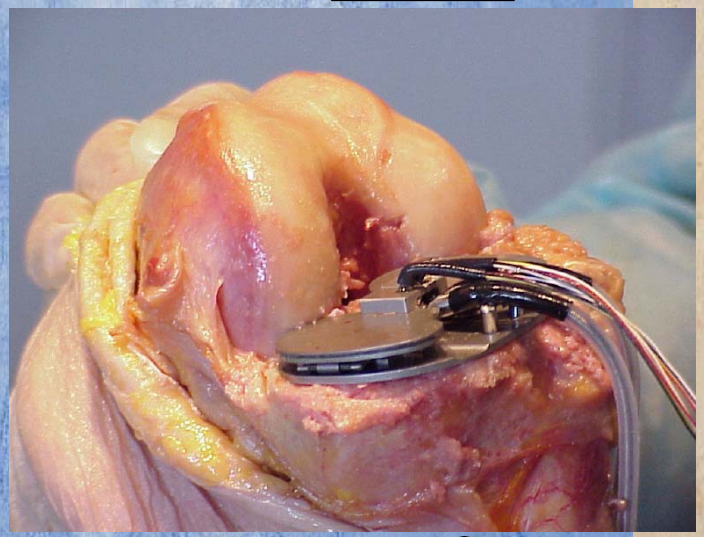
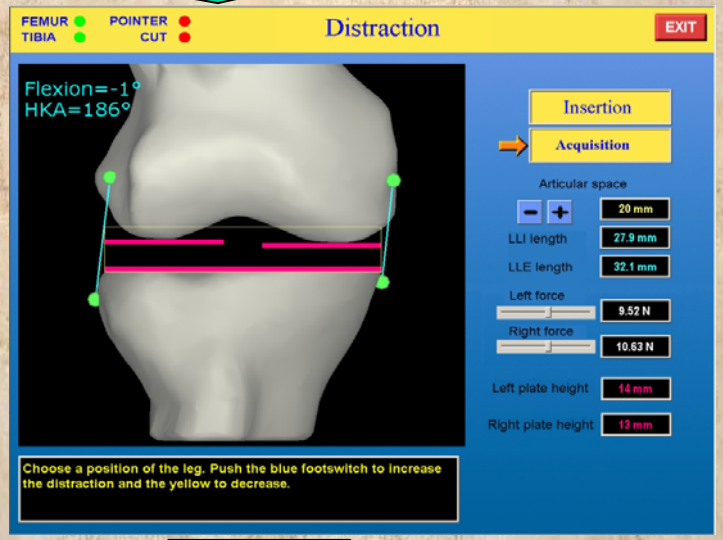
Decision

- **Level 2 : based on dynamic per-operative data**
  - **Loop until the threshold is reached**



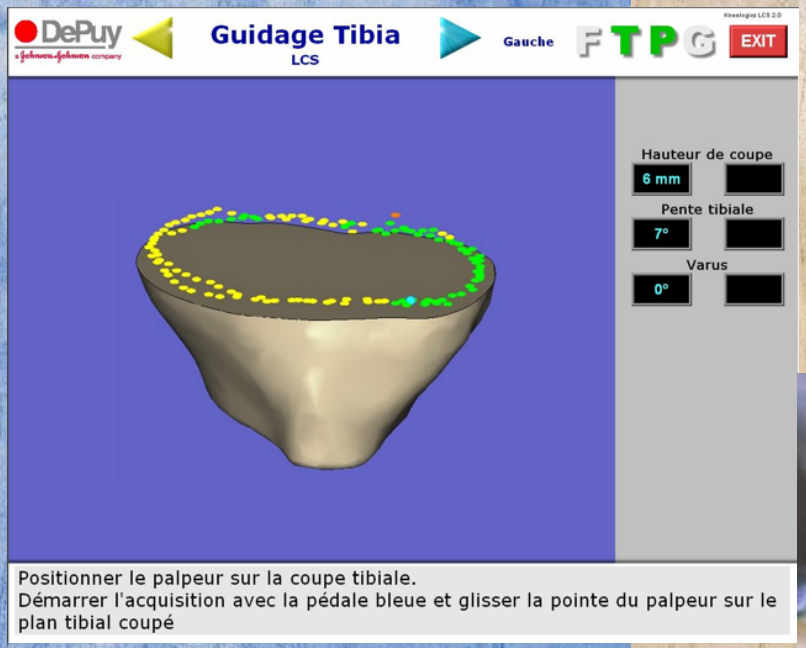


- **Courtesy of Christophe Marmignon and Philippe Cinquin – TIMC - Grenoble**

| Computer Assisted Orthopaedic Surgery |

Decision

- **Level 3 : Integration of quality control in the decision loop**

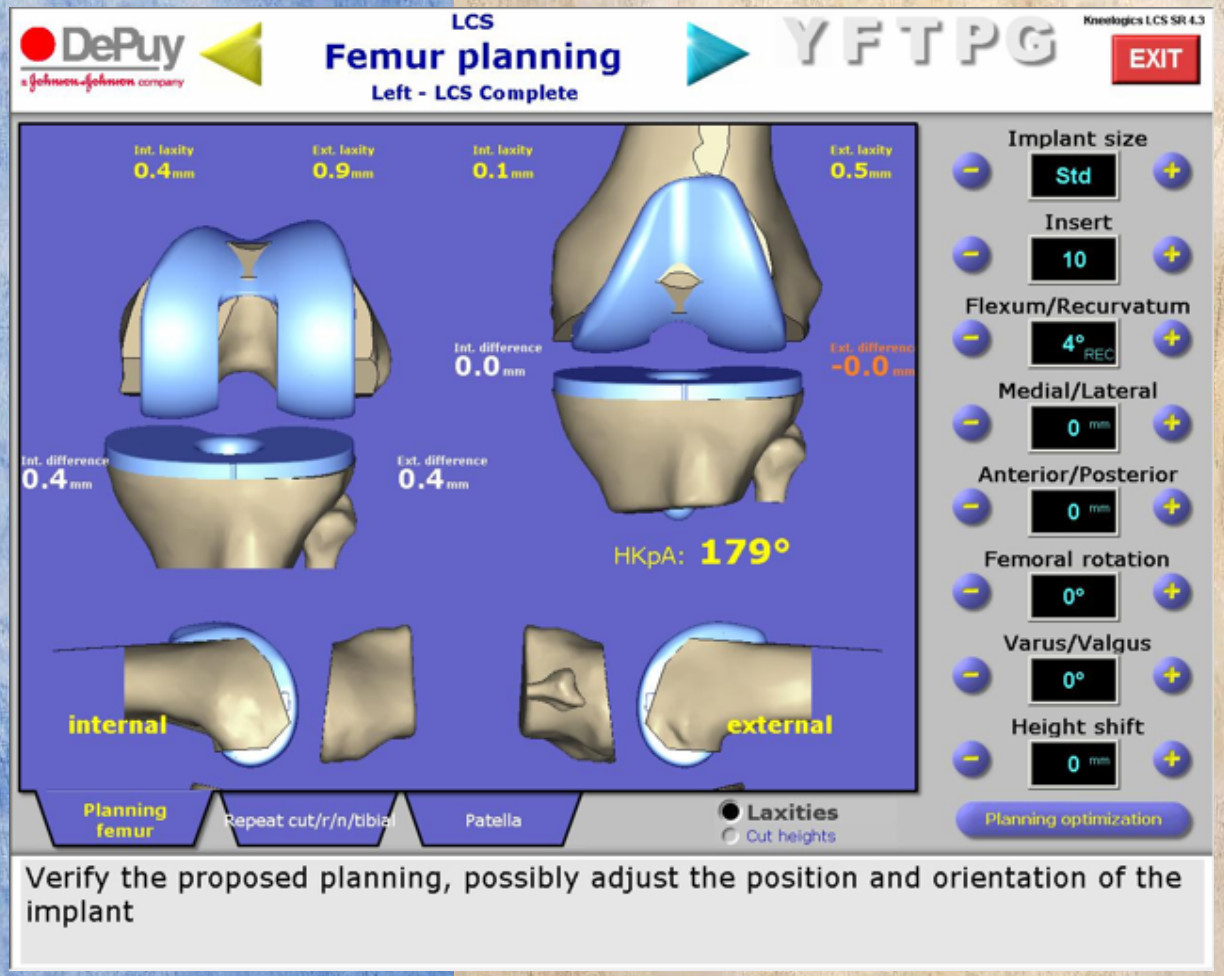


| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

Decision

- **Femoral planning**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

Non image based

| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

Action

Active system : robots

Passive system : navigation

- Freehand
- Tools are localized in the 3D space in real time with respect to the bones

| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

Action

- **Robotized cutting guides**

| Computer Assisted Orthopaedic Surgery |

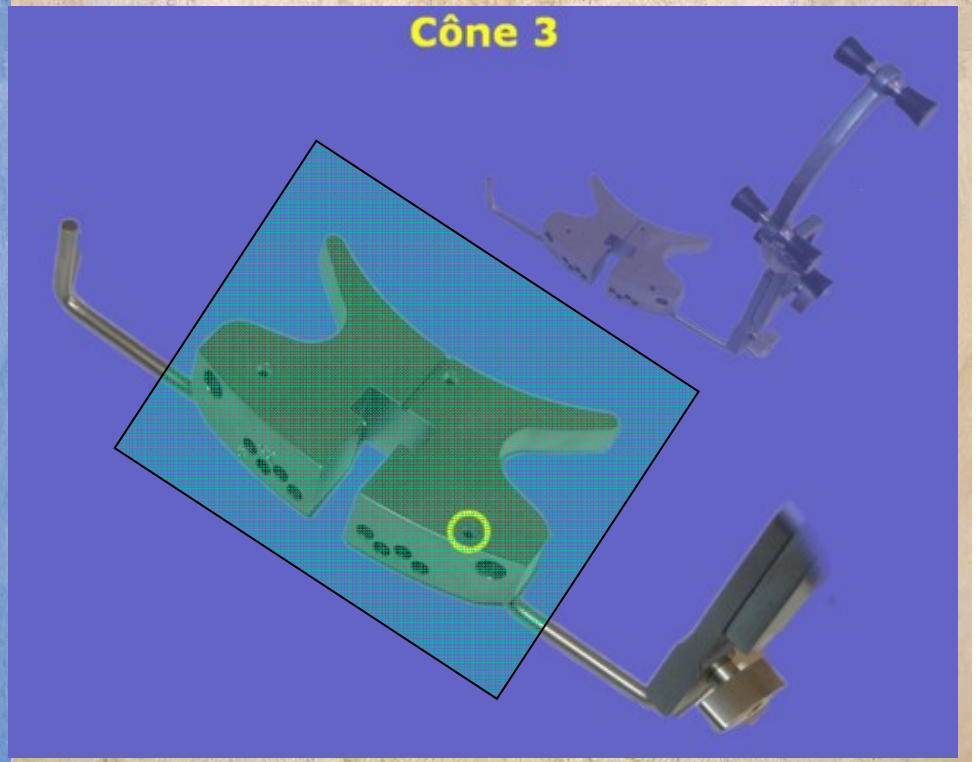
- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

