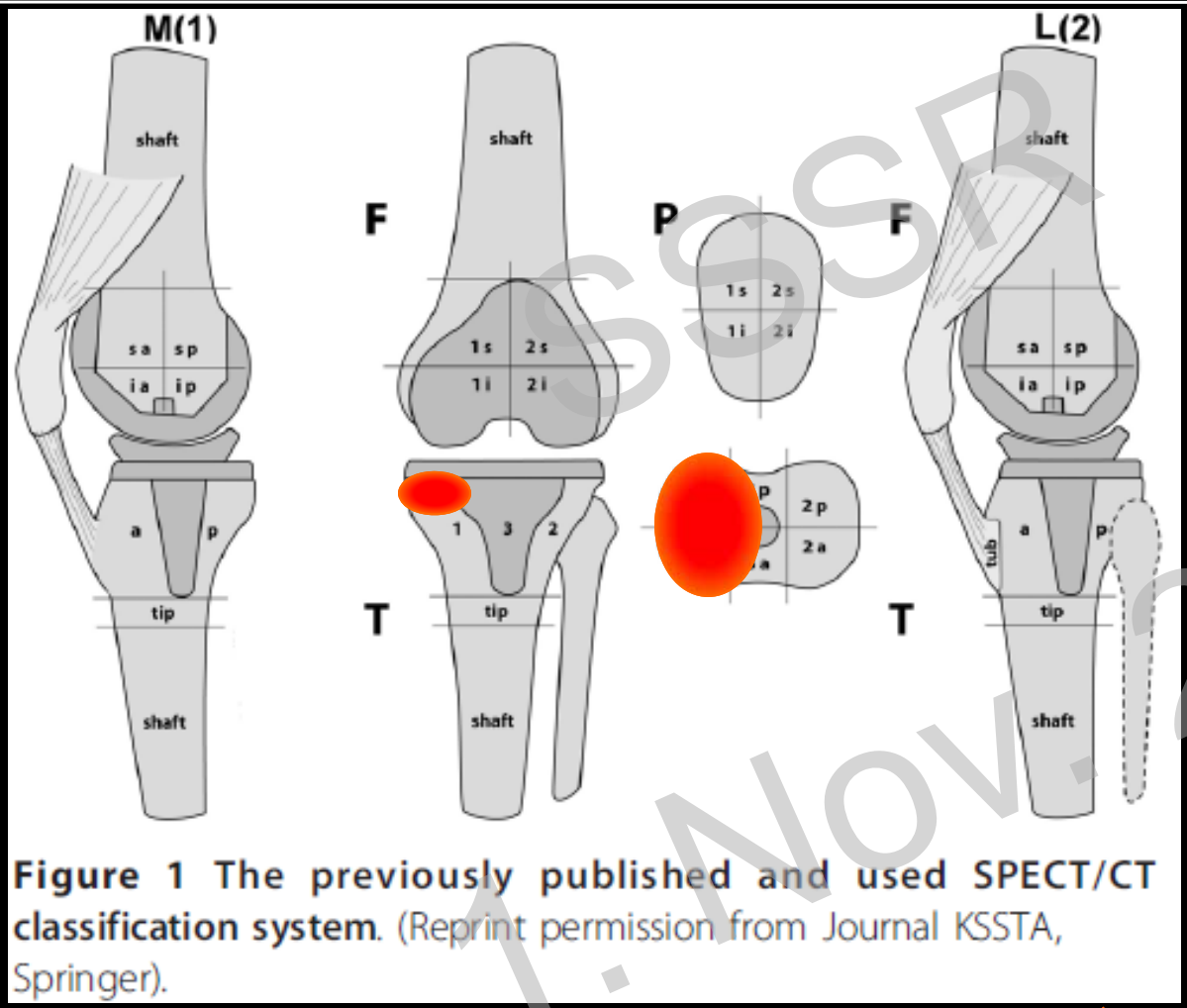

Figure 1 The previously published and used SPECT/CT classification system. (Reprint permission from Journal KSSTA, Springer).

Normal BTU
due to remodeling!

