Management of Knee OA

What are we trying to achieve?

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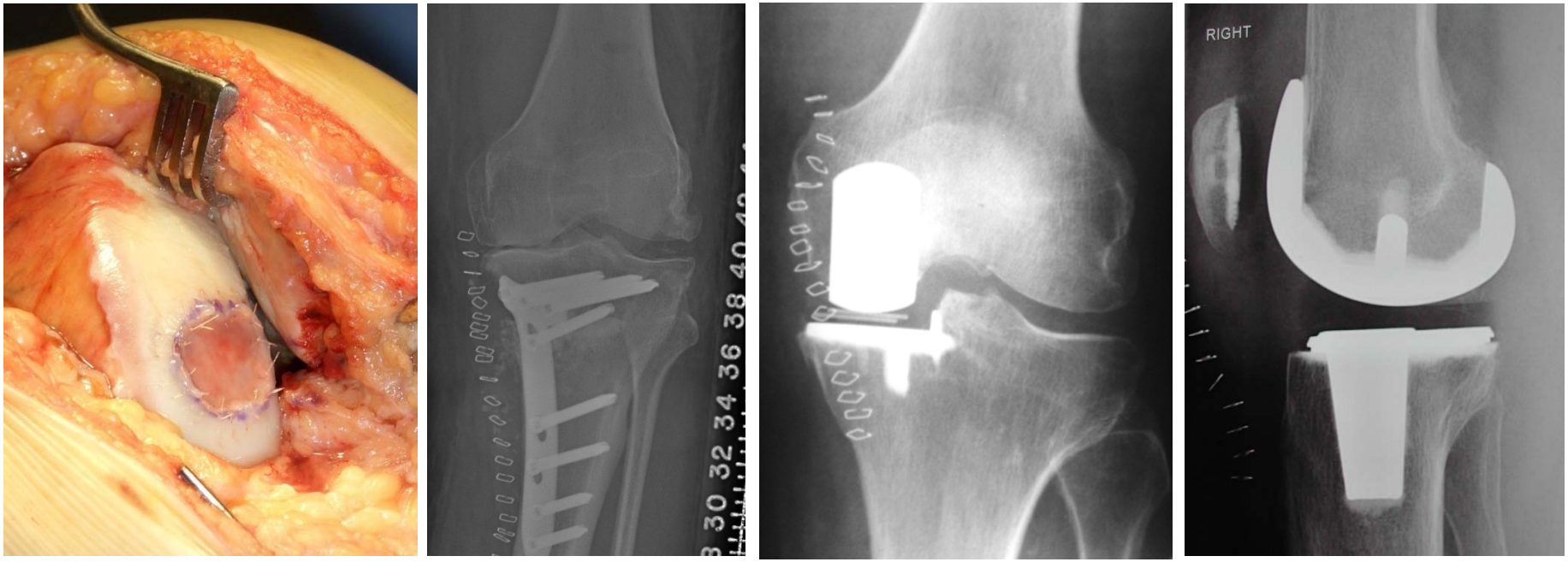
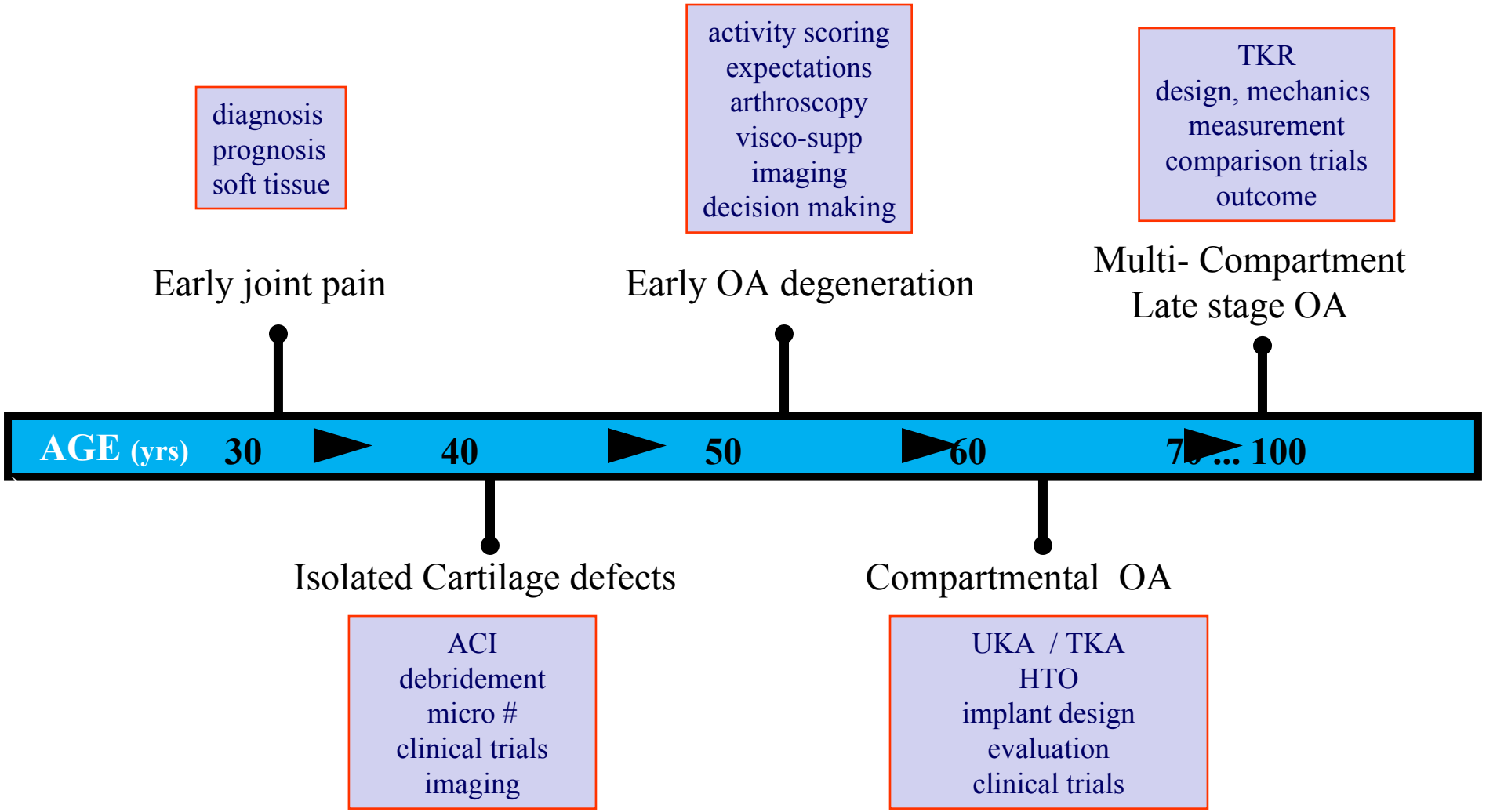
KNEE PROCEDURES IN OA
What are we trying to achieve?



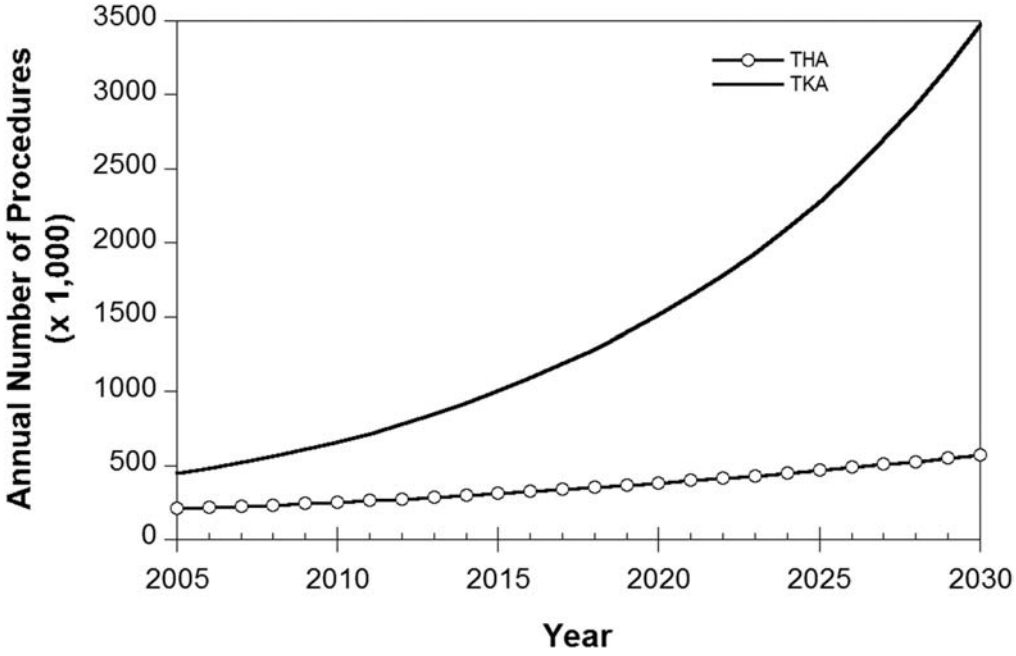
Sustained reduction in pain and improved function
Across the entire treatment history of the patient

NOC BRU Knee OA Clinical Research Programme

THE NATURAL HISTORY OF KNEE OA



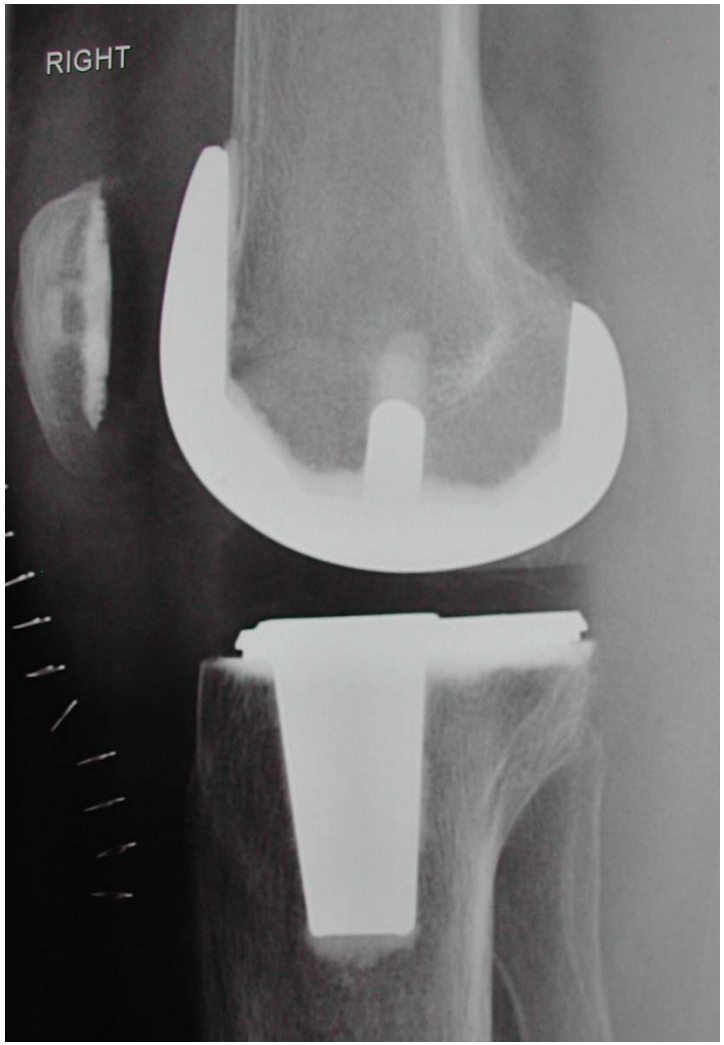
Knee Osteoarthritis



- Common
- Affects 34% of patients over 45
- Increasing demand for knee replacement
- 3.48 million by 2030

Kurtz et al JBJS am. 2007

TKA



Results

- Excellent long-term survival
- Functional results can be very good
- Established treatment

- ... But

Poor Outcome in TKA
(15-30%)

- Patient expectations affect satisfaction after TKA

  Noble: 2006 CORR

- Pain in the assessment of TKR

  Murray: 2000 JBJS Br

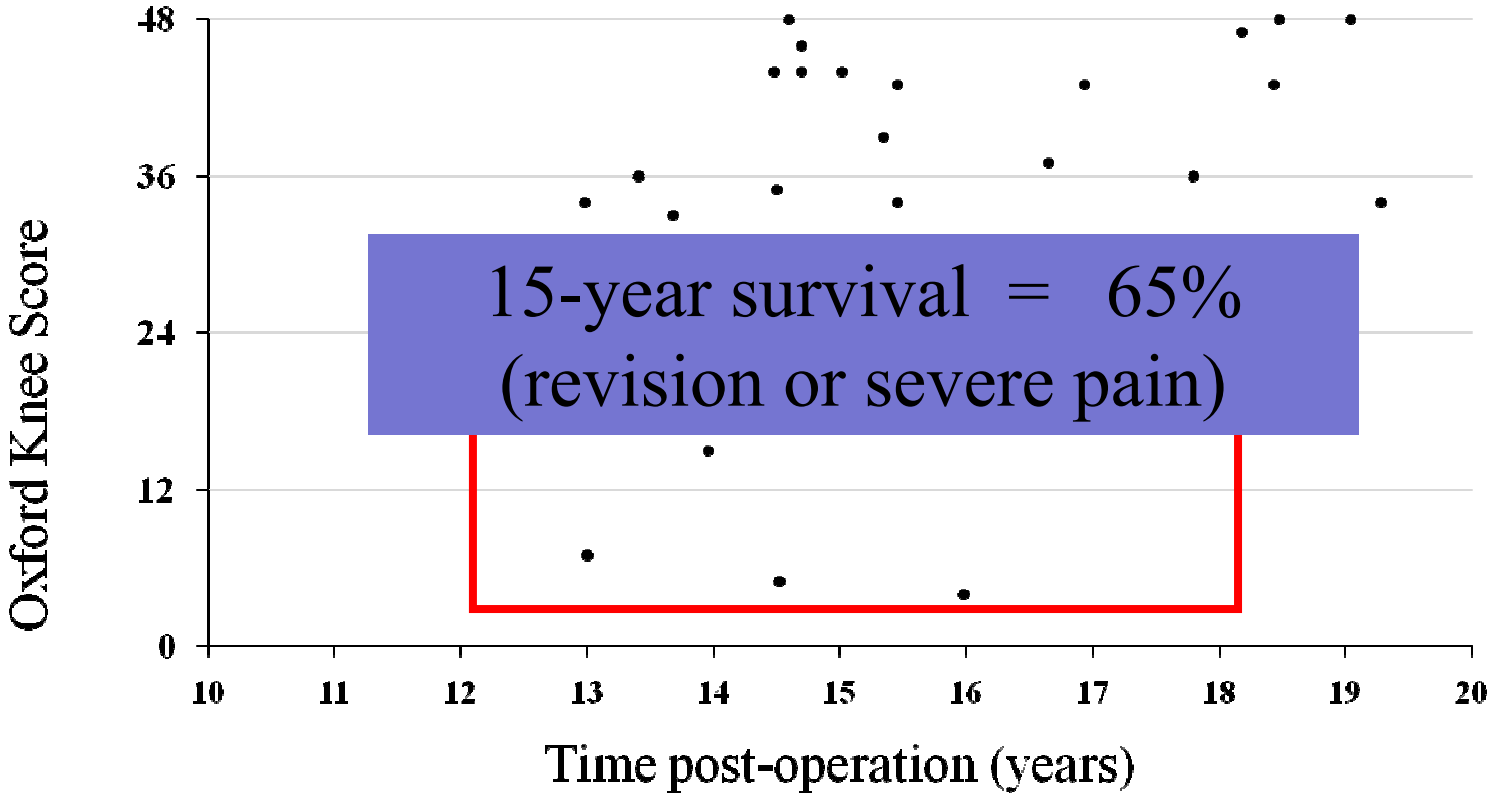
- Comparison of hip and knee arthroplasty outcomes at early & intermediate follow-up

  Beverland: 2009 Orthopaedics

Highlighted in young patients

OKS in TKA < 6 0 performed at NOC

Price et al. Knee 2 010



How to improve results of TKA ?

Prevent Failure

- Improved materials (poly)
- Improved prosthesis design (PFJ)
- Better fixation
- Refined indications
- Improved instruments
- Navigation

….will this improve functional outcome?