Action

Navigation of cutting guides

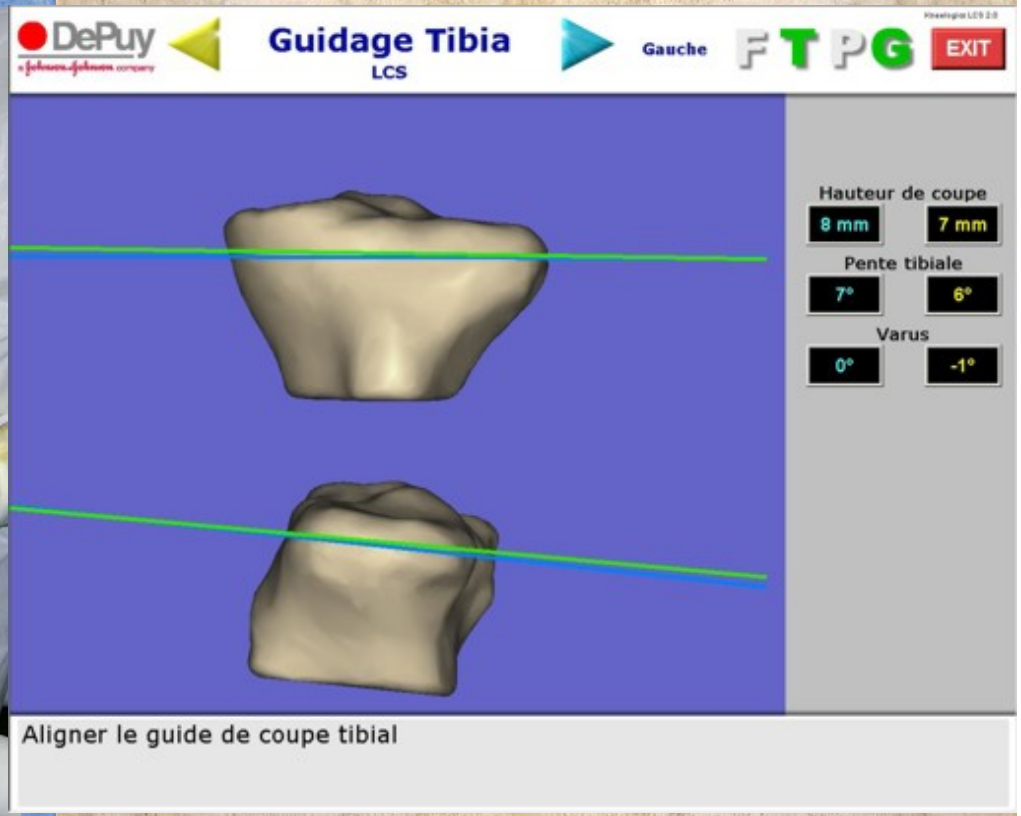


| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

Action

Navigation of cutting guides



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

Application : HTO

7 000 cases / Year / France

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

- **Integration of bricks**

-Hip center : Same brick

-Knee center : Specific solution

-Ankle center : Same brick

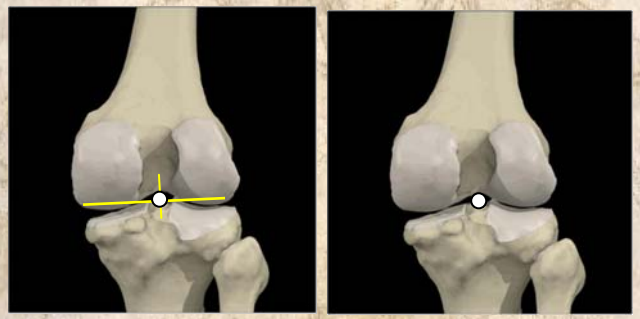
-3D Planning

Computer Assisted Surgical Protocol - CASP

| Computer Assisted Orthopaedic Surgery |

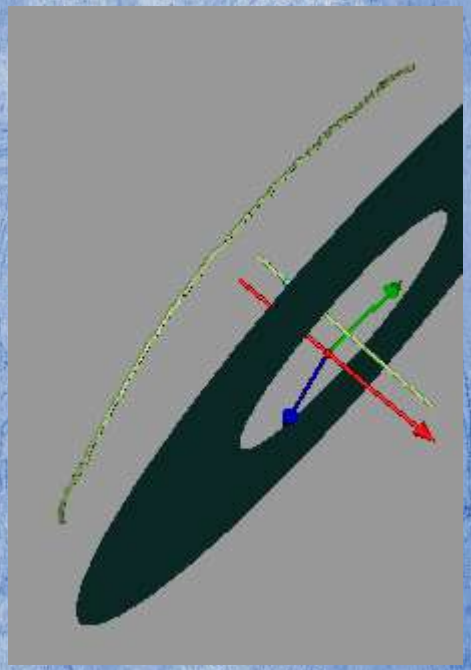
- **Knee center**

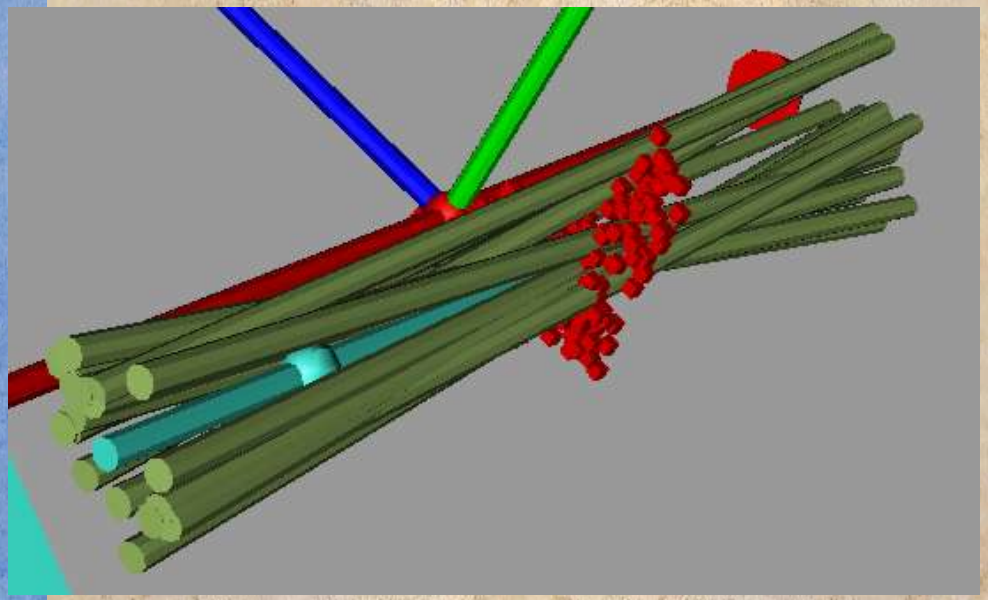
-No access to the joint
-Mixed approach
-Man / Machine synergy



SOMMER, H.J., Determination of first and second order instant screw parameters from landmark trajectories.

Mechanical Design, 1990: p. 141-142.



