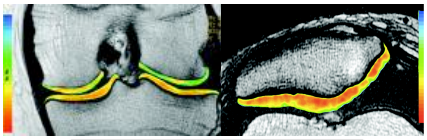
Imaging of the Knee: Current Concept



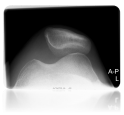
3rd Advanced Course on Knee Surgery
January 17th – 22nd 2010, Val d'Isère

G. van Hellemondt
Knee Reconstruction Unit
St Maartenskliniek
Nijmegen, The Netherlands

….considering the fact that imaging of the knee is, for the most, focused to one quadrant of the joint based on clinical findings.

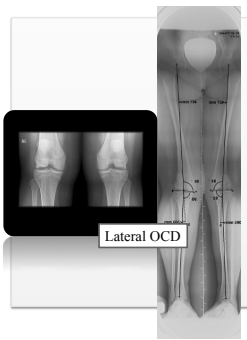
Routine Radiographic examination

- Standard AP/lat view
- Axial patella view
- Flexed (45°) WB PA view
- Tunnel view

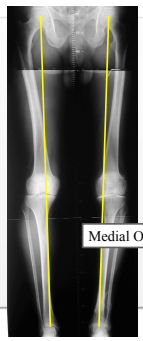


WB or non WB X-ray

Long standing X-rays



Lateral OCD



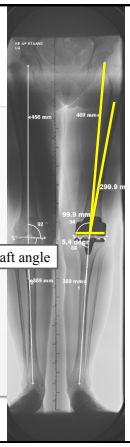
Medial OA

Long standing X-rays

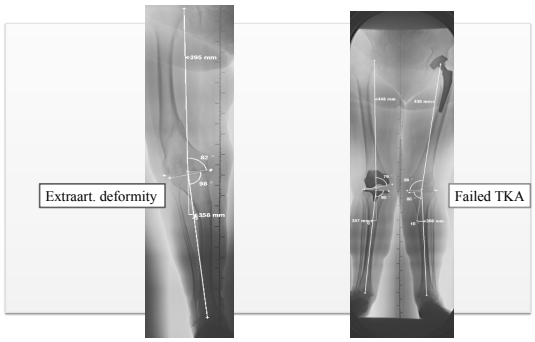
- Preop TKA

Intra / extramedullairy device?