Alternative approach…

Procedures preserving normal structures

Osteotomy

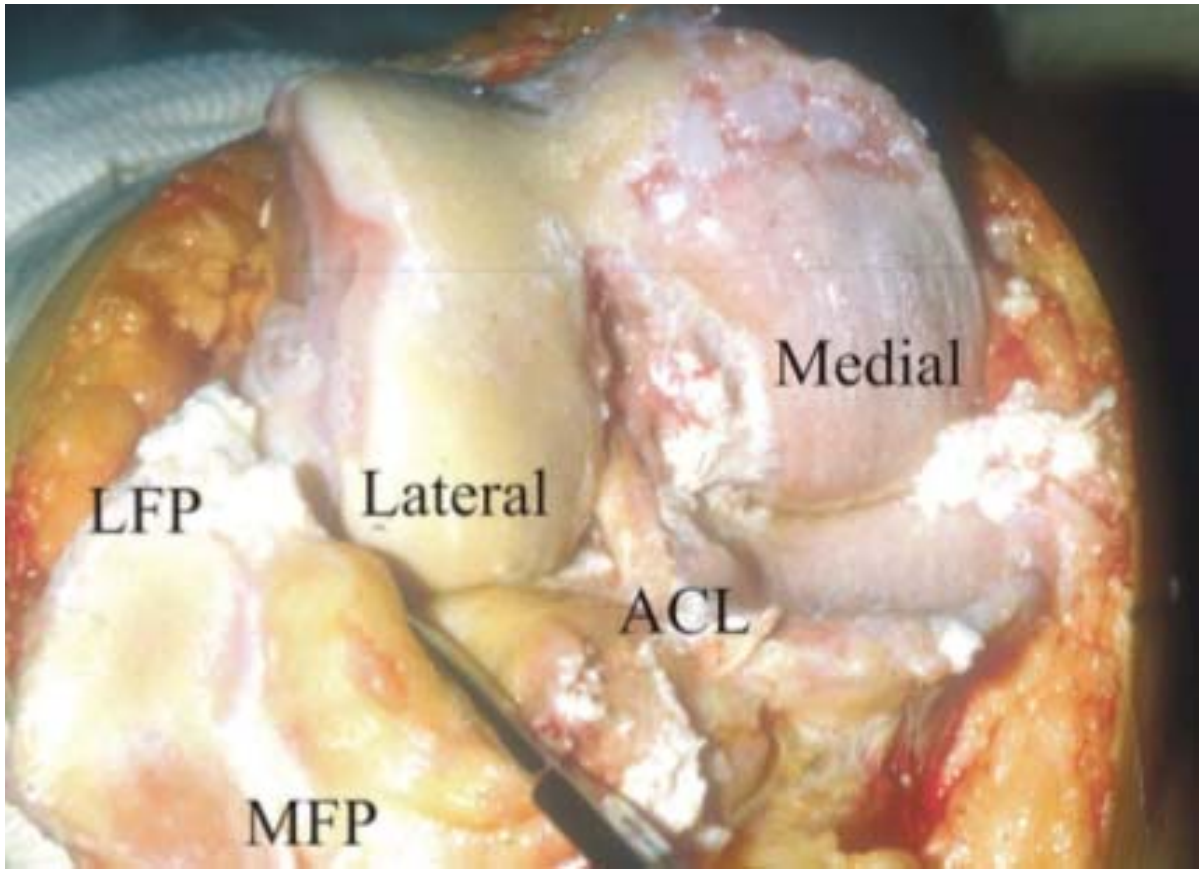
Partial knee replacement

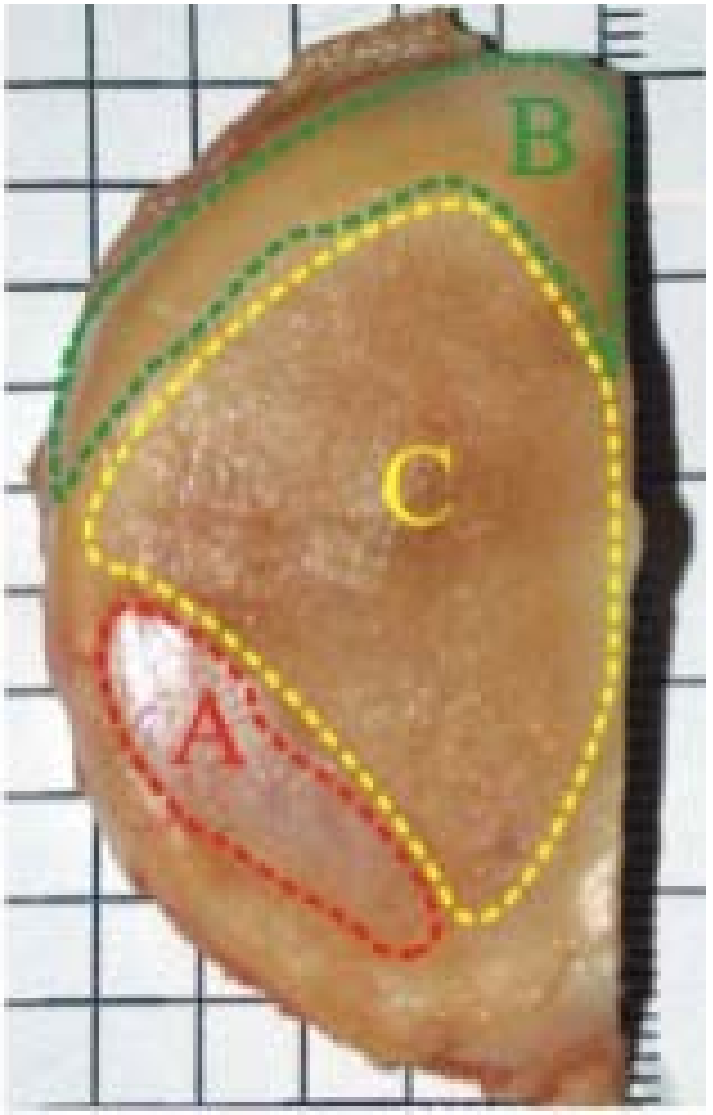
Recognising Different Phenotypes of OA

Antero-medial OA
Intact ACL
Correctable deformity

White et al. 1991

Anteromedial Gonarthrosis

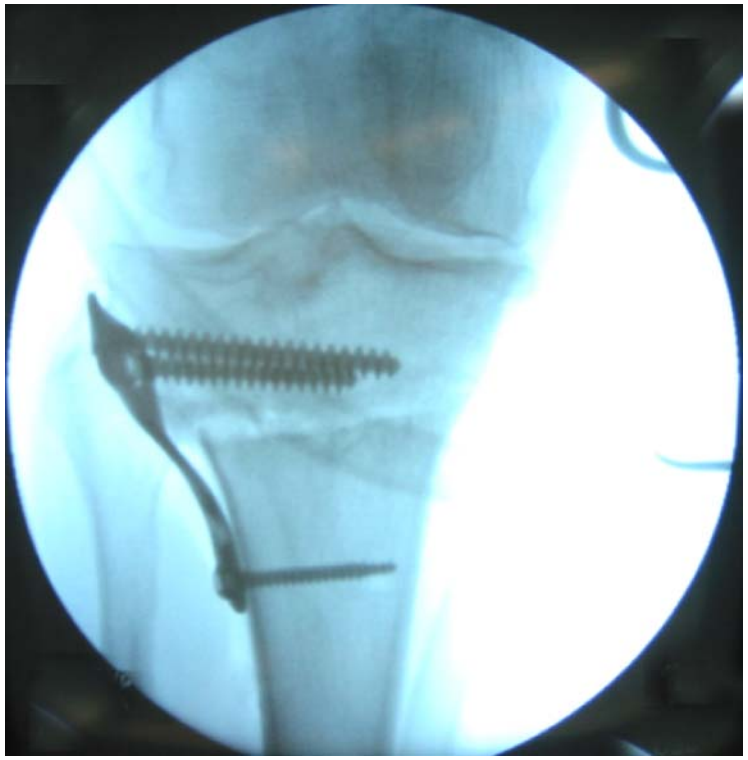



B
C
A

TKA

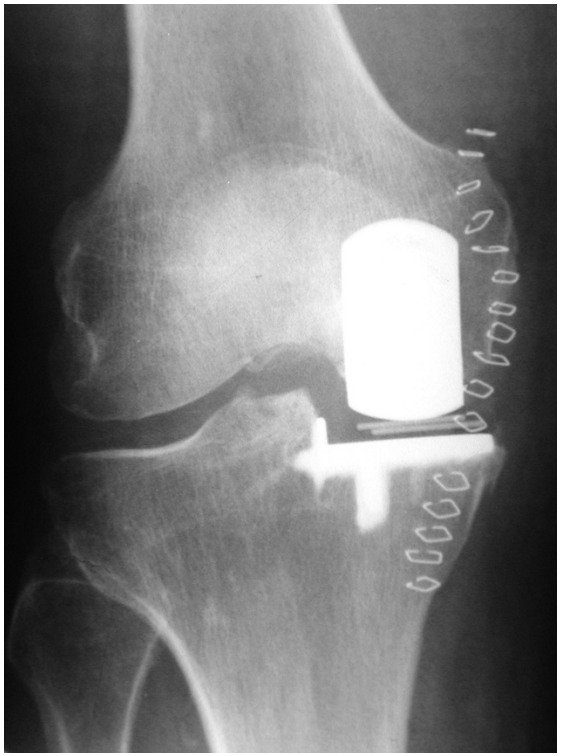
Alternative treatments

HTO

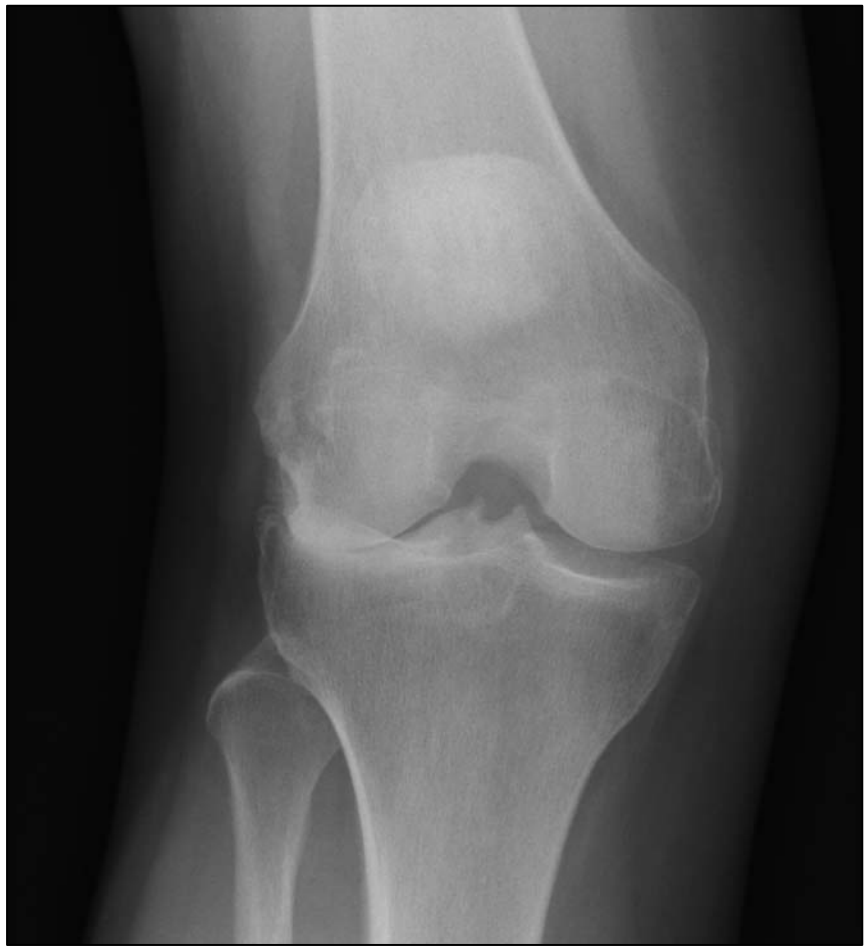


Alternative treatments

UKA



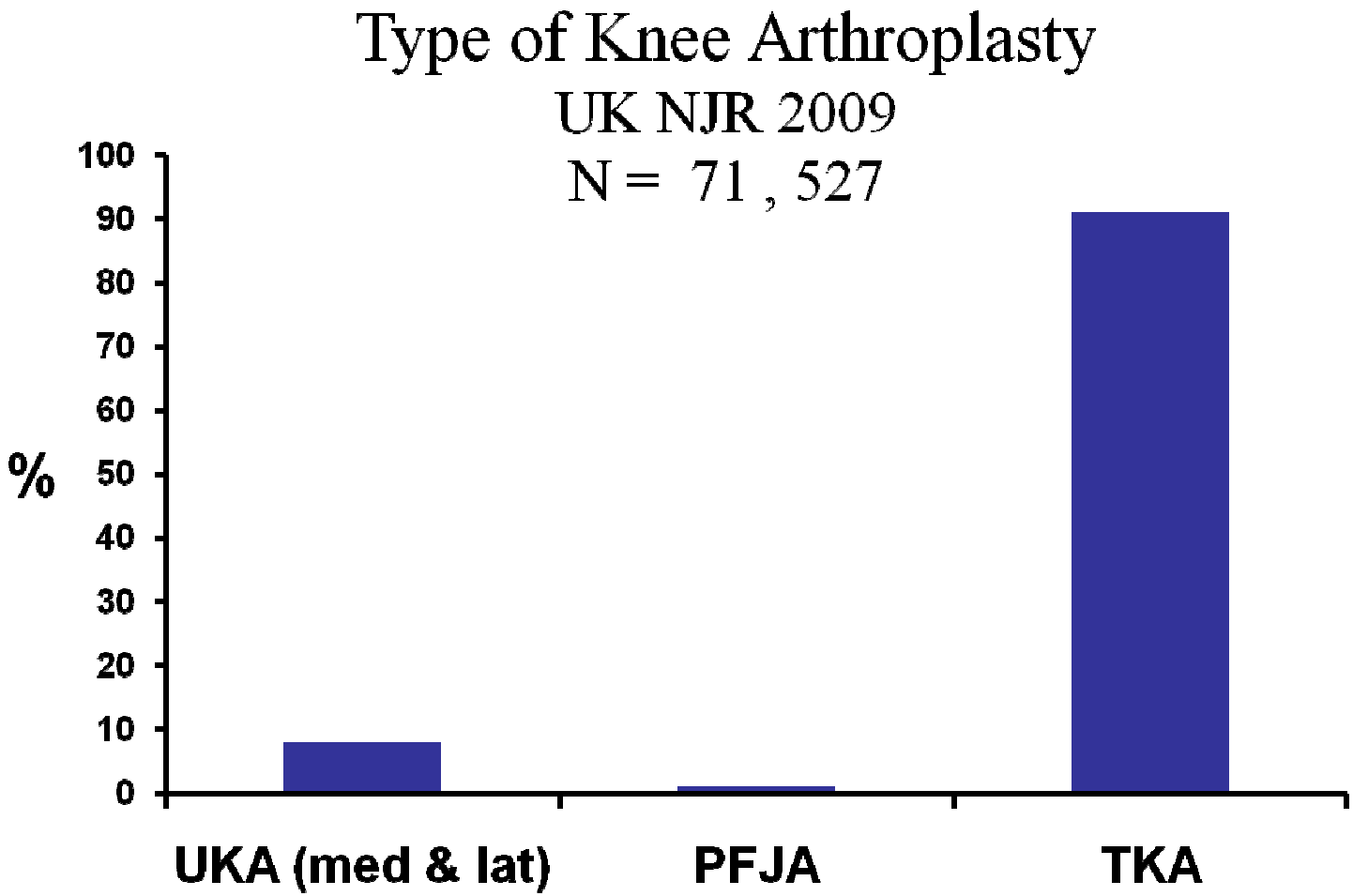
Lateral OA



P FJ OA

Partial arthroplasty

Knee Arthroplasty in the UK



What pattern of OA presents in clinic at the NOC?

- Continuous cohort study
- Primary referrals from local GPs only
- Tertiary and second opinions excluded
- 700 new patients with OA
- Radiographic assessment

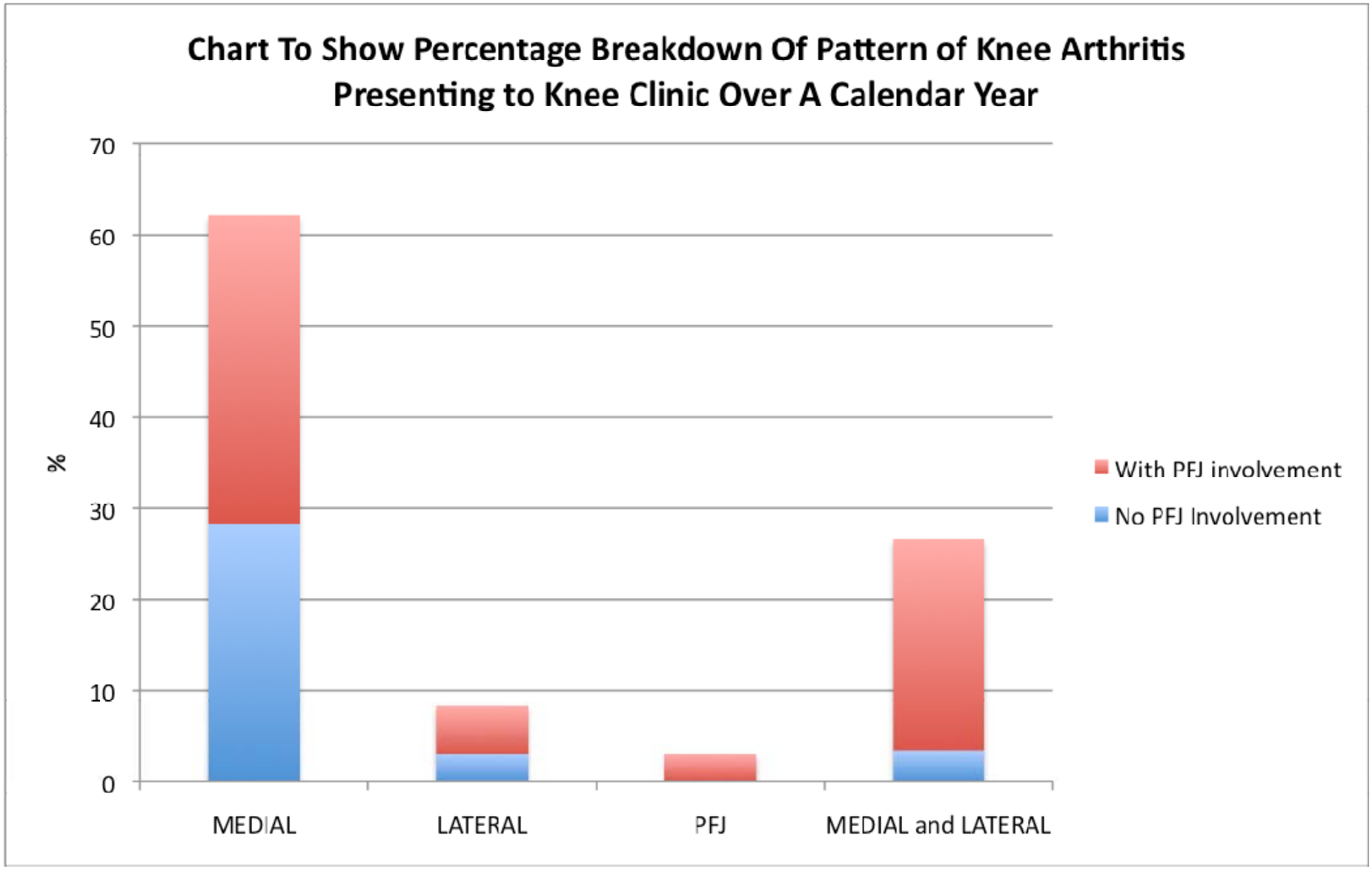
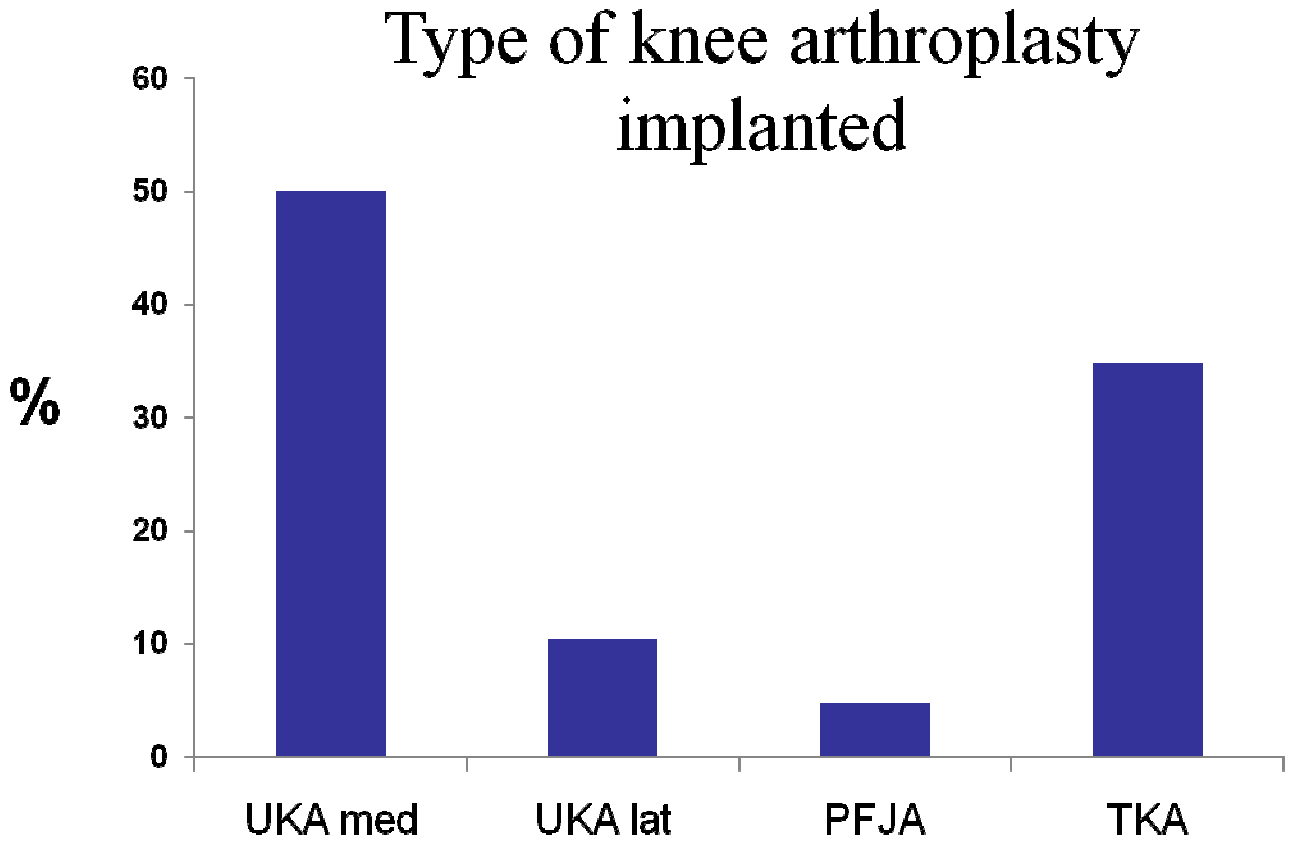


