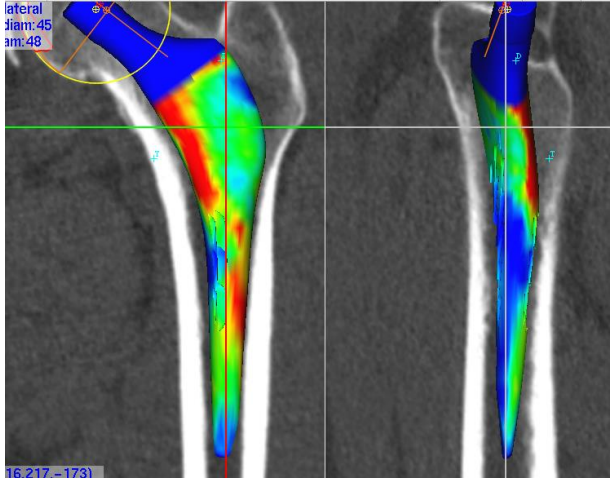
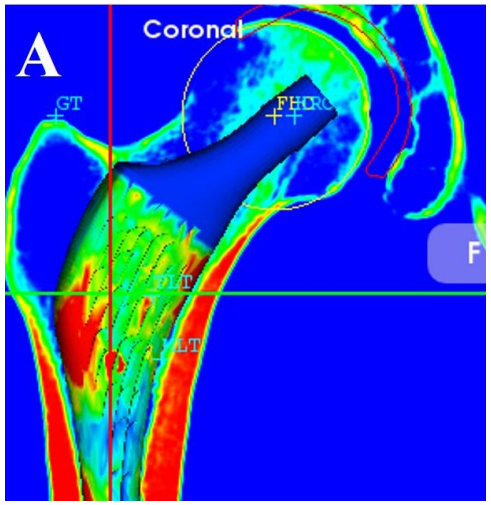
PARC

Paris Arthroplasty Research Center



Patient Specific Kinematical alignment in Total Hip arthroplasty using CT-scan Based 3D planning

The value of custom Individualized stems

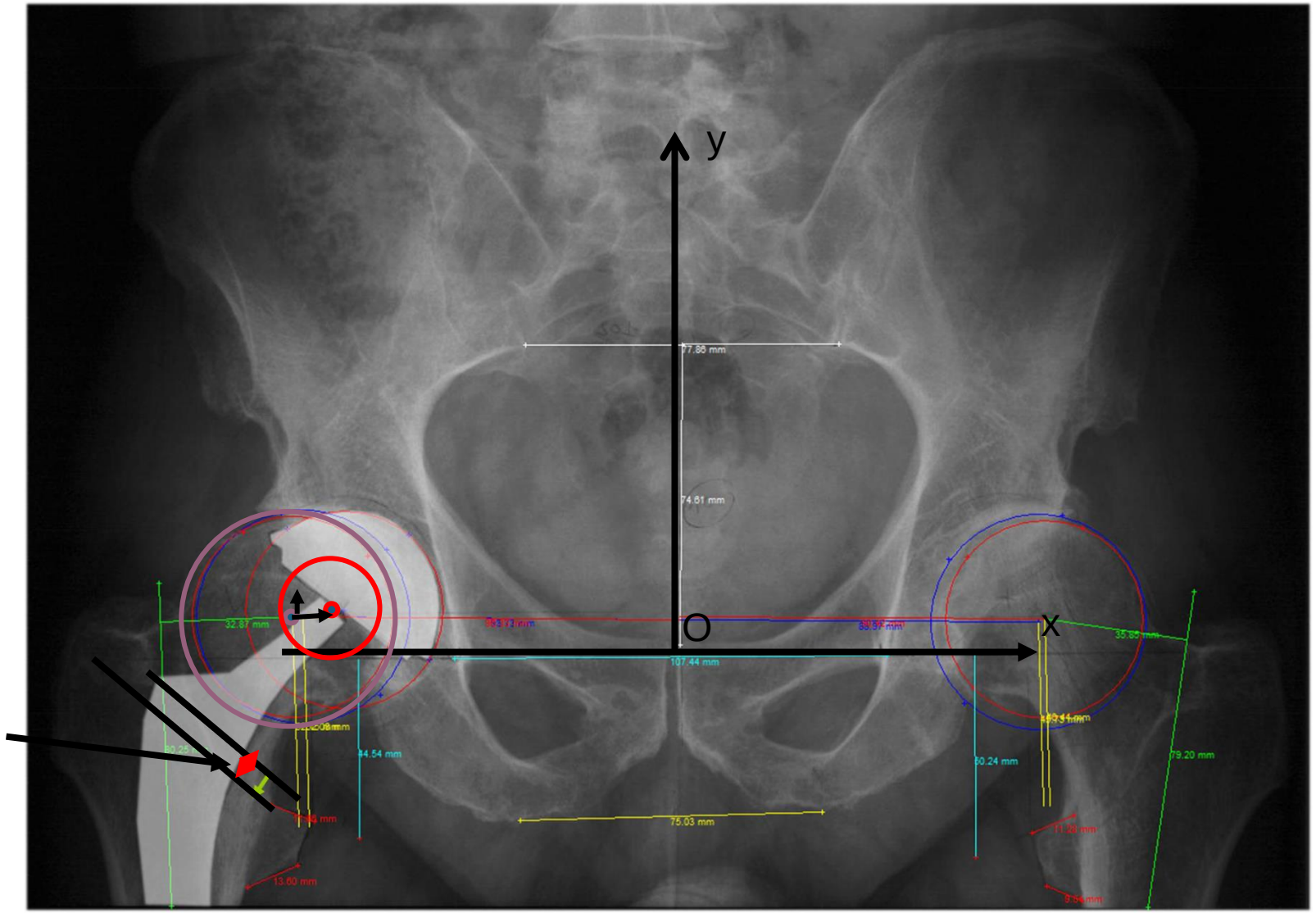


Professor SARIALI

La Pitié Teaching Hospital

Paris, France

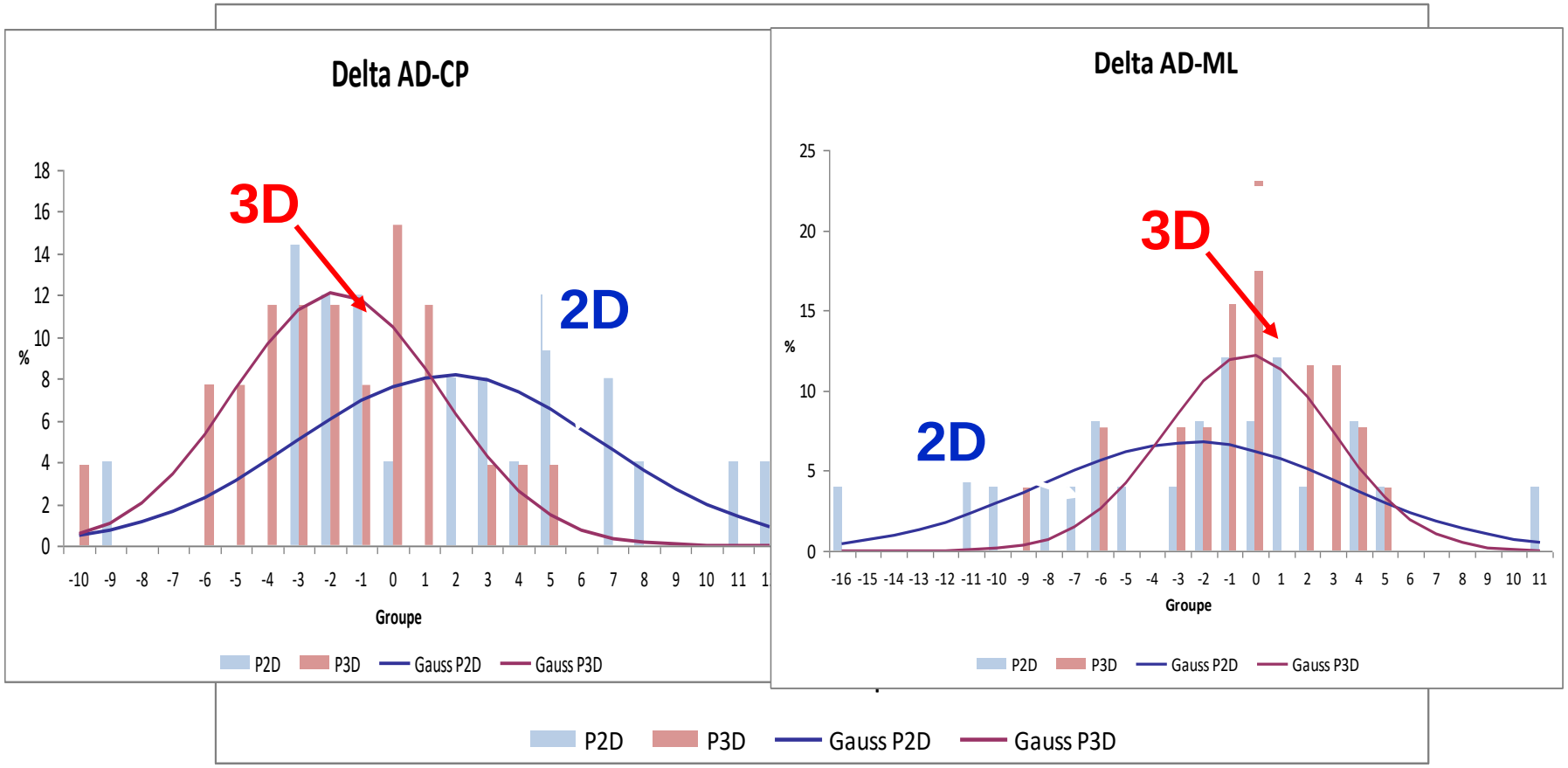
Reference Technique: 2D



- Templates magnification coefficient of: 1.15

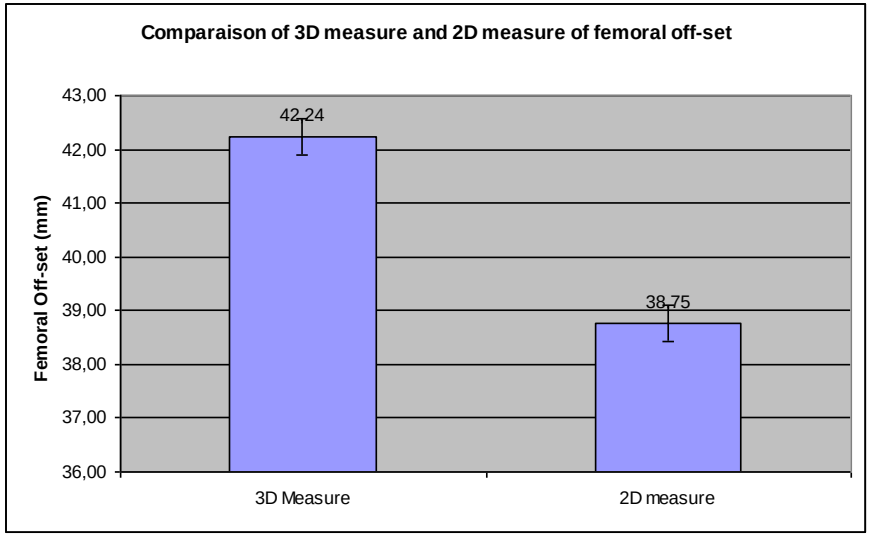
Limits of 2D planning:
Low accuracy: Length/ FO/ COR