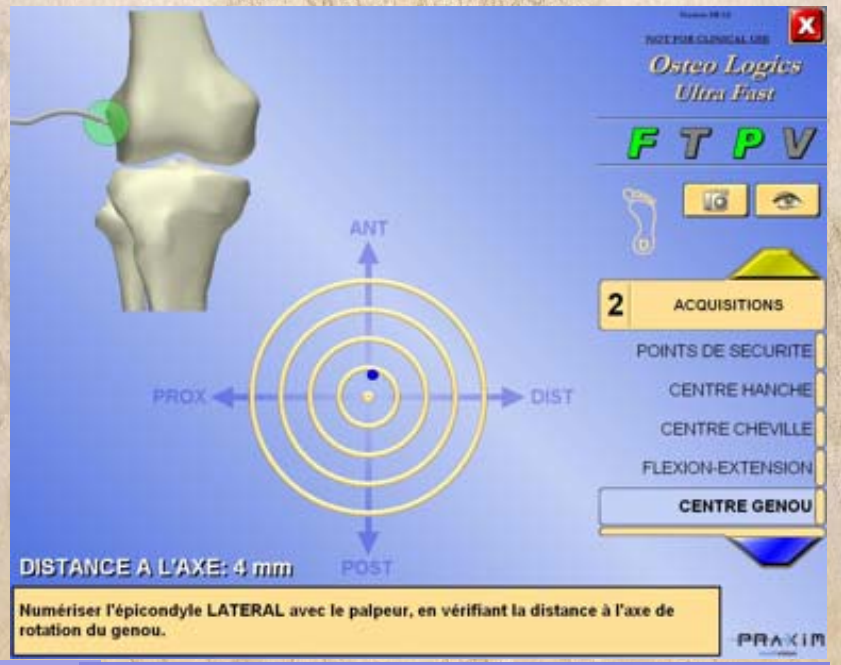


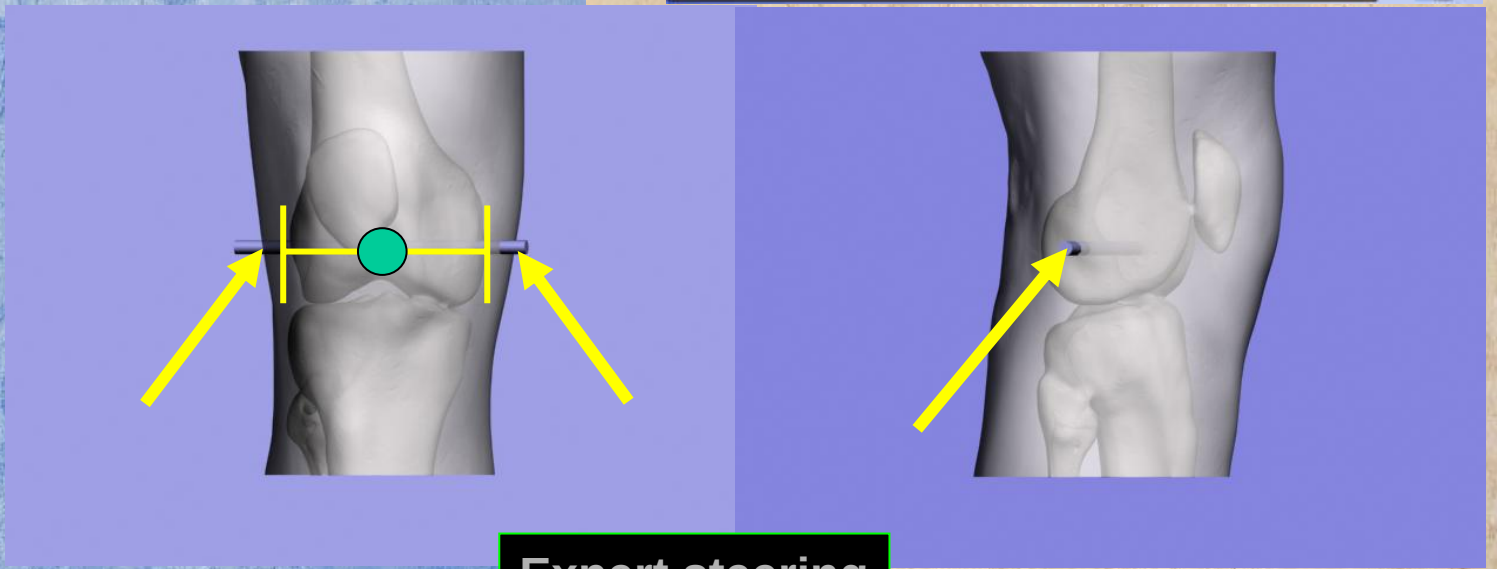
| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

•Knee center

-No access to the joint
-Mixed approach
-Man / Machine synergy





Expert steering

•Planning of the cuts: UGI

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

Application : ACL

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

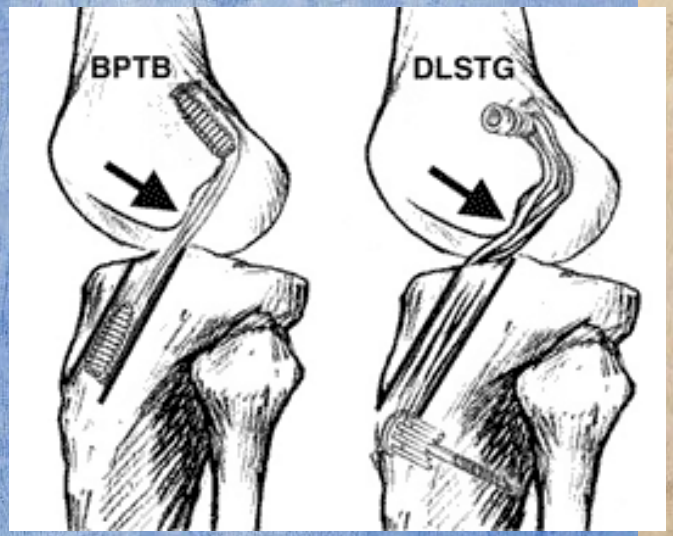
HTO

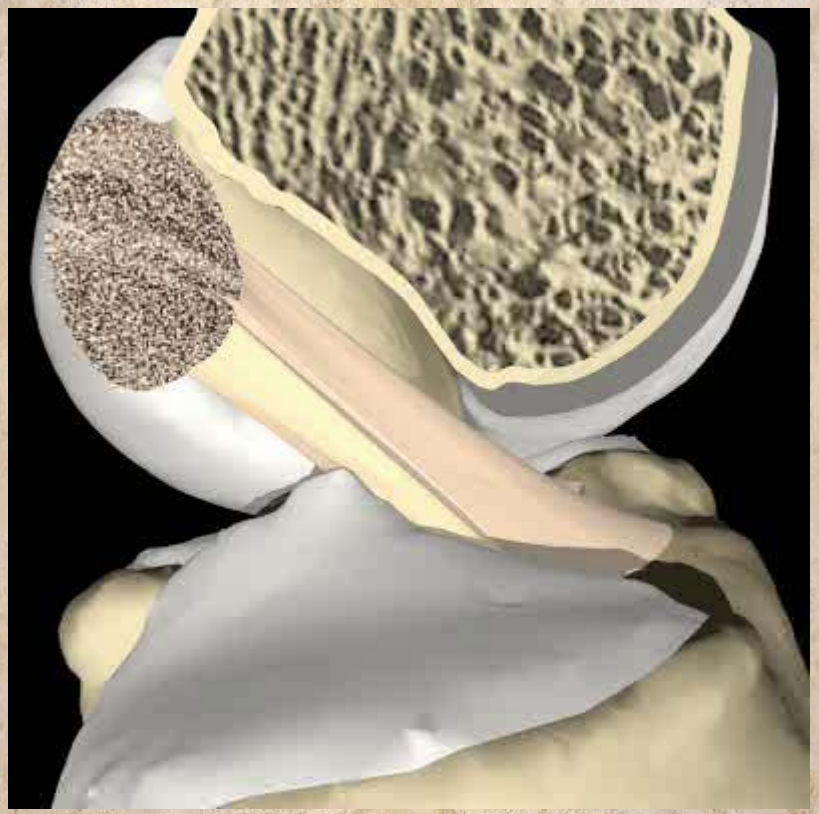
ACL

THA

Conclusion

- **Anterior Cruciate Ligament Replacement**
  - **The challenges**
  - Isometry
  - Avoid impingement

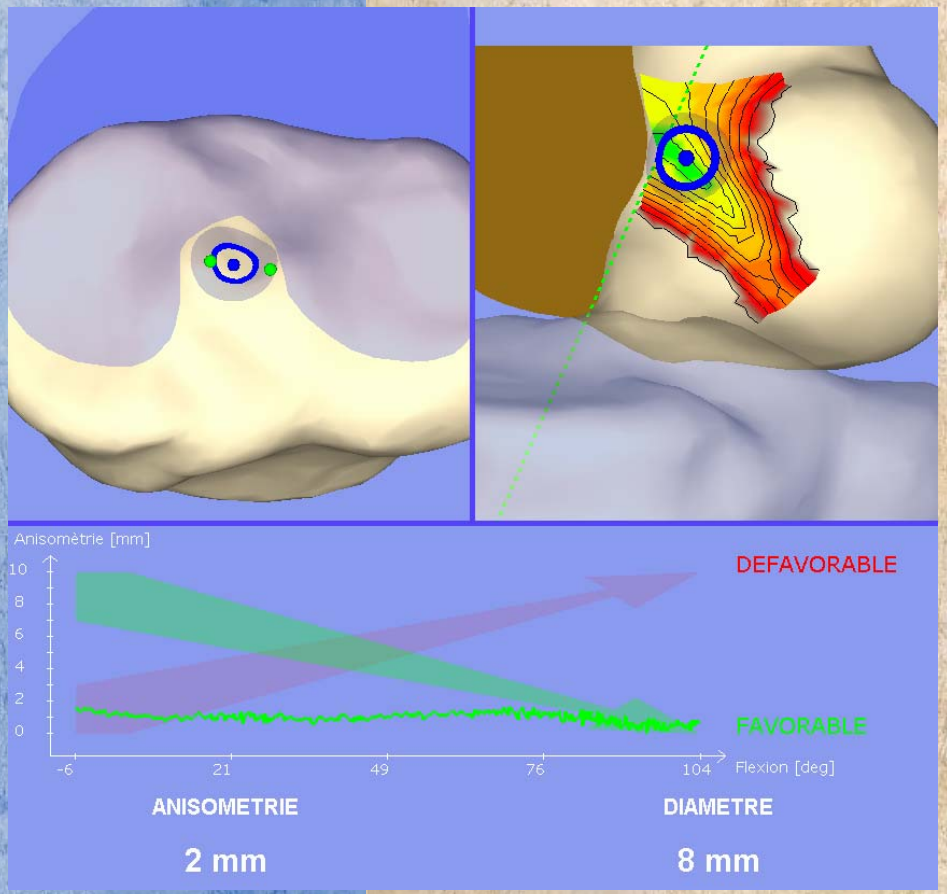




•Anterior Cruciate Ligament Replacement

•Planning

- Projection of the tibial point / Femoral notch projection
- Compute the anisometry map