Tibial varus / leg axis in varus = ↑ BTU

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SPECT/CT Imaging

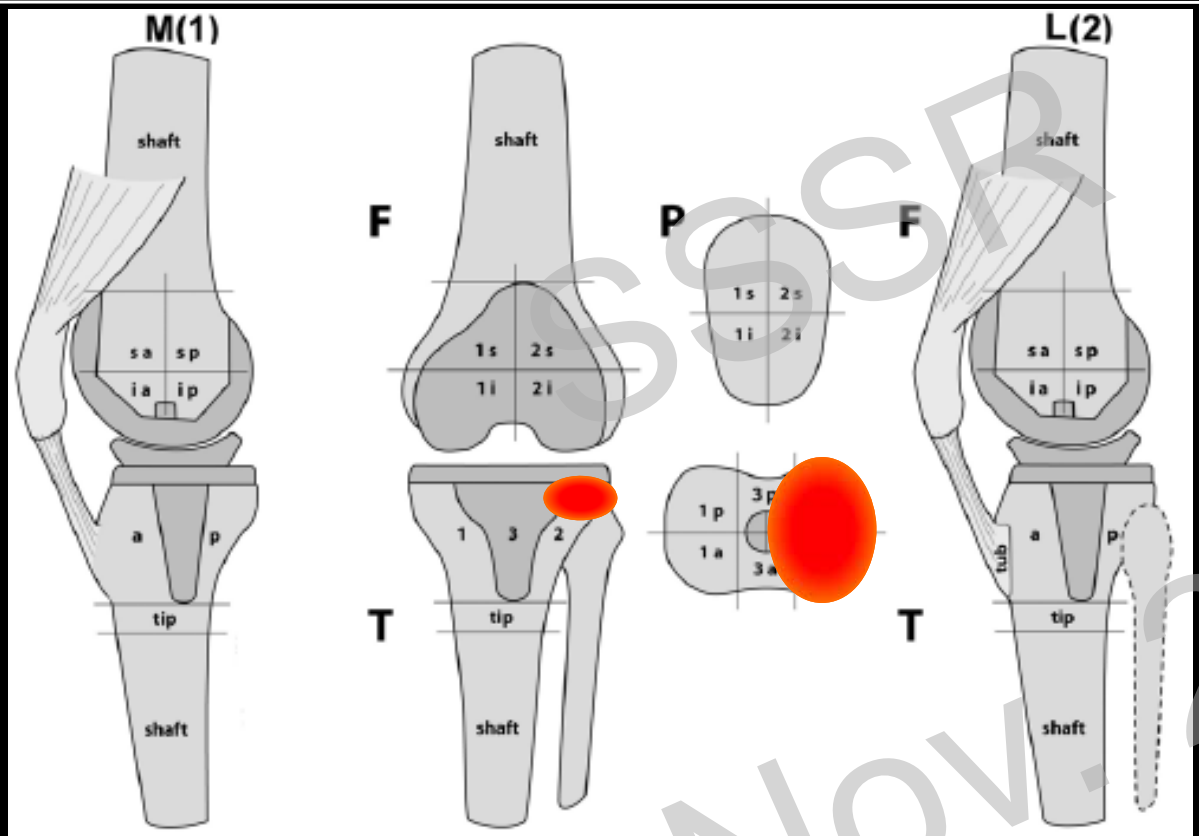

Figure 1 The previously published and used SPECT/CT classification system. (Reprint permission from Journal KSSTA, Springer).

Normal BTU
due to remodeling!

Tibial valgus / leg axis in valgus = ⬆ BTU

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SPECT/CT Imaging

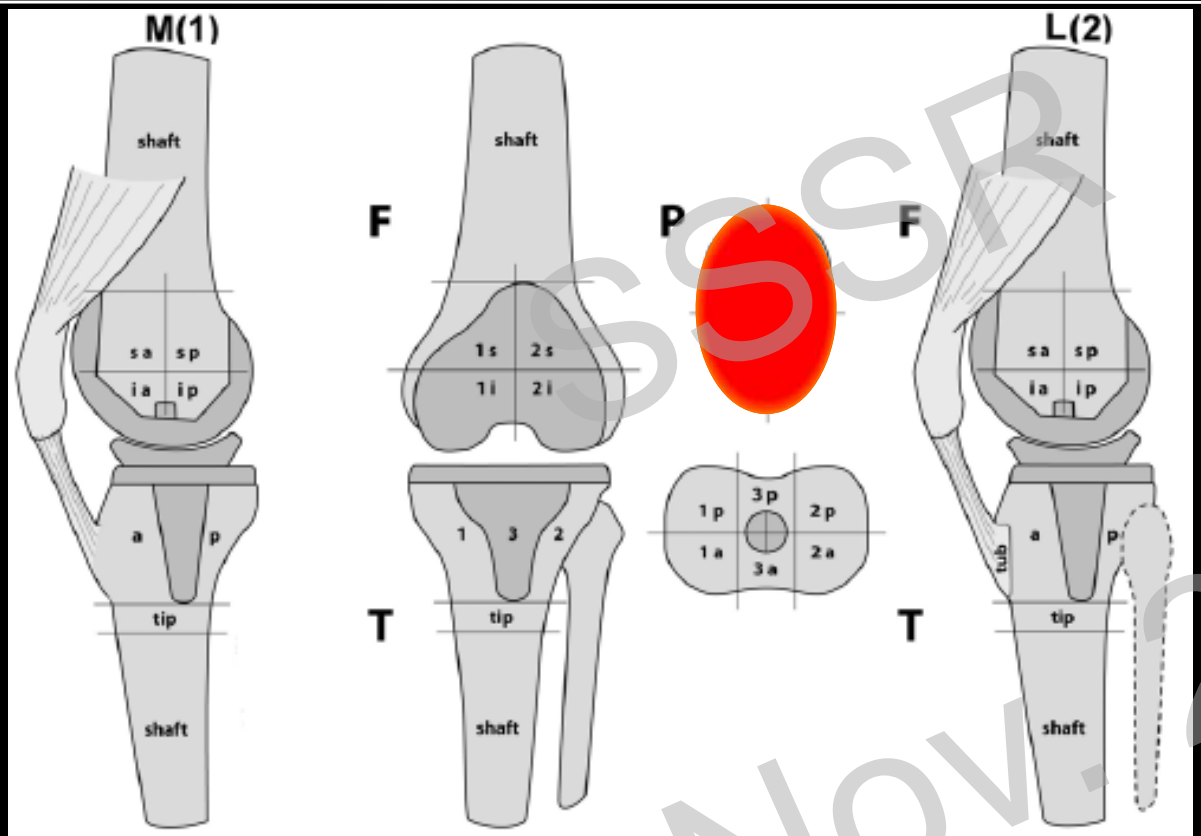
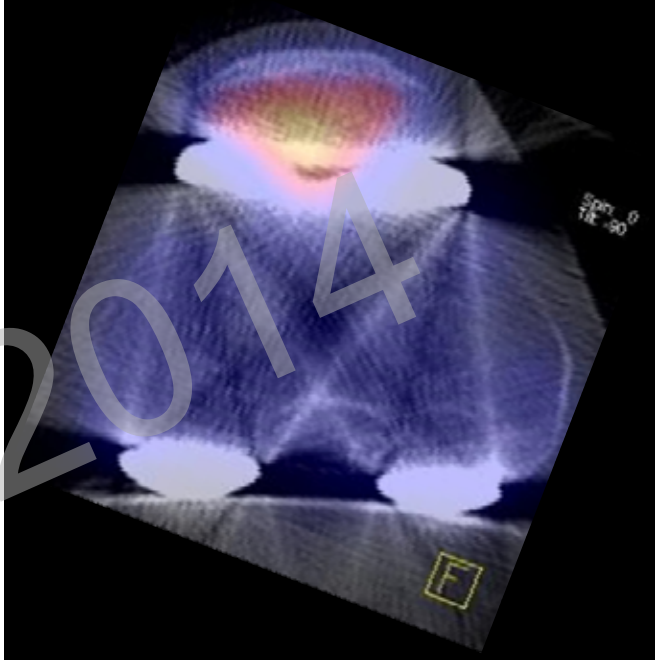


Figure 1 The previously published and used SPECT/CT classification system. (Reprint permission from Journal KSSTA, Springer).