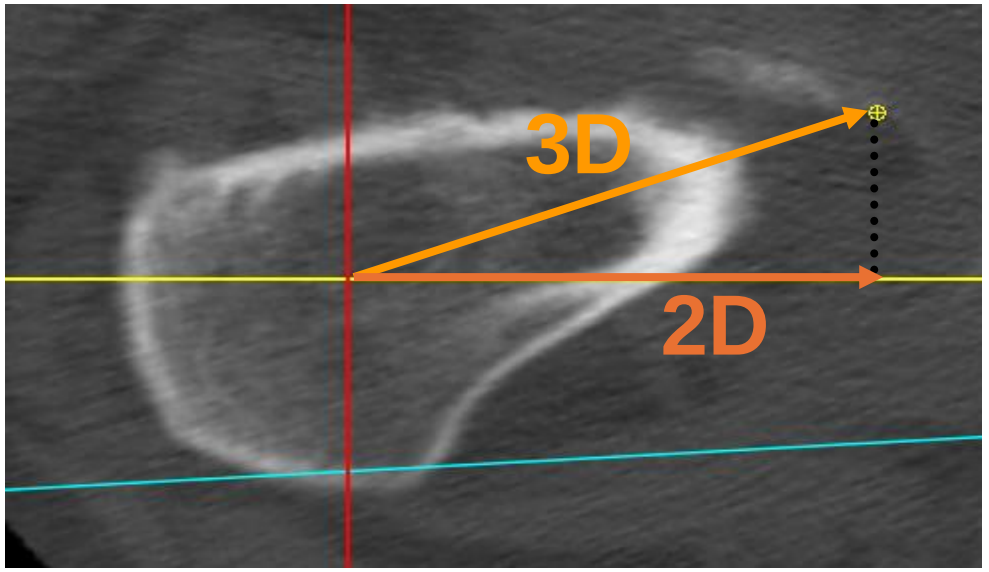
Sariali et al: JBJS 2009 et OTSR 2012



Limits of 2D planning: Under estimation FO

Sariali et al J OA 2008



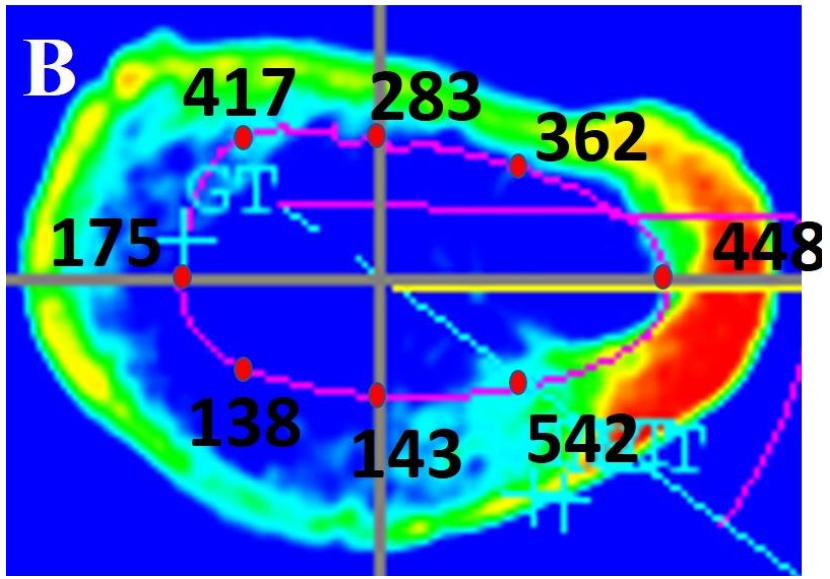


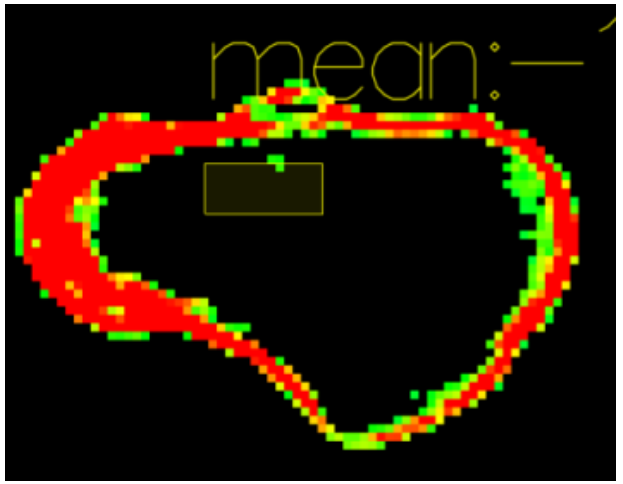
3.5 +/- 2.6 mm

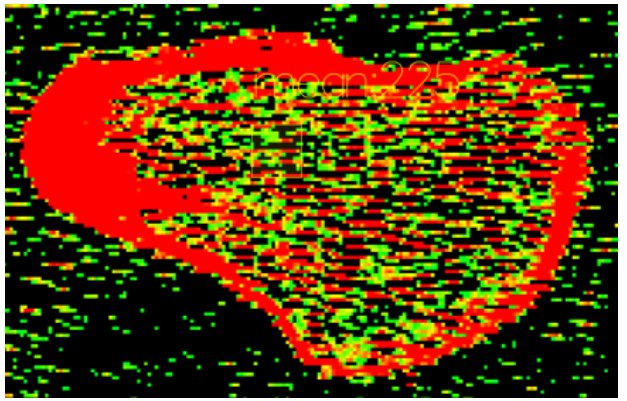
Max 13 mm

Limits of the 2D Templating: unavailable bone Density

- impose →
  - Fixation mode
  - where stem will be seated



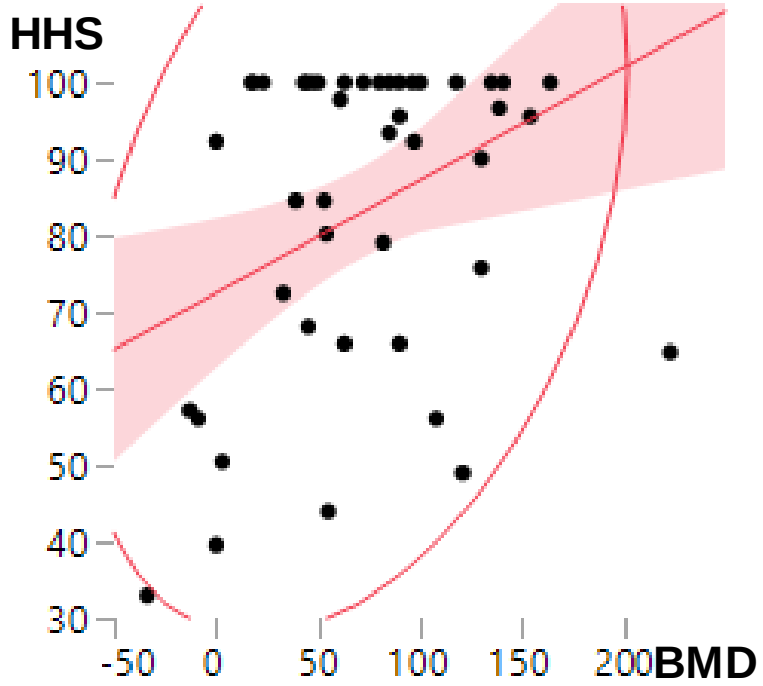


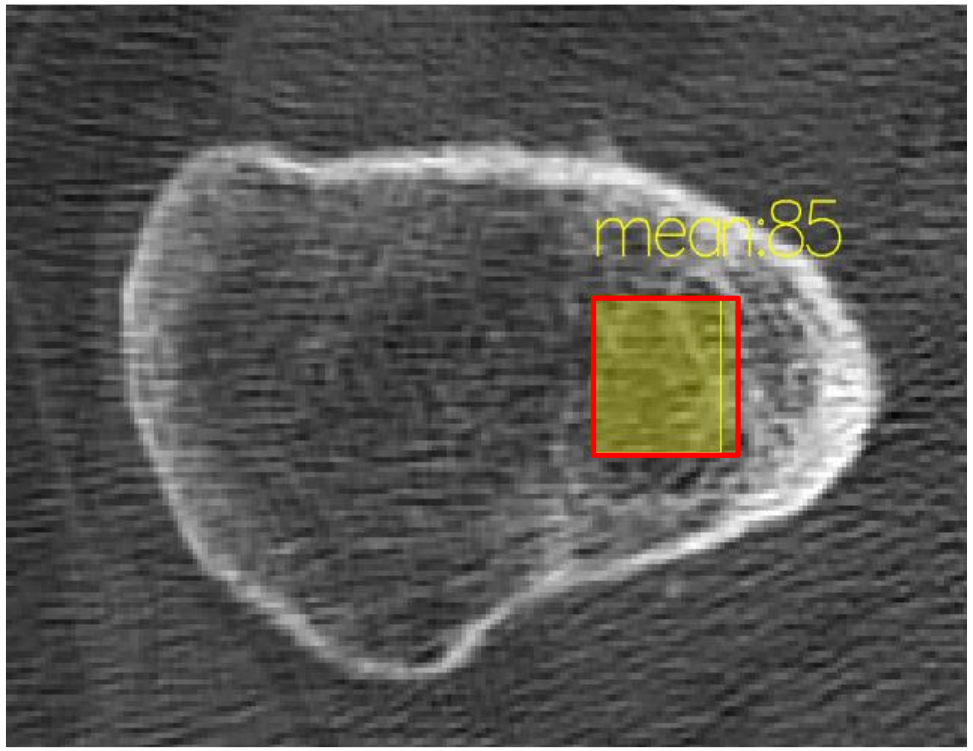


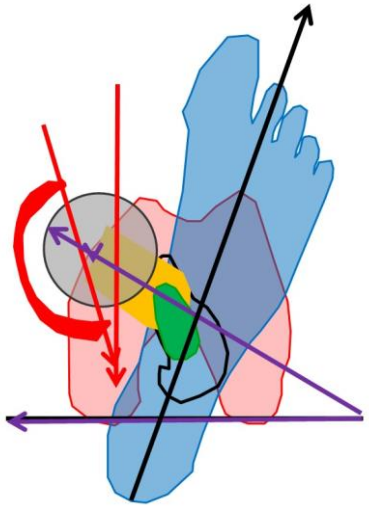
Preop BMD correlates with clinical outcomes

Sariali et al Int Ortho 2020

Cut-off: 72 g/cm3



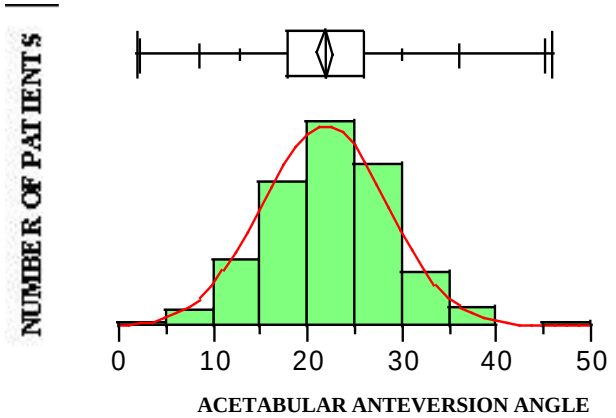




Limits of the 2D Templating unavailable date :Torsions

Sariali et JBJS 2009

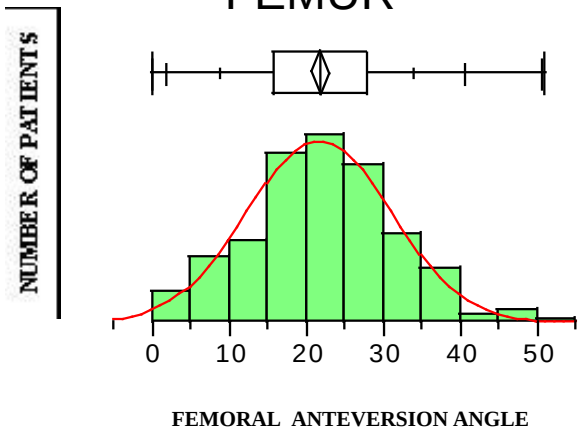
ACETABULUM



Acetabular anteversion in supine position (Murray [6] Technique)

21.9° +/- 6.6°

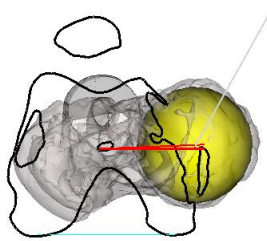
FEMUR

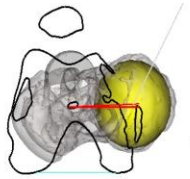


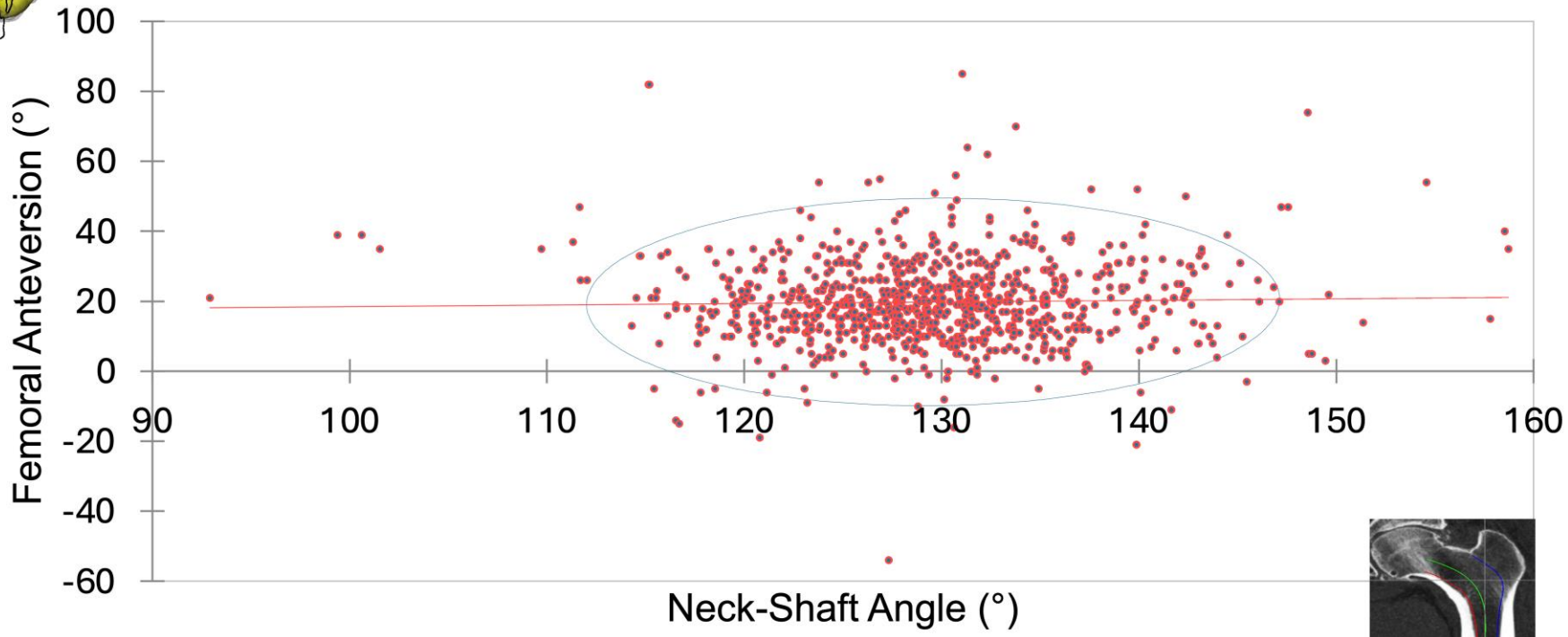
Femoral anteversion (Murphy [8] technique)

21.9° +/- 9.4°

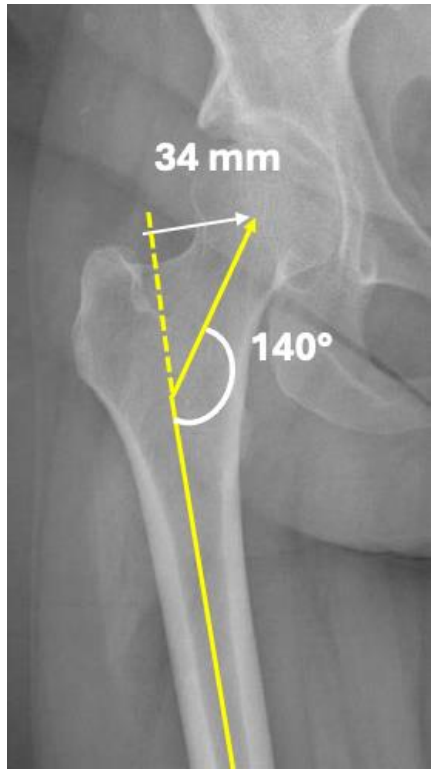
No Correlation: NSA and Femur Anteversion
Sariali et al JBJS Am 2025