Chart To Show Percentage Breakdown Of Pattern of Knee Arthritis Presenting to Knee Clinic Over A Calendar Year
70
60
50
40
30
20
10
0
%
MEDIAL
LATERAL
PFJ
MEDIAL and LATERAL
With PFJ involvement
No PFJ Involvement

Reflected in practice at NOC



Driven by different factors

- Clinical advantage
  - Functional outcome & kinematics
  - Less morbidity & rapid recovery (MIS)
- Survival improvement
  - D etailed indications
  - Series with good long-term outcome
- Cost effectiveness
  - Less expensive

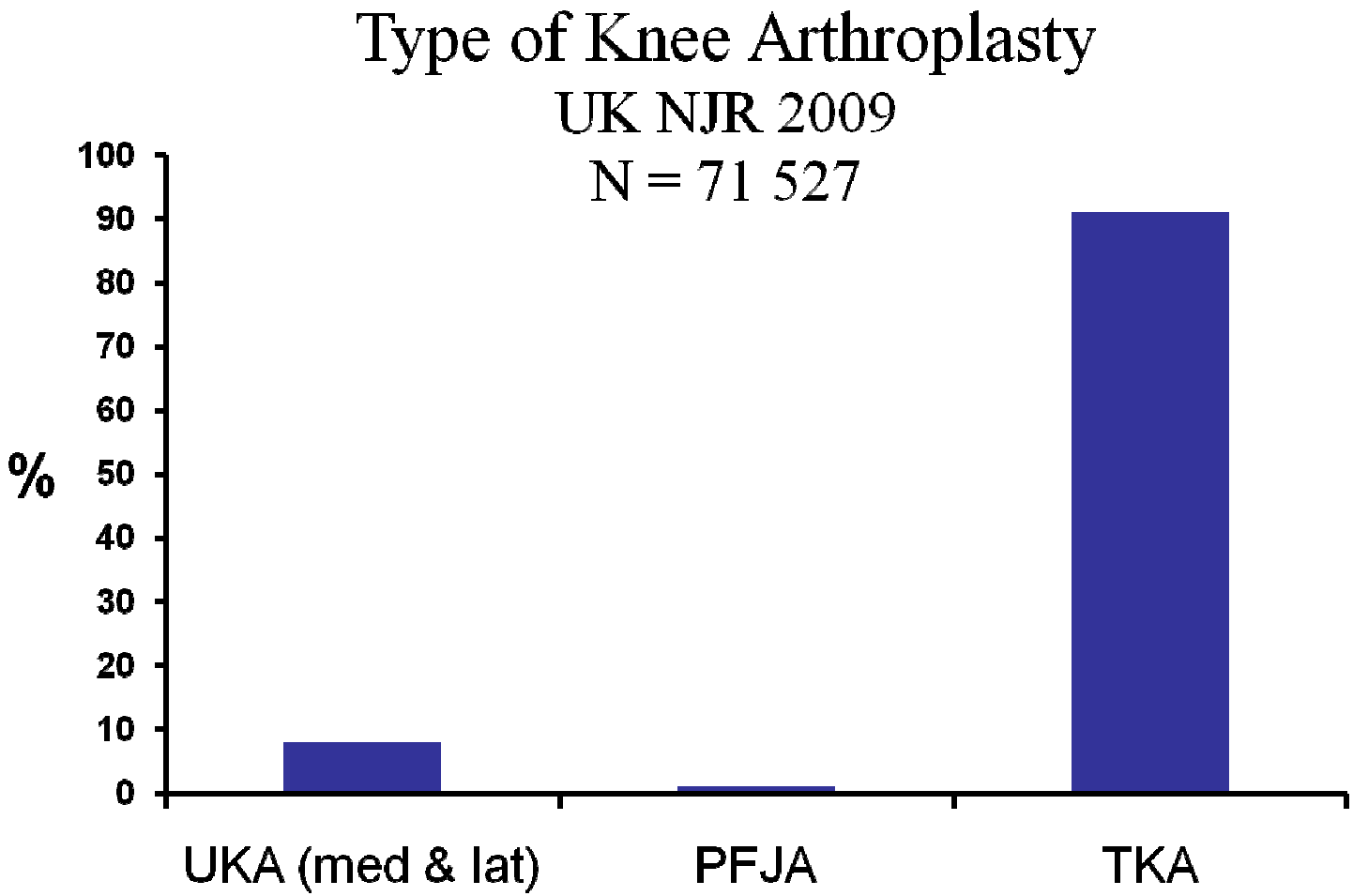
Willis Owen, Cobb et al. 2009 The Knee

Indications for medial UKA

Bone on bone antero-medial OA

- Full thickness articular cartilage loss
- ACL intact
- Correctable varus deformity
- Anterior medial OA

Knee Arthroplasty in the UK



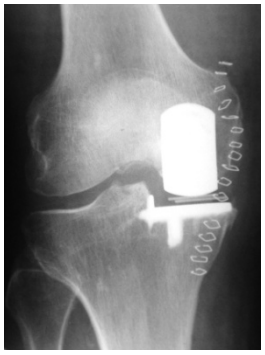
Evidence for partial replacement

- Not conclusive
  - Survival series
  - One RCT (Bristol)
- Better data to guide/change practice

Total or Partial Knee Arthroplasty Trial

TOPKAT

NIHR HTA RCT (£2.5m)



UKA or TKA

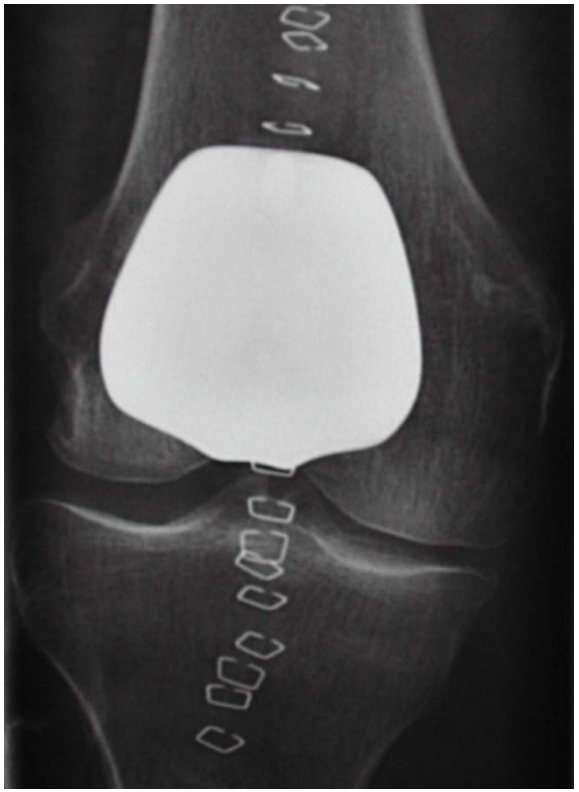
1-year functional outcome (OKS)

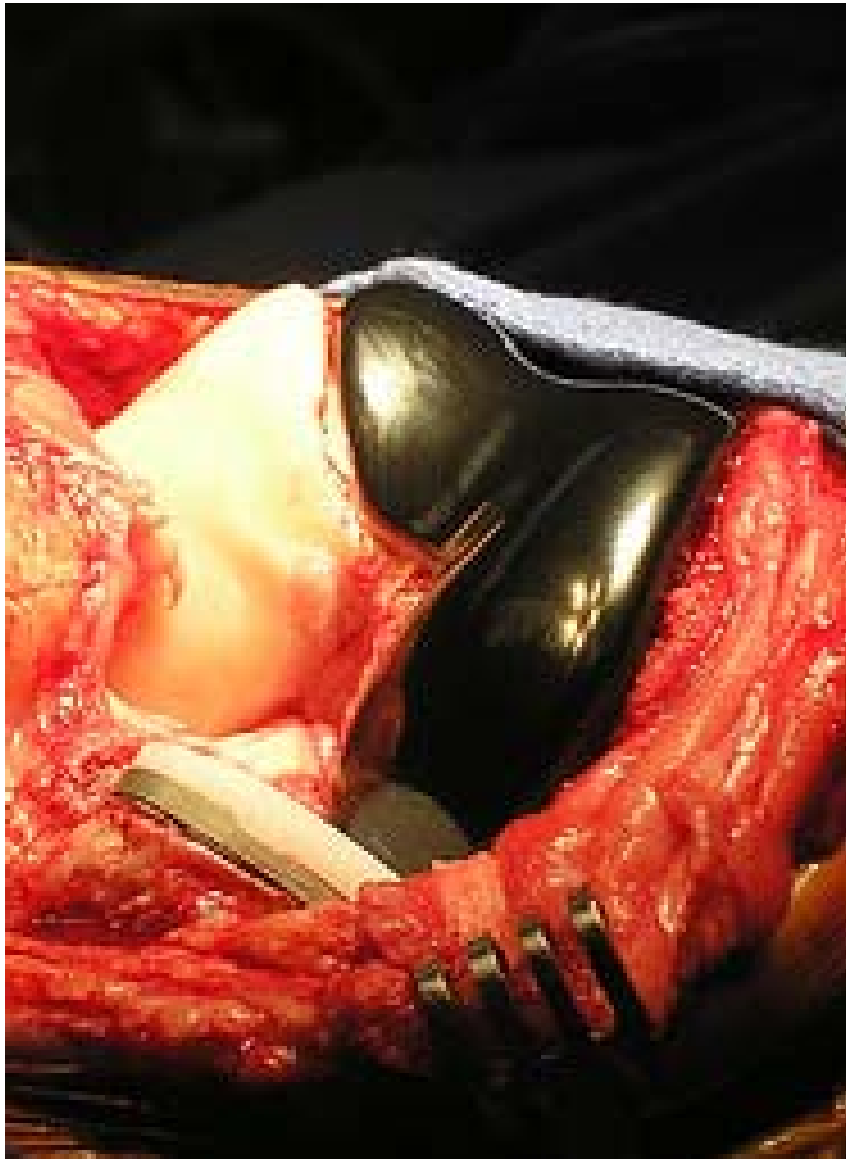
10-year survival

Health economics

Similar evidence for other procedures required







Extending Indications for Partial Knee Replacement

Medial UKA + ACL

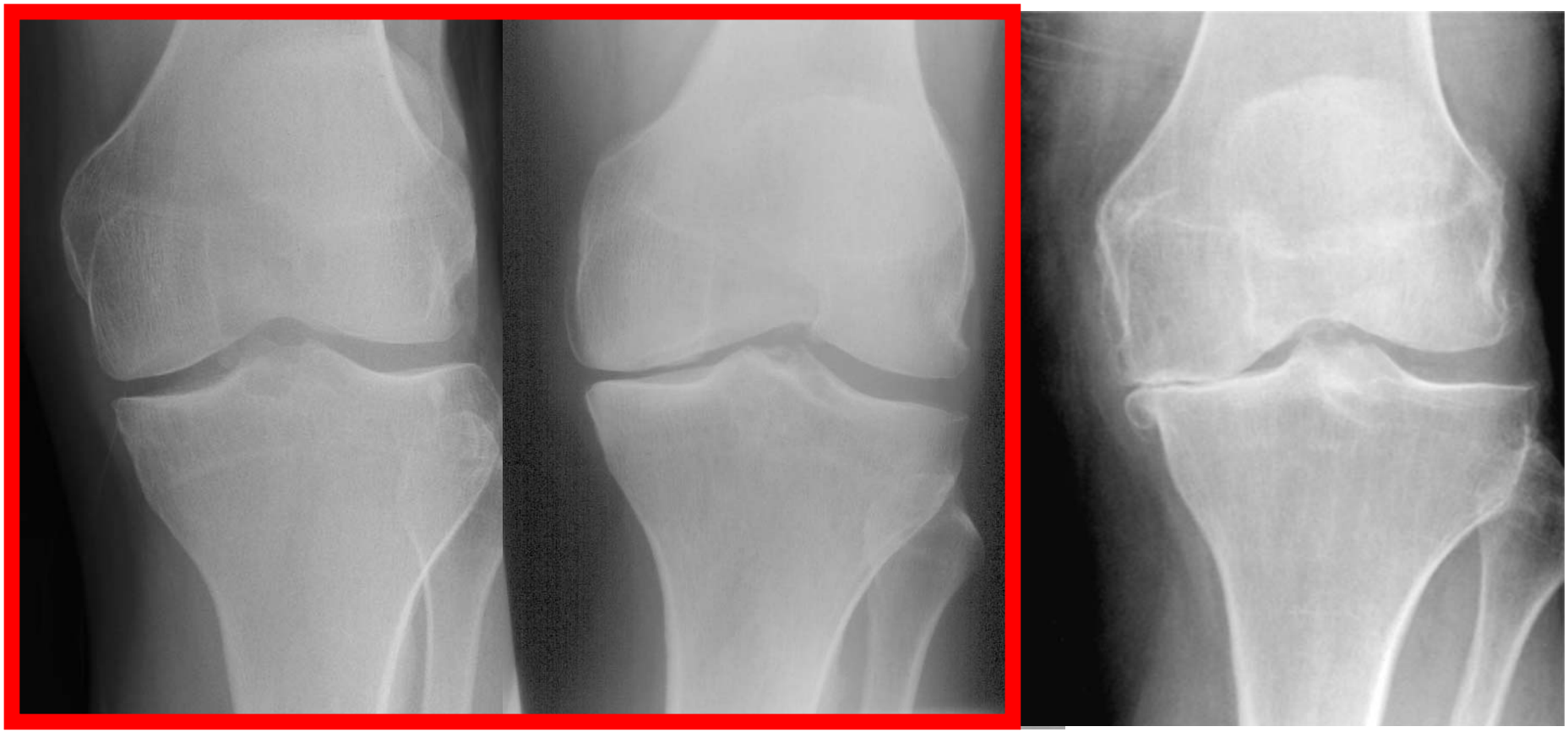
Early results in Oxford encouraging

Mean OKS 43 at 2 years (n = 30)

Treatment of earlier disease

We need to understand the pattern of early disease.