Normal BTU
due to remodeling!



„Hot patella“ = BTU entire patella, no relation to TKA position

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Failure of TKA

- 20% not satisfied/not painfree

Causes:

- Infection
- Instability
- Malposition/-sizing

< 2 years after TKA

- Loosening/Wear

> 2 years after TKA

- Patellofemoral Problems
- Extensor mechanism failure

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Infection

- 2-38% prevalence, mainly acute (< 3 mths)
- Rx not sensitive nor specific (73% normal)
- Tc-labeled white blood cells

	Sensitivity	Specificity	PPV
Tc WBC	87.5	77	58
Tc WBC+ 24 h delayed images	100	82	67
Tc bone scan	100	5	28

BUT: normal bone scan 95% negative PV for excluding infection

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Instability

F, 81 yo. 5 ya primary CR TKA due to varus OA

Persistent pain medial / instability climbing stairs

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Courtesy M. Hirschmann

Instability

Increased medial JS = Valgus laxity

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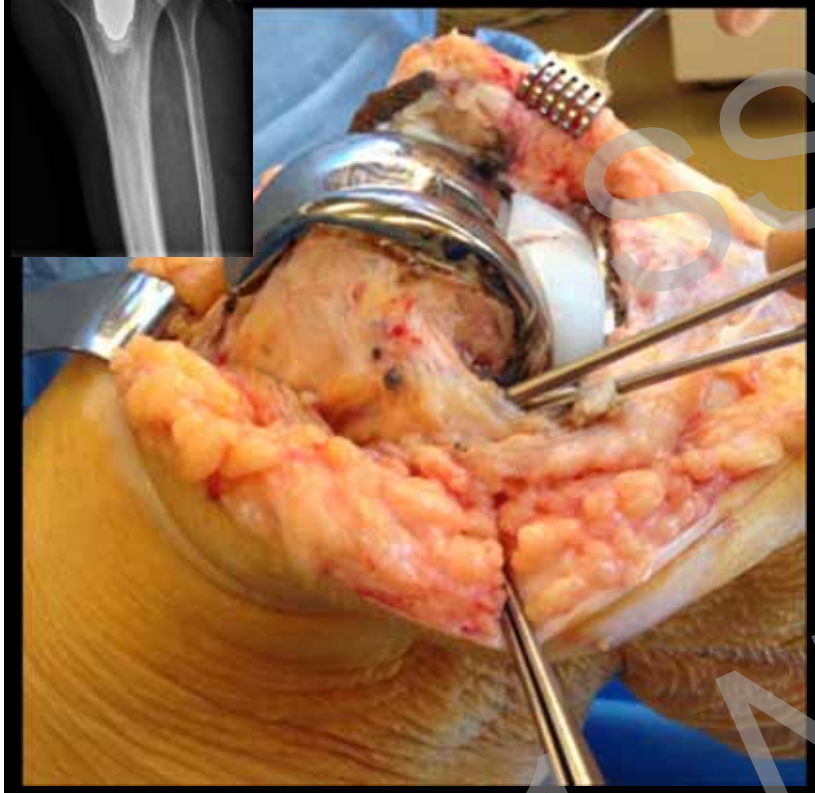
Instability



Medial ligament insufficiency after previous intraoperative repair

Rotating Hinge TKA

Courtesy M. Hirschmann

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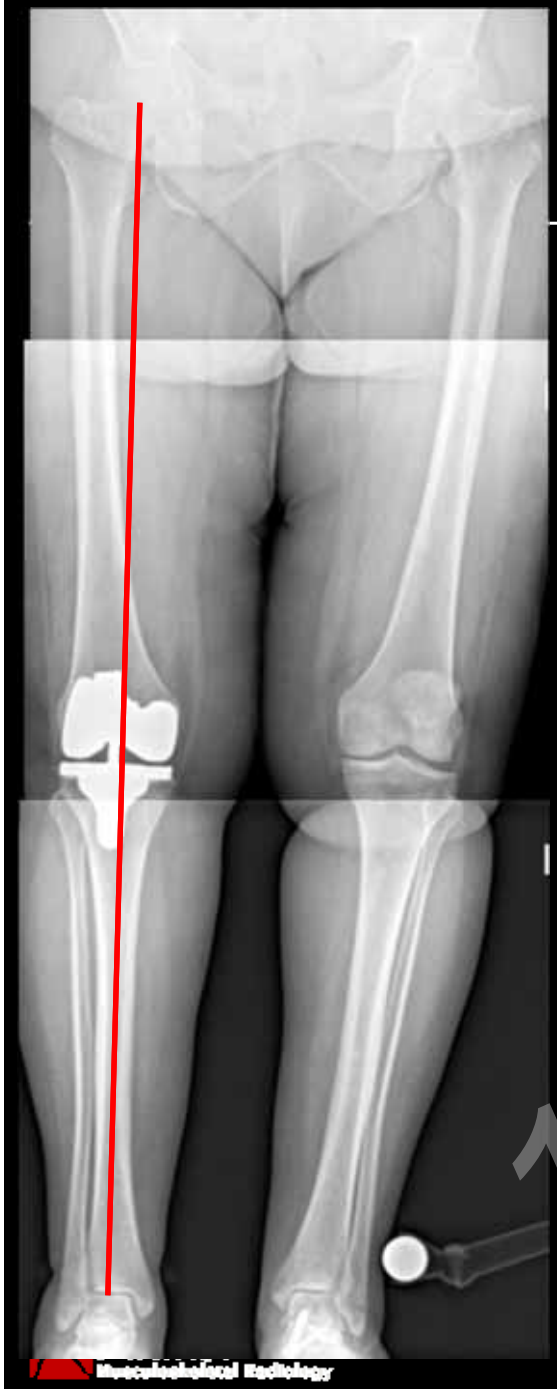
Malposition/Malsizing