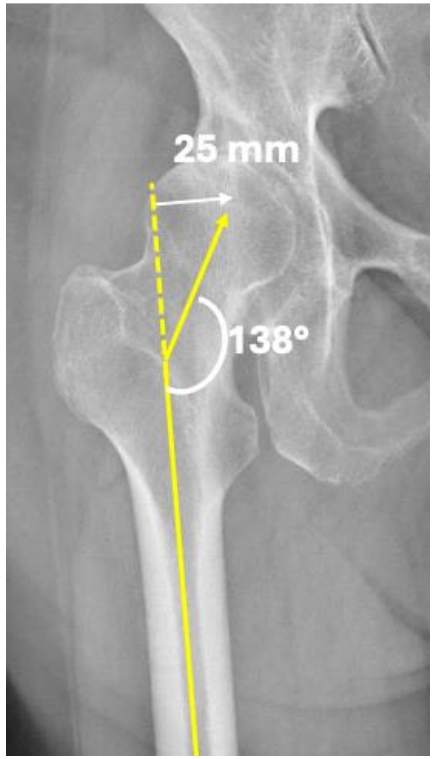




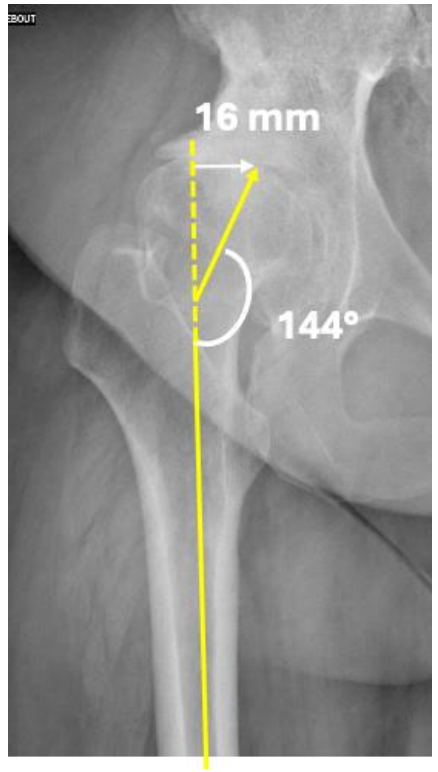
No Correlation: NSA and Femur Anteversion
Sariali et al JBJS Am 2025



6°

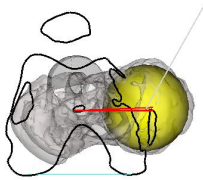


21°



35°

Hip Morphotypes classification



	Retroversa	Neutroversa	Anteversa
Coxa-Vara	1,2%	9,9%	2,0%
Coxa-Neutral	7,4%	56,9%	9,6%
Coxa-Valga	1,4%	9,5%	2,1%