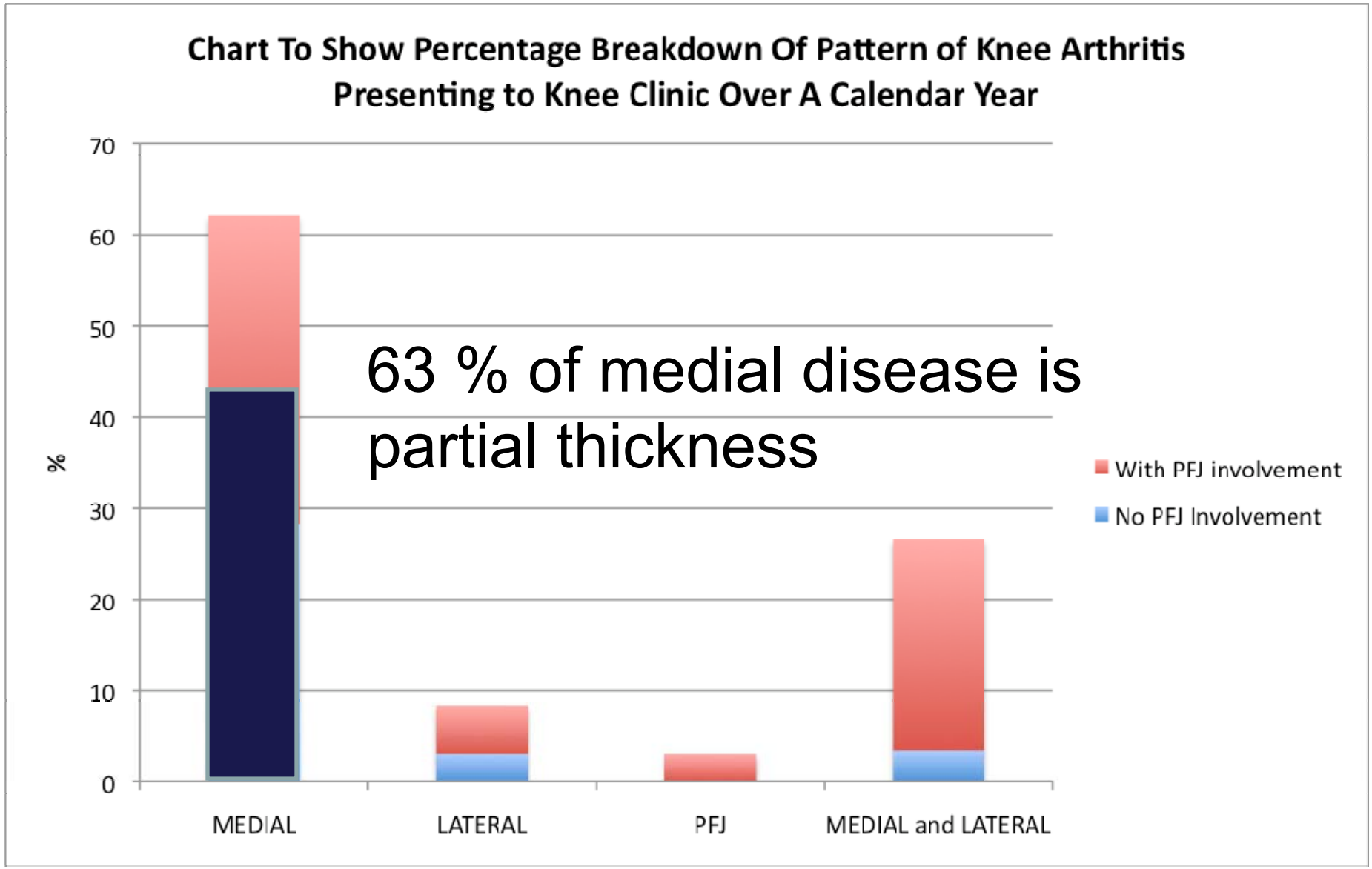
‘Partial thickness’ radiographic AMG



Kellgren -Lawrence Grade 2

Kellgren -Lawrence Grade 3

Kellgren -Lawrence Grade 4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10
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%
63 % of medial disease is partial thickness
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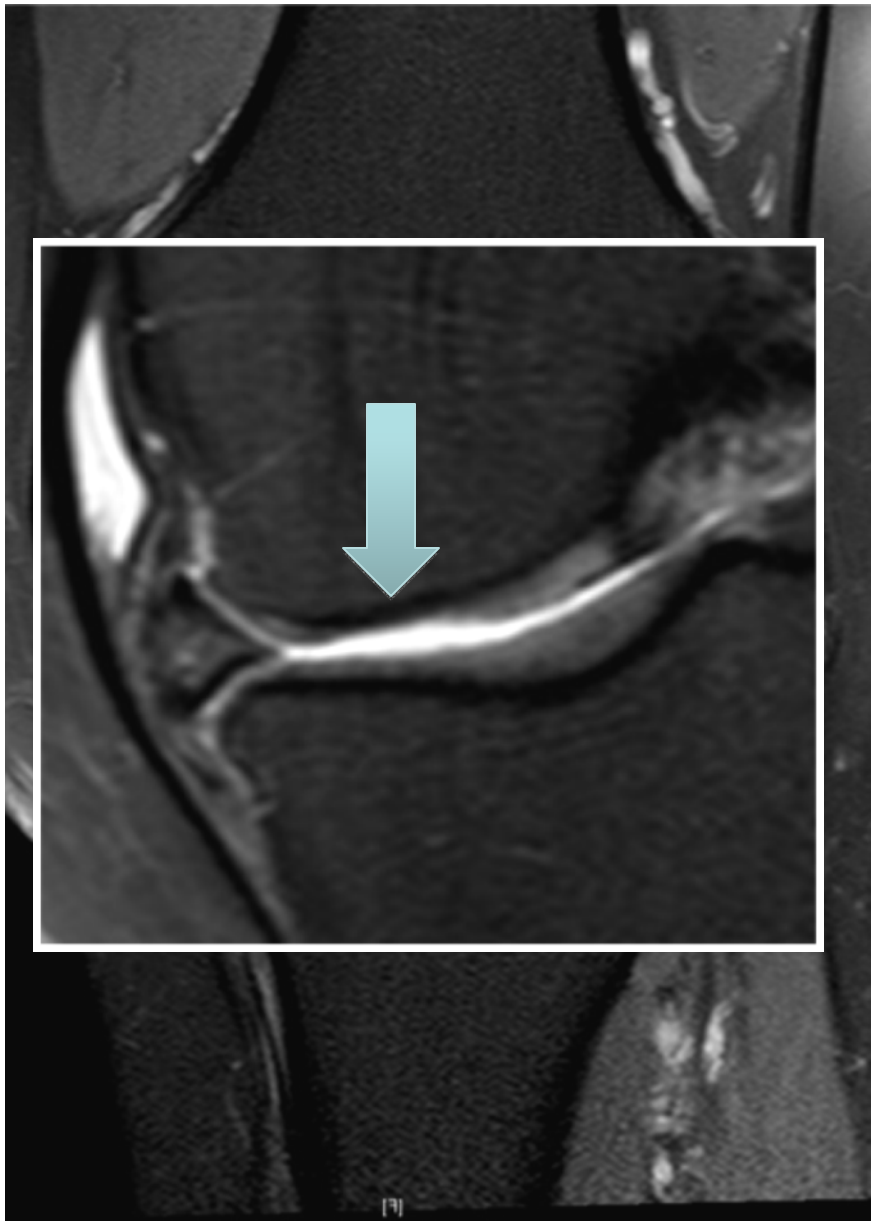
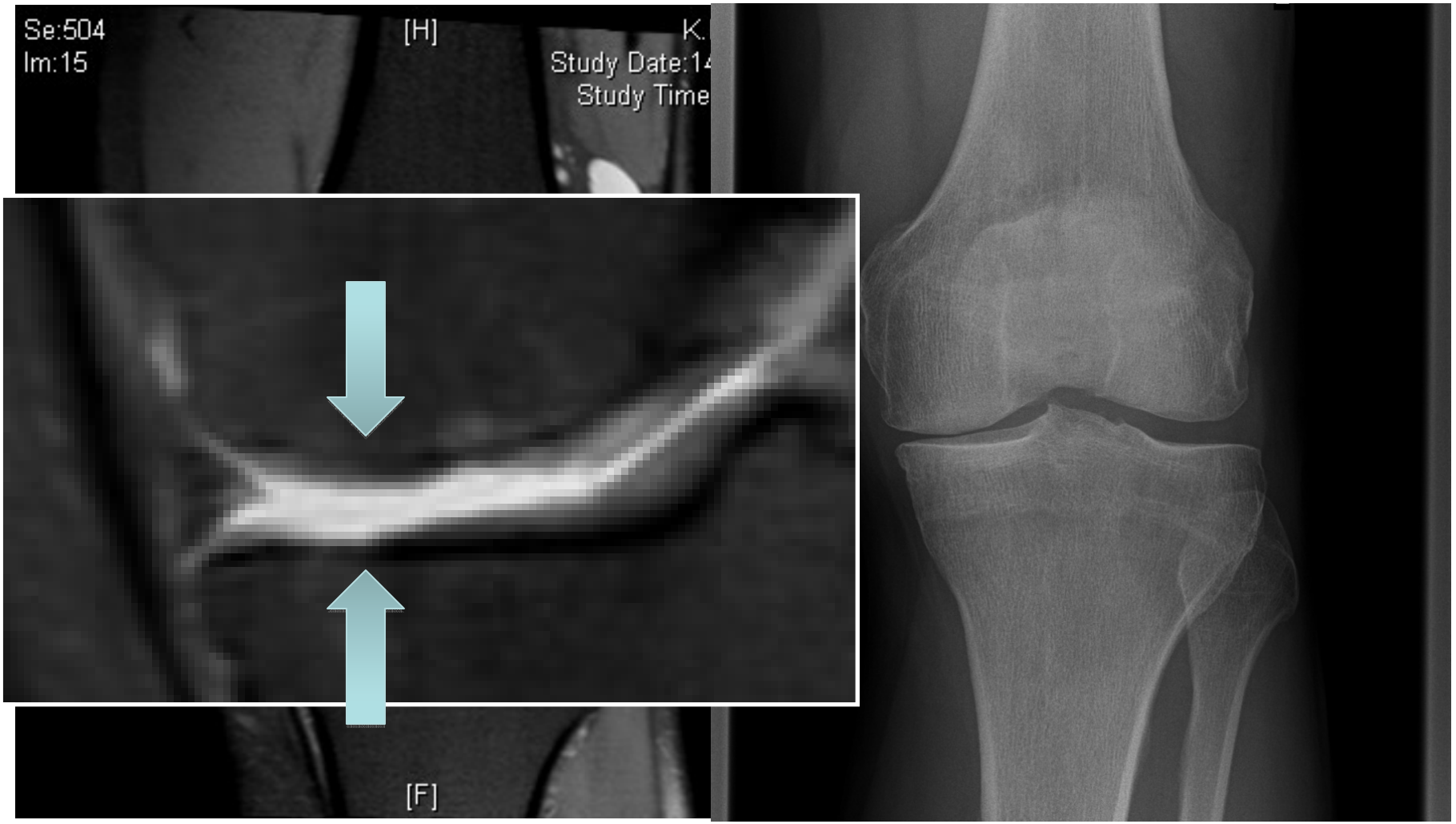
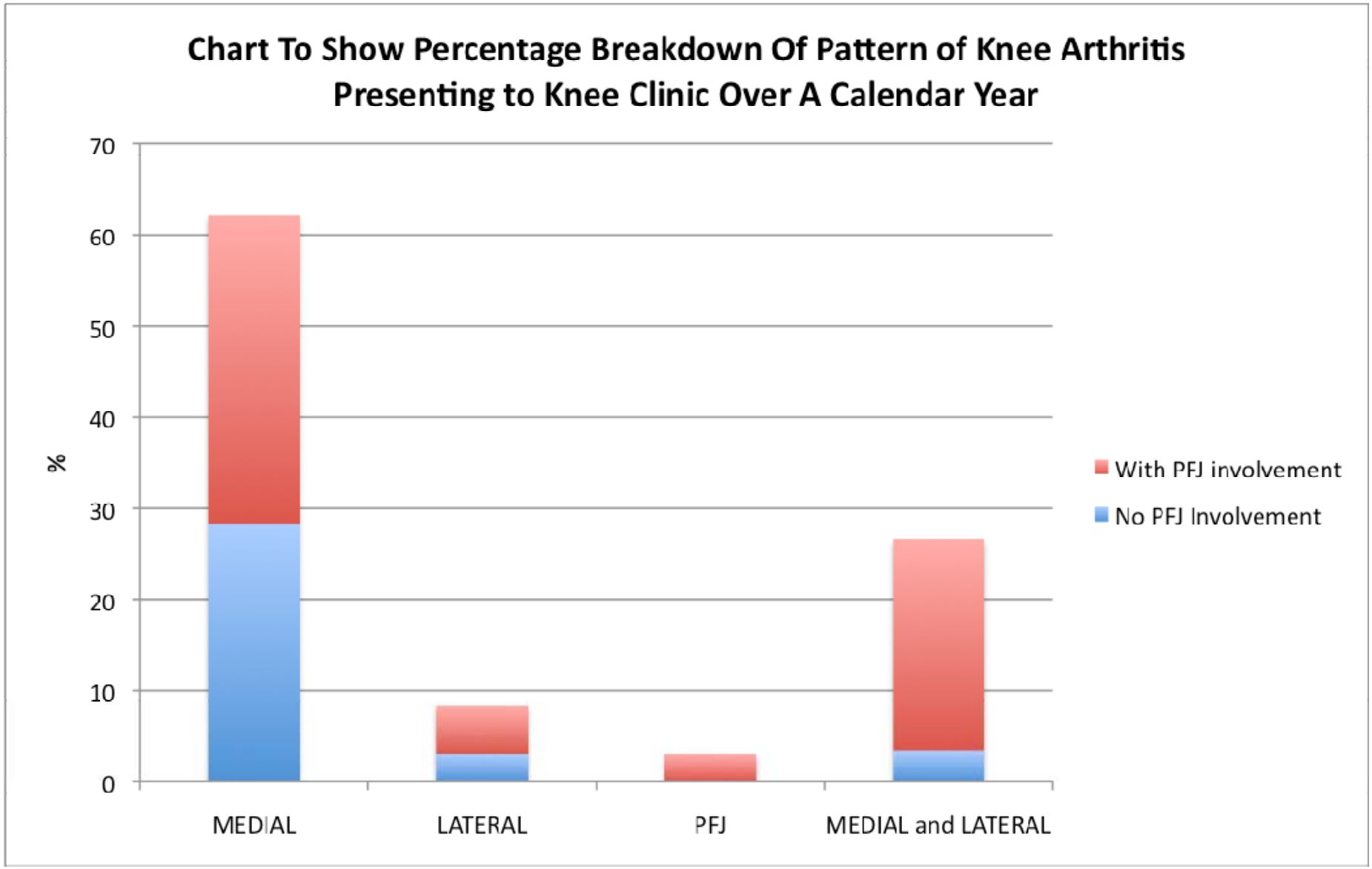
LATERAL
PFJ
MEDIAL and LATERAL
With PFJ involvement
No PFJ Involvement




Se:504
Im:15
[H]
K.
Study Date:1
Study Time
[F]