Hip-Knee shaft angle

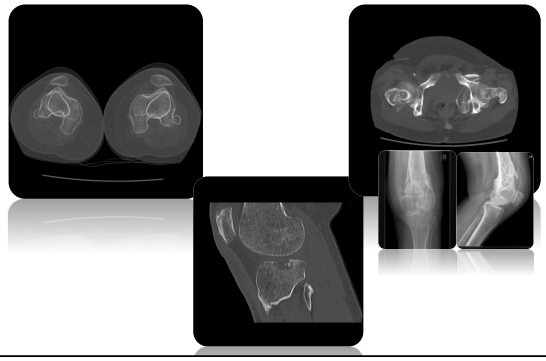


Long standing X-rays

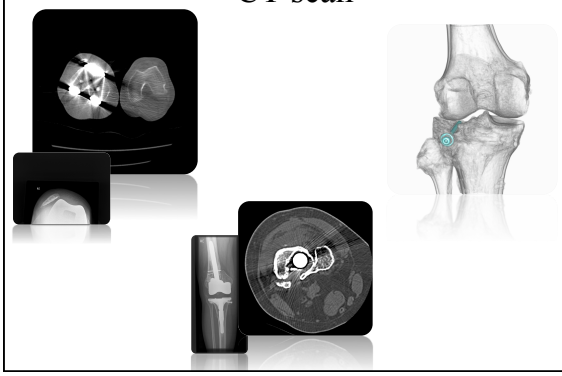


Stress X-rays / Fluoroscopy

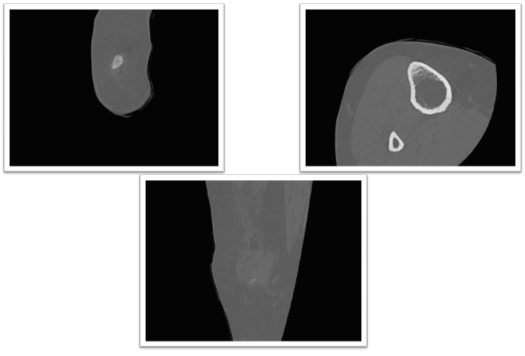
CT-scan



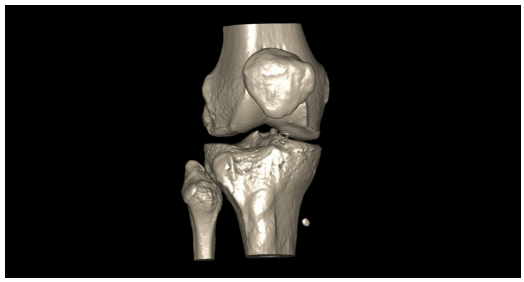
CT-scan



CT -scan

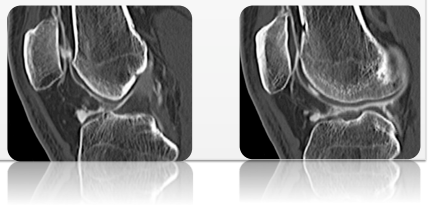


3-D reconstruction CT

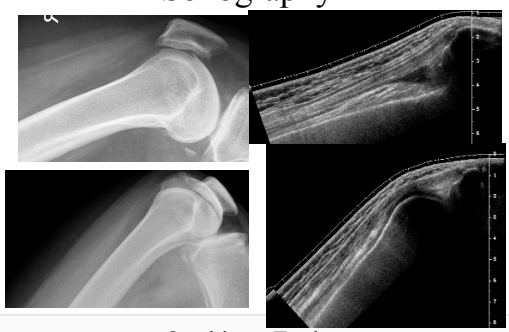


Artro CT scan

- Visualisation of cartilage is possible with CT
- Information on deliniation, less of quality of cartilage