•For a specific tibial point choose the best location of the femoral point

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

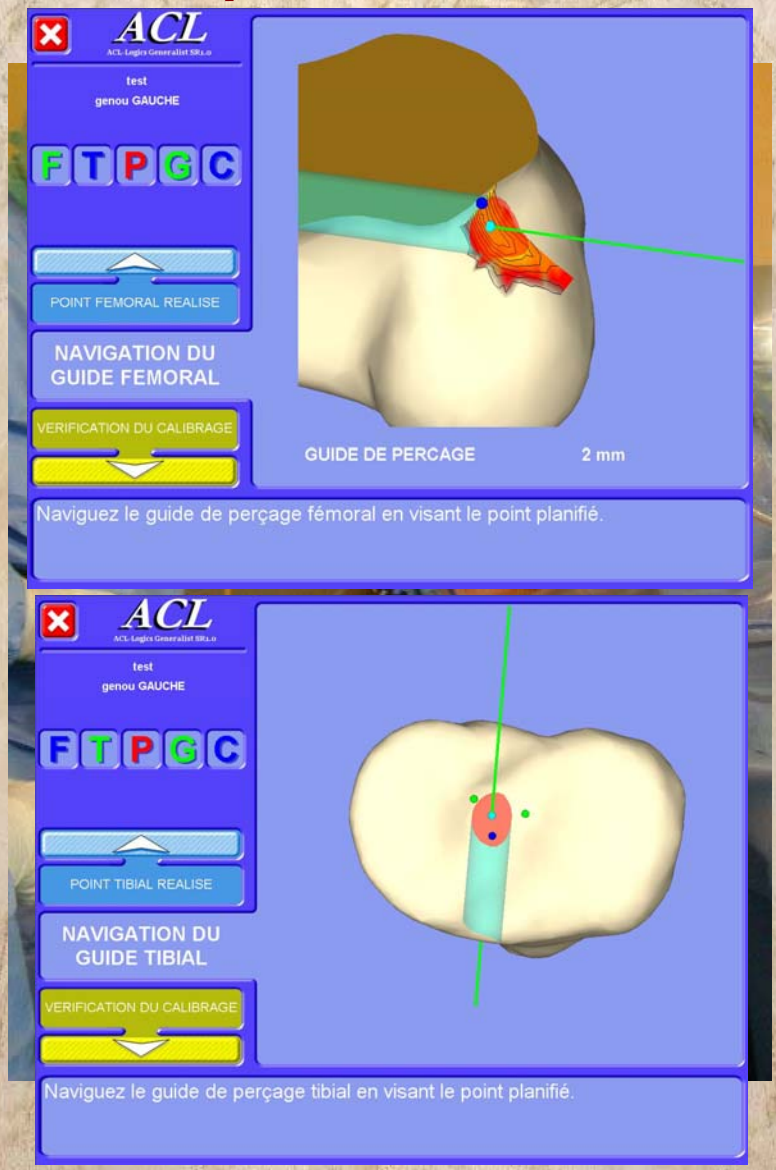
ACL

THA

Conclusion

- **Anterior Cruciate Ligament Replacement**
  - **Action**

- Take the usual guide
- Attache a rigid body
- Perform the calibration
- Drill the tunnels with the help of the GUI



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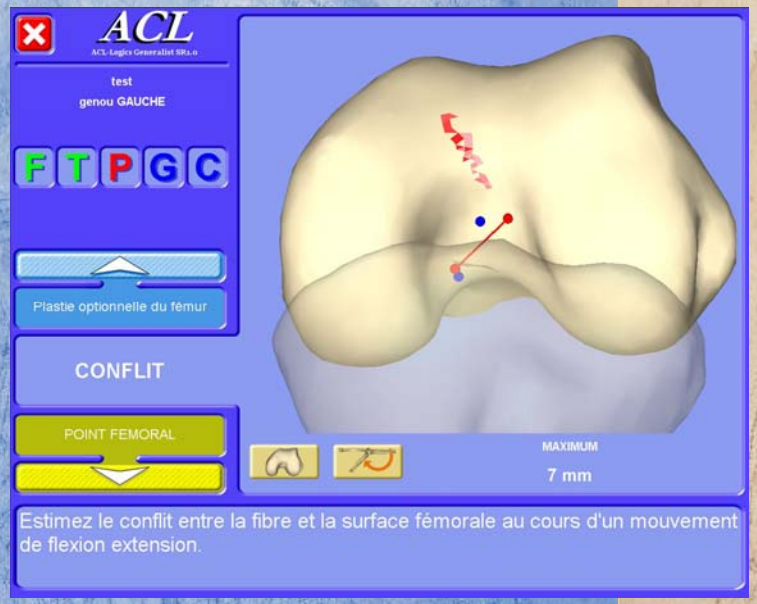
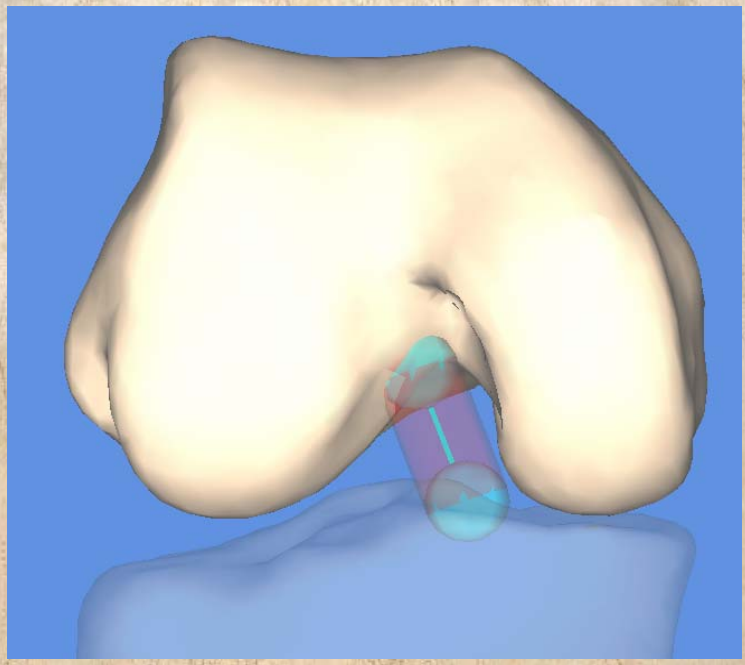
- **Anterior Cruciate Ligament Replacement**
  - **Impingement**





- Digitized the anterior fiber of the graft

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

Application : THA

100 000 cases / Year / France

| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

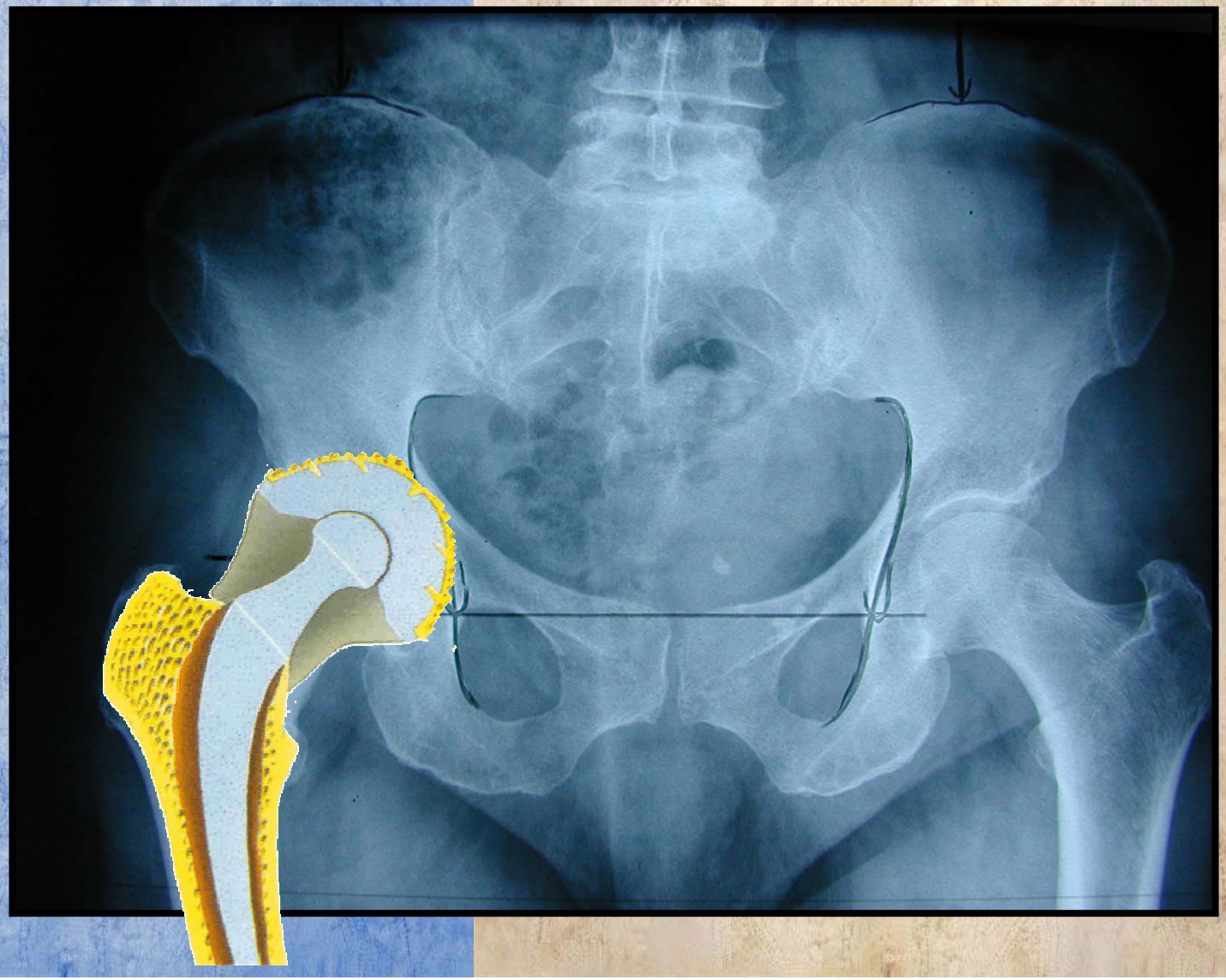
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