Progression Line for Knee medial OA

Normal	Subclinical	Early OA 'Partial Thickness'	End Stage 'Bone on Bone'
		Progression →	
	Symptoms Begin	Symptomatic: Best treatment unknown	Symptomatic: Established treatment (Arthoplasty)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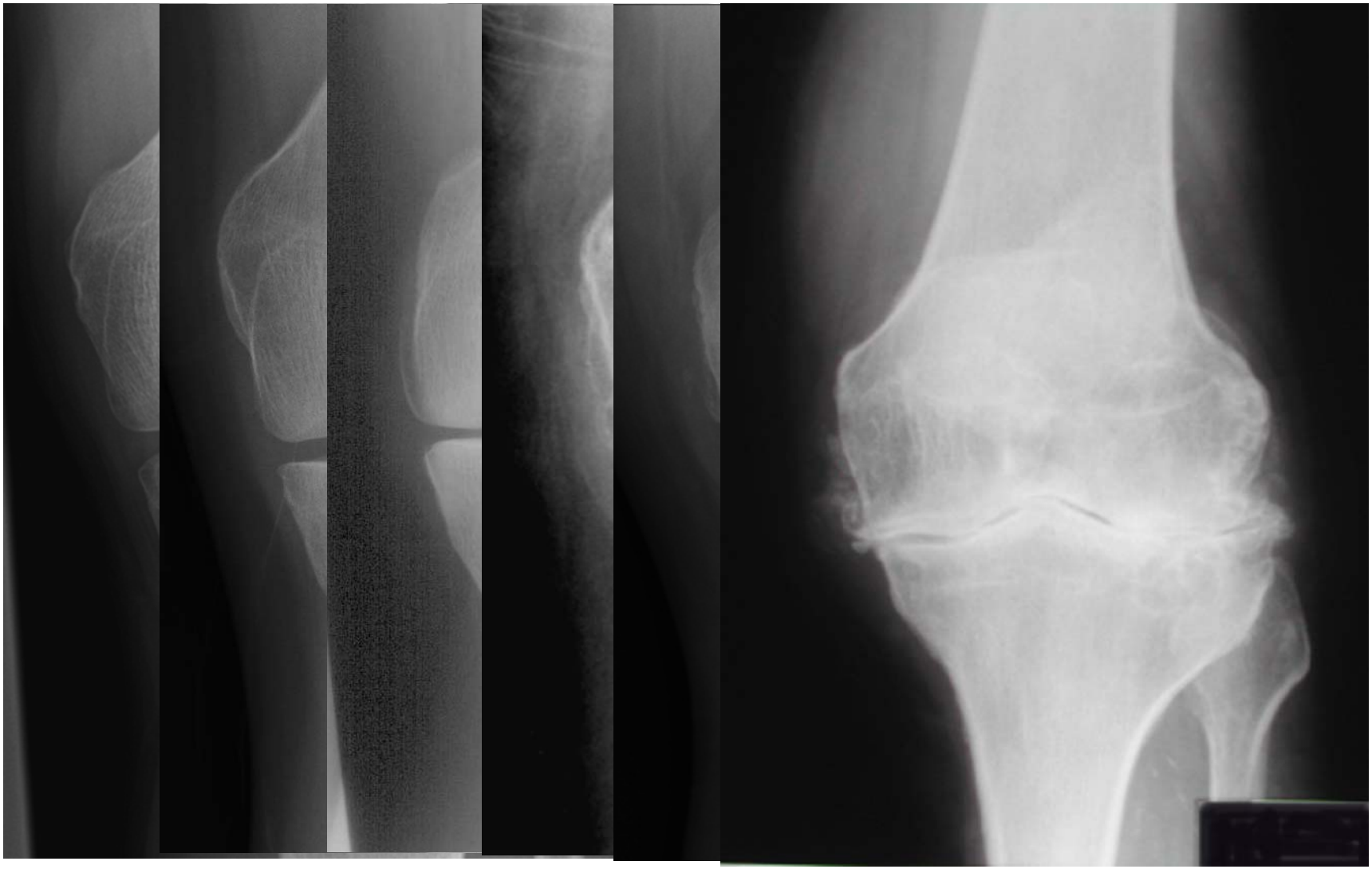
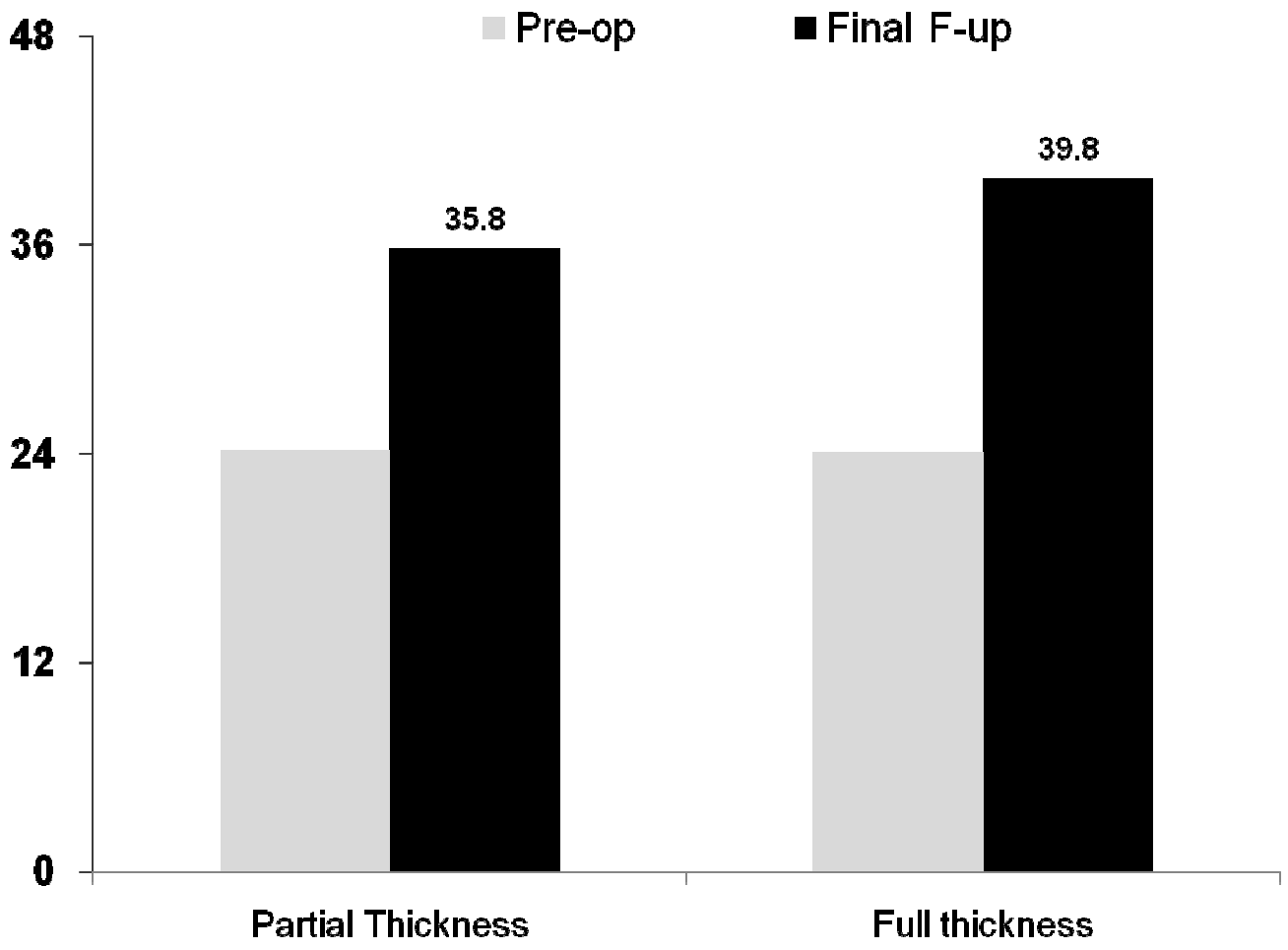
Progression of medial OA



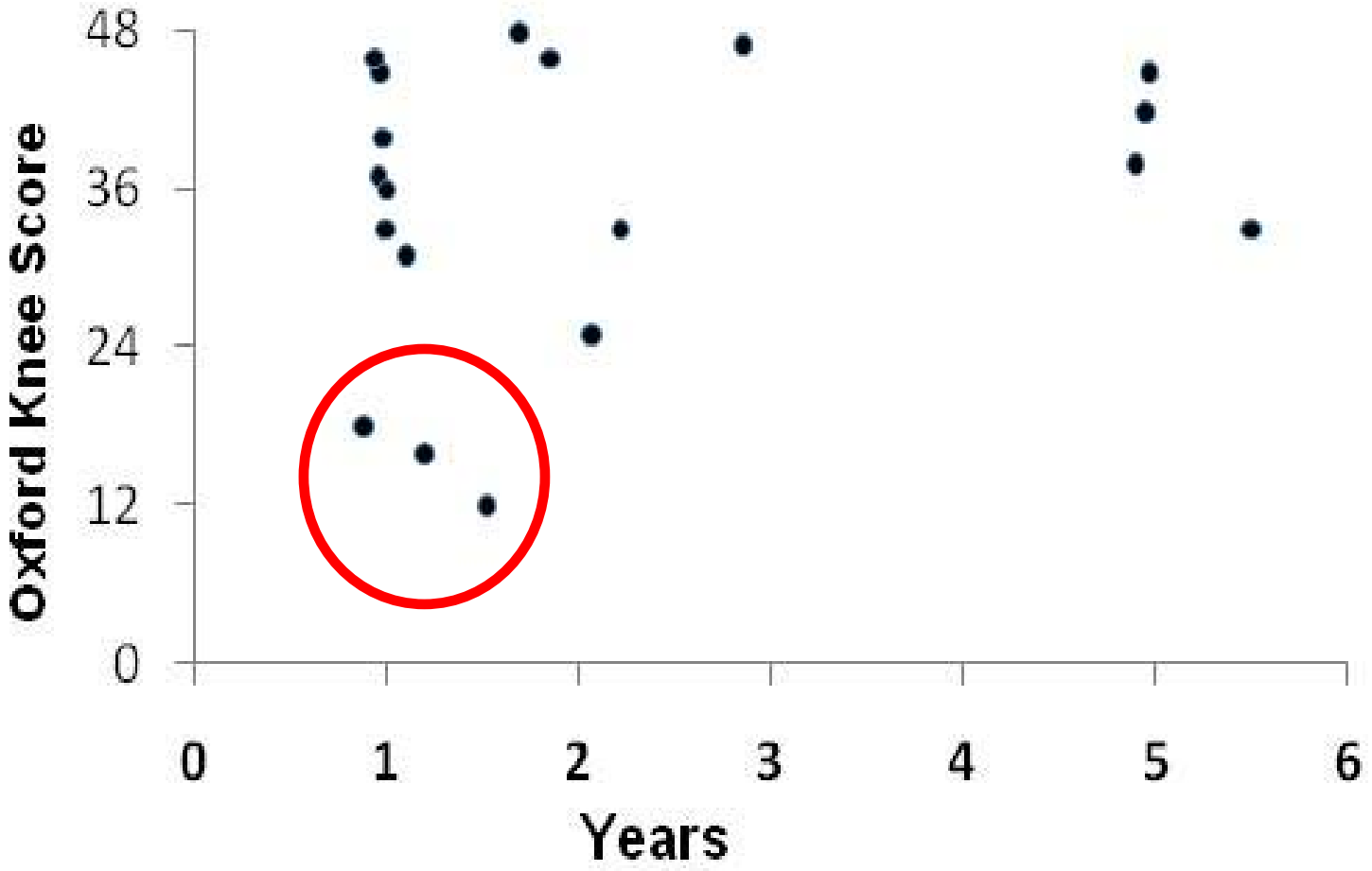
UKA for Partial Thickness AMG at the NOC

- UKA in KL grade 2 or 3
- 21 Knees & patients (out of total series of 1150)
- Oxford mobile bearing UKA
- Partial thickness (PT) compared to
  Full thickness (FT) cartilage damage

UKA for Partial Thickness at the NOC



UKA for Partial Thickness OA



Define Indications for UKA in earlier disease

- Understand the stages of medial OA

Role of Osteotomy

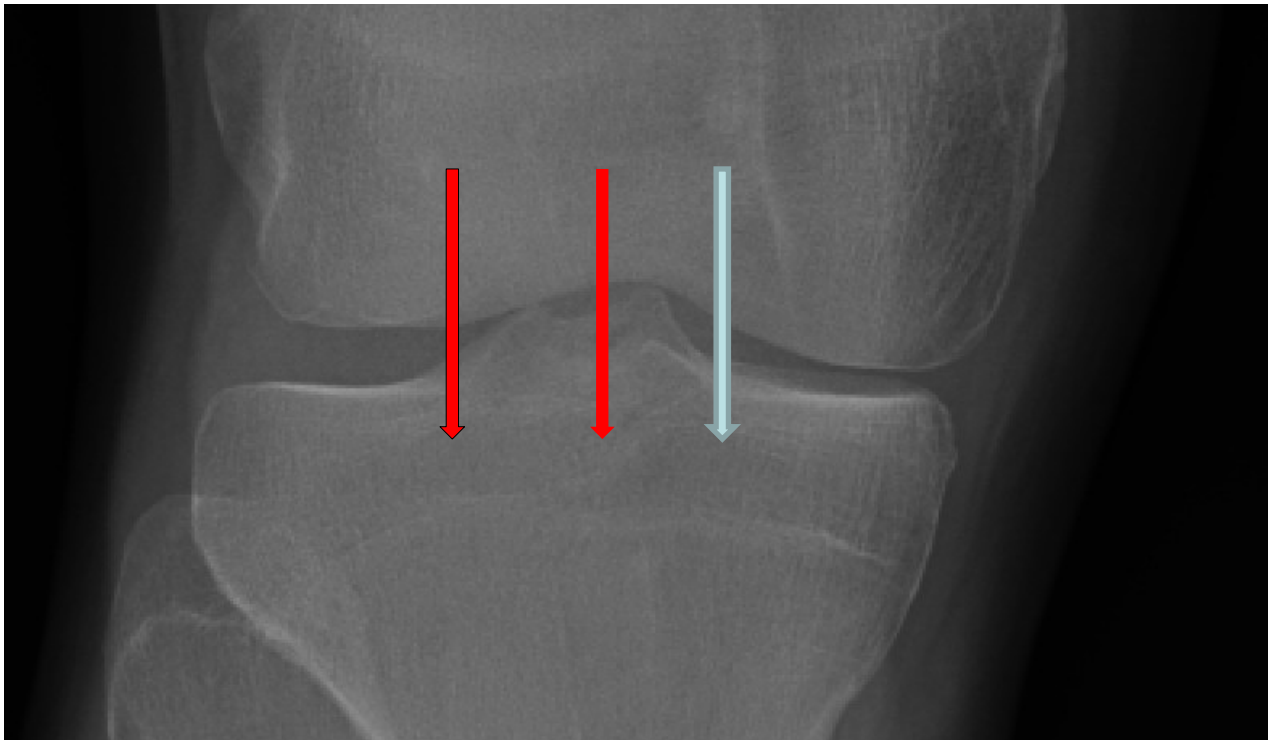
Malalignment associated with progression

Sharma et al. 2 0 0 1 JAMA

Osteotomy may prevent progression

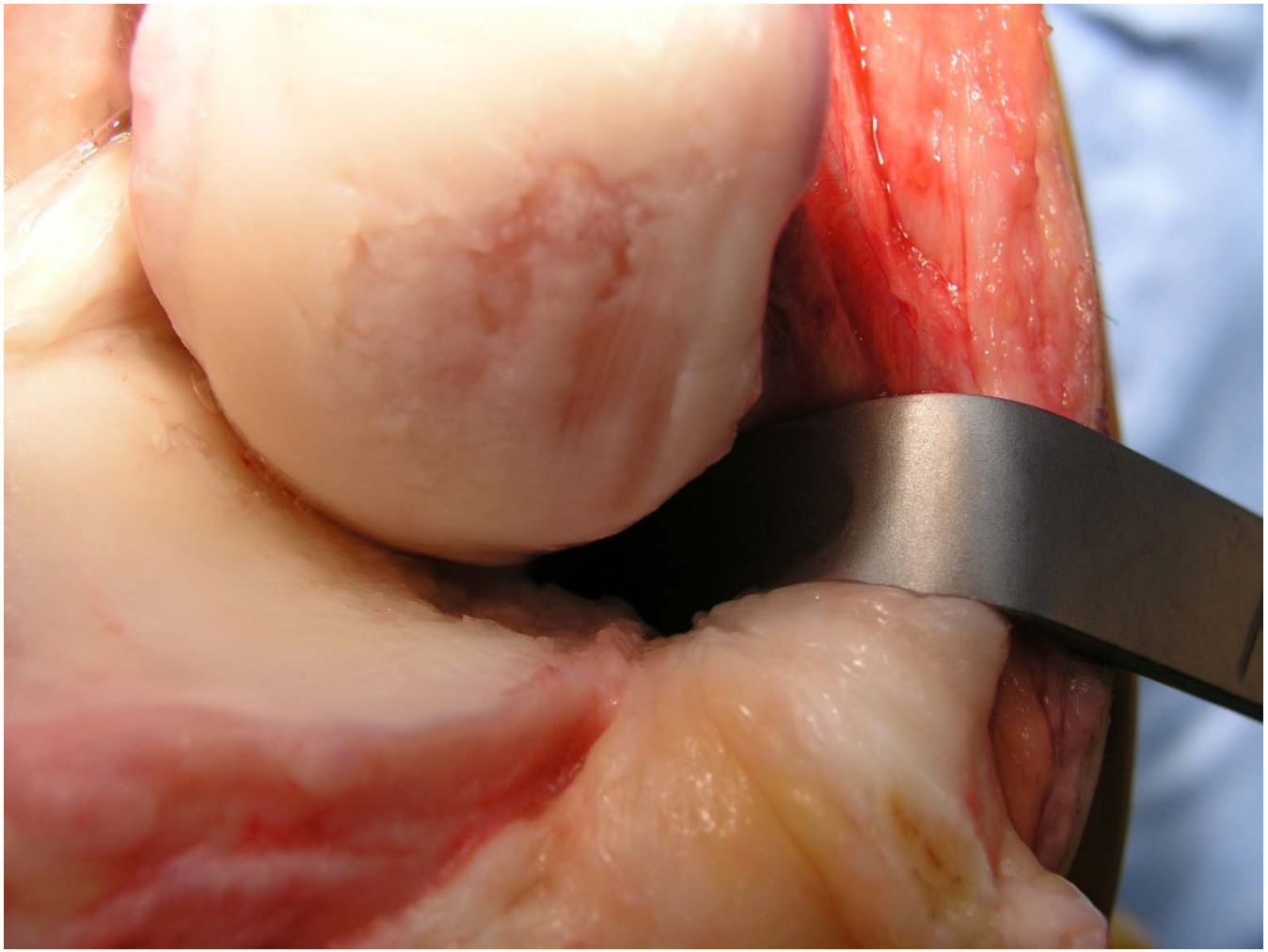
HTO: Opening vs. closing ?