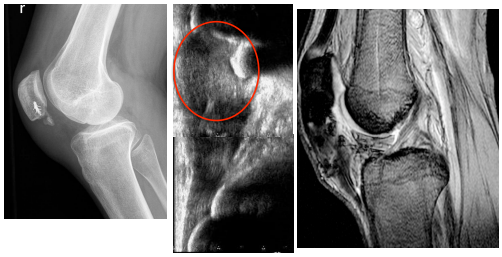


Sonography

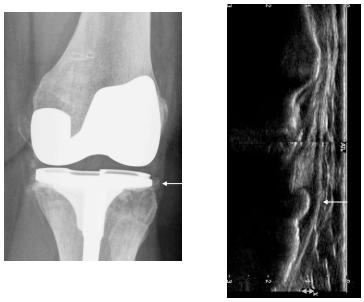


Quadriceps Tendon
Extension/Flexion

Post-Traumatic Tear

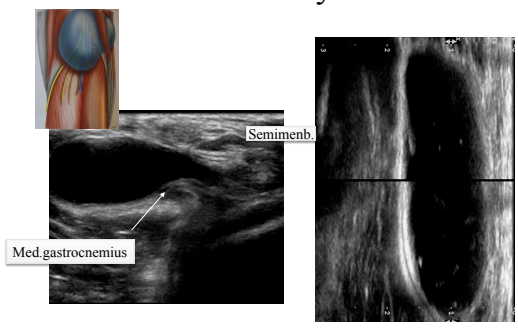


Iliotibial Band

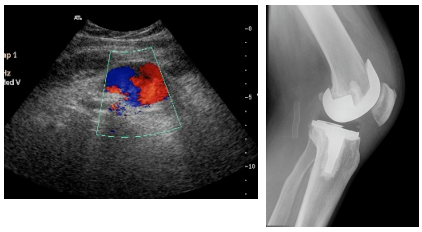


Avulsion # Tuberositas Tibiae

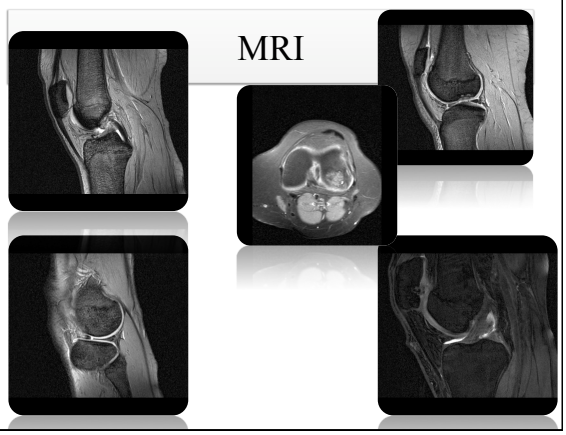
Baker's Cyst



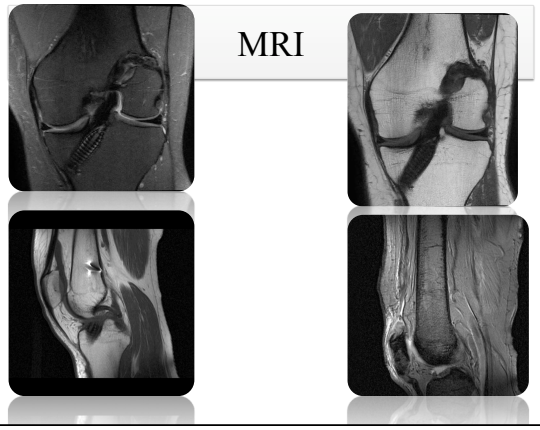
(Pseudo)aneurysma A.Poplitea



MRI



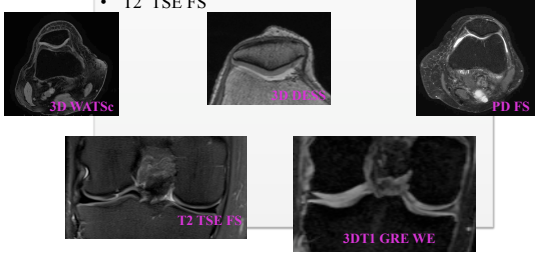
MRI

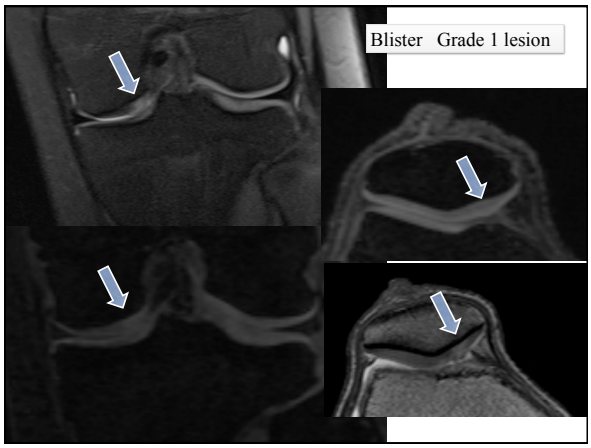


MRI

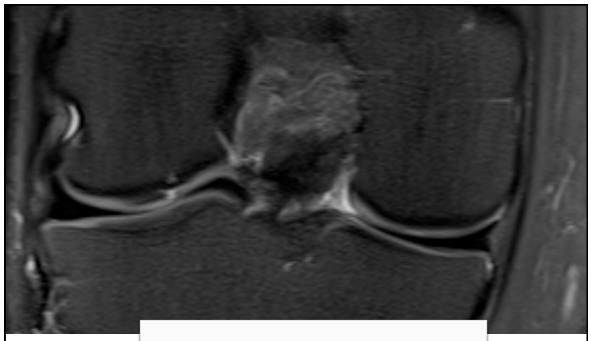
Sequences

- 3D DESS Dual Echo Steady State
- 3D T1 GRE WE Gadient Echo Water exitation
- Philips: 3D WATSc or WATSf
- PD FS
- T2 TSE FS





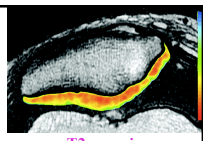
Grade 3 fissure



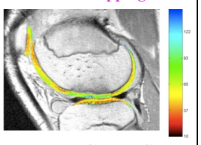
Grade 4 fissure with bone oedema

Future

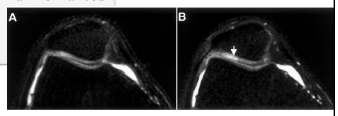
- 3D isotropic voxels high resolution 1 acquisition : vieuwing in all planes possilble.
- 3 Tesla: more detail.
- T2 mapping T2 values in cartilage. Tissue caracteristics.
- dGEMRIC: delayed Gadolinium enhanced MRI of cartilage
- T1 Rho (spin lock)