Goal: proper tension and balancing

Tibial varus

Normal tibial component alignment

Posterior Offset

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Malposition

Cruciate retaining prosthesis

High posterior tibial slope

Posterior stabilized prosthesis

Normal:
0-3° posterior tibial slope (PS)/as preoperative (CR)

Anterior tibial slope

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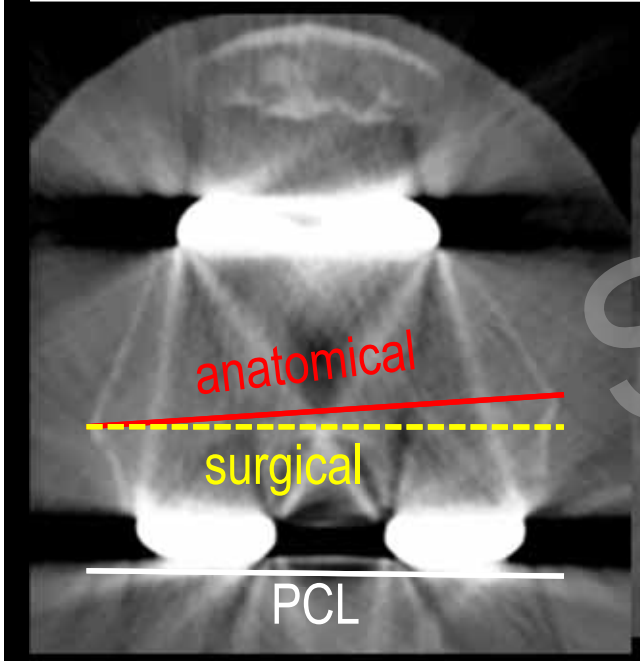
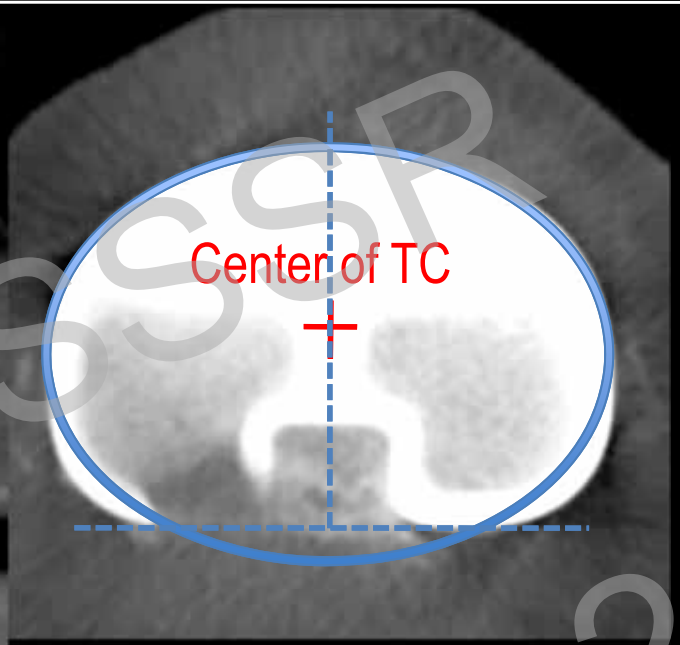
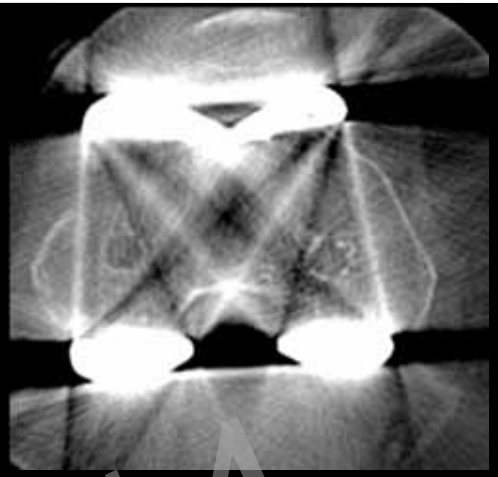
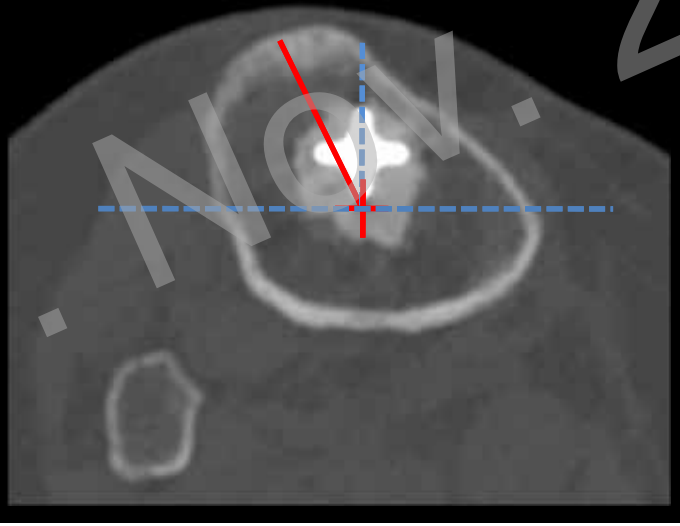
Malposition









Normal values
Posterior condylar line to epicondylar axis:
0° (surgical)
3° internal rotation (anatom)

Berger RA et al. Clin Orth Rel Res 1998

Normal value:
18° ± 2.6° internal rotation of tibial component (TC) to tibial tuberosity