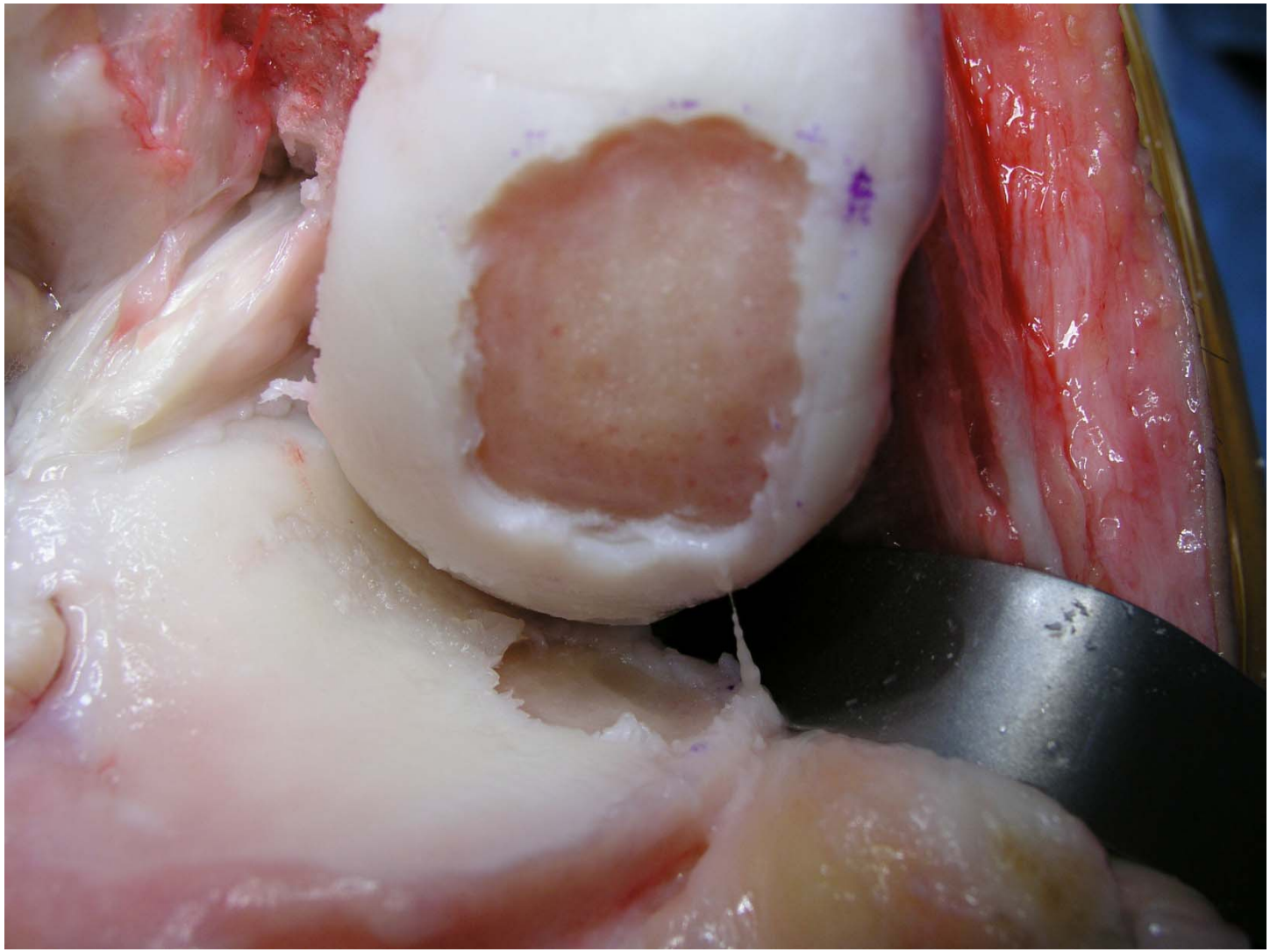
HTO ? Size of correction

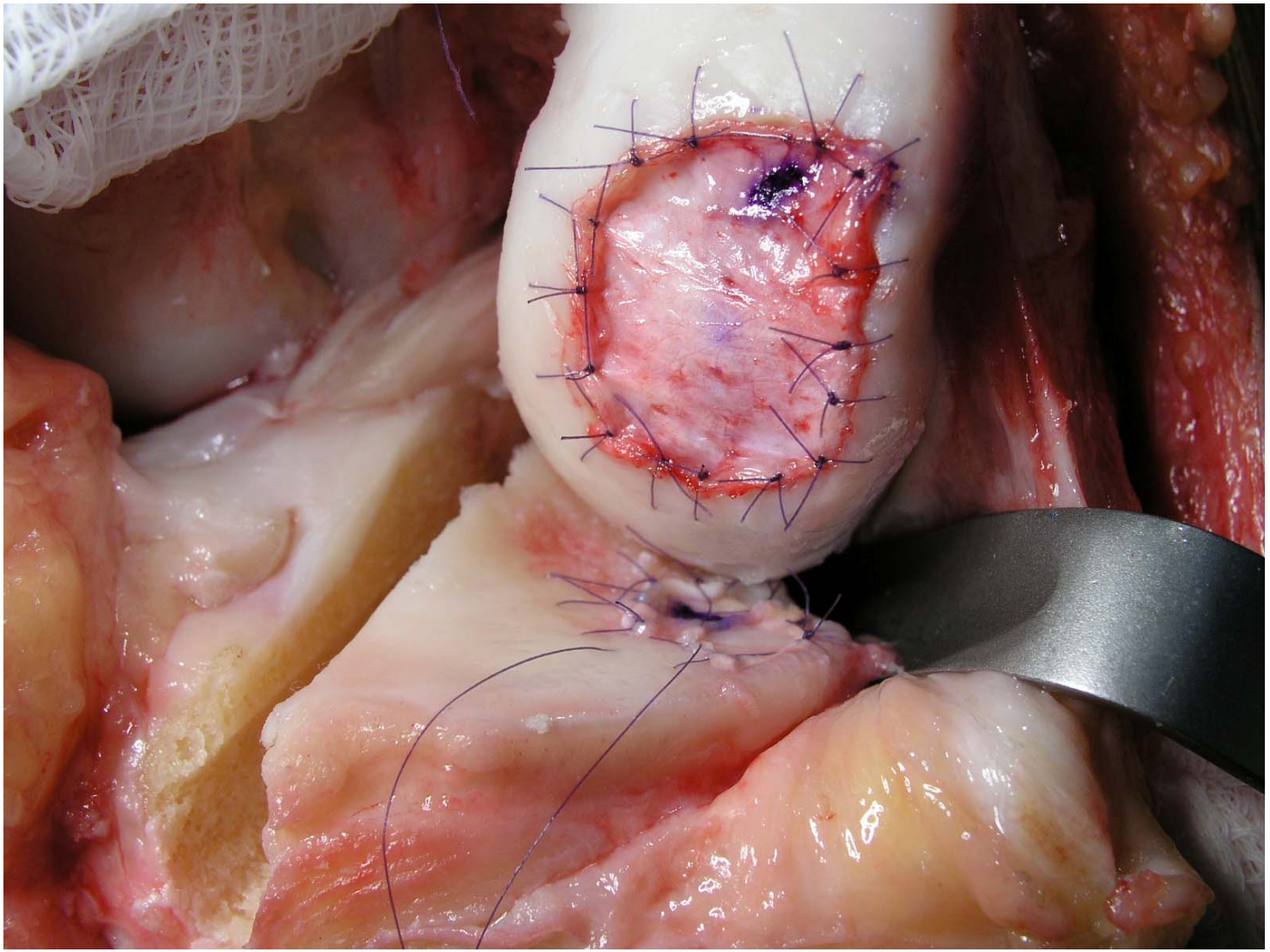


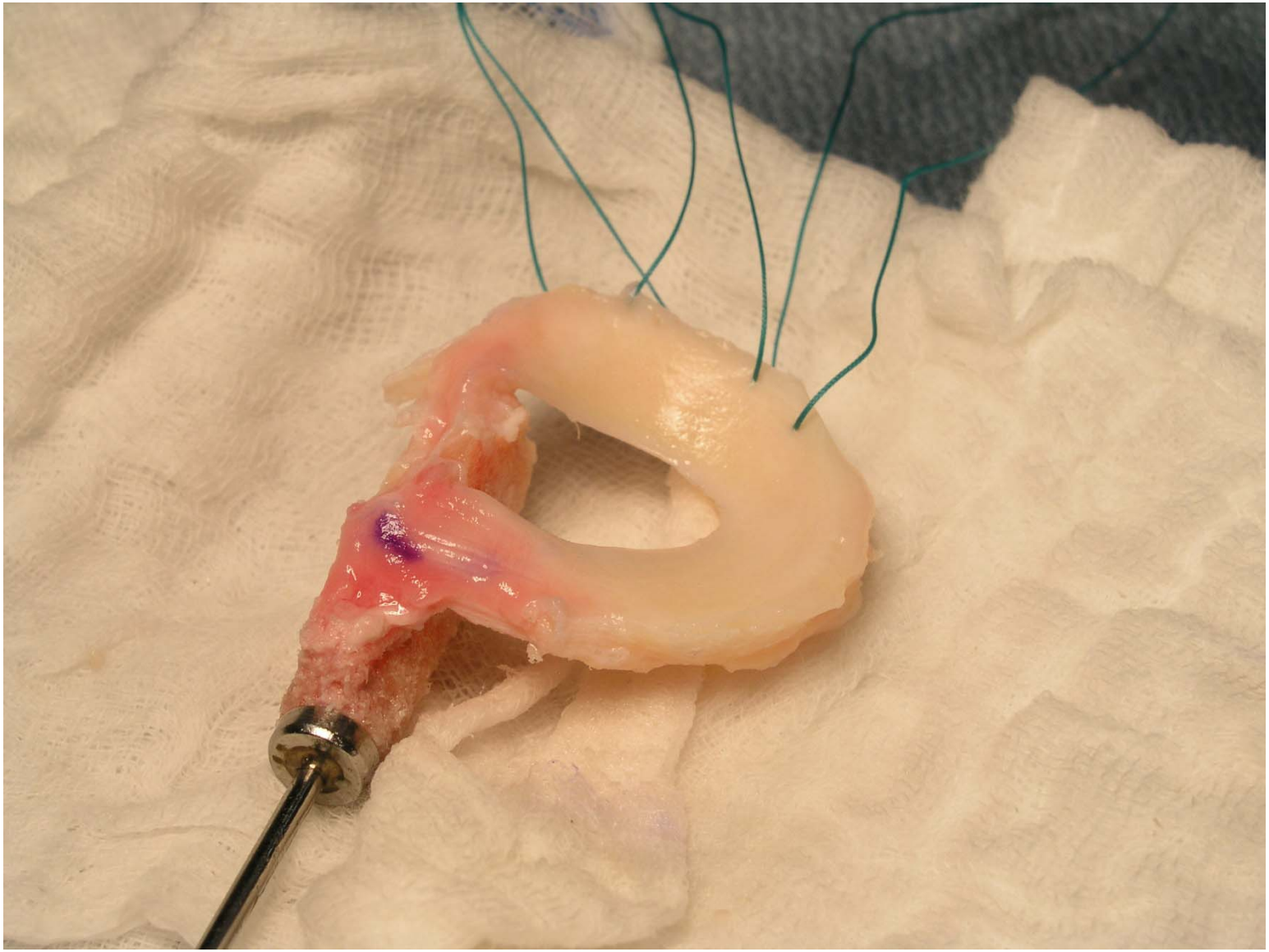
Role for navigation

Role of Biological Replacement







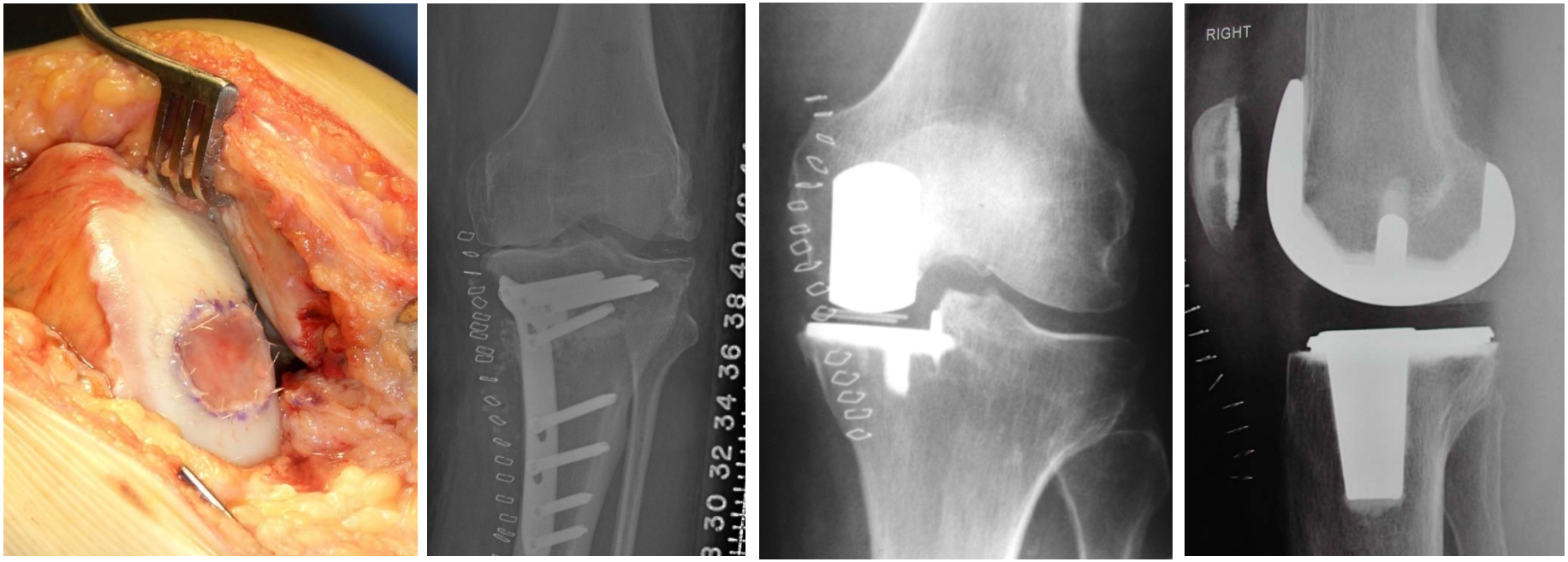


Biological Reconstruction

- Indication: Young patients
- Few short term reports
- No longer-term results
- Post-operation morbidity
- Cost – prohibitive in NHS

- More data required

KNEE PROCE D URES IN OA
What are we trying to achieve?



Sustained reduction in pain and improved function
Across the entire treatment history of the patient

AIMS
Development of knee OA treatment

- Improve established TKA procedure
- D evelop use of partial knee arthroplasty if established as clinically advantageous
- Use HTO to treat early disease to slow progression

