

Sous la présidence  
des Dr Michel BRAX  
et Dr Jérôme VILLEMENOT

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SOCIÉTÉ D'ORTHOPÉDIE ET  
DE TRAUMATOLOGIE DE L'EST

**SOT  
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14-16  
JUIN  
2018

# Tiges modulaires chez le jeune adulte Modular stem in young adult

**Institut Universitari  
Dexeus**

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# Disclosure

- MICROPORT : RTAP & royalties for implants design.
- CONMED - LINVATEC : consulting.
- ADLER-ORTHO : consulting, implants design.
- SMITH & NEPHEW: consulting
- LINK: consulting



# Which are the issues in young adults ?

THA implantation  
Pain alleviation - clínicaf-functional improvement.



*LEARMONTH et al. The Lancet. 2007*

In young adult: higher expectancies: sport - activity

*HEALY WL et al. J Bone Joint Surg. 2008*



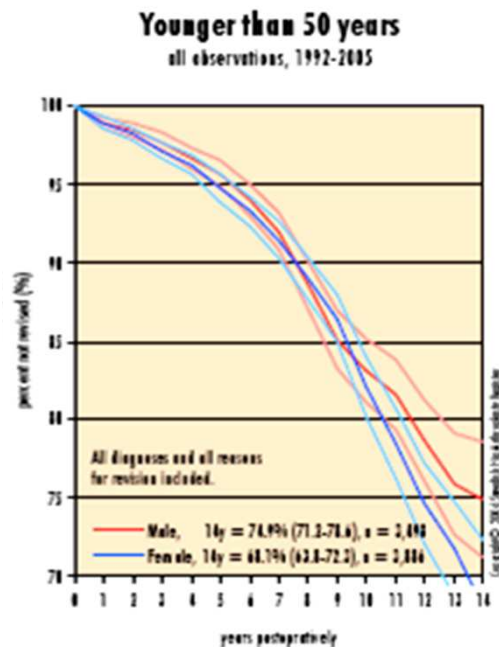
# Which are the issues in young adults ?

THA survivorship in young adults (< 50y.) is LOWER than older population .

Swedish Register

Annual Report 2010

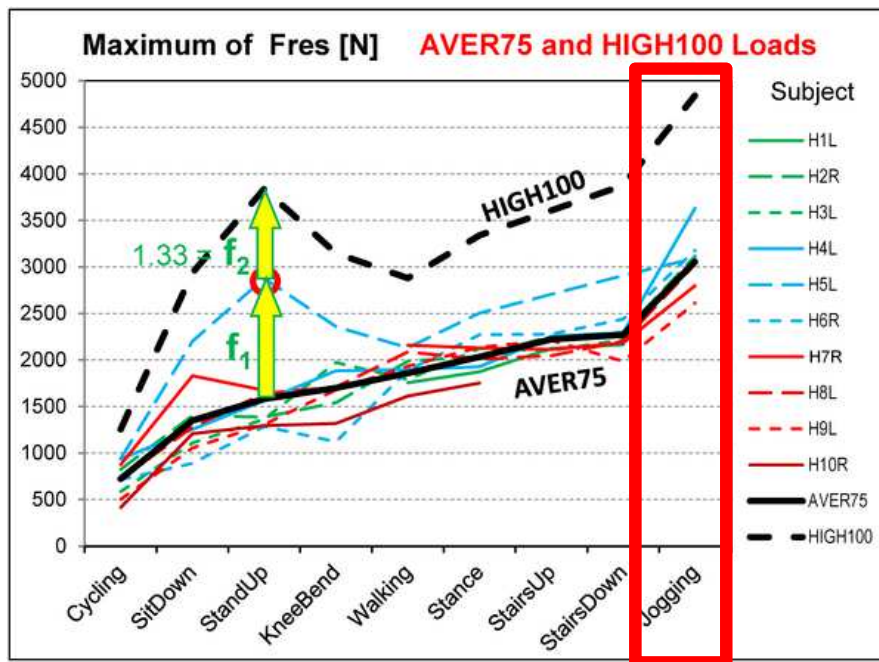
- THA < 50 a
- @ 19y 39,4 % CRR  
(CI 95%, 33 to 43,8)



# Which are the issues in young adults ?

Young adults are reluctant to modify their life habits

MEIRA EP, ZENI J. : Sports participation following total hip arthroplasty.  
IJSPT. 2014; 9: 839-850.