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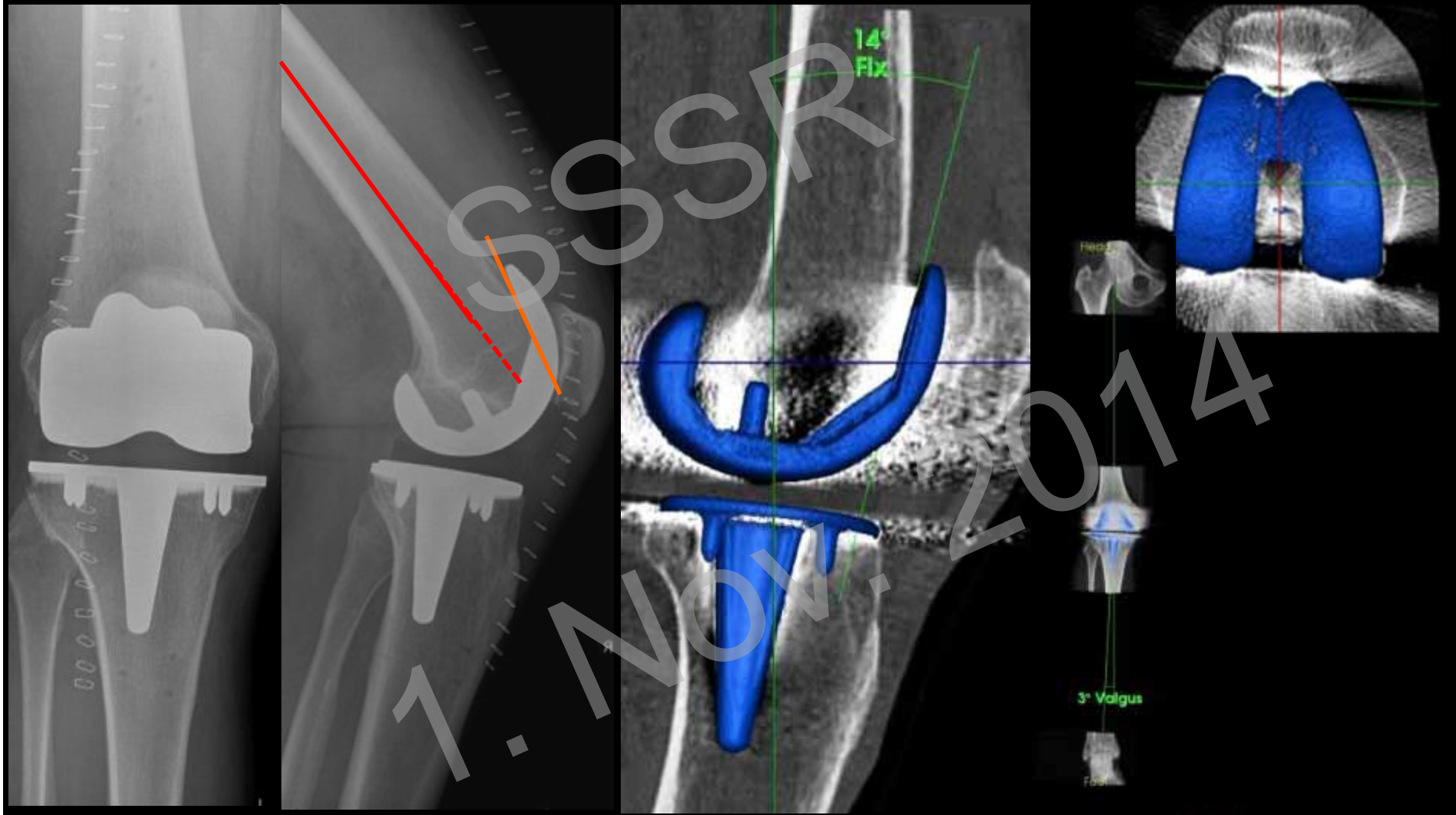
Malposition



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Malposition

Patellofemoral overloading in unresurfaced patella due to internally rotated and flexed femoral TKA component

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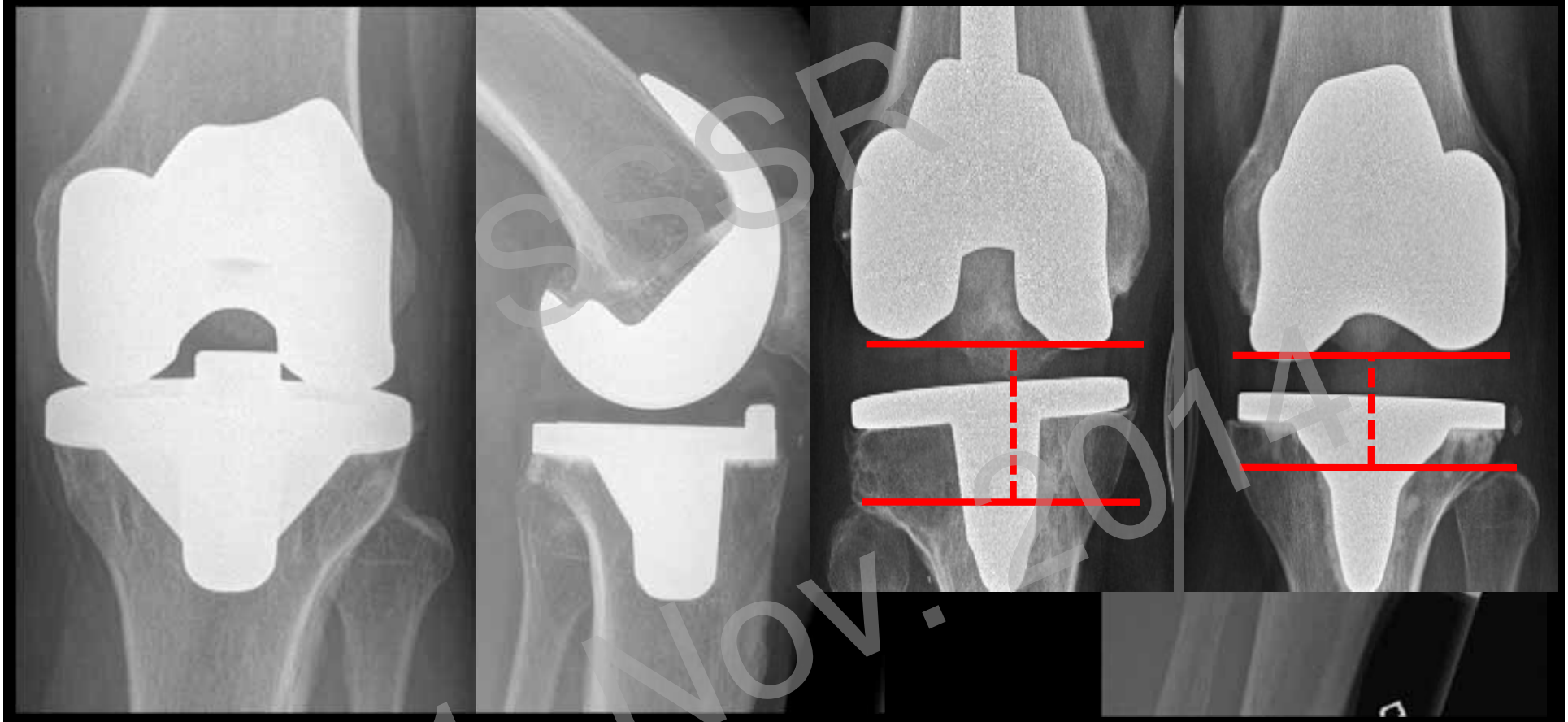
Malposition