Higher Reliability for 3D measurments

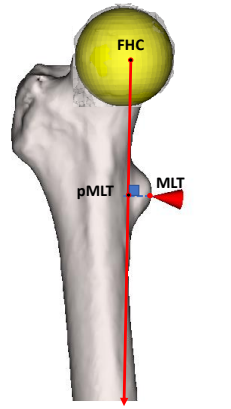
Sariali et al Int Orthop 2021

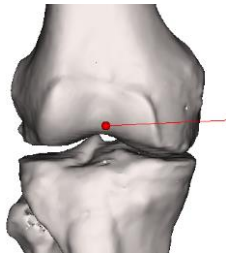
2D

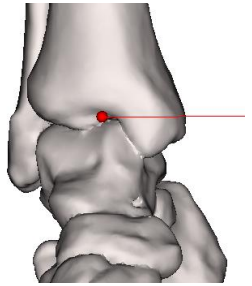
- Intra-articular LLD

- Intra class correlation
  - 0.8 for 2D
  - 0.95 for 3D

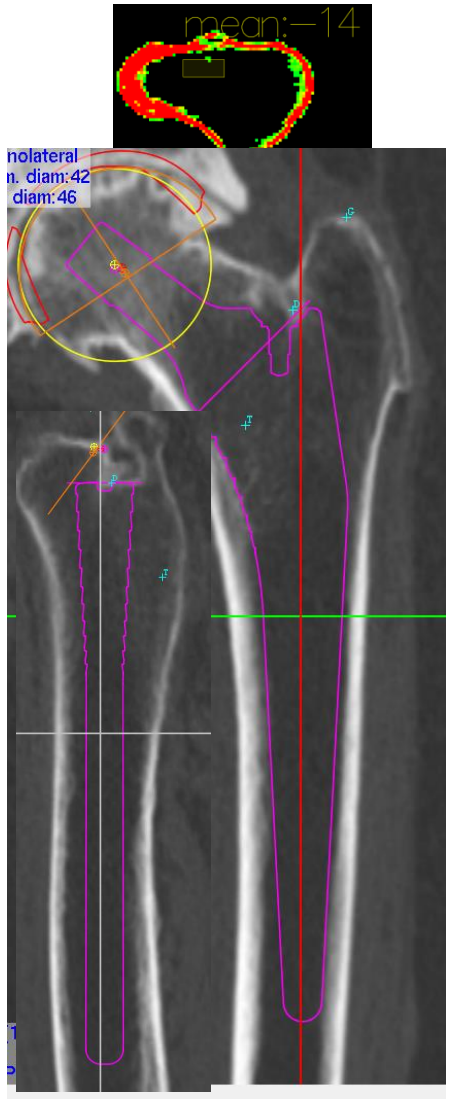
3D



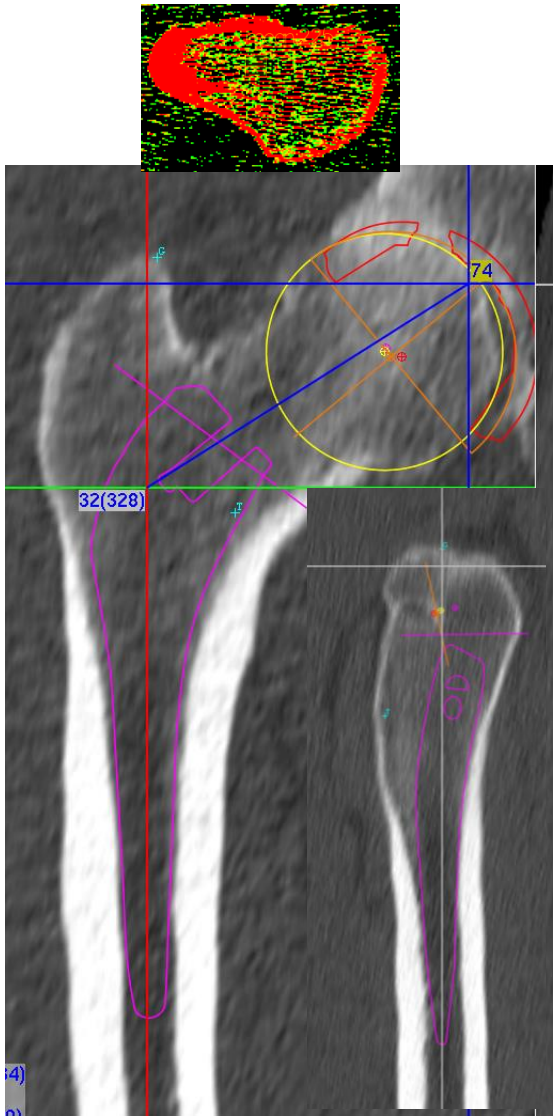




Bone Density/ Femoral Morphotype

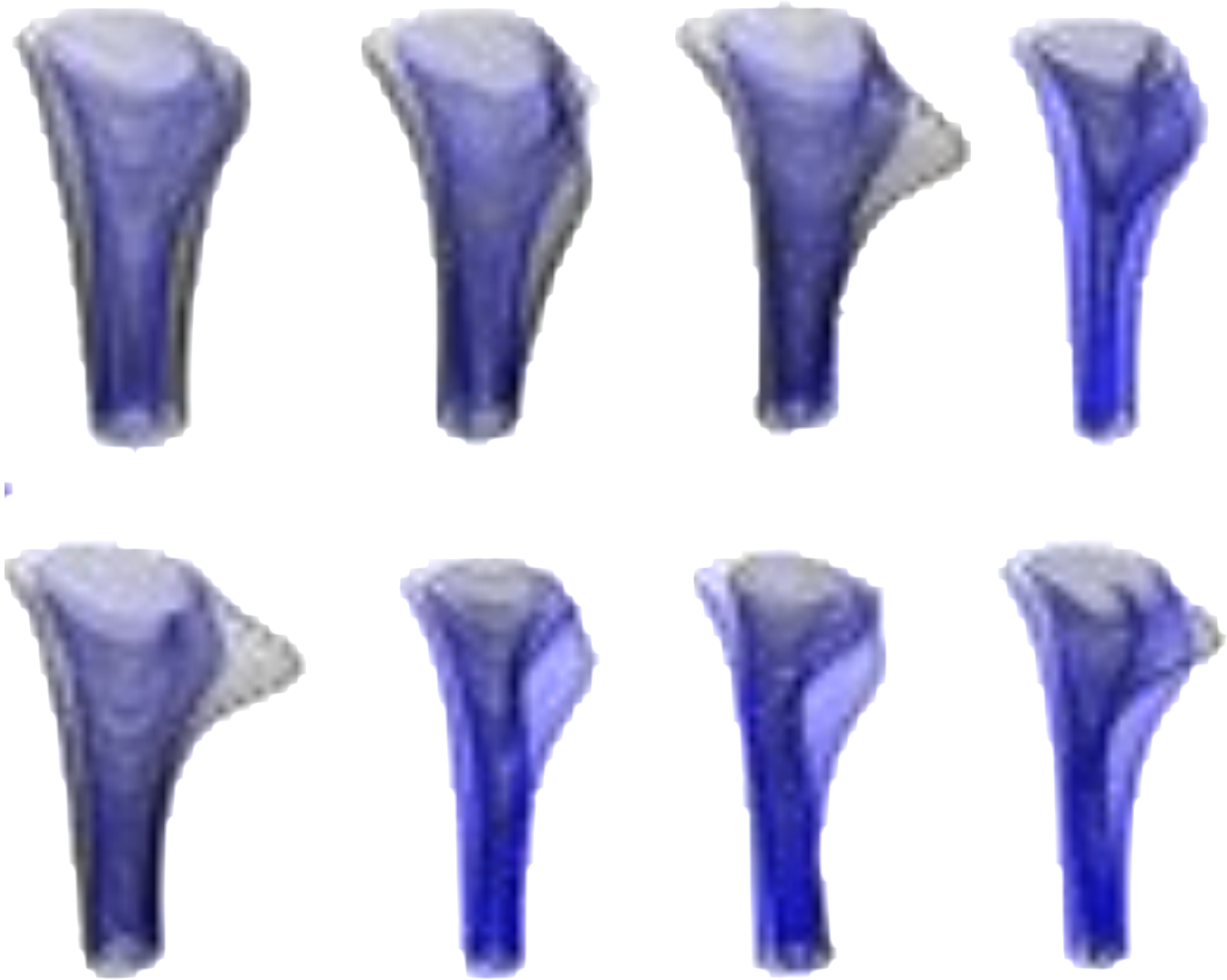


STOVE PIPE/ EMPTY FEMURS



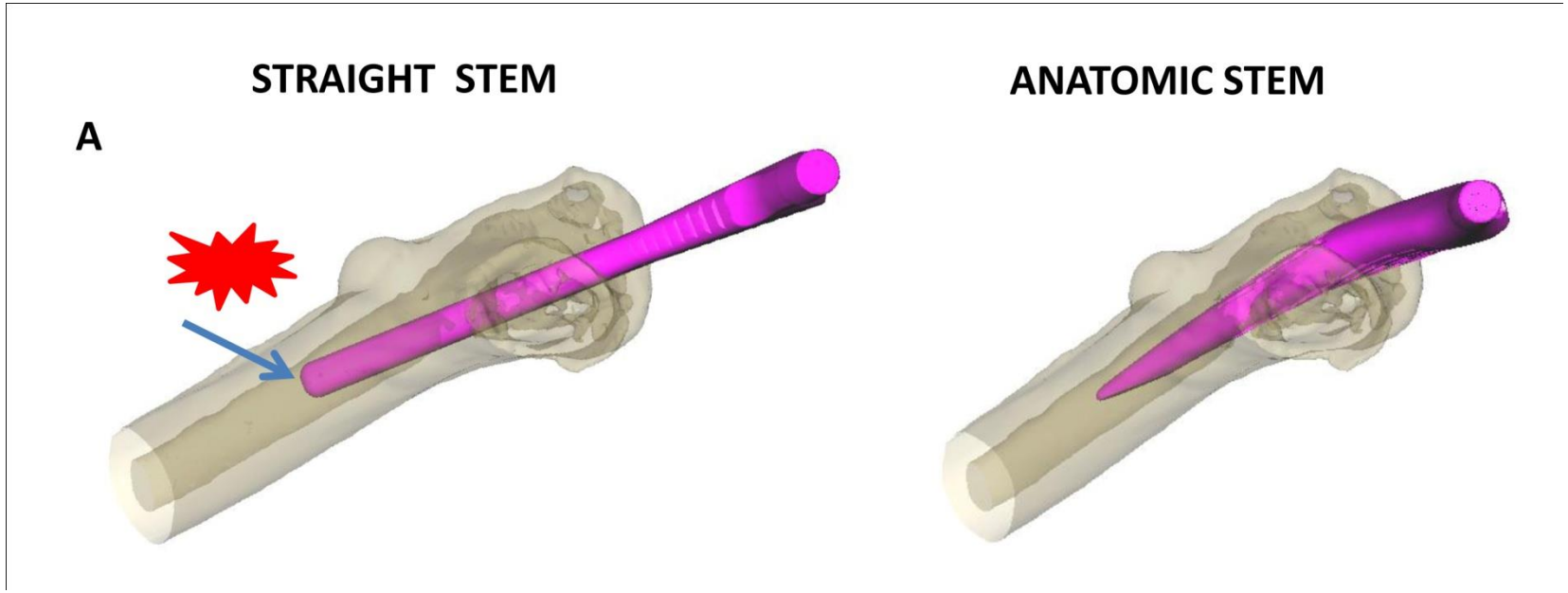
CHAMPAGNE FLUT/ HARD BONE

Very High Variability: femur intracanal anatomy

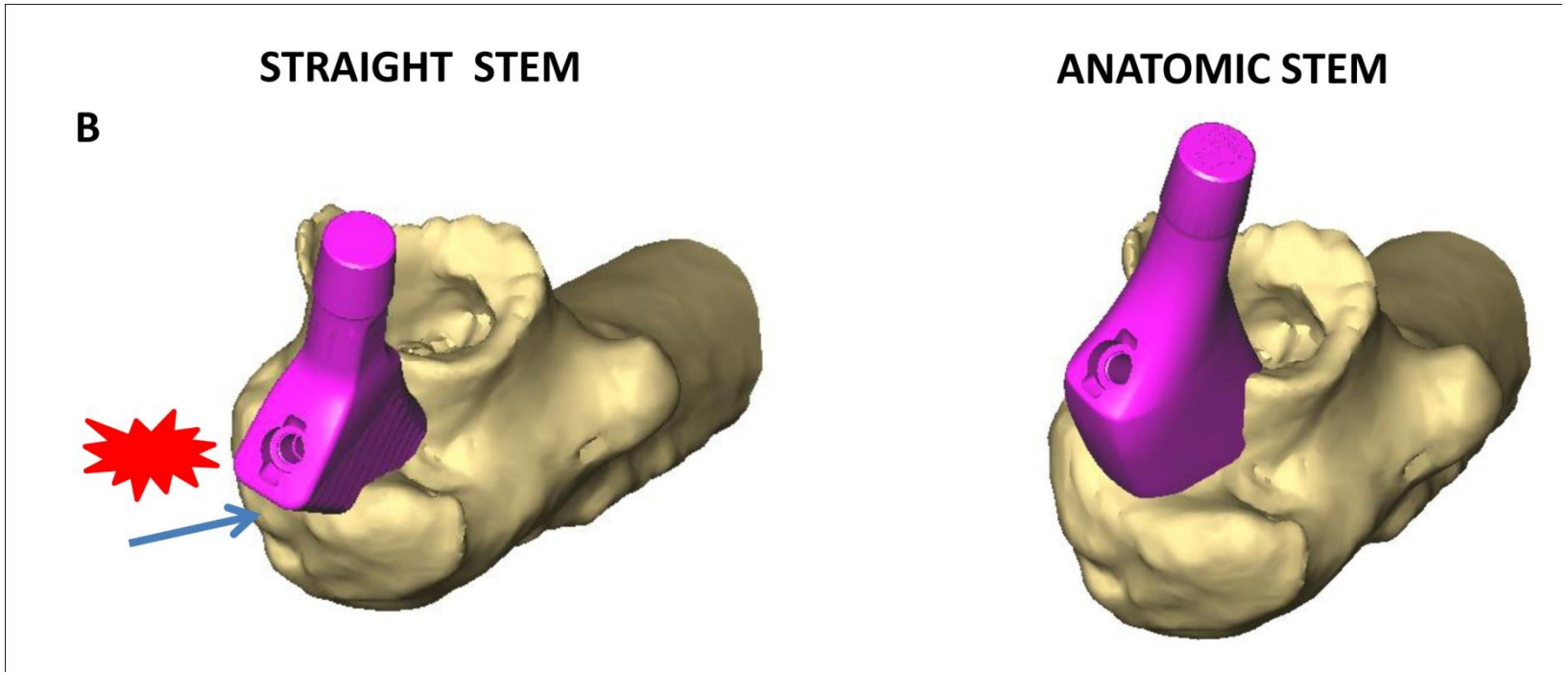


Adapt the stem design to the femur morphotype

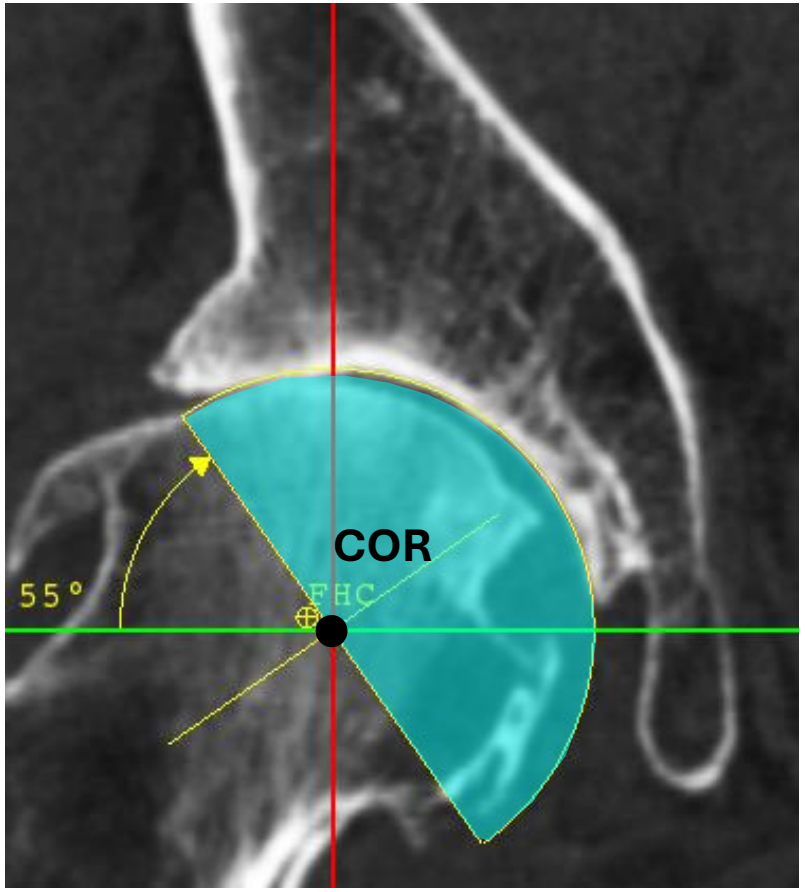
Anatomic stem in case of a high anterior proximal femur flare