1. High resistance to impact
2. Physiological load transfer
3. Minimal “Stress shielding”
4. Maximal stability
5. Maximal durability

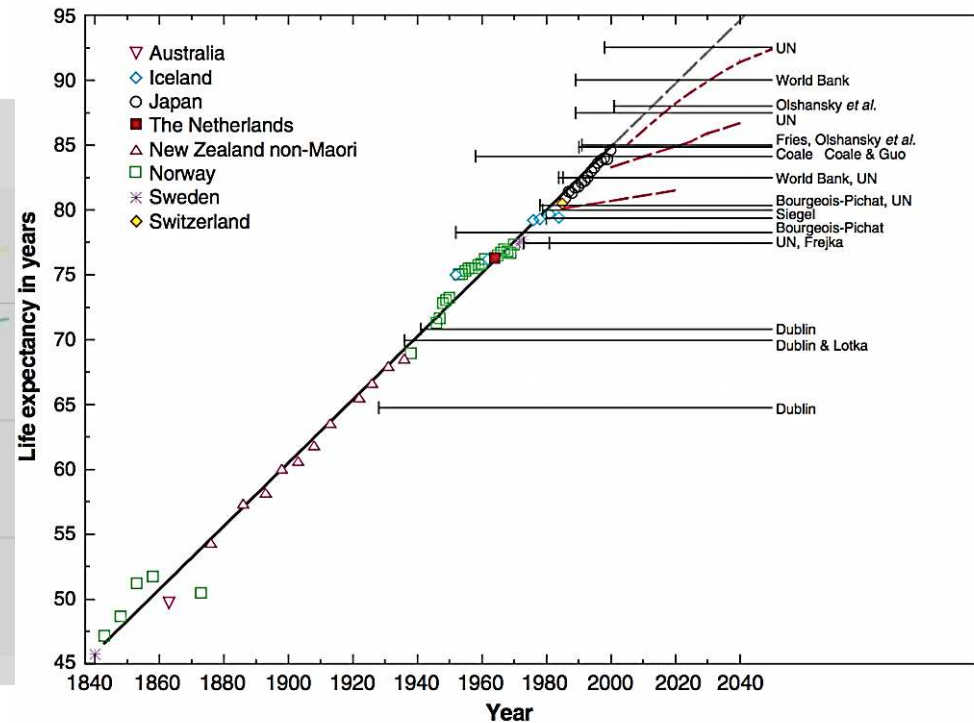
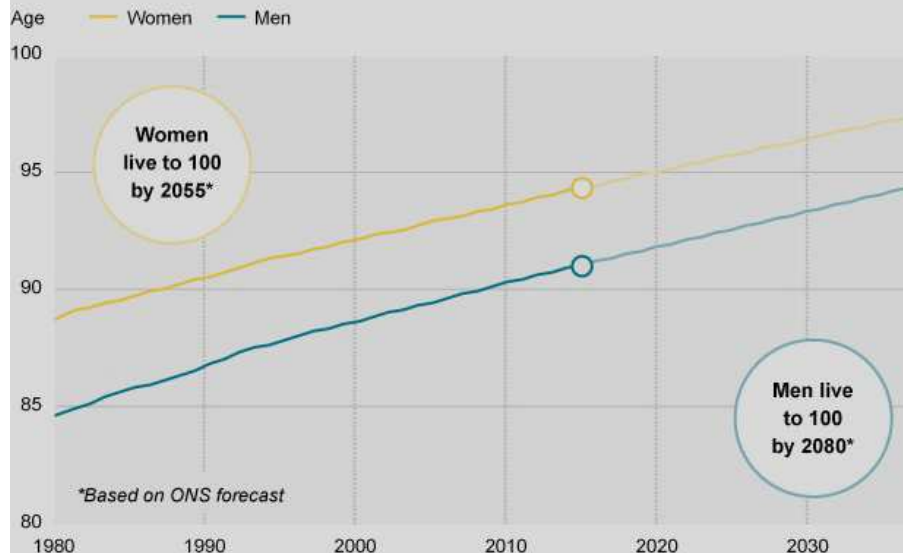
# Which are the issues in young adults ?