- Elevated ioint line
- Pseudopatella baja

Normal joint line

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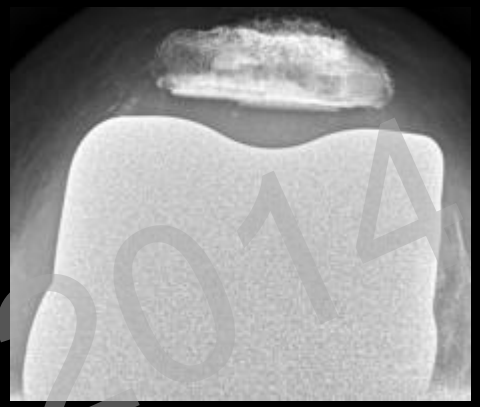
Patellofemoral Complications

- Position of patella (thumb-rule patella hight same way as to the tibia plateau)
- Ap thickness patella+PE = native patella > = PF Overstuffing



Normal: no tilting

PF Instability:

- IR of component
- Overstuffing (stress lat retinaculum)

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Patellofemoral Complications

Patella baja

Patella alta after revision

Patella tendon rupture

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Rupture of patella tendon > quadriceps tendon

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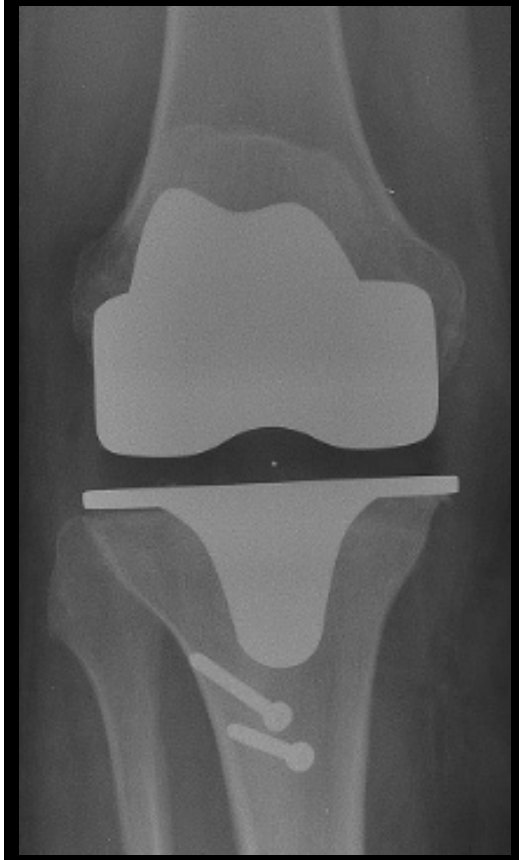
Aseptic Loosening



Normal:

Lucency < 2 mm ± sclerotic line

- 1-6 months cemented
- 1-2 years uncemented
- no progression

Loosening:

- > 2 mm lucency
- Progressively widening
- Tilting of component (tibial into varus, femoral into flexion)
- tibial > femoral

Lucency ≠ Loosening!

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Aseptic Loosening/PE-Wear

Mechanical stress, particle debris with osteolysis

Fx of Inlay and subsidence of tibial component

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Manaster BJ AJR 1995

Aseptic Loosening/PE-Wear

Metal line sign

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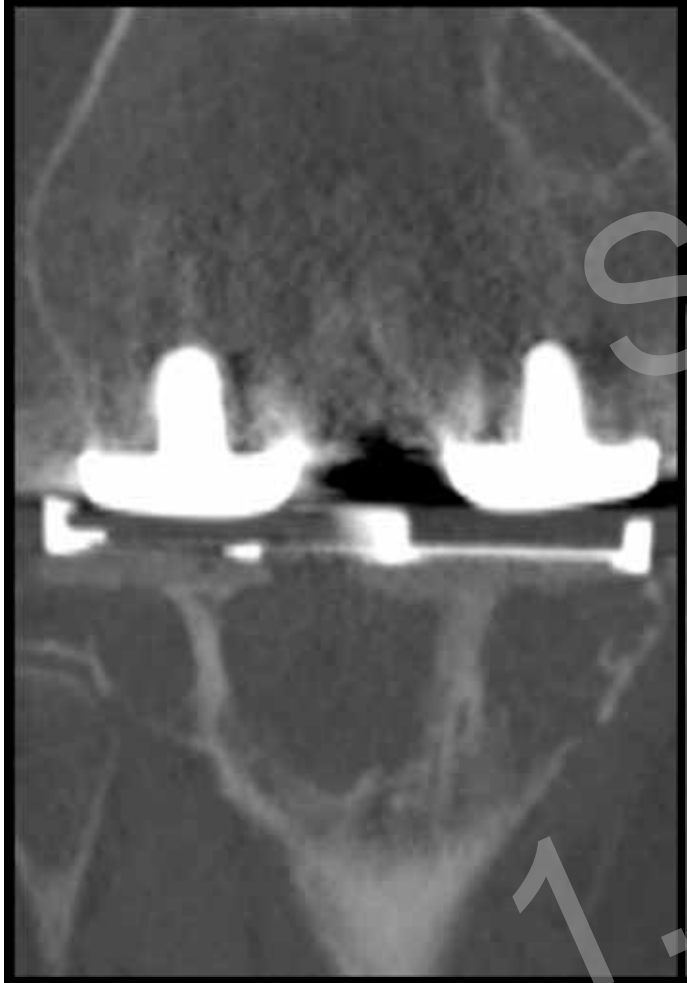
Mulcahy H, Chew FS AJR 2014 Helito CP, Pécora JR Skelet Radiol 2014