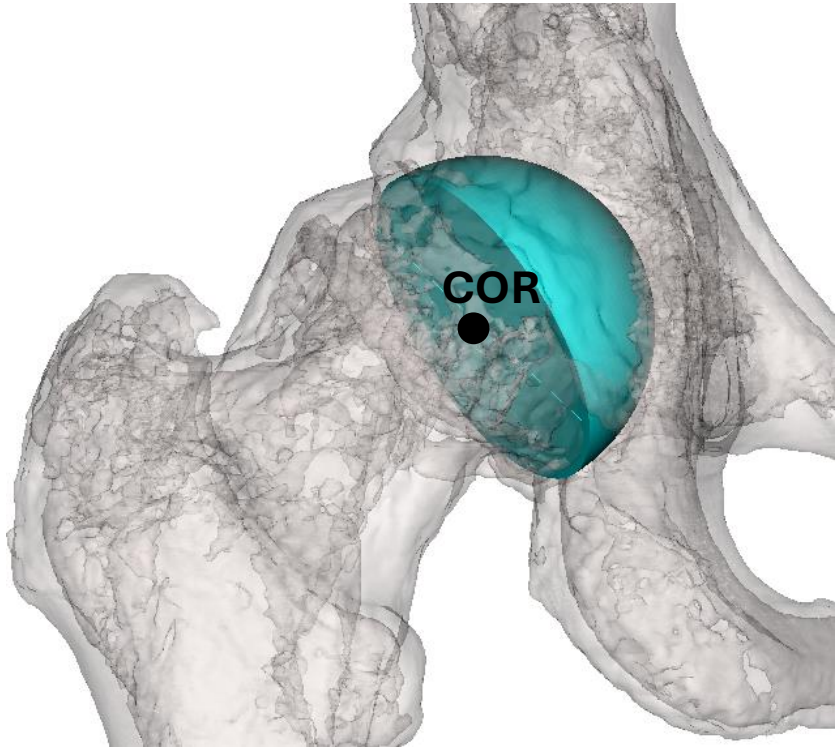


The value of anatomic stem in medially deformed greater trochanter

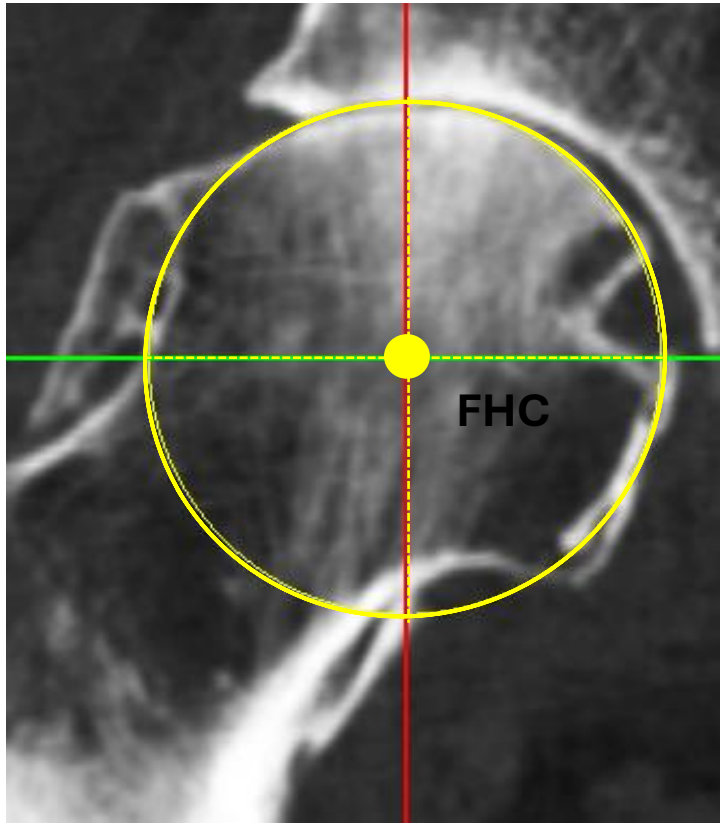


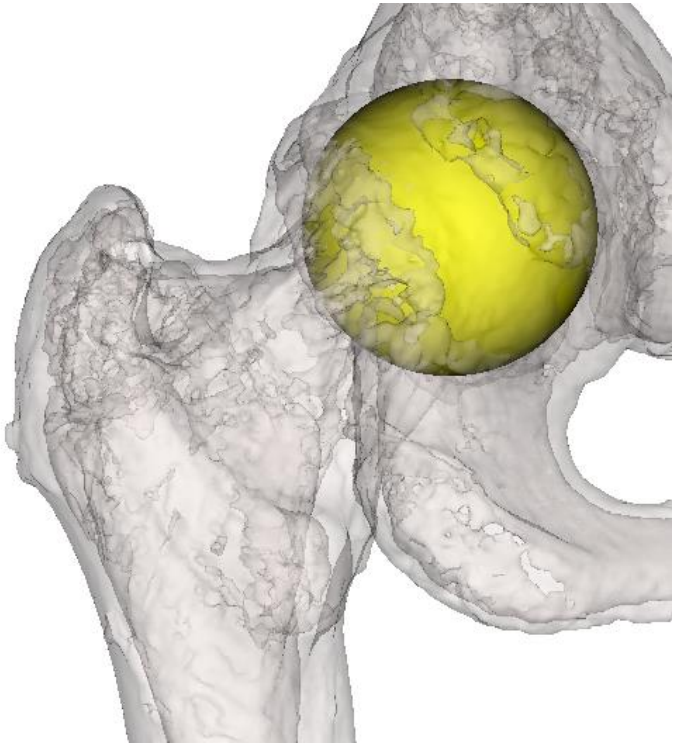
Kinematical alignment principal



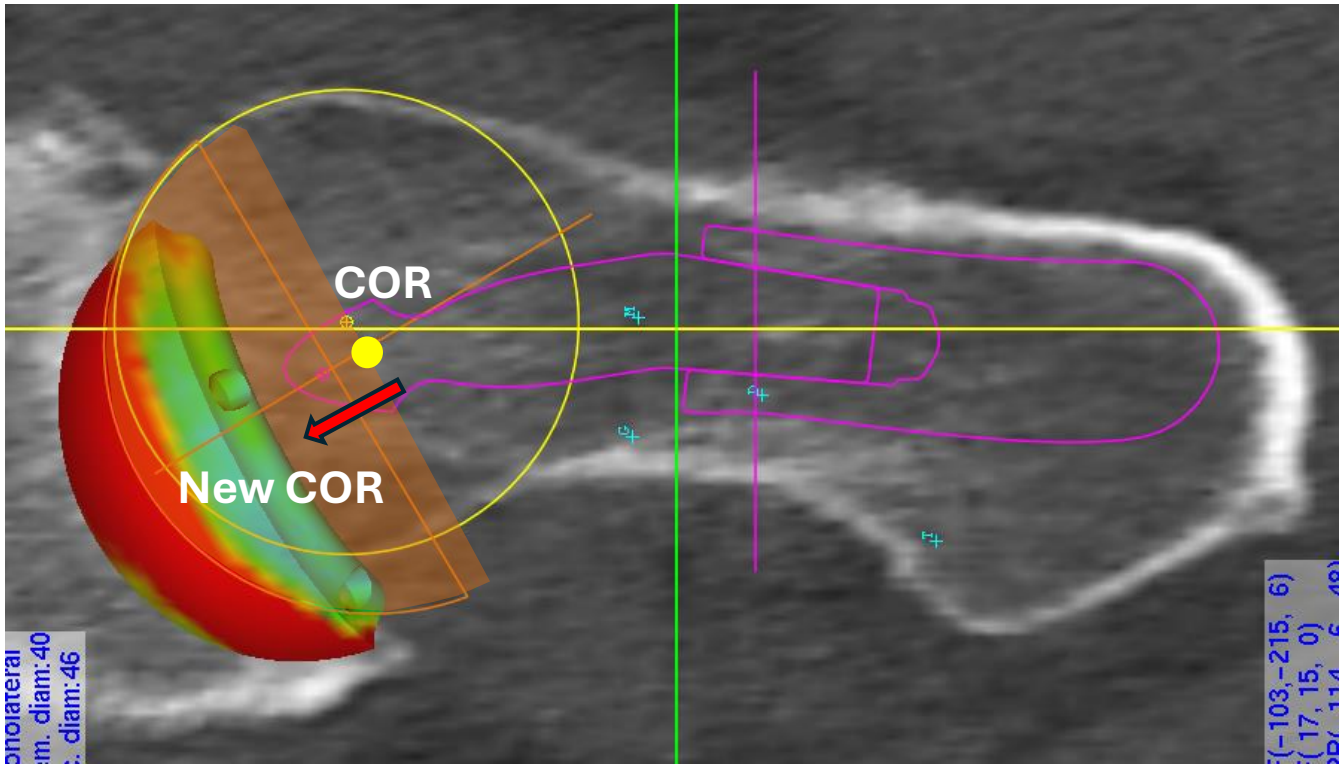


Kinematical alignment principal

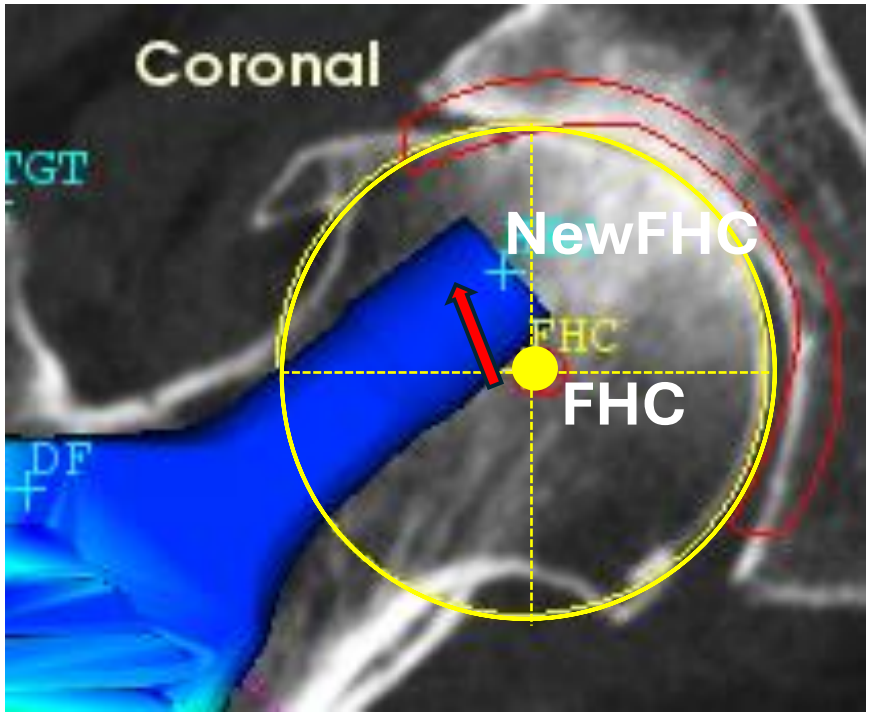




Vecteur Acetabular Displacement: AD

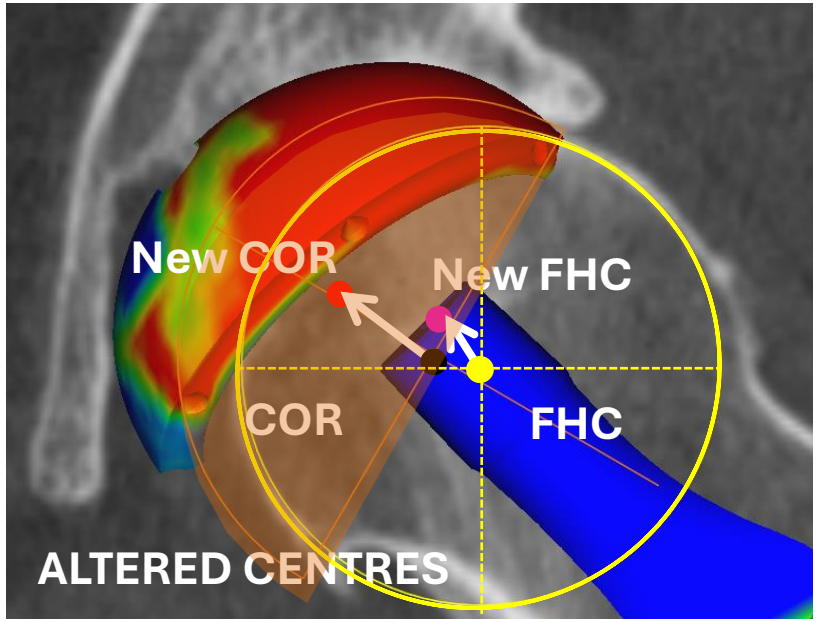


Vecteur Femoral Displacement: $\overrightarrow{FHD}$

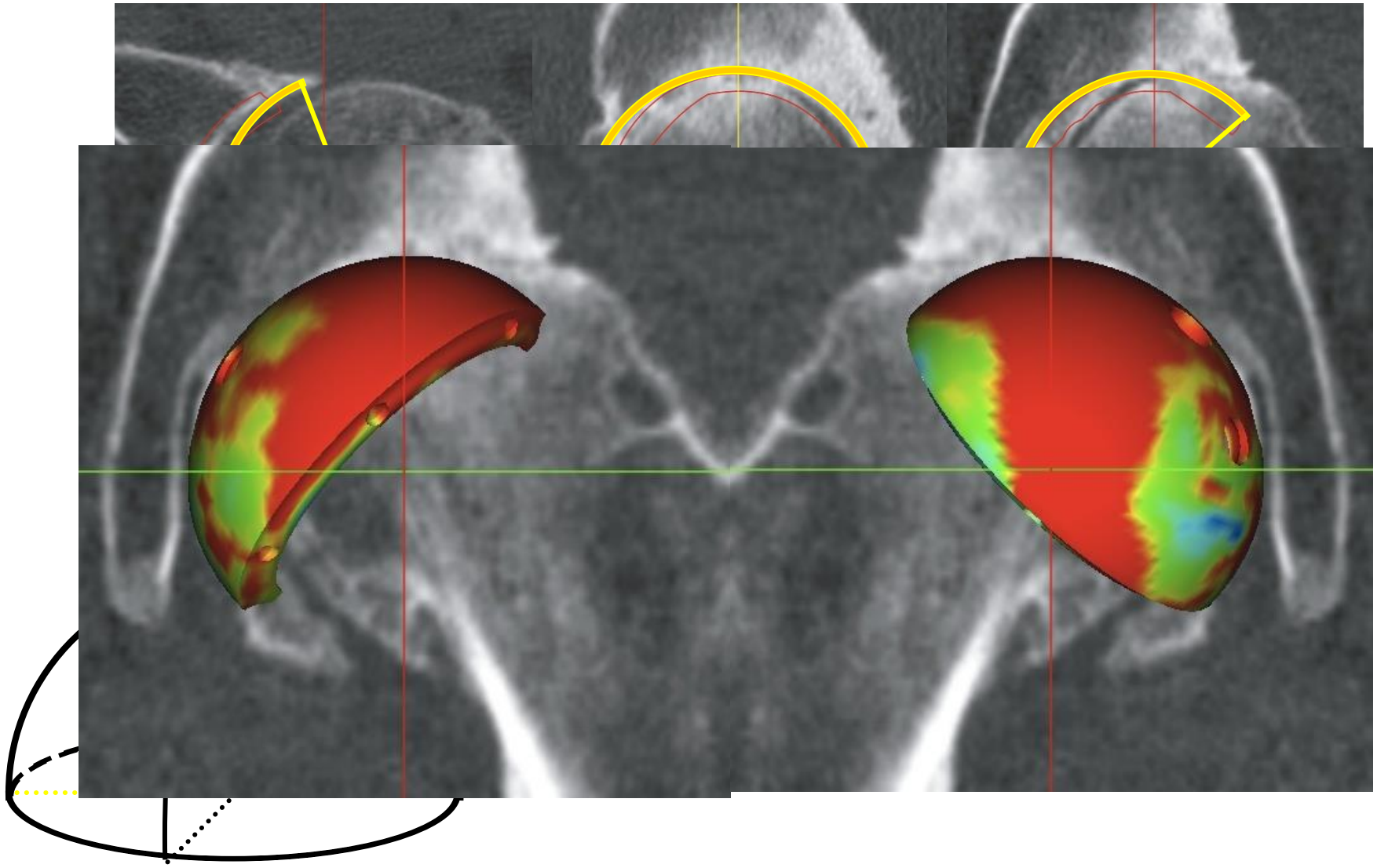


Kinematical alignment
3D vectorial assessment centres alteration induced by Arthroplasty

3D Compensation : $\overrightarrow{AD} + \overrightarrow{FHD} = \overrightarrow{O}$