World Health Organization

## 1st – Life's expectancy is increasing

Cohort life expectancy at birth, UK, 1980 – 2037





# Ideal THA

## What to seek ?

### Maximal

- Versatility
- Resistance to impact
- Stability
- Physiological load transfer

### Minimal

- Friction
- Stress-Shielding

# Why modularity

adjustment / versatility

- Version
- CCD
- Offset
- Leg length



Individualized  
THA

# Why modularity

adjustment / versatility

- Anatomical
- Biomechanical
- Clinical

# Anatomical basis

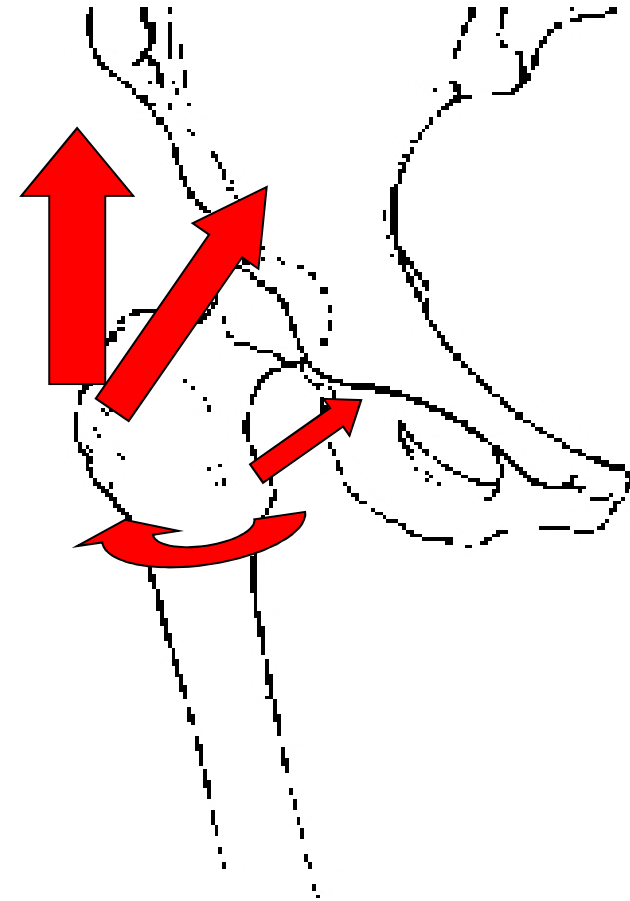
## Proximal femur: high anatomical variability.

1. Offset: 27-57mm (Davey J.R. AAOS 2003)
2. CCD angle :  $105.7^{\circ}$  -  $154.5^{\circ}$  (Noble P.C. CORR 1988)
3. Low correlation upper femur with canal. (Noble P.C. CORR 1988)
4. Significant anatomy differences between male and female anatomy (Wang SC, Ass.Ad.Autom.med, 2004; Traina F, JBJS 2009)