OA surgery treatment pathway

- Implications of each treatment for the next

HTO

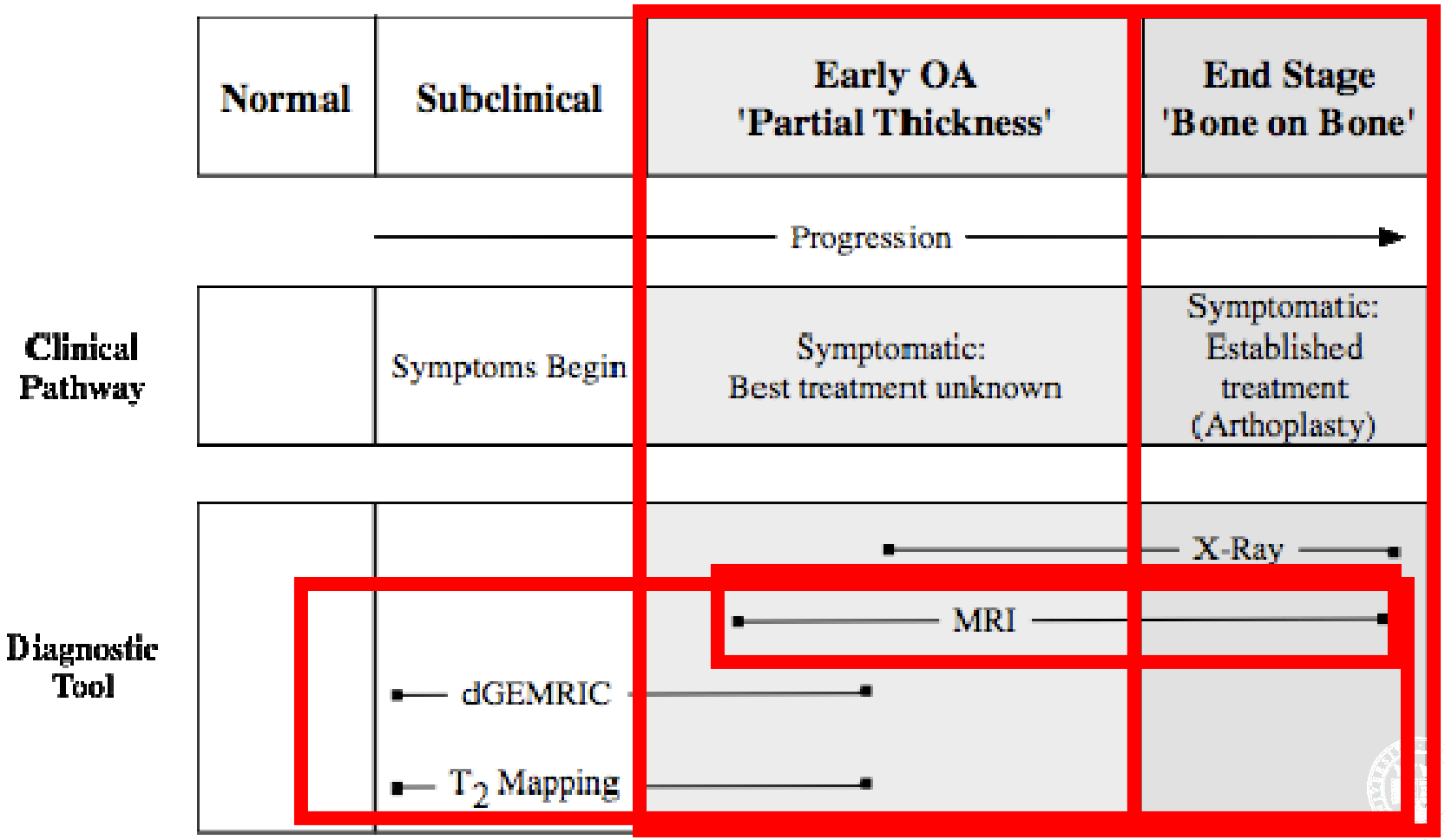
UKA

TKA

Revision TKA

Thank you

Time Line for Knee OA



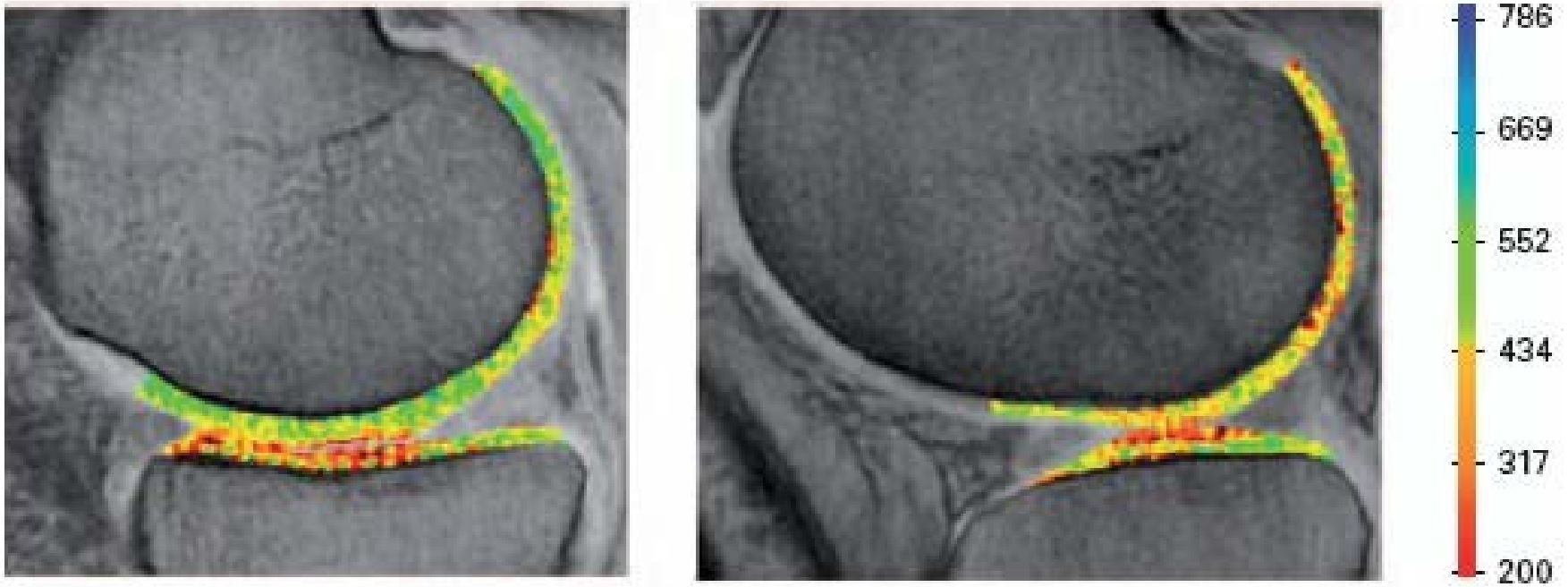
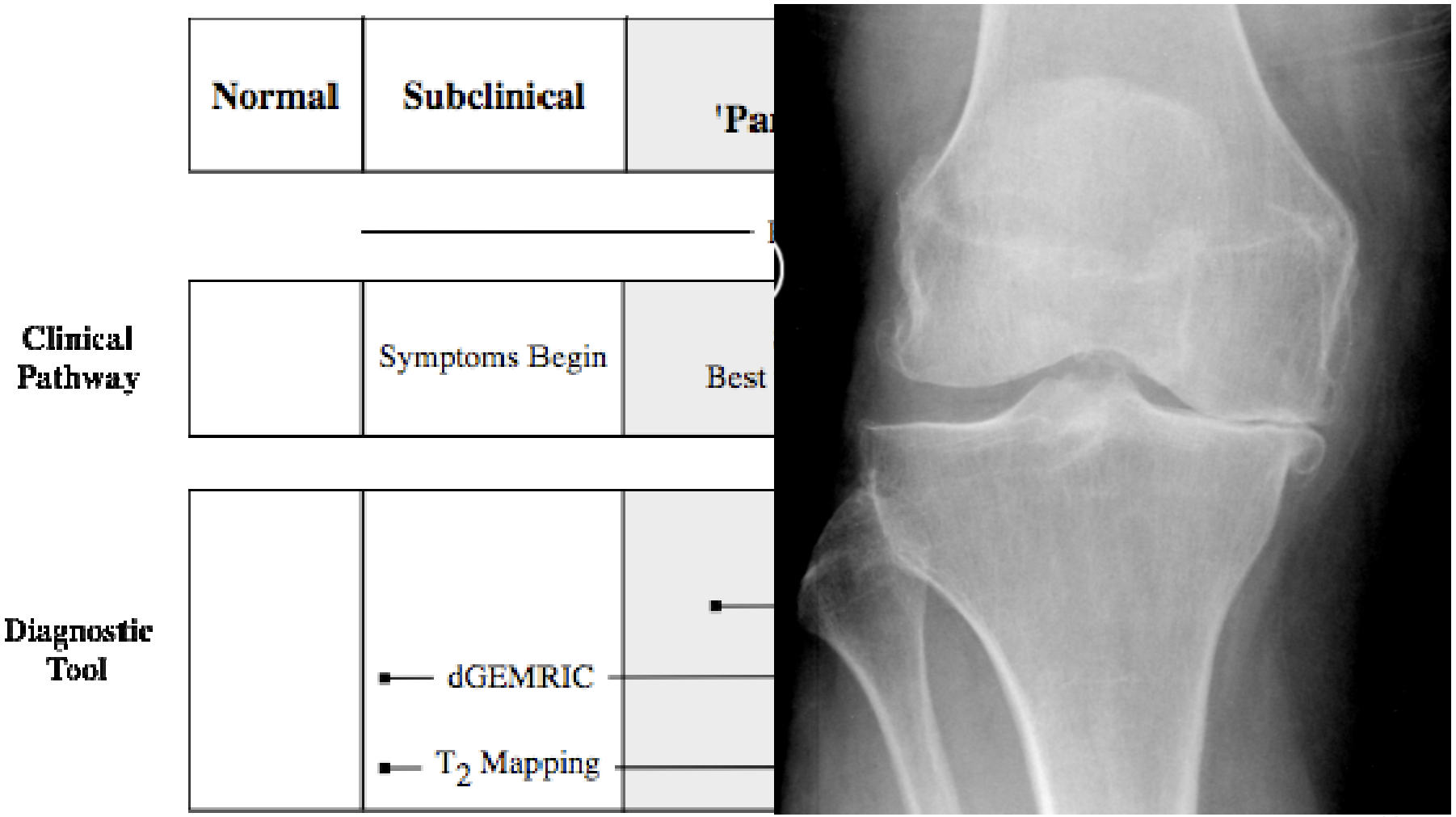


Fig. 3

A delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) scan of the knee showing slices from the medial (left) and lateral (right) compartments. The scale (ms) represents the dGEMRIC index (T_{1Gd}), the colour scale applied to the image facilitates visual interpretation. Higher values of T_{1Gd} represent increased glycosaminoglycan (GAG) content. The scan demonstrates the physiological reduction in concentration of GAG as one moves from the deep to superficial cartilage zones, particularly clearly for the tibial cartilage of the lateral compartment. The tibial cartilage of the medial compartment demonstrates a relative depletion of GAGs anteriorly compared with posteriorly, in the absence of chondral erosion, suggesting early anteromedial osteoarthritis (image kindly provided by Dr Deborah Burstein, Beth Israel Deaconess Medical Center, Boston).

Time Line for Knee OA




Rosenberg View
R


Se:301
Im:16
[H]
[RP]
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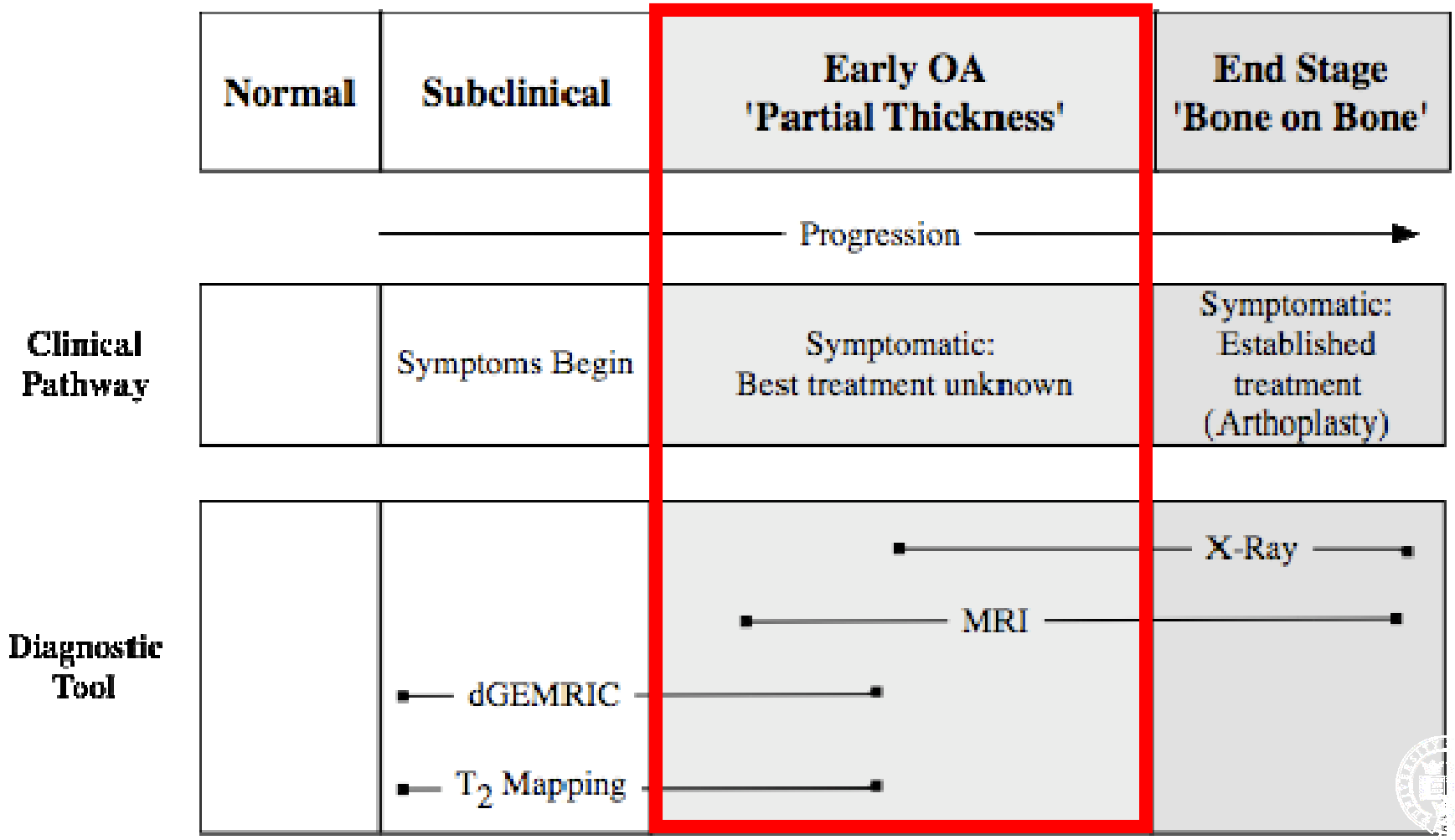
Time Line for Knee OA



Conclusion

Surgery for medial OA at 50

HTO

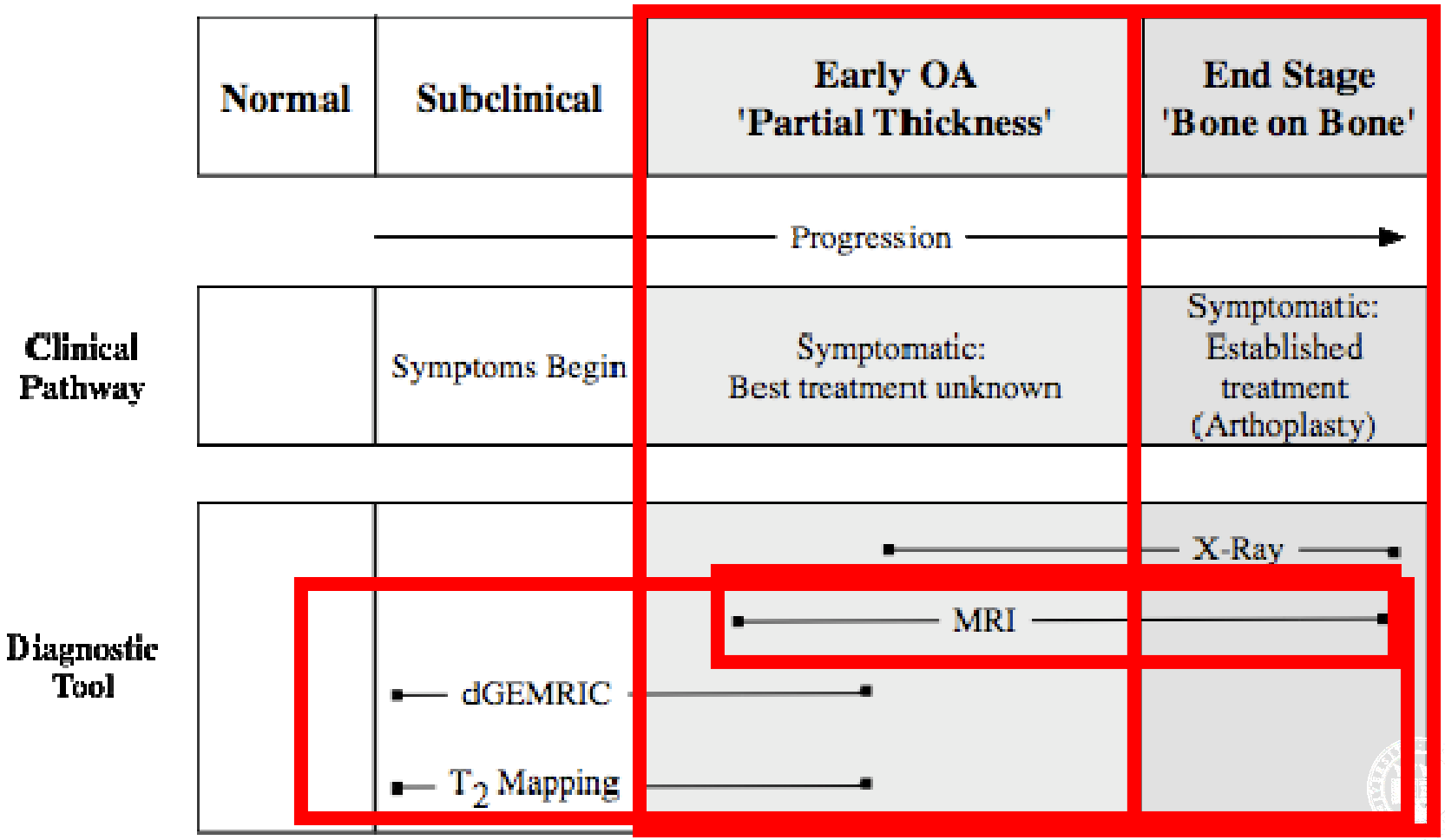
UKA

TKA

Knee surgeon requires all these methods to treat the spectrum of disease seen with OA in the young adult.

Each has its correct indications.

Time Line for Knee OA



Alternative treatments

TKA

Modern imaging techniques

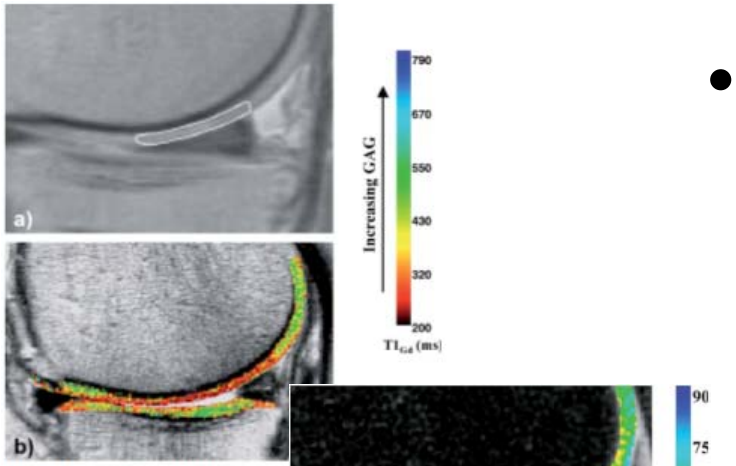


Figure 10. Sagittal dGEMRIC images
means of obtaining relaxation time inf
signal intensity from a given region
images comprising the relaxation res
metric representing the relaxation beh
of tissue. (b) Alternatively, the relaxatio
on a pixel by pixel basis for a relaxati
example, the dGEMRIC Index (T_{1Gd}) ca
sharp demarcation of a region of lo
femoral condyle.

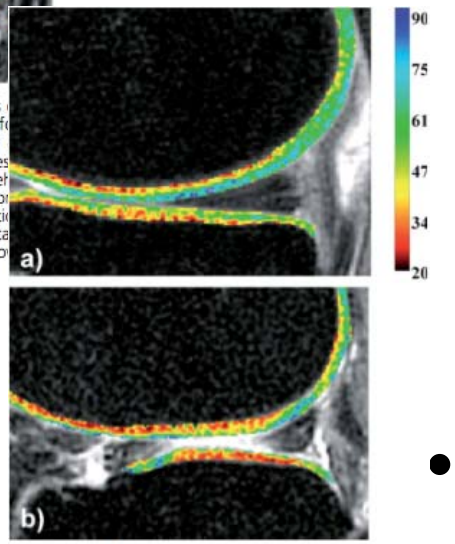
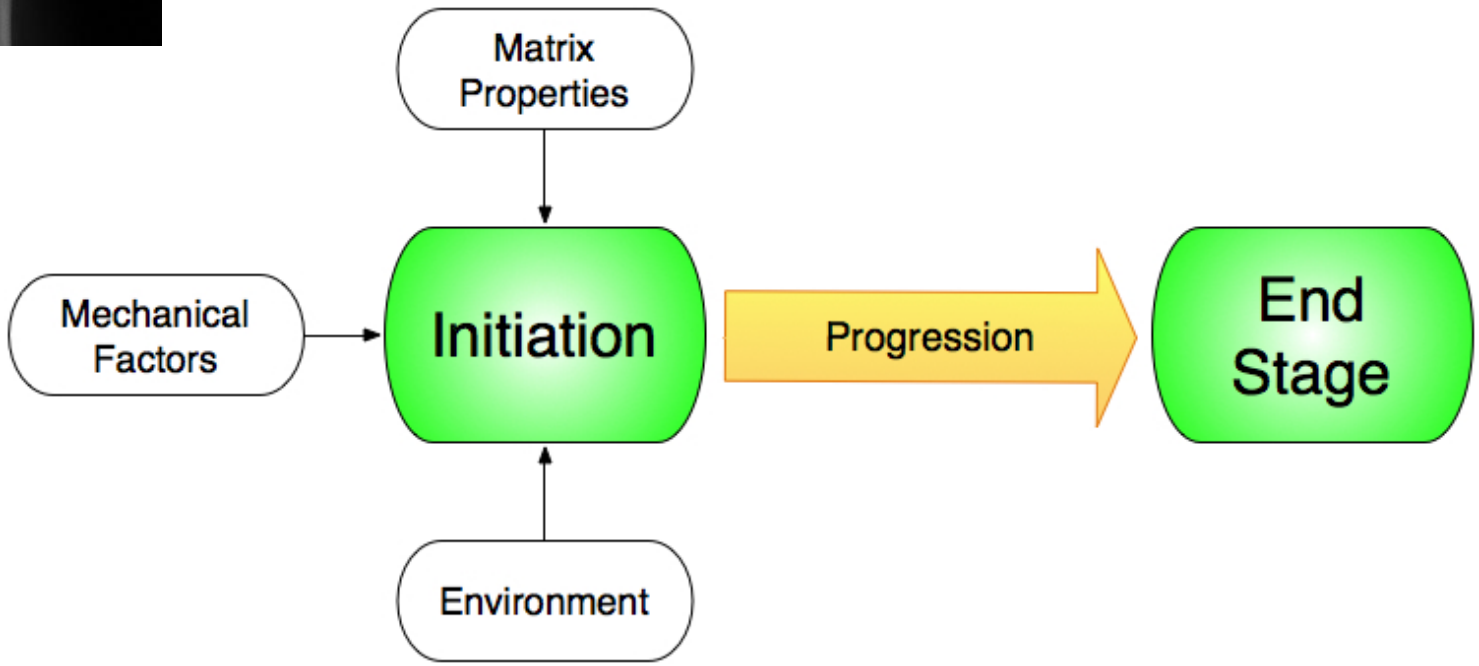


Figure 9. (a) T_2 images are inherently heterogeneous, with lower T_2 in the deep zone of cartilage. (b) In T_2 images that appear abnormal, the overall mean value for T_2 of the cartilage area may not change substantially; however, the pattern of T_2 heterogeneity might be altered owing to changes in cartilage architecture, molecular structure or concentration.