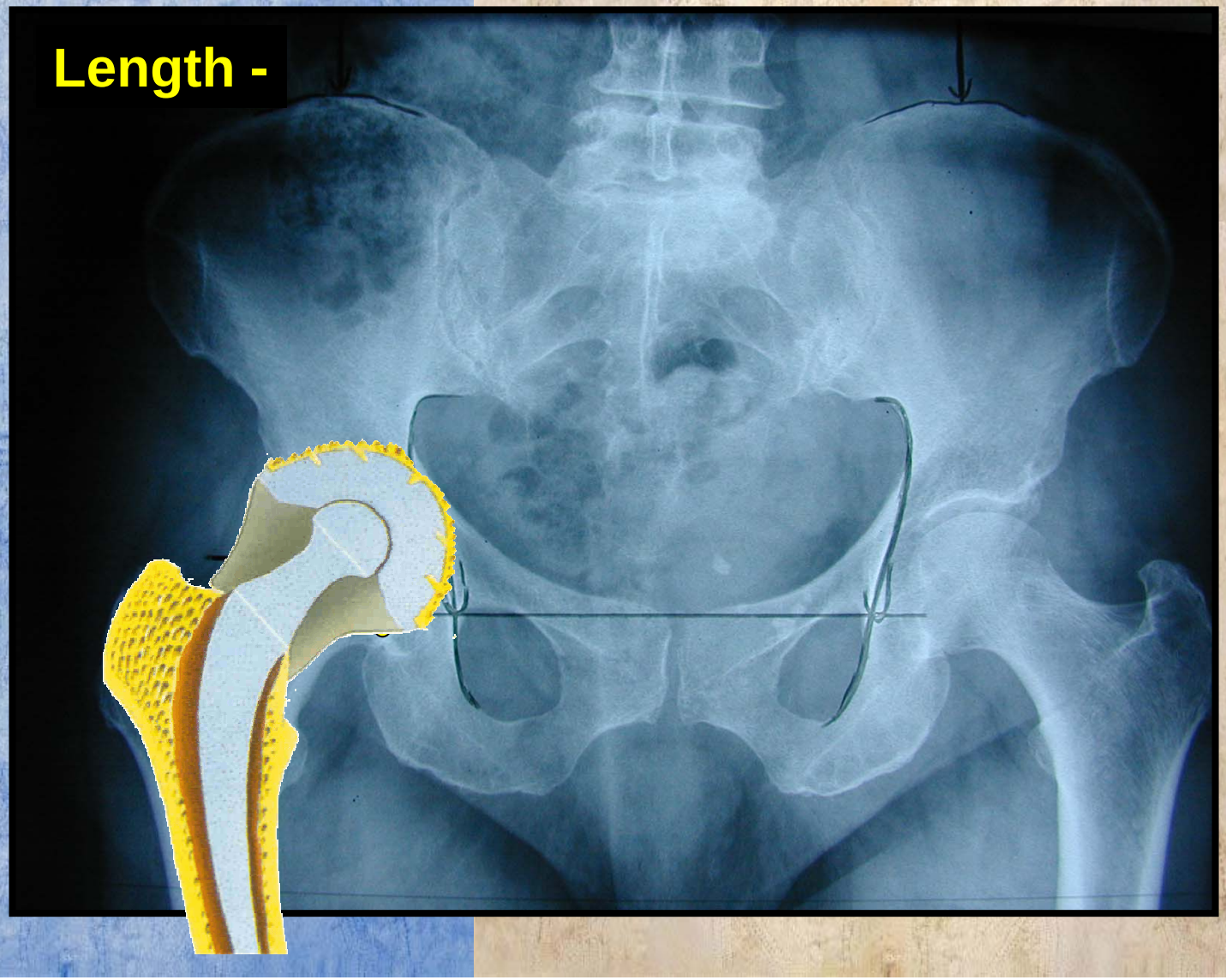
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

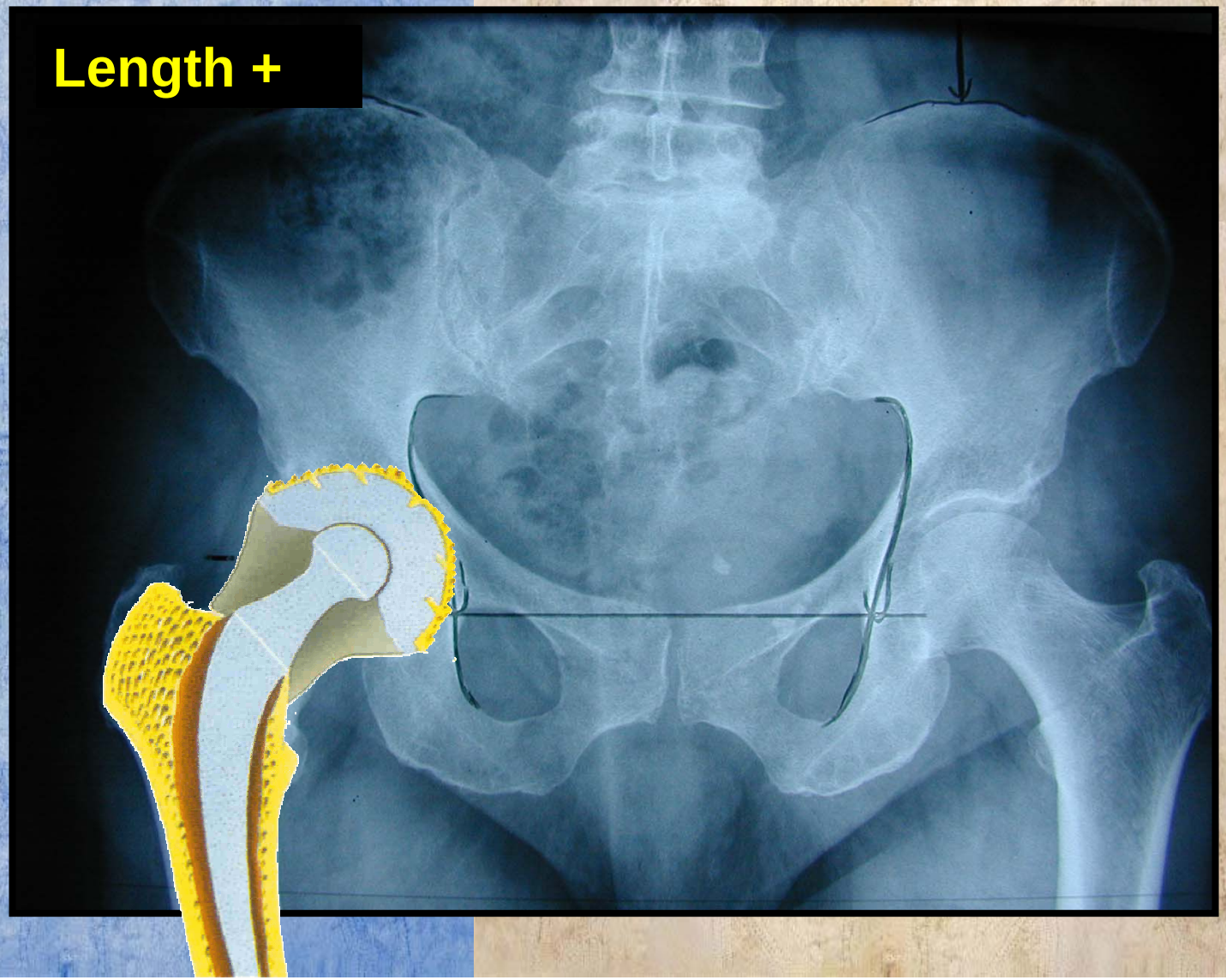
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

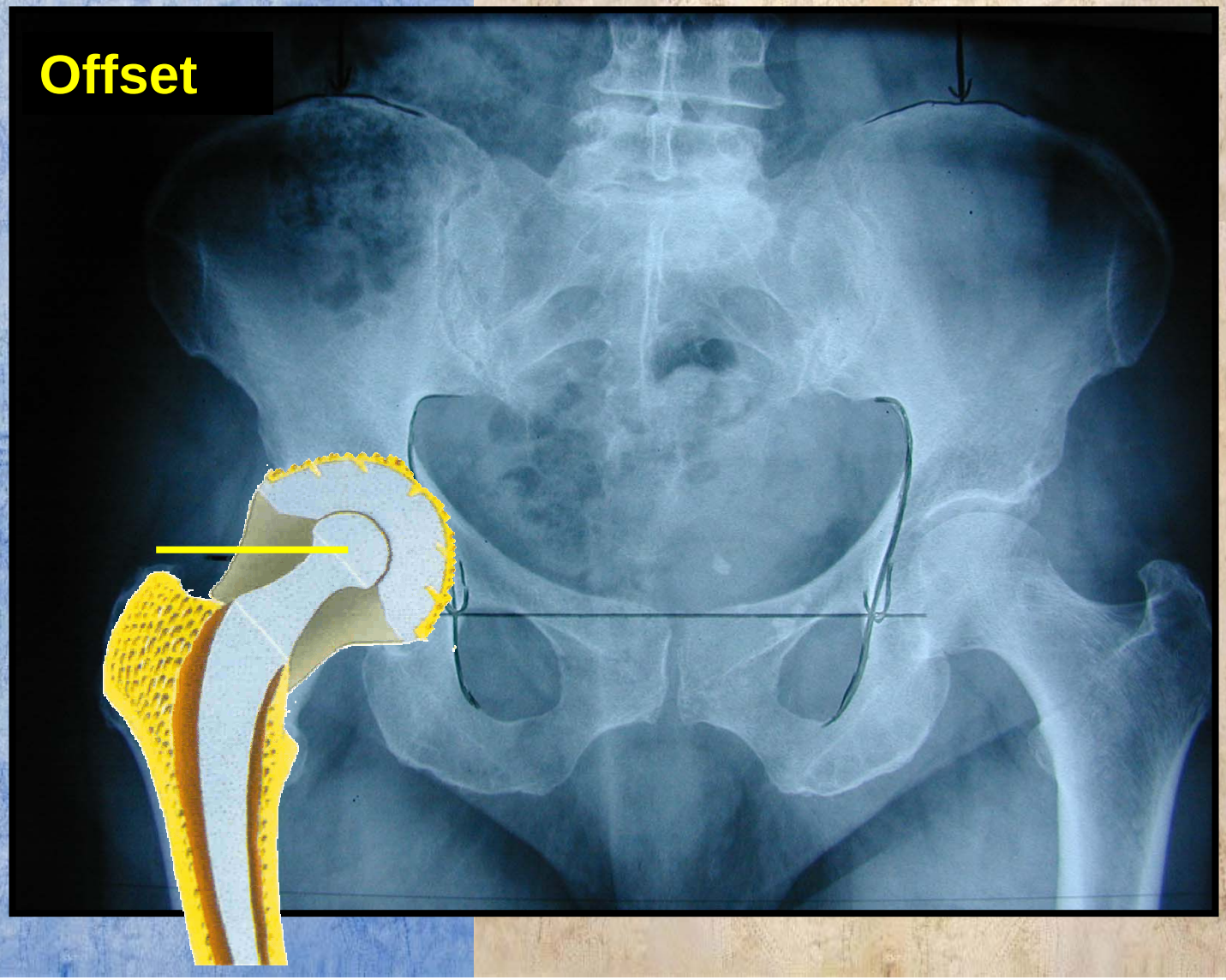
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