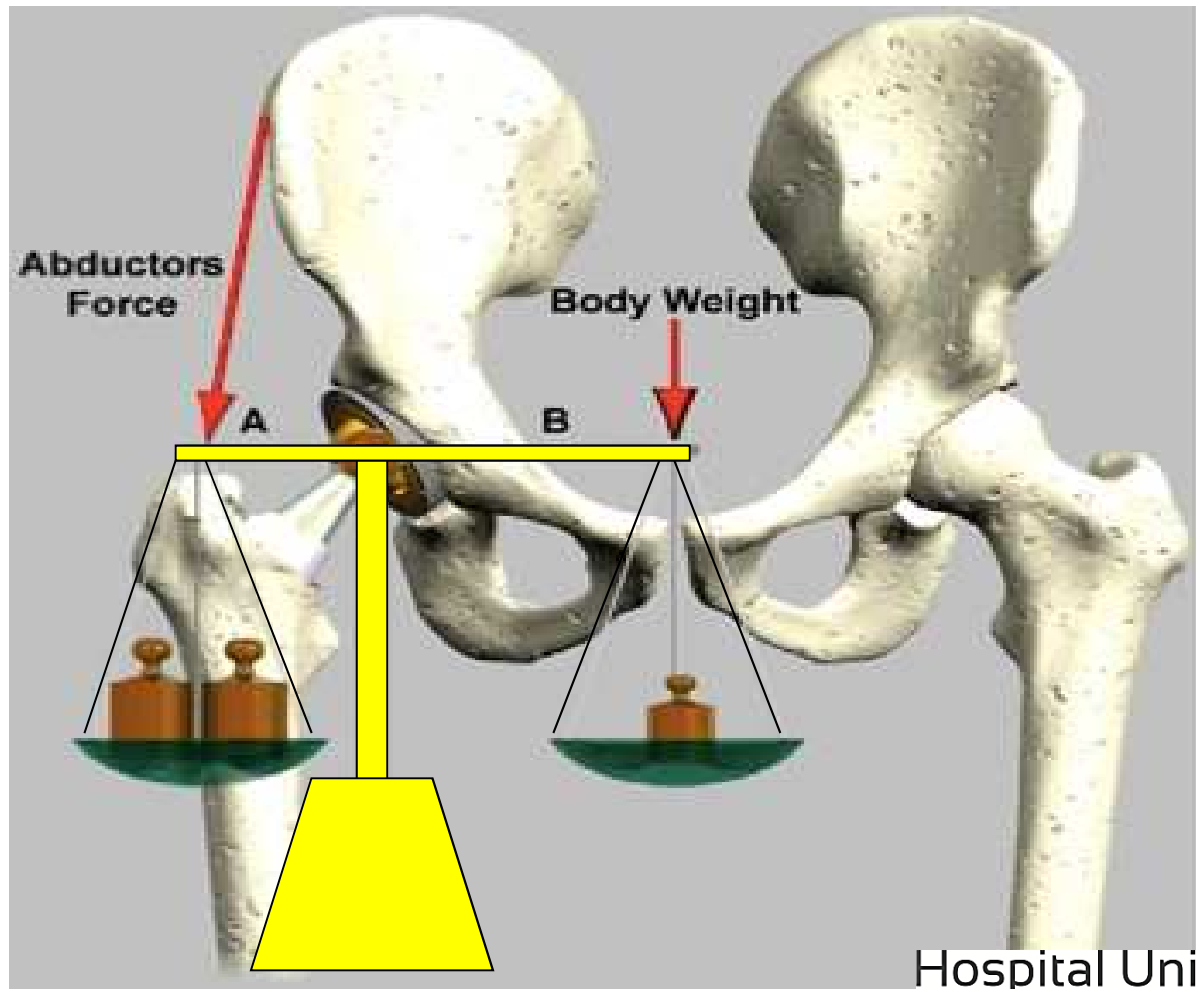
# Biomechanical basis

- The hip muscles work on a certain rotation centre
- Each muscle works on a specific lever arm
- The goal of THA is to restore the physiological centre of rotation