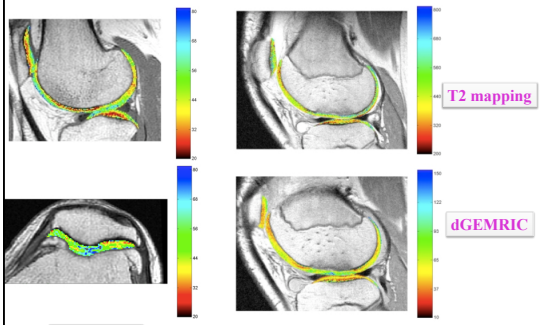
T2 mapping



dGEMRIC



T2 FS TSE T1 rho



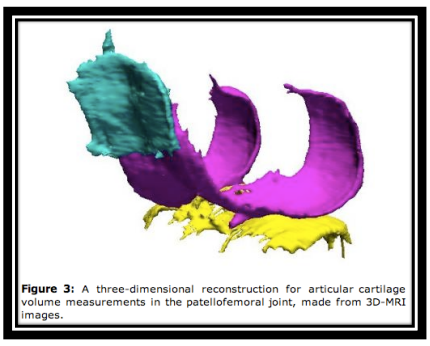
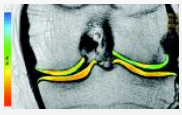


Figure 3: A three-dimensional reconstruction for articular cartilage volume measurements in the patellofemoral joint, made from 3D-MRI images.

MRI

- Functional cartilage MRI T2 mapping: evaluating the effect of age and training on knee cartilage response to running (*Mosher et al, osteoarthritis cartilage 2009)*



MRI in TKA

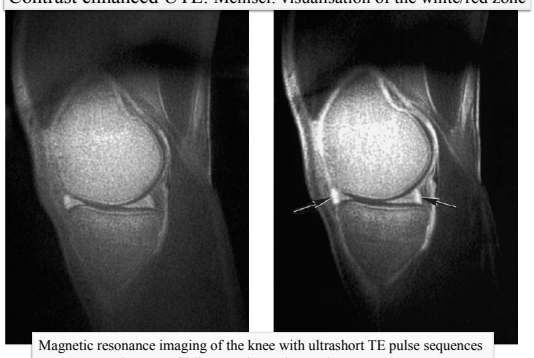
- MRI in vivo PF kinematics after TKA *(Carpenter et al , Knee 2009)*
- MRI with metal suppression for evaluation of periprosthetic osteolysis after TKA *(Vessely et al J arthroplasty 2006 / Mosher et al J Arthroplasty 2006)*
- Several reports discribing soft tissue pathology after TKA diagnosed with MRI

- MRI with same image quality as CT

Tibial plateau fracture

Magnetic resonance imaging of cortical bone with ultrashort TE pulse sequences *Magnetic Resonance Imaging, Volume 23, Issue 5, Pages 611-618I.Reichert, M.Robson, P.Gatehouse, T.He, K.Chappell, J.Holmes, S.Girgis, G.Bydder*

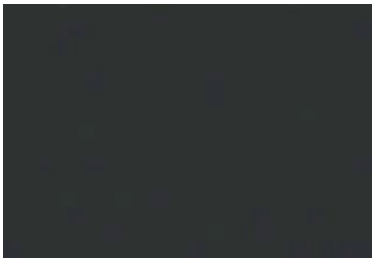
Contrast enhanced UTE: Menisci: visualisation of the white/red zone



Magnetic resonance imaging of the knee with ultrashort TE pulse sequences Peter D. Gatehousea, Rhidian W. Thomasb, Matthew D. Robsonc, Gavin Hamiltond, Amy H. Herlihyd, Graeme M. Byddere,*BJR 2004

- Very high sensitivity and specificity of abnormalities of menisci and cartilage using findings at surgery as reference standard

Synthetic-echo time postprocessing technique for generating images with vaiable T2 – weighted contrast: Diagnose of meniscal and cartilage abnormailitie of the knee
Andreisek et al Radiology 2010



- Special thanks to Dr M Obradov / Dr JJ Veryser
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Nijmegen The Netherlands