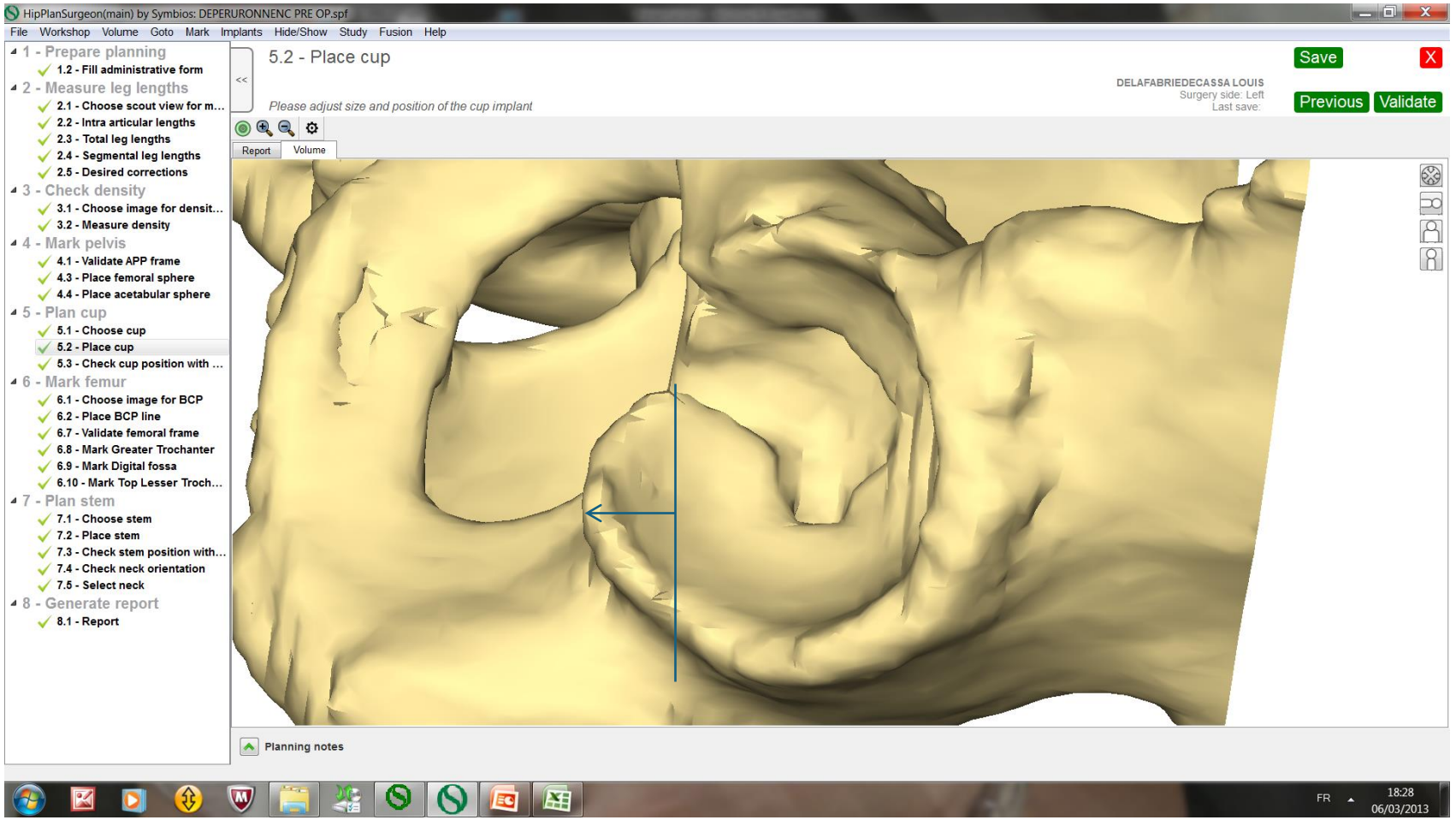


3D Cup Planning

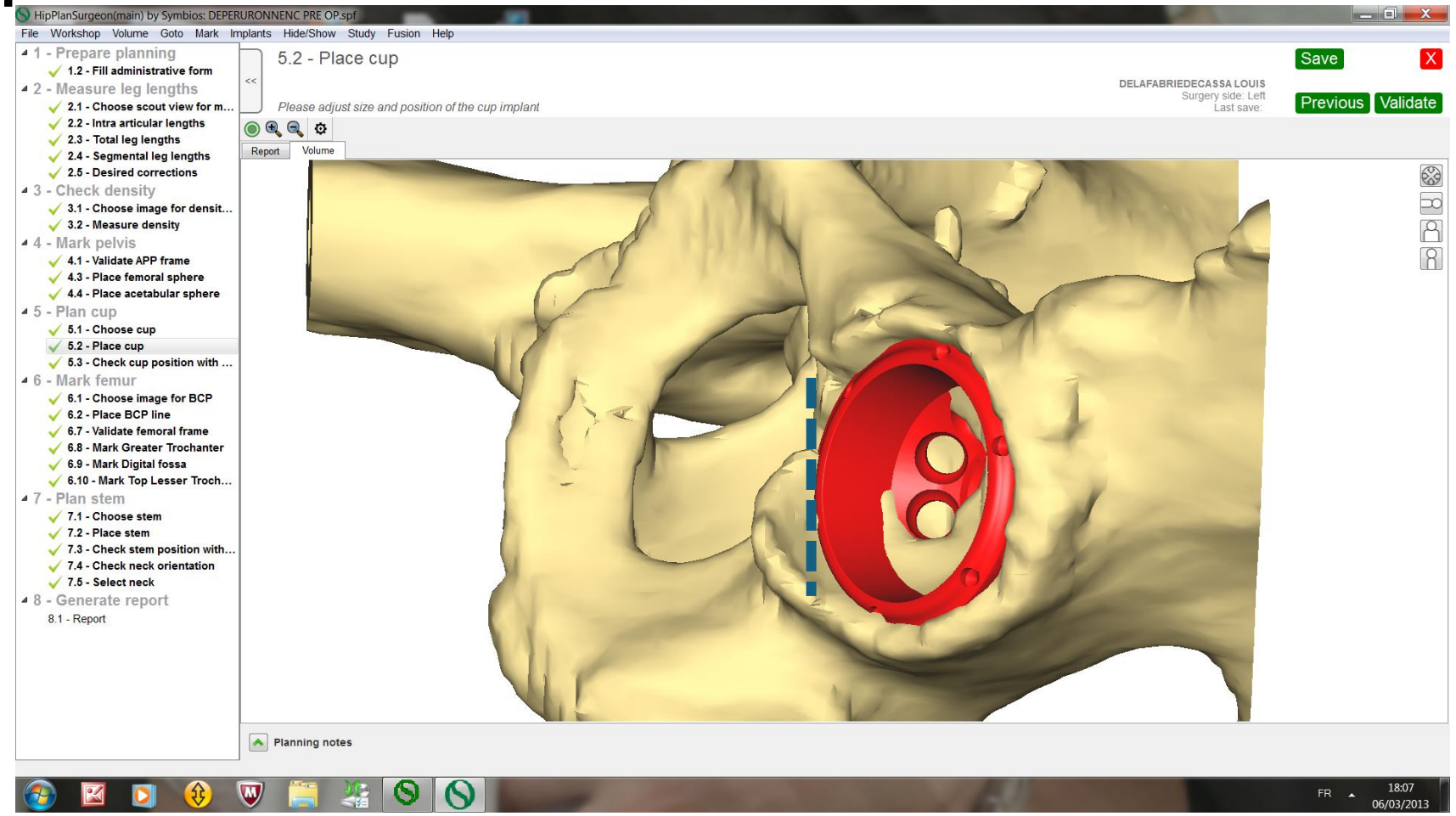


Half-sphere

Preoperative Visualization tool

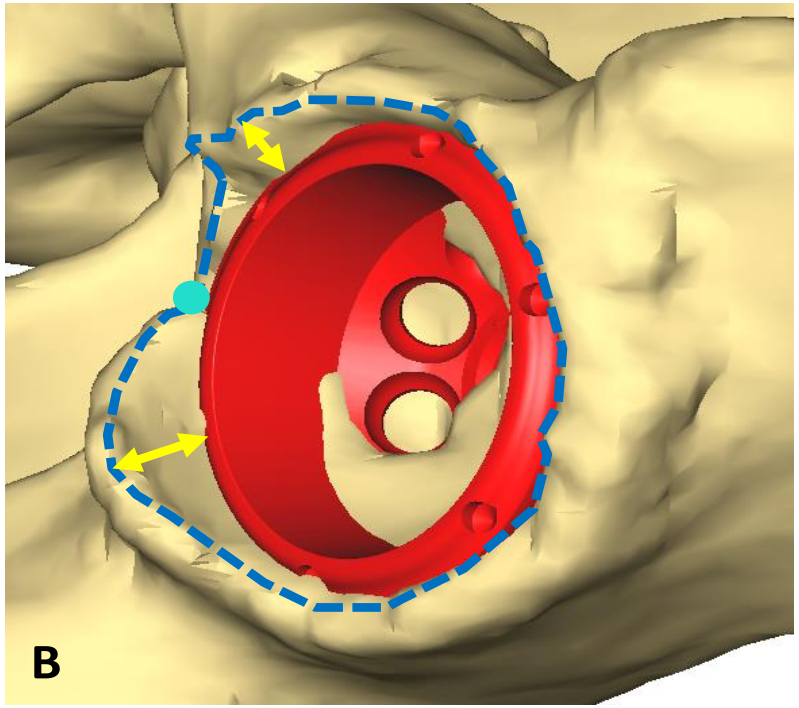


Preoperative Visualization tool



The value of 3DP visualisation tools for cup positionning

Sariali et al JBJS Am 2016

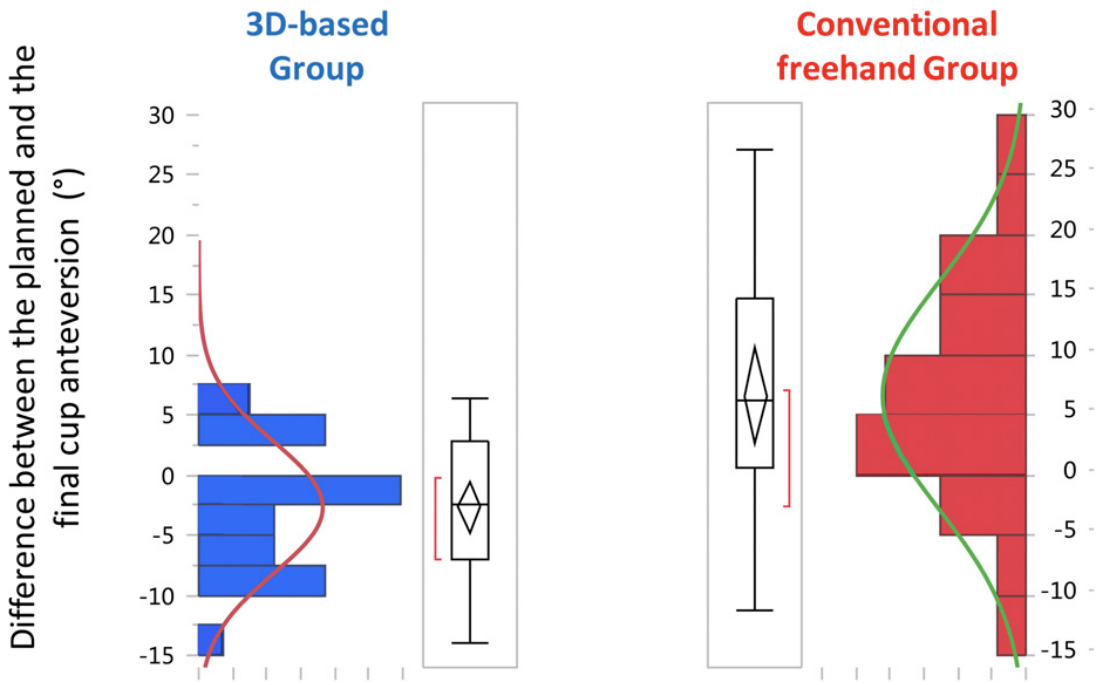


Comparison of Three-Dimensional Planning-Assisted and Conventional Acetabular Cup Positioning in Total Hip Arthroplasty

A Randomized Controlled Trial

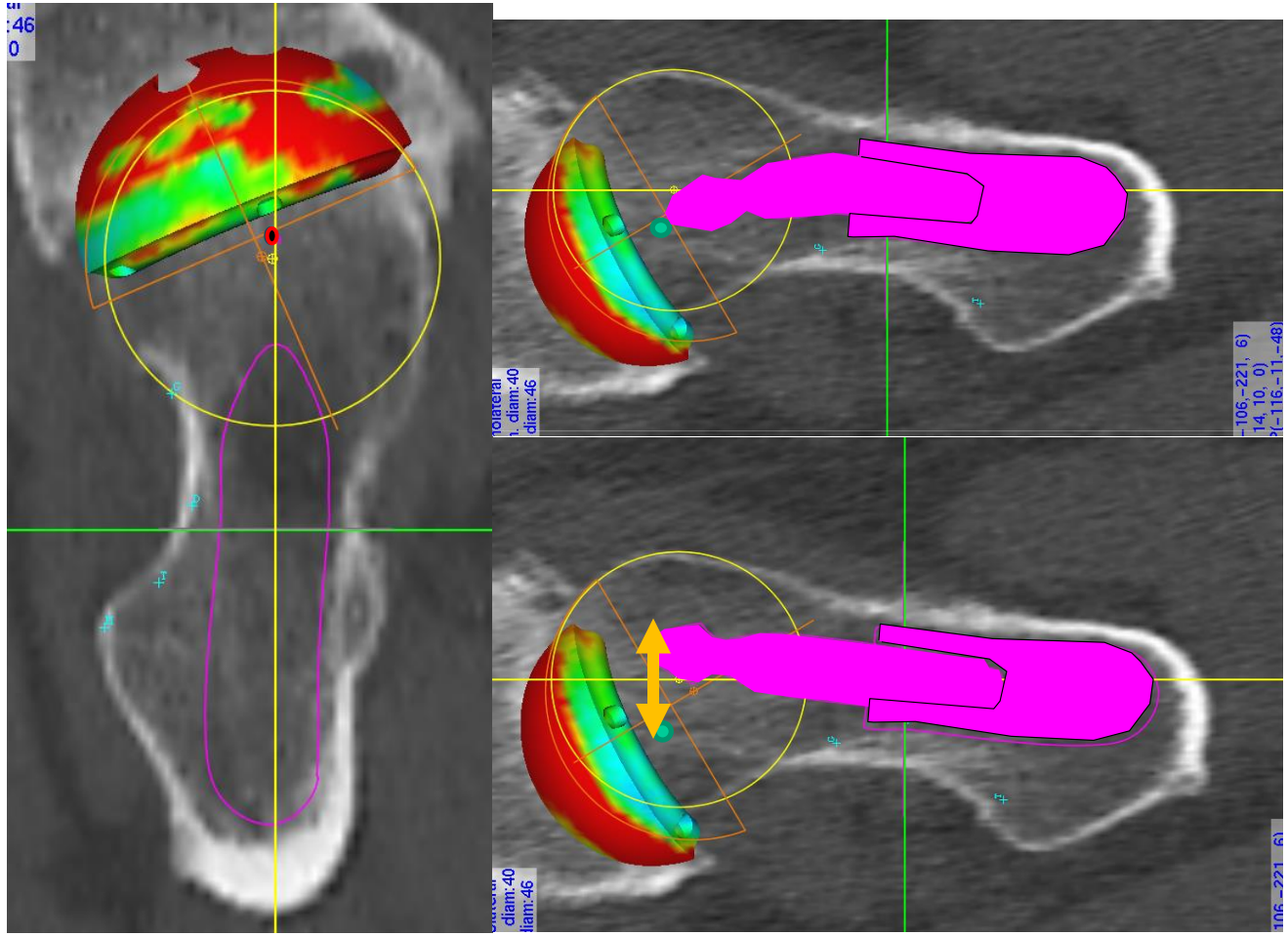
Elhadi Sariali, MD, PhD, Nadia Boukhelifa, PhD, Yves Catonne, MD, and Hugues Pascal Moussellard, MD, PhD

Investigation performed at the Hôpital La Pitié Salpêtrière, Paris, France



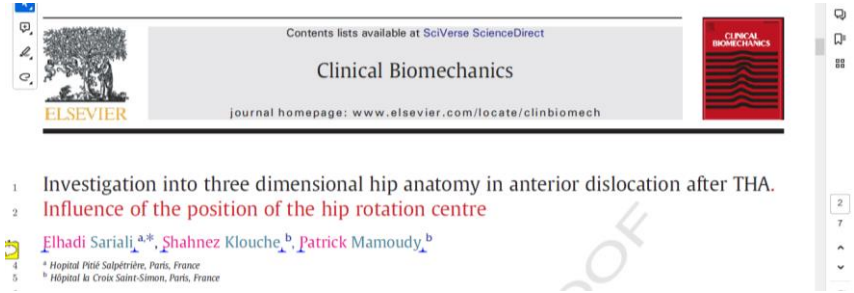
Adapt femoral anteversion

- Mismatch between the acetabulum center Femoral ball center



Dislocation/ Microseparation risk

>8 mm Mismatch



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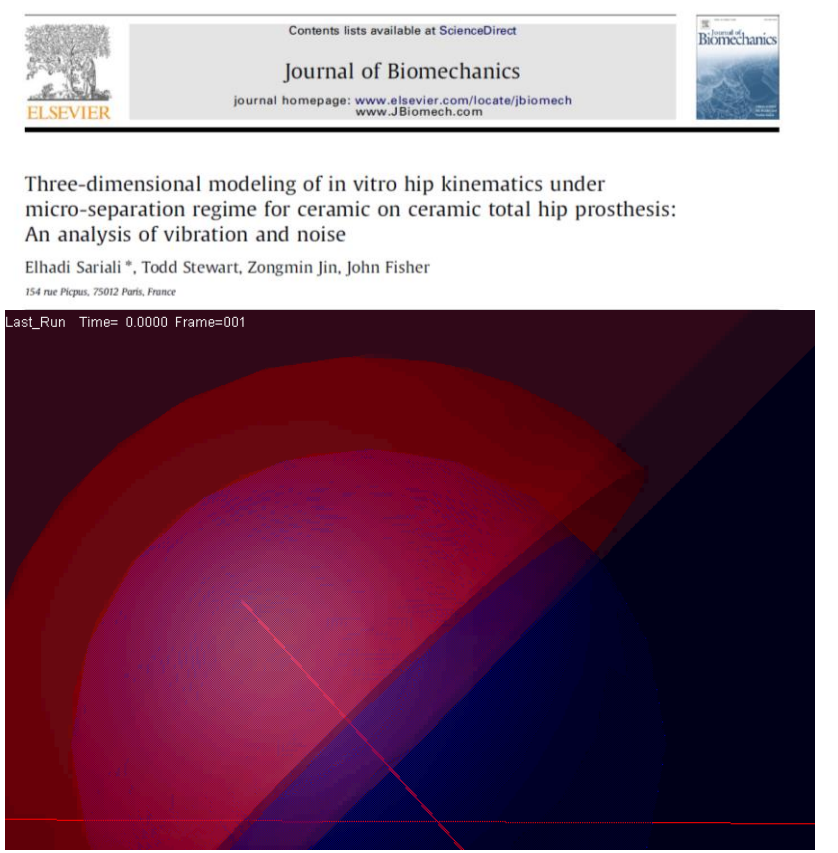
journal homepage: www.elsevier.com/locate/clinbiomech

Investigation into three dimensional hip anatomy in anterior dislocation after THA. Influence of the position of the hip rotation centre

Elhadi Sariali [a,*], Shahnez Klouche [b], Patrick Mamoudy [b]

[a] Hopital Pitié Salpétrière, Paris, France
[b] Hôpital la Croix Saint-Simon, Paris, France