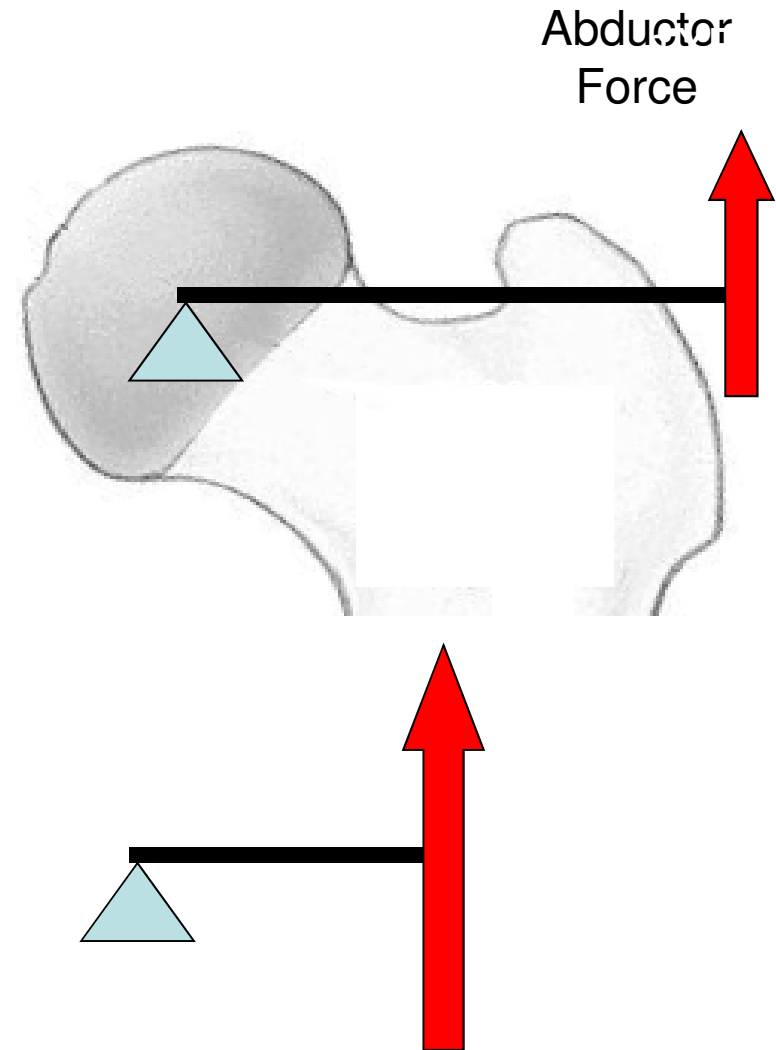
# Biomechanical basis

More balanced load distribution. *Pauwels*

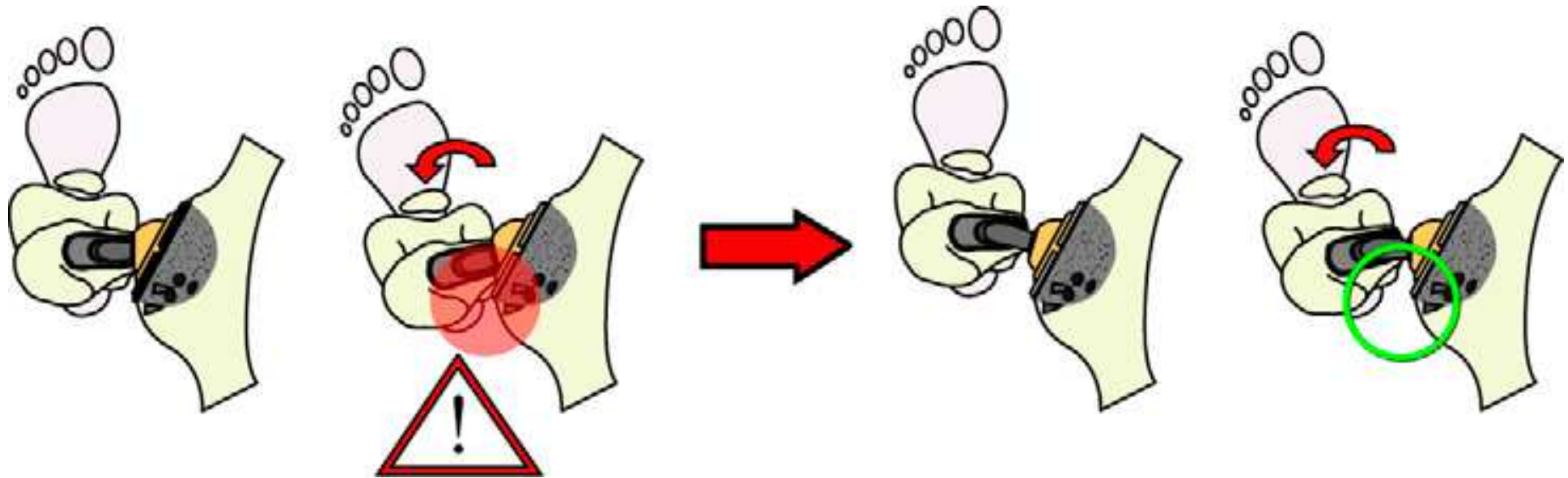


# Biomechanical basis

- If offset ↓ :  
pelvitrocanteric muscles  
force to increase to keep  
same moment.
- If it doesn't occur, THA  
doesn't recreate the  
same rotation center and  
muscle force has to  
increase tension and  
force to balance.