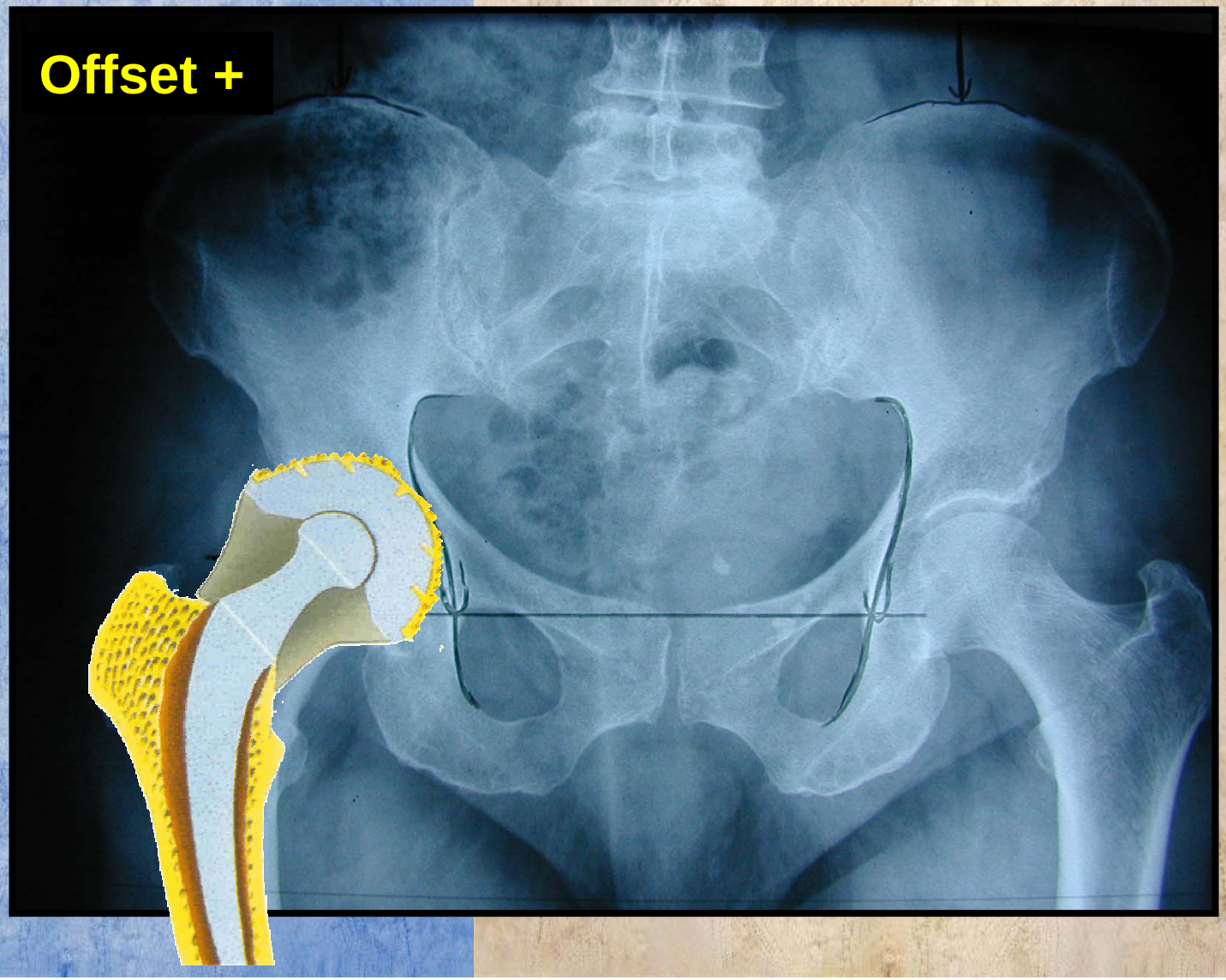
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