4 to 8 mm Mismatch



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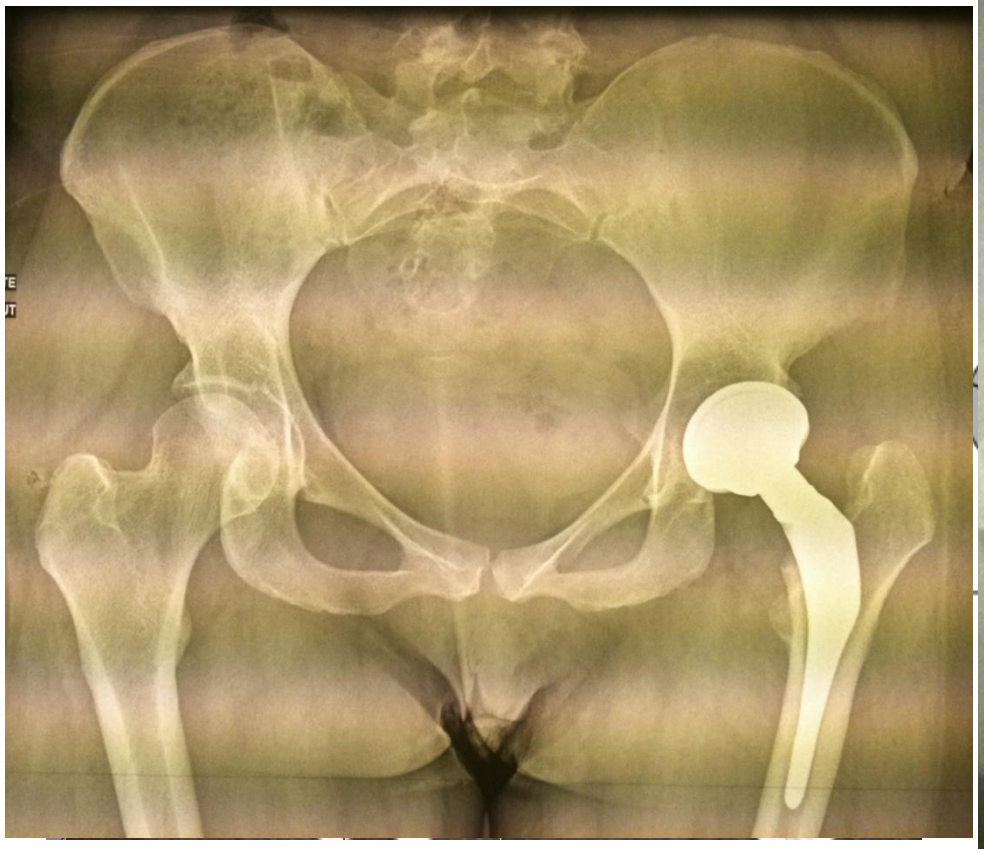
Three-dimensional modeling of in vitro hip kinematics under micro-separation regime for ceramic on ceramic total hip prosthesis: An analysis of vibration and noise

Elhadi Sariali *, Todd Stewart, Zongmin Jin, John Fisher

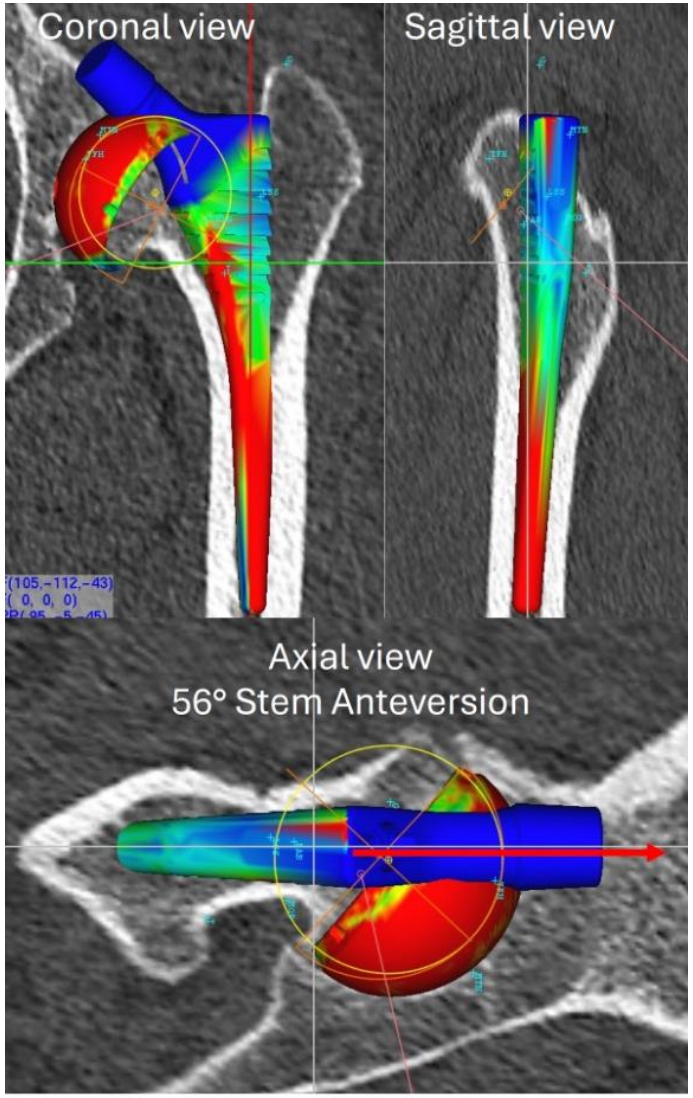
154 rue Picpus, 75012 Paris, France

Custom designed stems based on CT scan

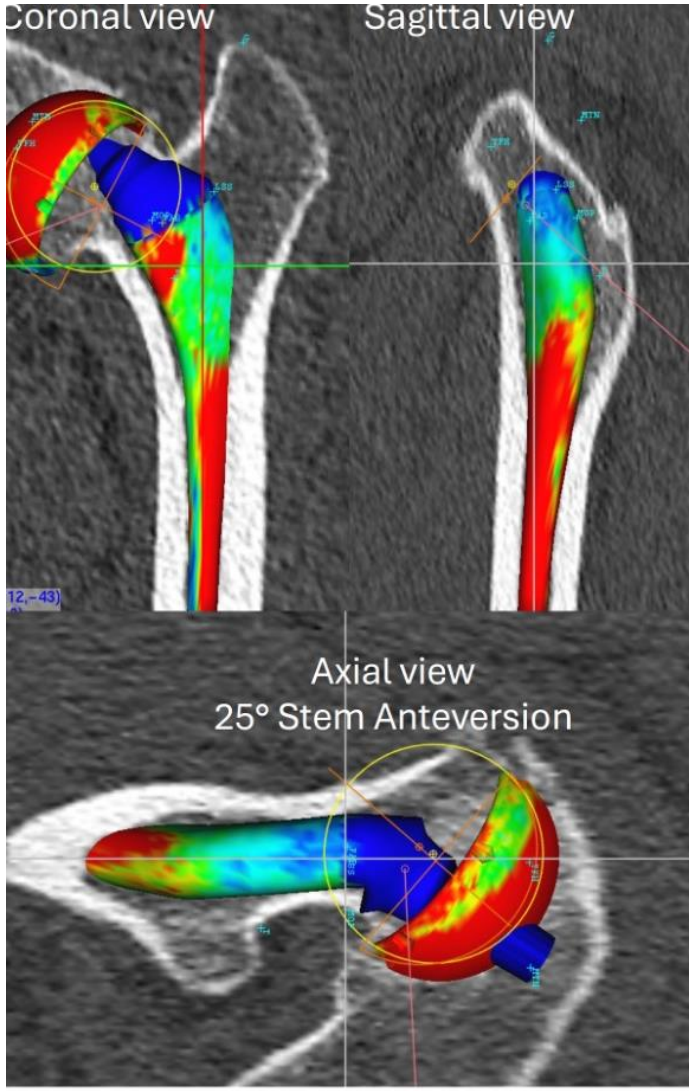
- Torsional abnormality of the femur



56° Standard stem Anteversion



25° Custom stem Anteversion



A 20-year follow-up evaluation of total hip arthroplasty in patients younger than 50 using a custom cementless stem.

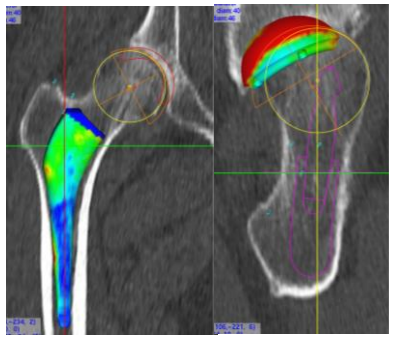
Dessyn E[1], et al

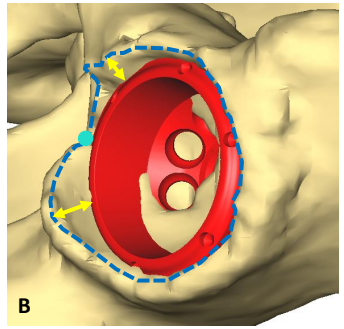
For Whom?
Usefull for Everyone!!
Mandatory in 13%

Material and Methods

- Prospective study
- Orthowave v7 (PROMS, Complications)
- Included: all patients
  - Surgery 2009 to 2021: 1 senior surgeon
  - THA par DAA
  - Implants: APRIL/ SPS system
  - Alumina-Alumina
  - Diamètre 28 (<44), 32(44< <52), 36 mm

- Low-dose CT TDM
  - 3D Planning (Hip Plan)
  - Kinematical alignment



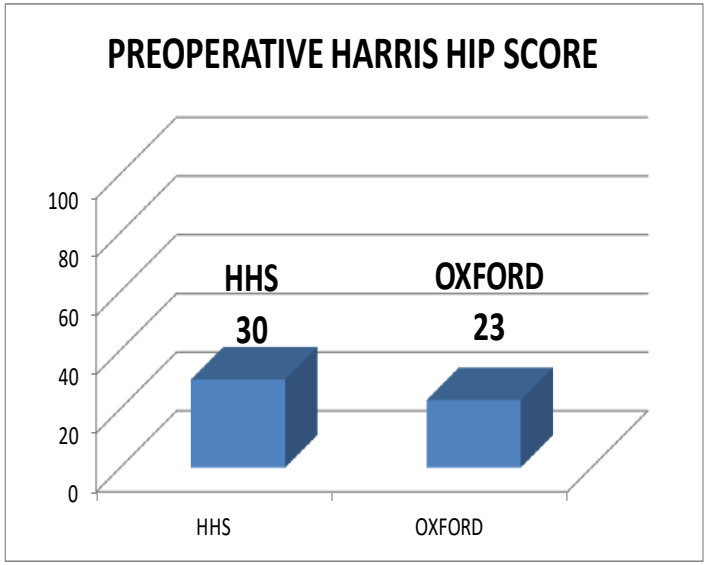


Results

•1210 consecutive patients consécutifs

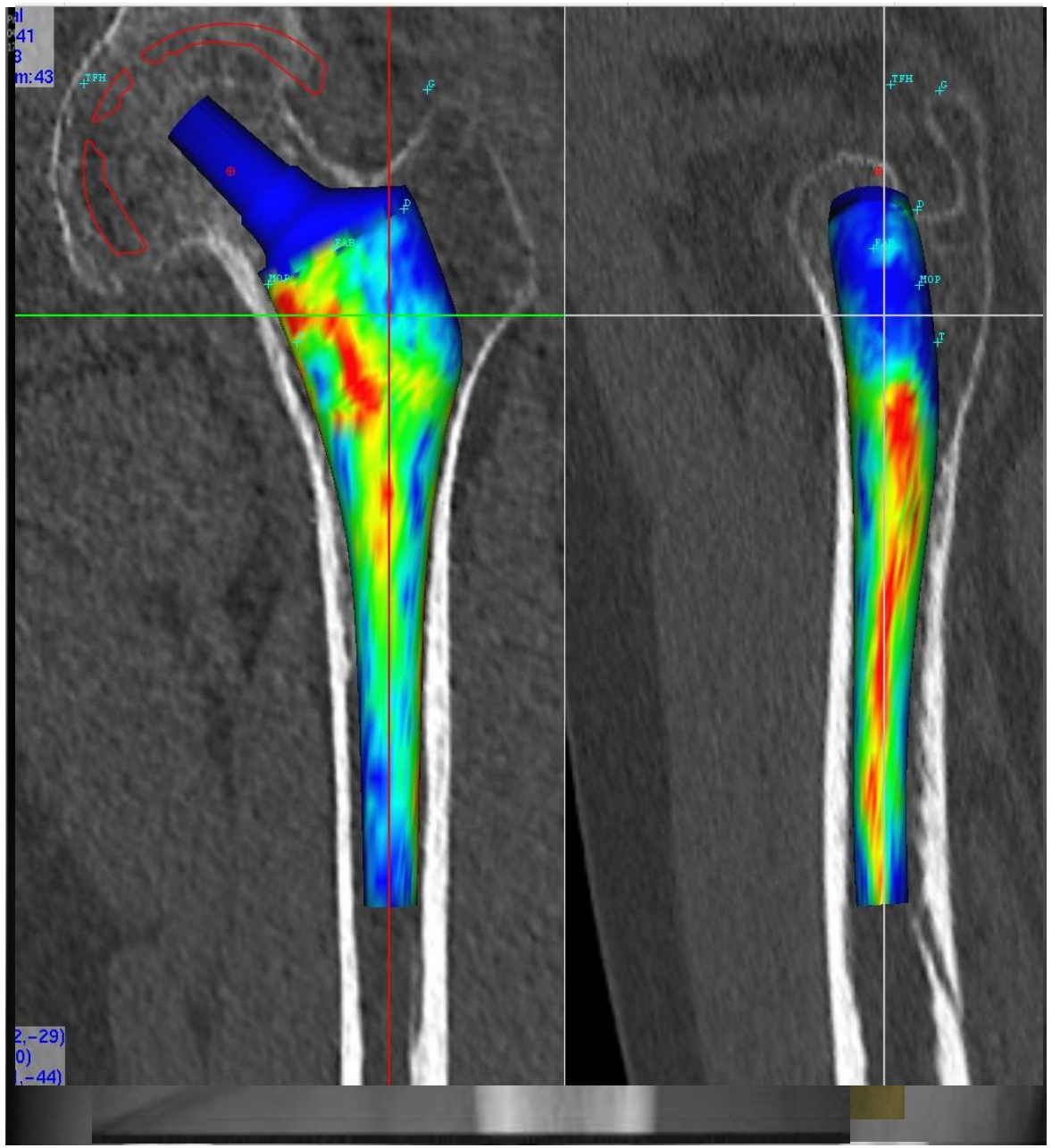
• a custom stem required in 137 patients (13%)