Aseptic Loosening/PE-Wear



- Prosthetic fracture
- PE Wear
- Metallosis

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Uncommon Causes of TKA Failure I

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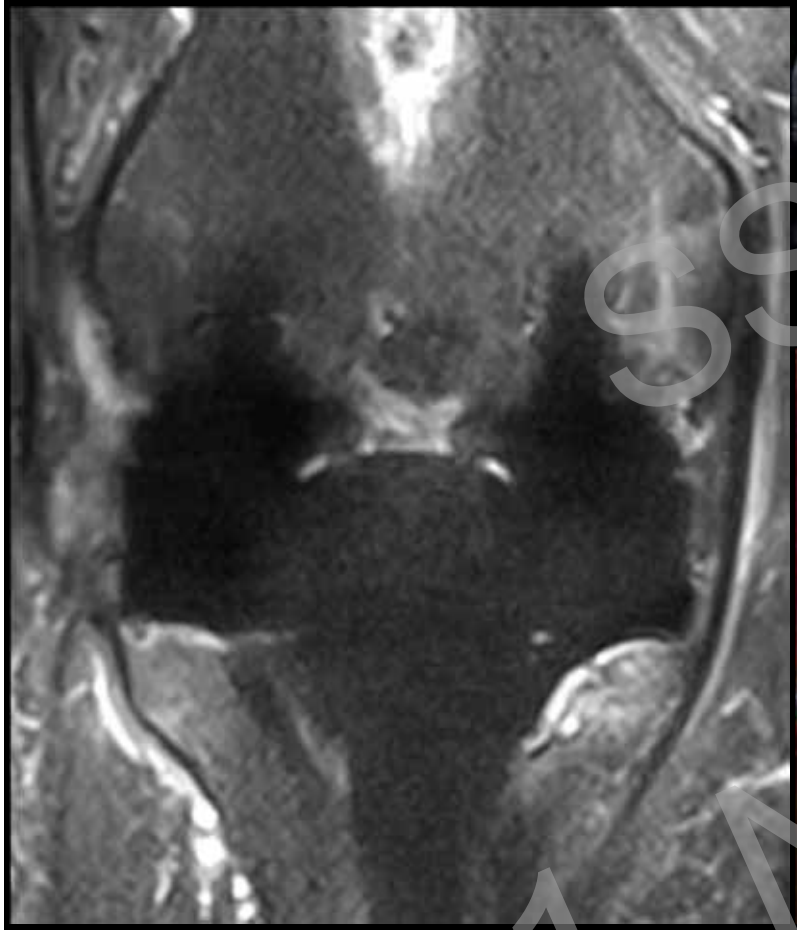
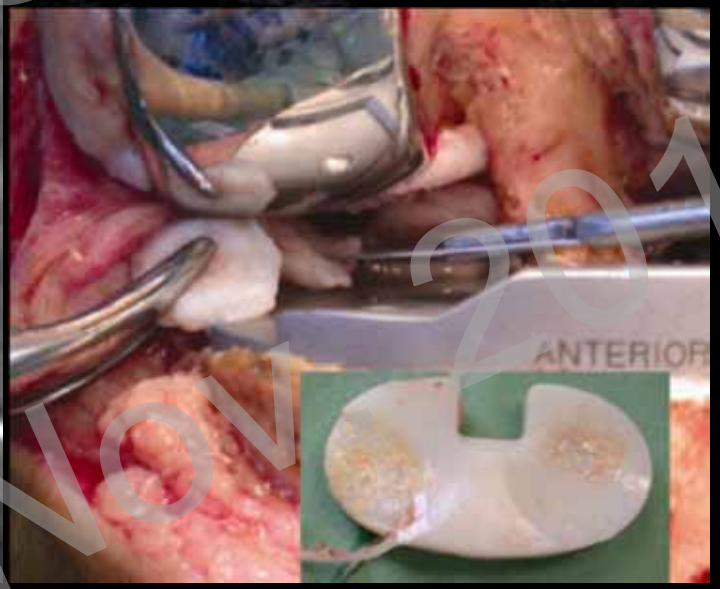
Tibial loosening and subsidence
Eminentia impingement

Revision, still pain / restriced motion

Uncommon Causes of TKA Failure I





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Remnant meniscus/Pseudomeniscus

Saouti R J Med Case Rep 2007

Uncommon Causes of TKA Failure II

- TKA 1 year ago
- arthroscopic arthrolysis
- persistent pain
- restricted flexion 90°