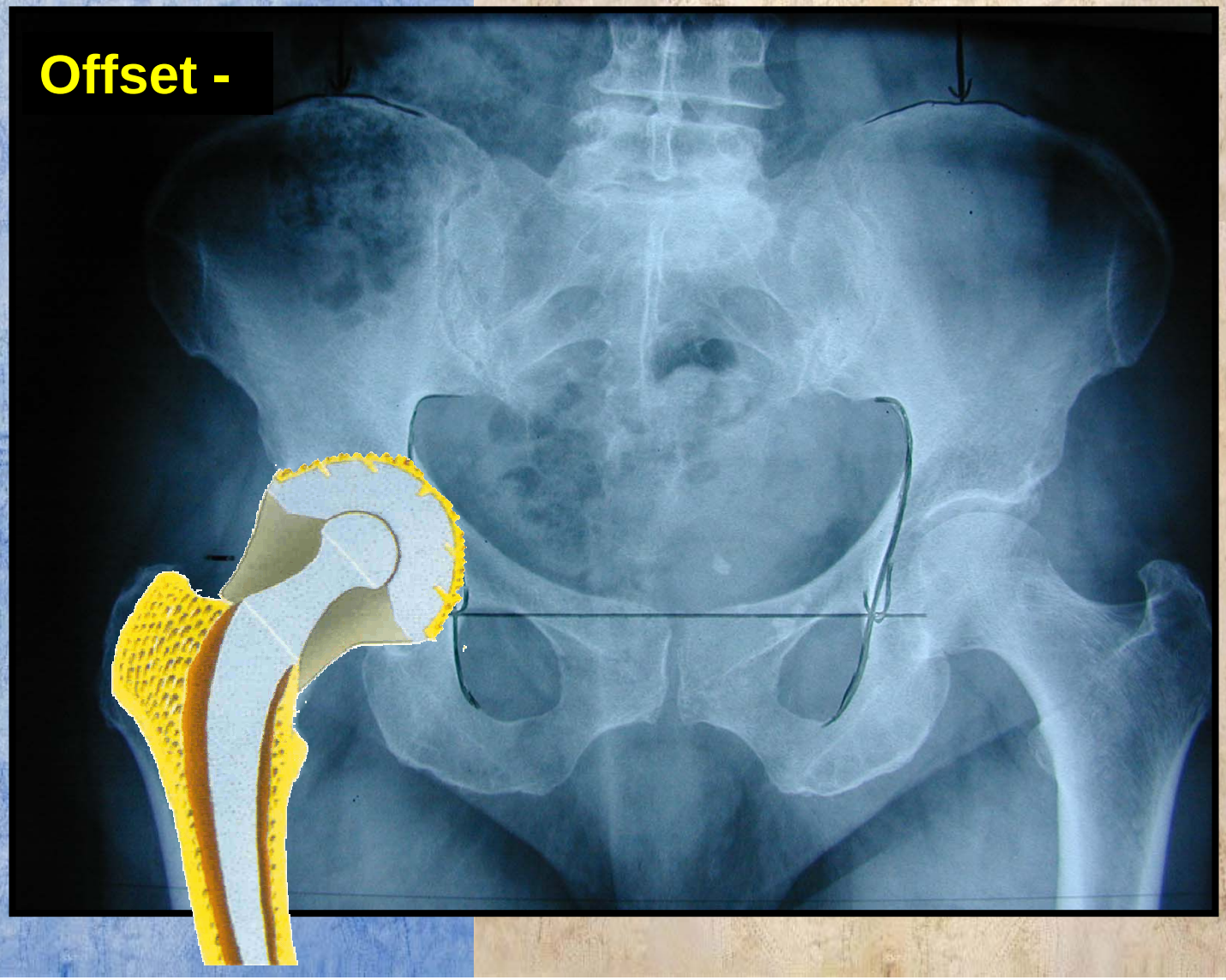
HTO

ACL

THA

Conclusion

- **Total Hip Arthroplasty**



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

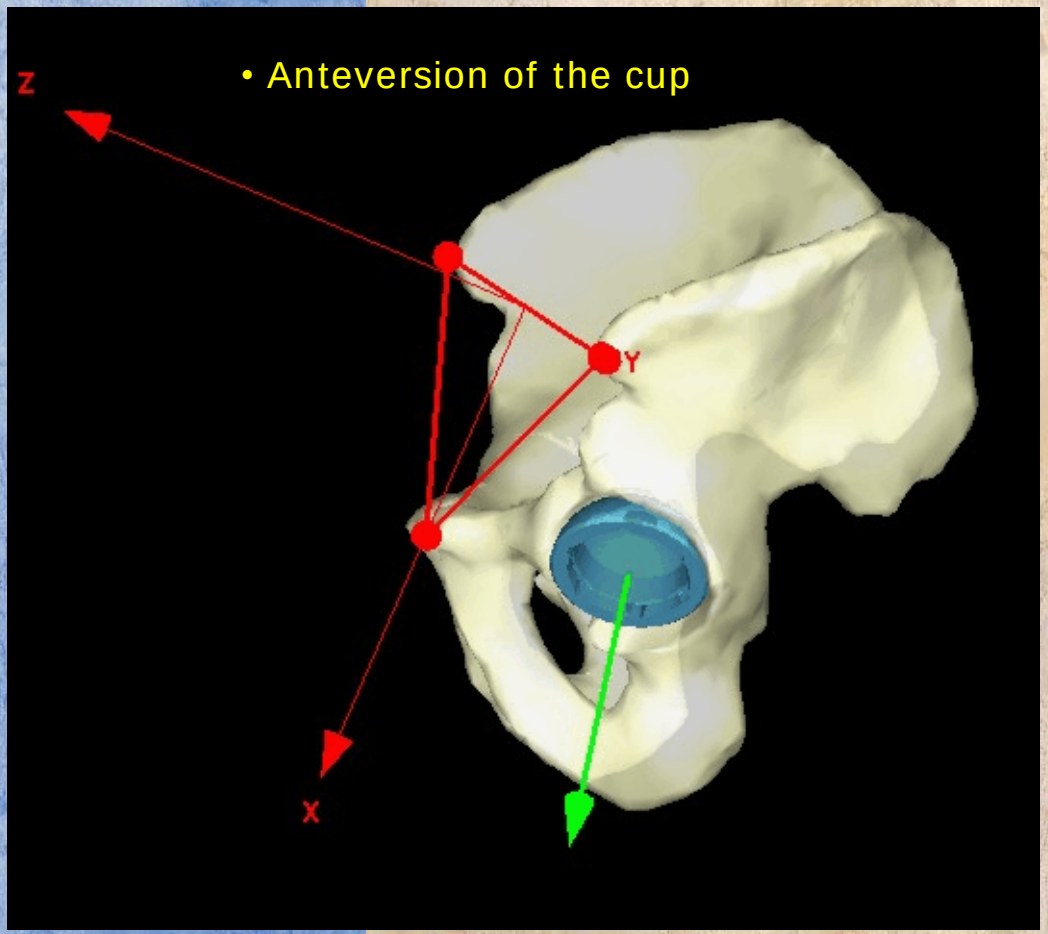
ACL

THA

Conclusion

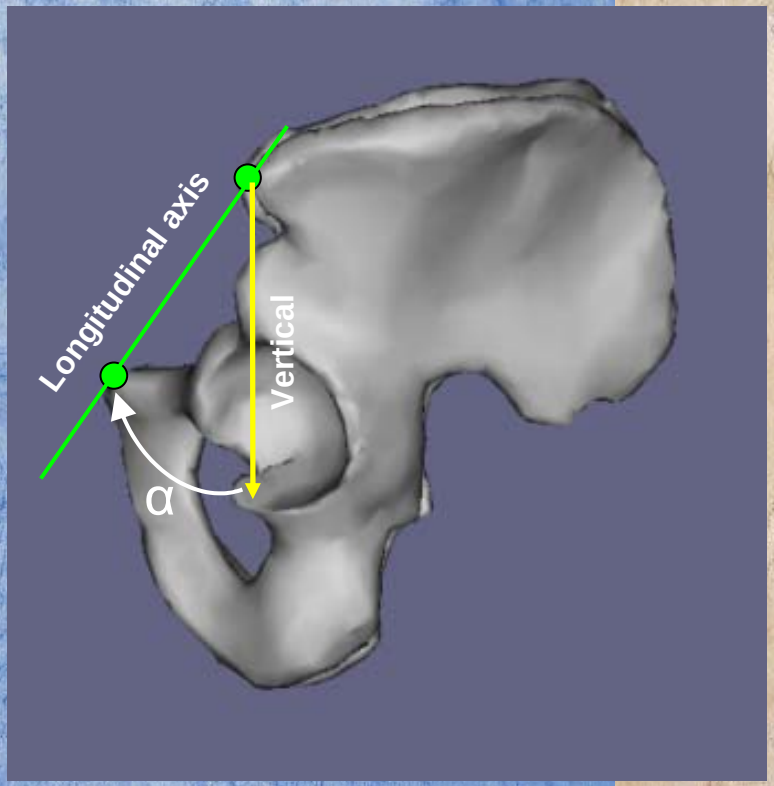
•Total Hip Arthroplasty

-Length	-Centre of rotation
-Offset	**-Stability**



•Total Hip Arthroplasty

-Reference plane



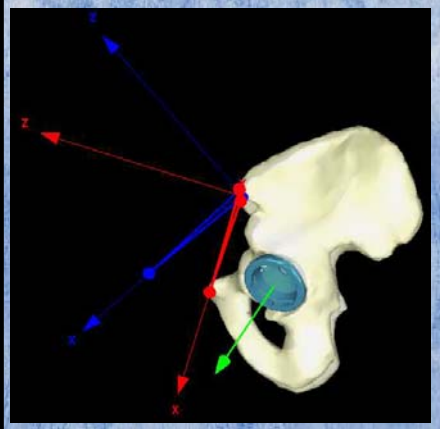
- Not an absolute reference
- Can be define on an X-Ray
- Change in supine position
- Influence anteversion values

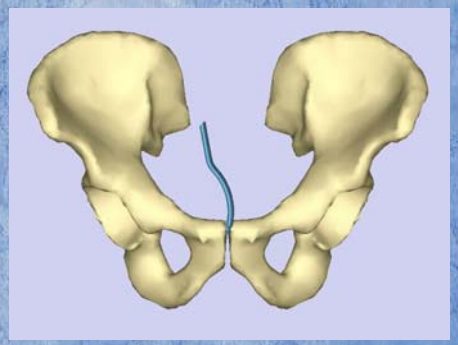
| Computer Assisted Orthopaedic Surgery |

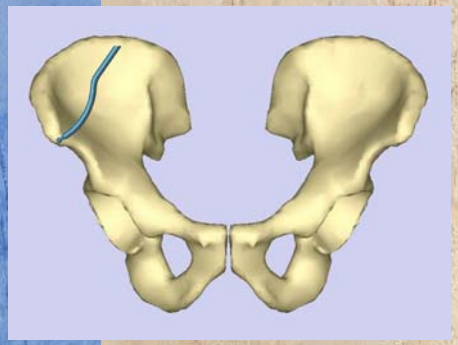
- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion

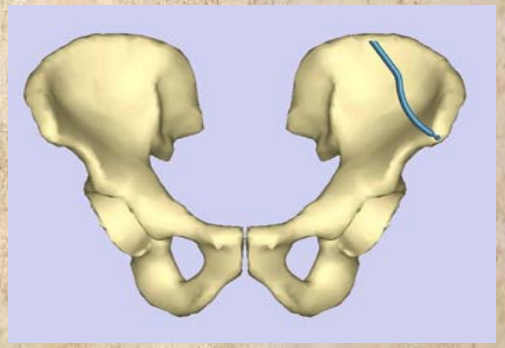
•Total Hip Arthroplasty

-Reference plane





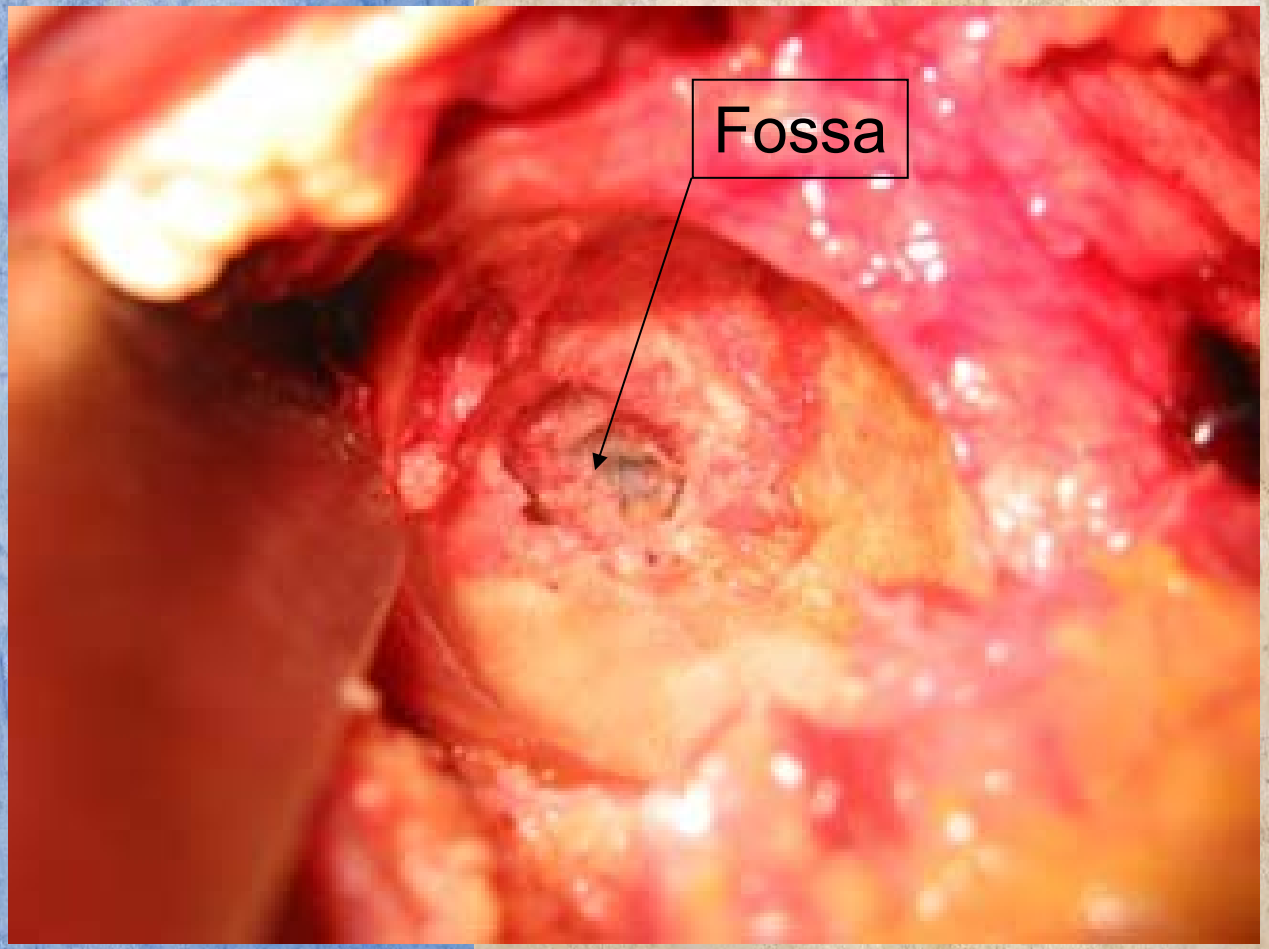




•Total Hip Arthroplasty

-Local bone morphing instead of global

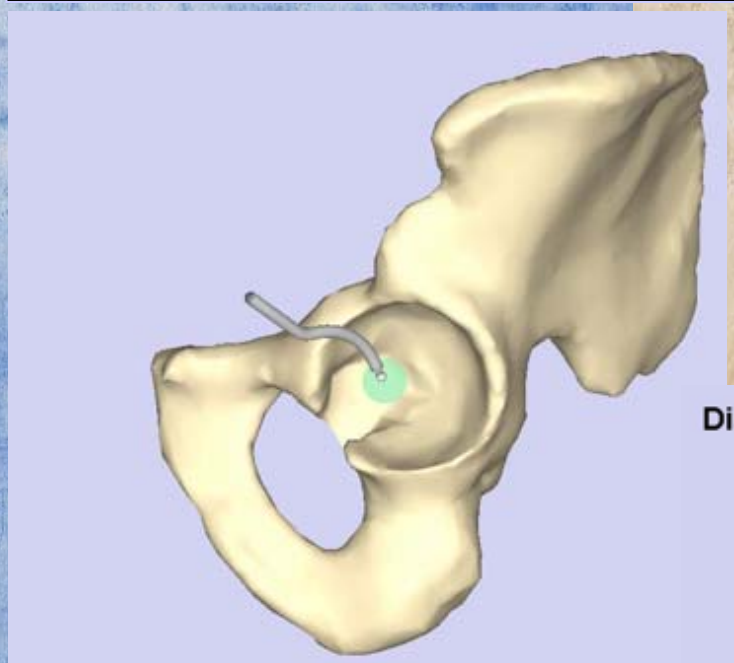
•View of the acetabulum fossa before reaming



| Computer Assisted Orthopaedic Surgery |

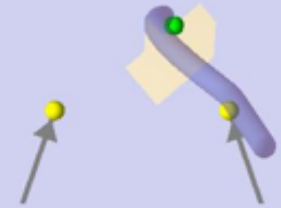
•Total Hip Arthroplasty

-Local bone morphing instead of global



Distance à la surface osseuse : 0.6 mm

Nombre de points acquis: 108



Corne Antérieure

Corne Postérieure

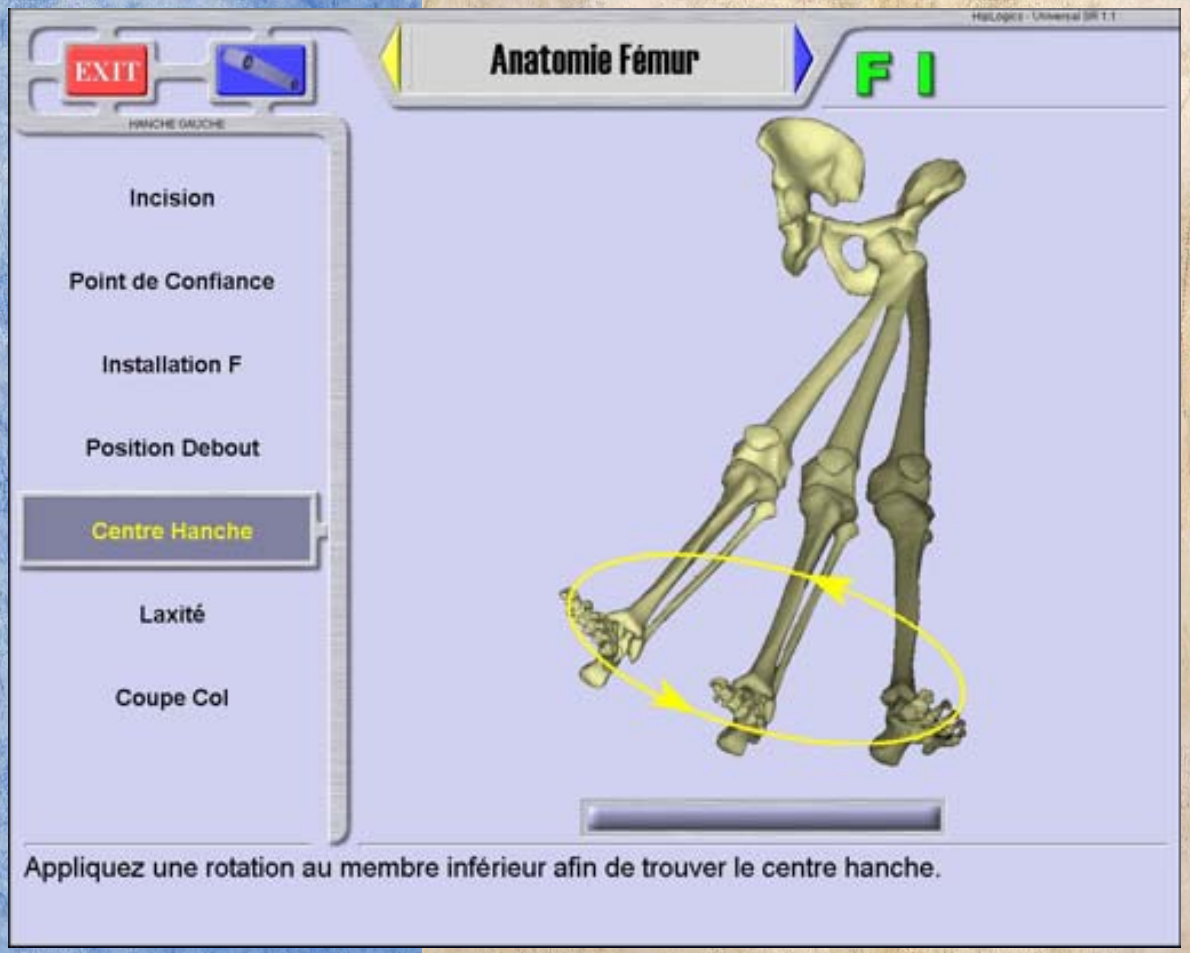
•Total Hip Arthroplasty

-Local bone morphing instead of global

•Total Hip Arthroplasty

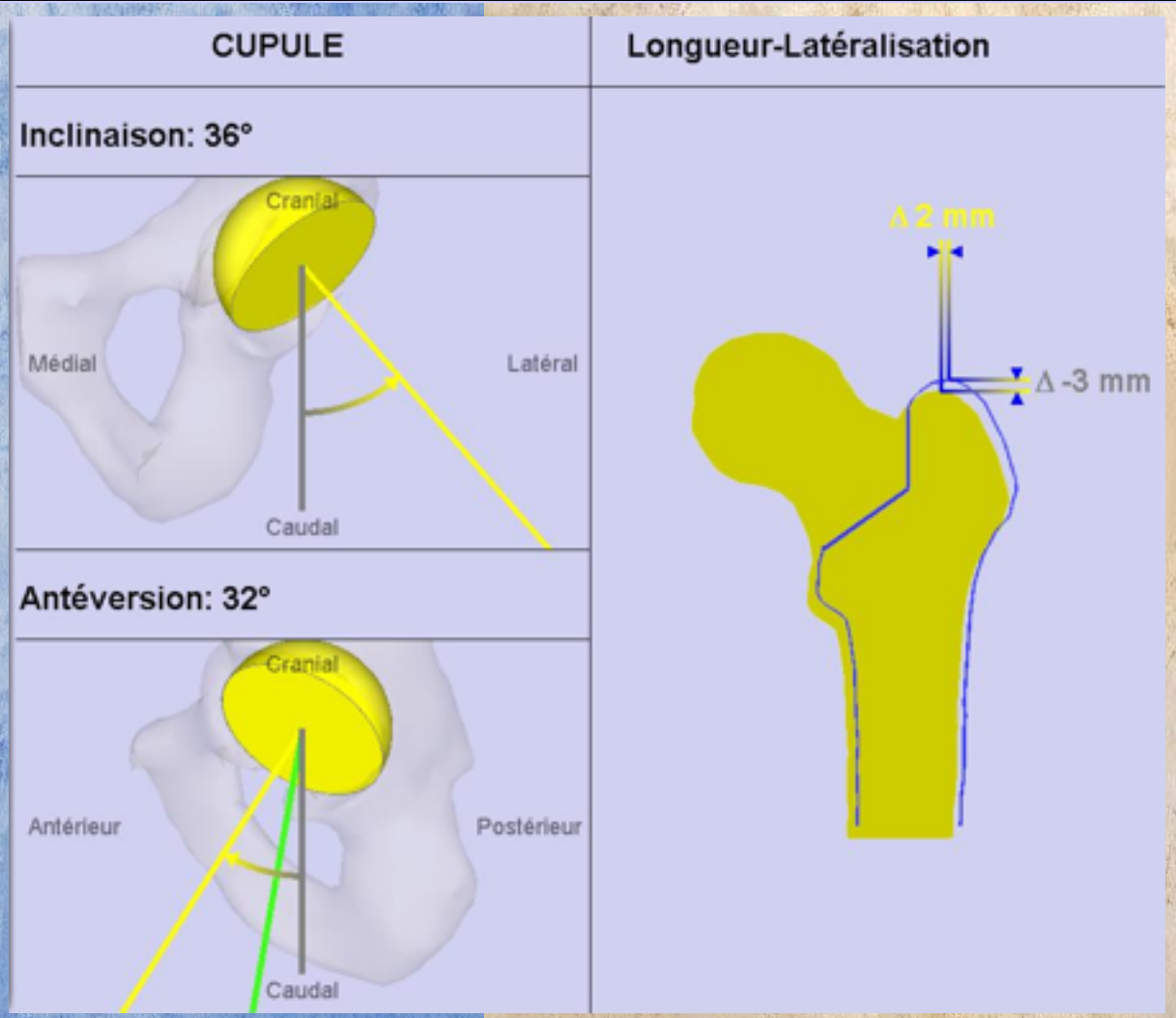
-Fine tunning of the implants

• Final hip center location



•Total Hip Arthroplasty

-Fine tunning of the implants



| Computer Assisted Orthopaedic Surgery |

Introduction

History

Basics

TKA

HTO

ACL

THA

Conclusion

Conclusion

| Computer Assisted Orthopaedic Surgery |

- Introduction
- History
- Basics
- TKA
- HTO
- ACL
- THA
- Conclusion