- ➢80 F/ 57 M
- ➢Mean age 48 ±15.4
- ➢24: previous surgery
- ➢Mainly DDH



Screening to detect the 13% outliers

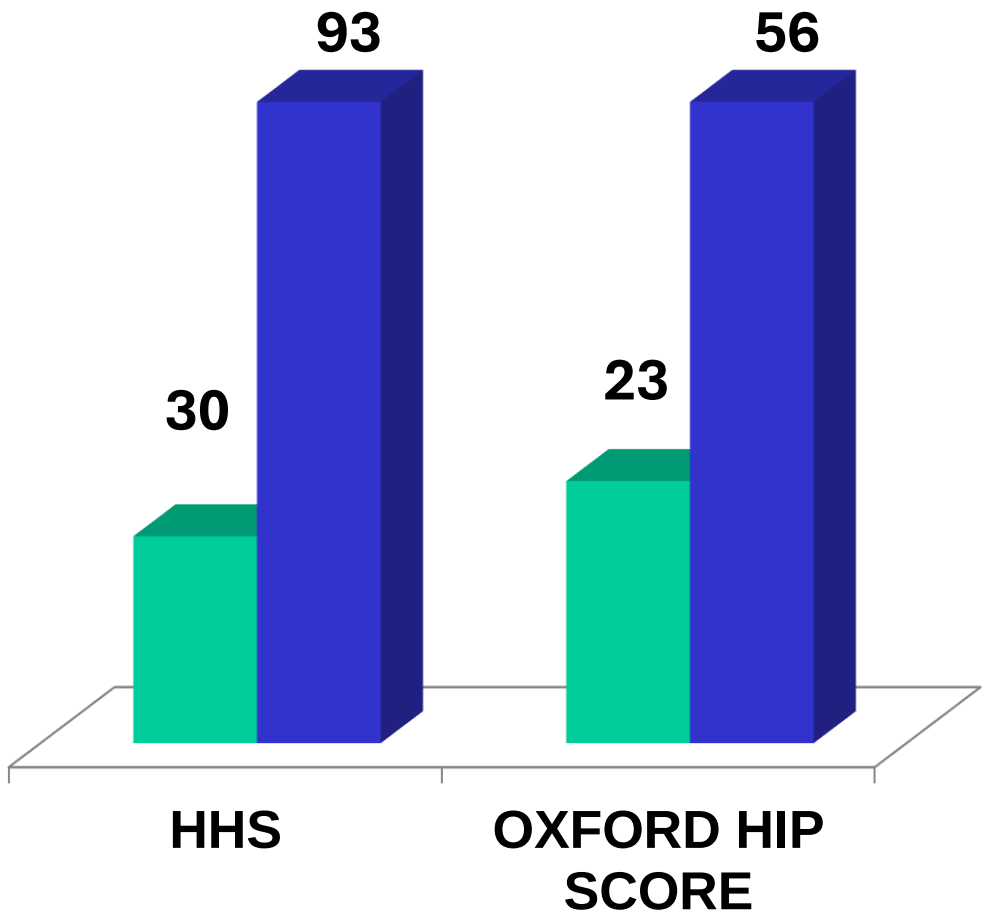
- Severe torsion abnormalities
- Coxa valga:
  - To avoid fractures
  - Increase in FO
- Coxa vara
  - Avoid excessive lengthening
  - Decrease in FO
- Long Necks
- Small narrow femurs
- To achieve an optimal fit:
  - Increase primary stability
  - Whilste avoiding fracture



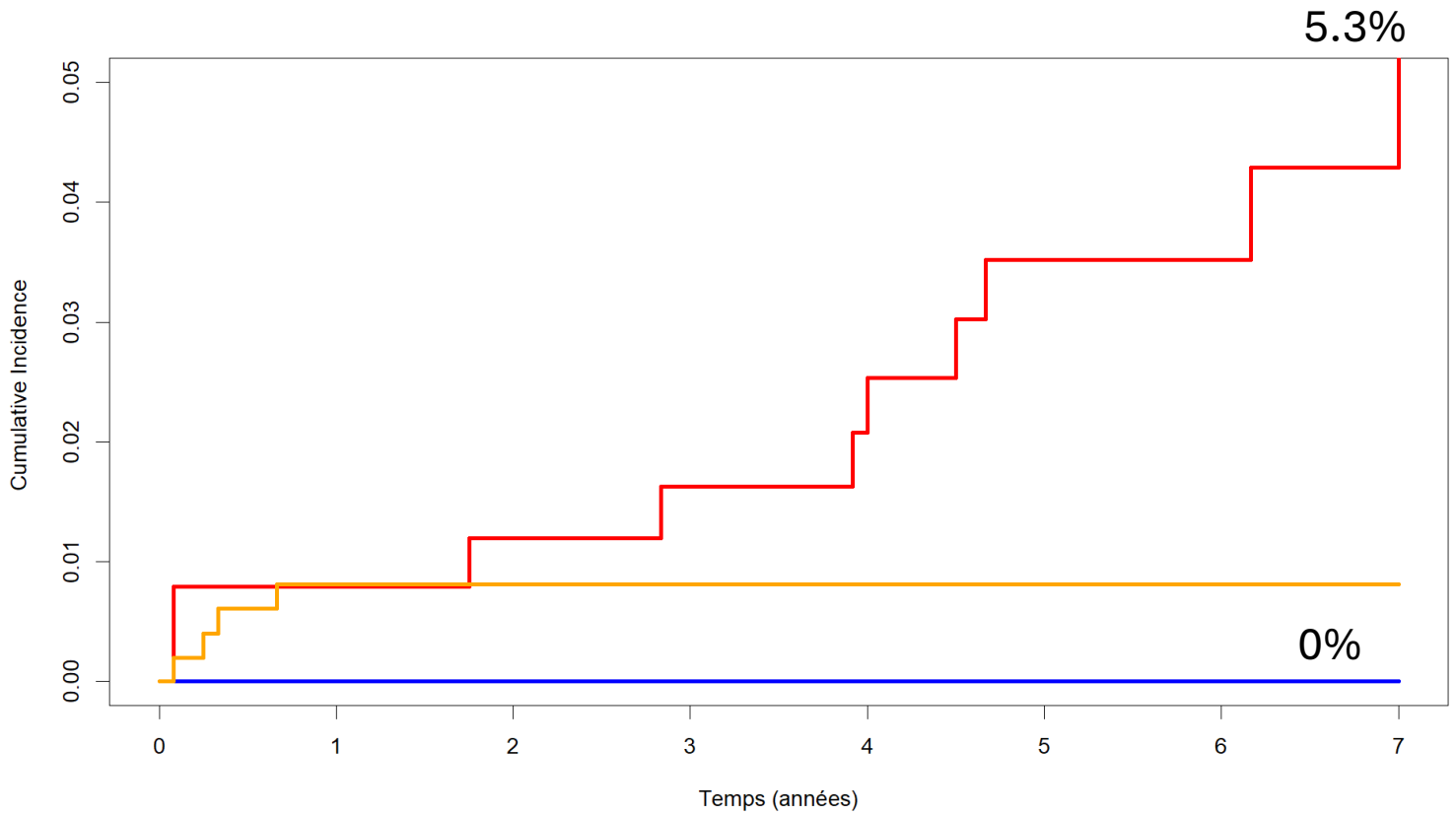
Excellents midd-term results: Custom stems

- A 8 ± 2.5 years follow up
  - No lost atL Fup
  - No dislocation
  - No LLD> 5mm
  - No fractures

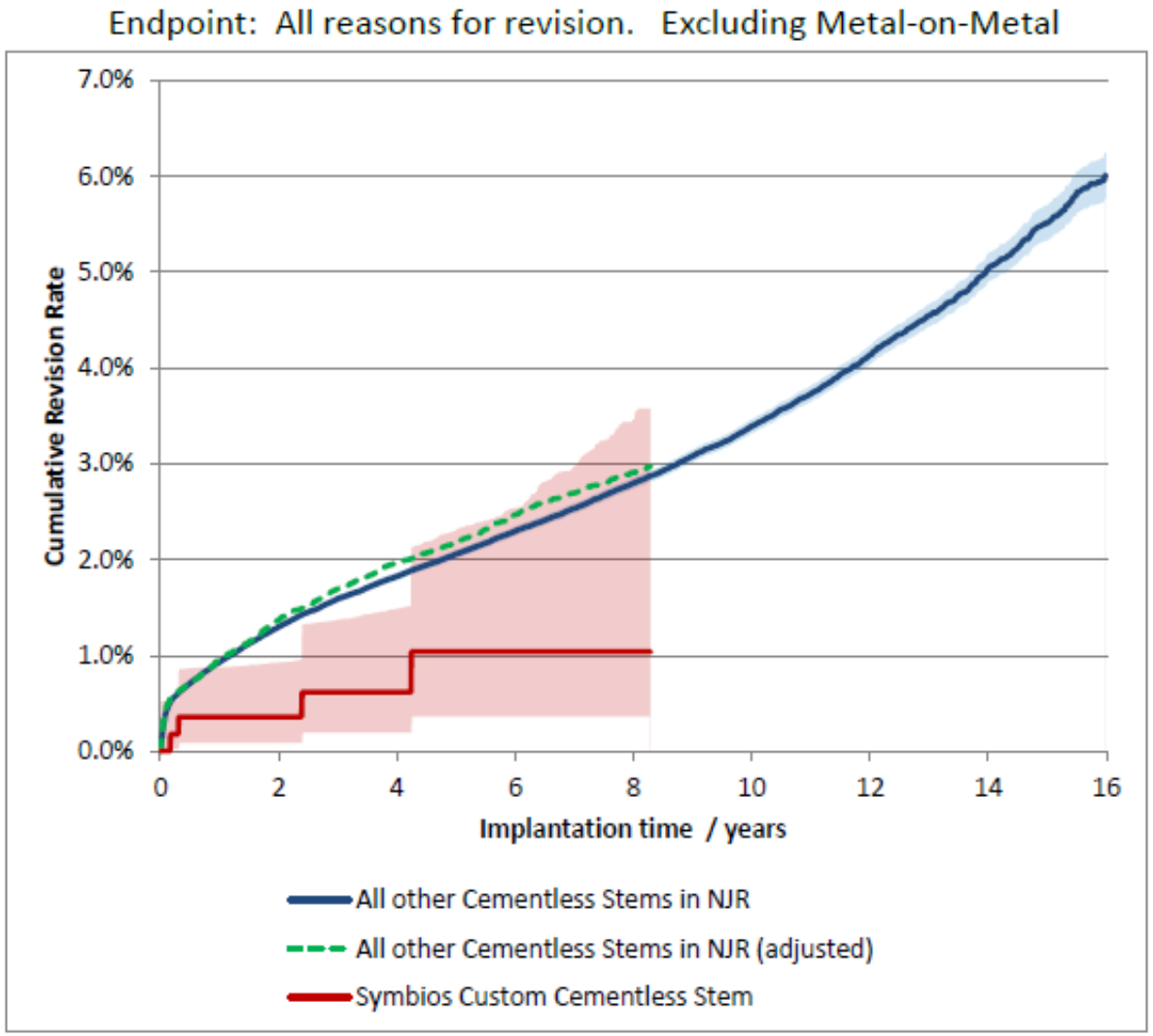
- Excellent clinical results
  - 93 ± 16
  - 56 ± 9



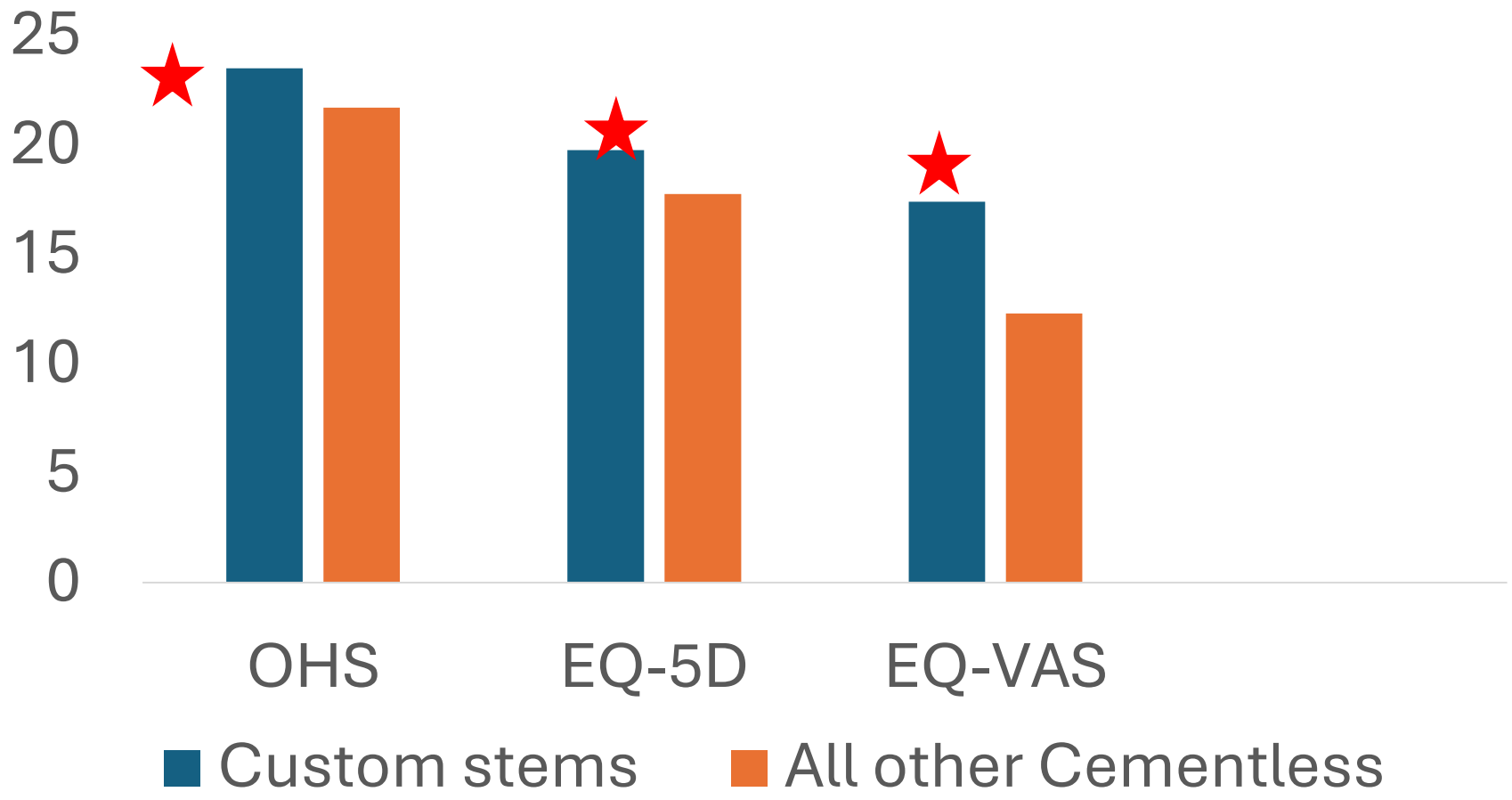
No mechanical Failure at 8 years Fup
Comparison to standard stems (Orthowave Registry)



National Joint Registry UK: Lower Revision Rate



National Joint Registry UK: Better PROMS



THANK YOU