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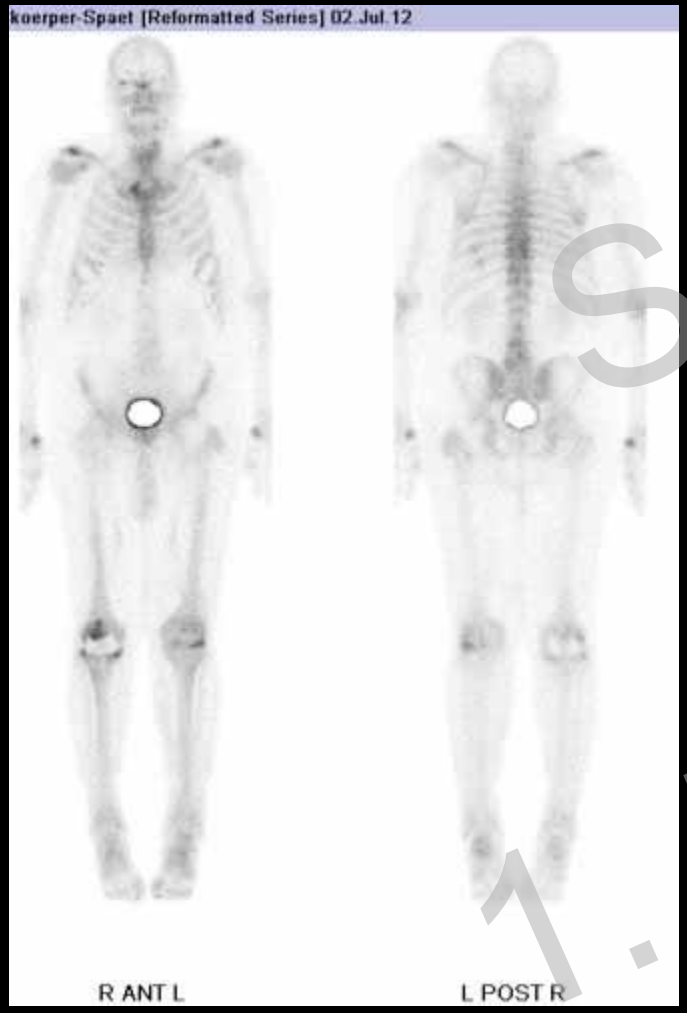
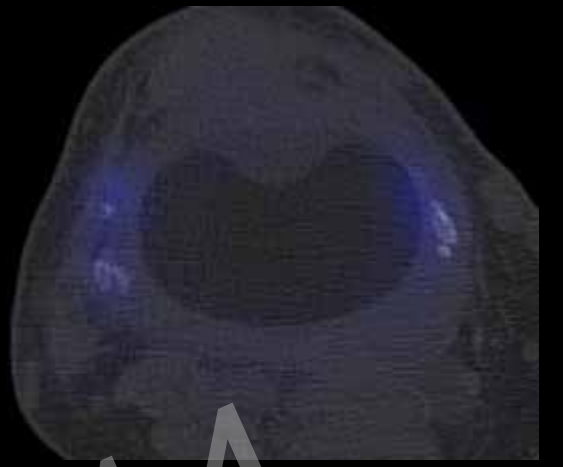
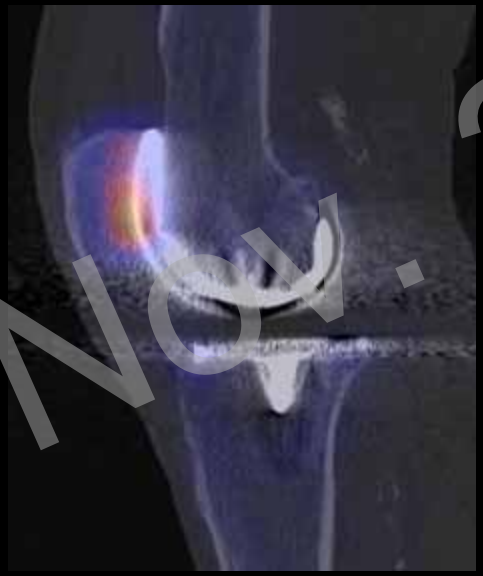
Uncommon Causes of TKA Failure II







Patella hyperpression

Anything else?

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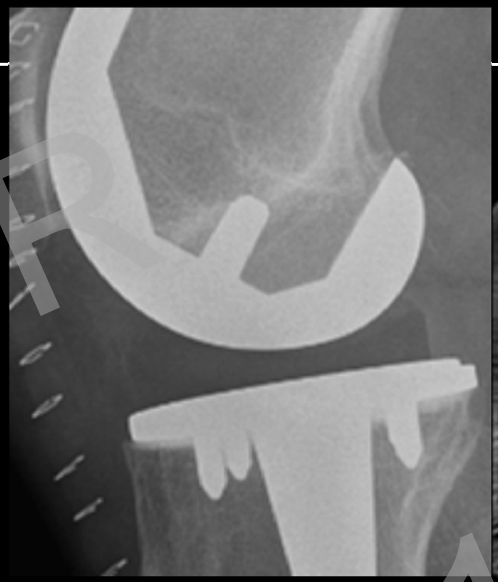
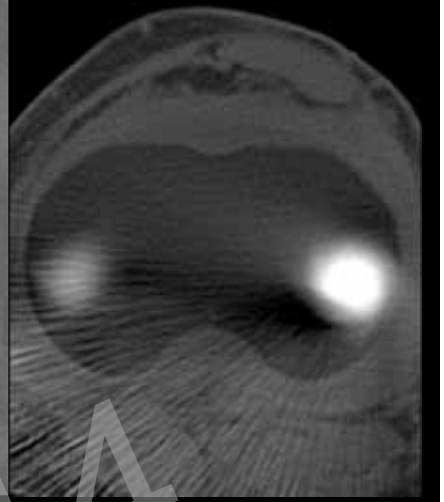
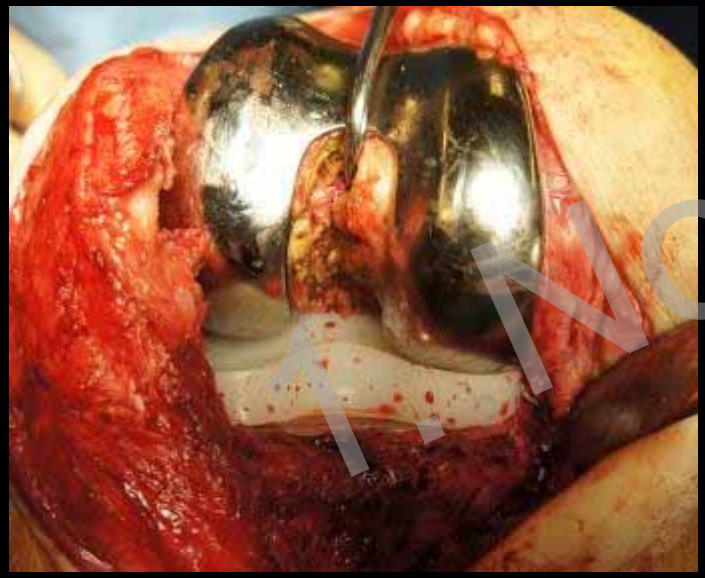
Uncommon Causes of TKA Failure II





normal



Secondary patellar resurfacing

180° spin out of inlay

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Talk to your orthopedic surgeon!

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Thank you for your attention!