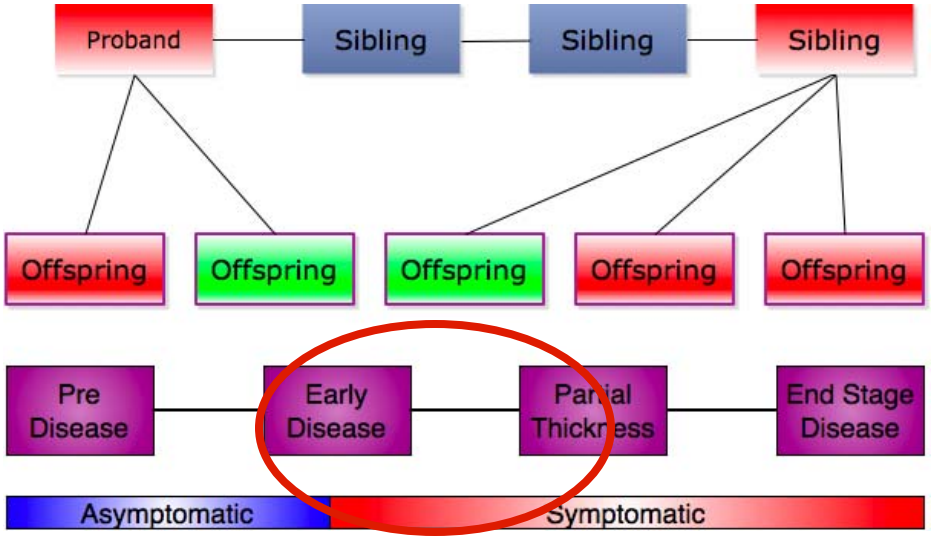
- dGEMRIC
  - Delayed Gadolinium MRI of Cartilage
  - proteoglycan assessment
- T_2 Mapping
  - Collagen assessment

Genetic Risk



Sib-Kid Imaging

- Long leg X-Rays, MRI and CT of Sib Kid cohort
- Describe stages of OA



Family Studies

- Sibling Risk
  - Hip OA - 2.05
    - Lanyon et al 2000
  - Hip or knee OA - 2.32
    - Chitnavis et al 1997
  - Tricompartmental knee OA - 2.8
    - Neame et al 2004
  - AMG - 3.21
    - McDonnell et al 2007
- Offspring Risk
  - Hip OA - 3.5
    - Spencer et al 2005

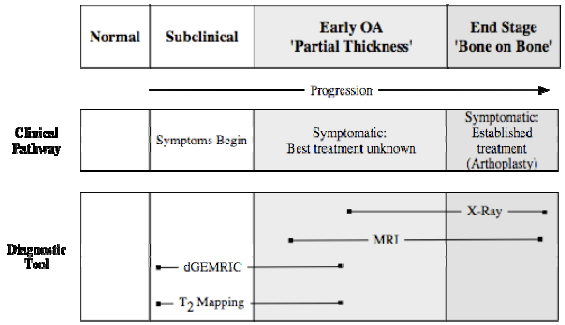
Risk
- Family Studies

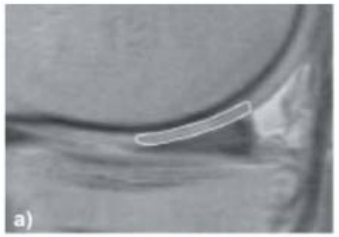
Proband

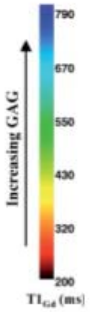
Early OA of the Knee

- How do we identify patients with early disease?

Figure 1 - A timeline of knee osteoarthritis







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sharp demarcation of a region of lo
femoral condyle.

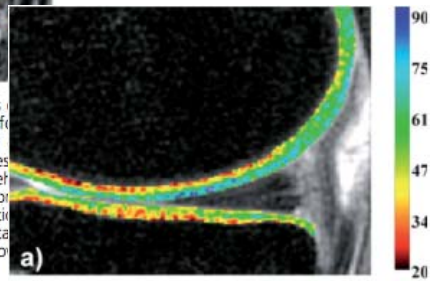
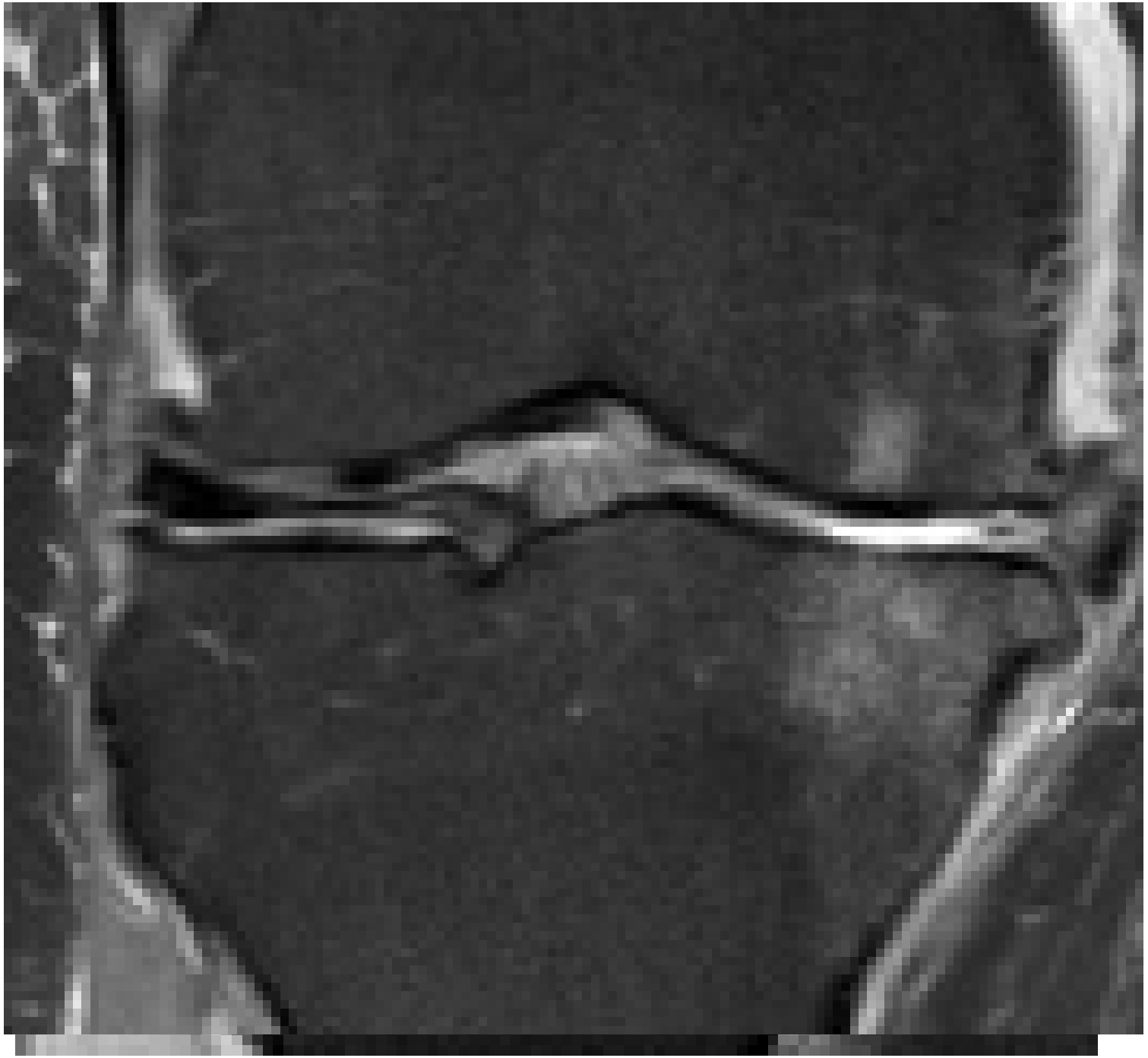
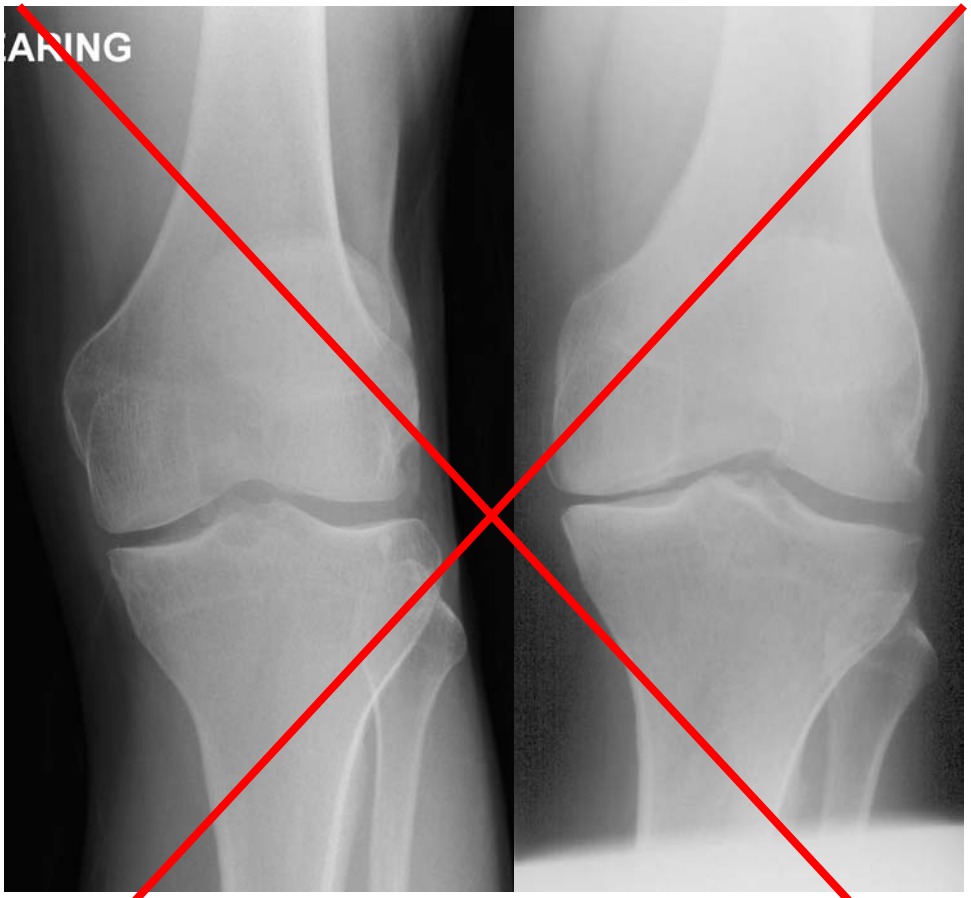


Figure 9. (a) T_2 images are inherently heterogeneous, with lower T_2 in the deep zone of cartilage. (b) In T_2 images that appear abnormal, the overall mean value for T_2 of the cartilage area may not change substantially; however, the pattern of T_2 heterogeneity might be altered owing to changes in cartilage architecture, molecular structure or concentration.

- dGEMRIC
  - Delayed Gadolinium MRI of Cartilage
  - proteoglycan assessment
- T_2 Mapping
  - Collagen assessment



Present indication for UKA for Antero-medial OA

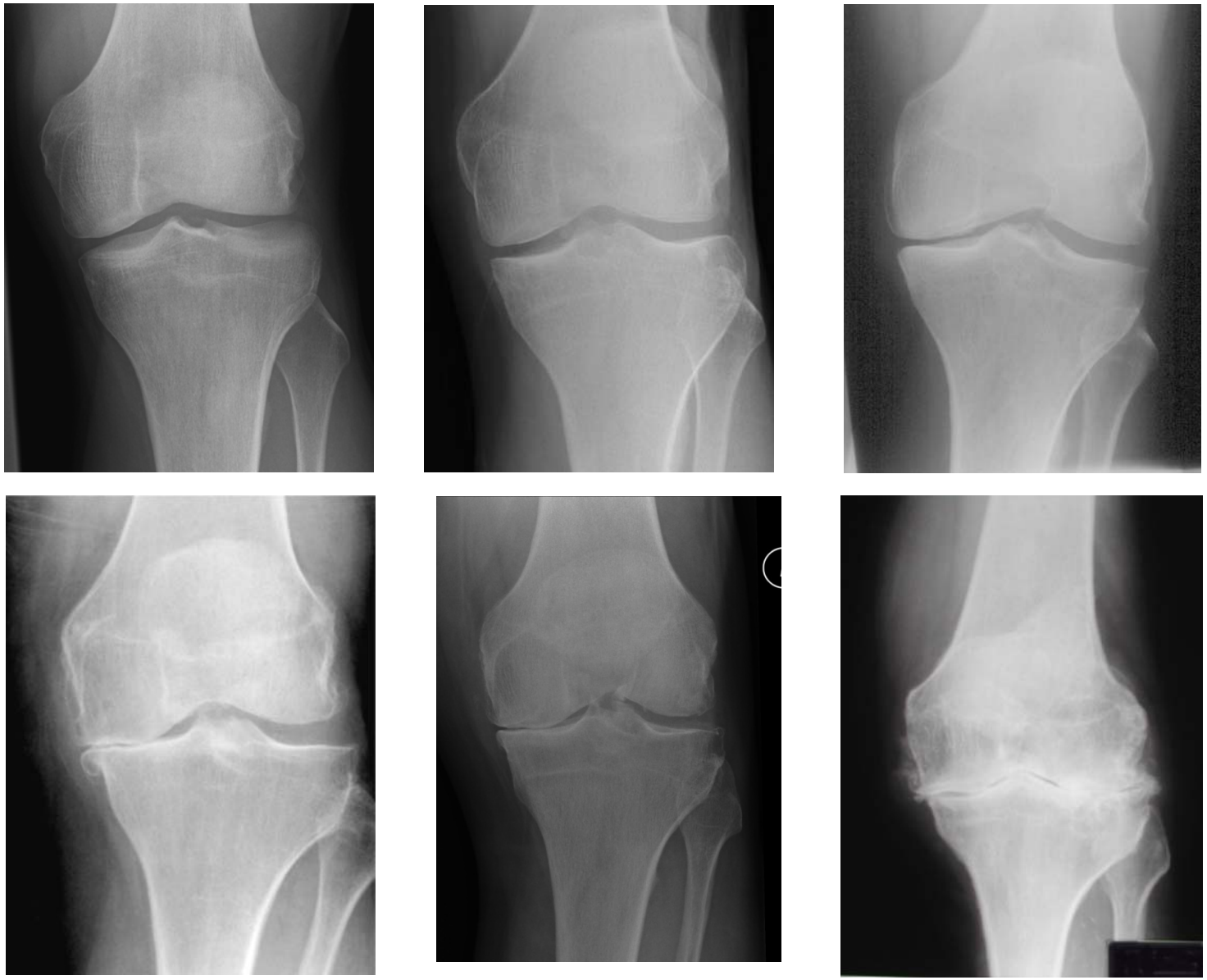


Partial thickness

Full thickness Bone on Bone

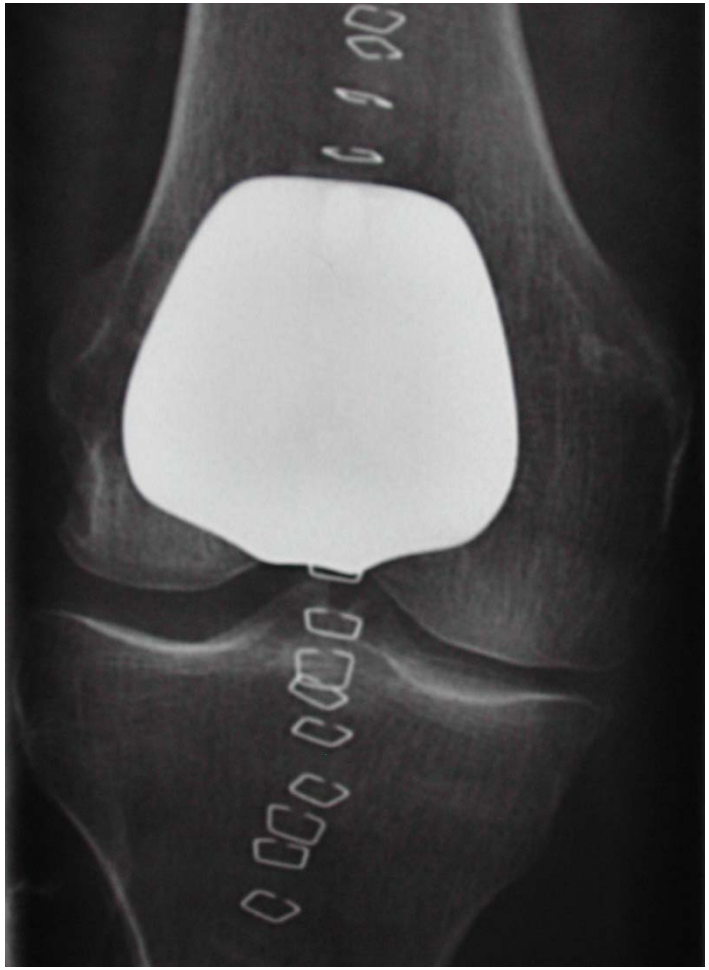
- Cost of UKA

Progression of medial OA



Anteromedial Gonarthrosis (AMG)

- White et al 1991
  - Medial compartment wear
  - Intact ACL and MCL
  - Correctable varus deformity
- McDonnell, Price et al 2008
  - As ACL damage progresses, the lesion extends further posteriorly



Indications for UKA

Knee pathology

- **Full thickness articular cartilage loss**
- ACL intact
- Correctable varus deformity
- Anterior medial OA