# Biomechanical basis



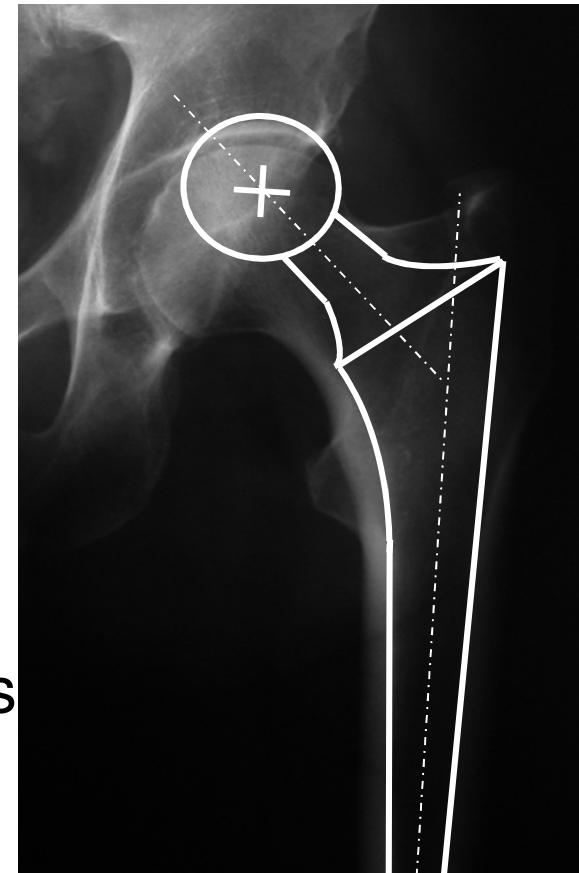
offset ... ↑ cup – neck Impingement



# Biomechanical basis

## Monoblock stem

- Patient's anatomy is forced to implant design.
- Lengthening is needed to obtain stability.
- Lever-arm alteration  
( ↓ offset = ↑ resulting F = ↑ WEAR )
- To adjust offset: .... different implants are required.



# Clinical basis

Plaass et al. Hip-Int 2011

*Patients with a shorter operated leg on clinical assessment were more prone to limping ( $p < 0.05$ ), and patients with a longer leg had more pain compared to patients with equal leg lengths ( $p < 0.05$ ).*

Parvizi et al. JBJS Am 2003

*LLD in THR is frequently associated with pain, instability, paresthesia.*

# Clinical basis

## Retrospective study

- 1734 Patients
- Anca-fit / modular neck / ceramic head
- Age: 55.5 years
- 53.3% female
- 66% OA, 24% DDH

Toni et al. *AAOS 2004*

Scientific Exhibit at the 71st AAOS Annual Meeting

### **MODULAR NECK PRIMARY PROSTHESIS: EXPERIMENTAL AND CLINICAL OUTCOMES**

Francesco Traina<sup>1,2</sup>, MD, Massimiliano Baleani<sup>2</sup>, M Eng,  
Marco Viceconti<sup>2</sup>, PhD, M Eng, Aldo Toni<sup>1,2</sup>, MD

1. I Department of Orthopaedic Surgery, Rizzoli Orthopaedic Institute, Bologna, Italy  
2. Medical Technology Laboratory, Rizzoli Orthopaedic Institute, Bologna, Italy

San Francisco, March 10-14, 2004

# Clinical basis

## Results

- No neck fracture
- Survivorship 97,5% @ 10y
- Dislocation rate 1,4 %
- 18 revisions for dislocation, loosening, infection, femoral leg discrepancy (shorter).

Toni et al. *AAOS 2004*

Scientific Exhibit at the 71st AAOS Annual Meeting

### **MODULAR NECK PRIMARY PROSTHESIS: EXPERIMENTAL AND CLINICAL OUTCOMES**

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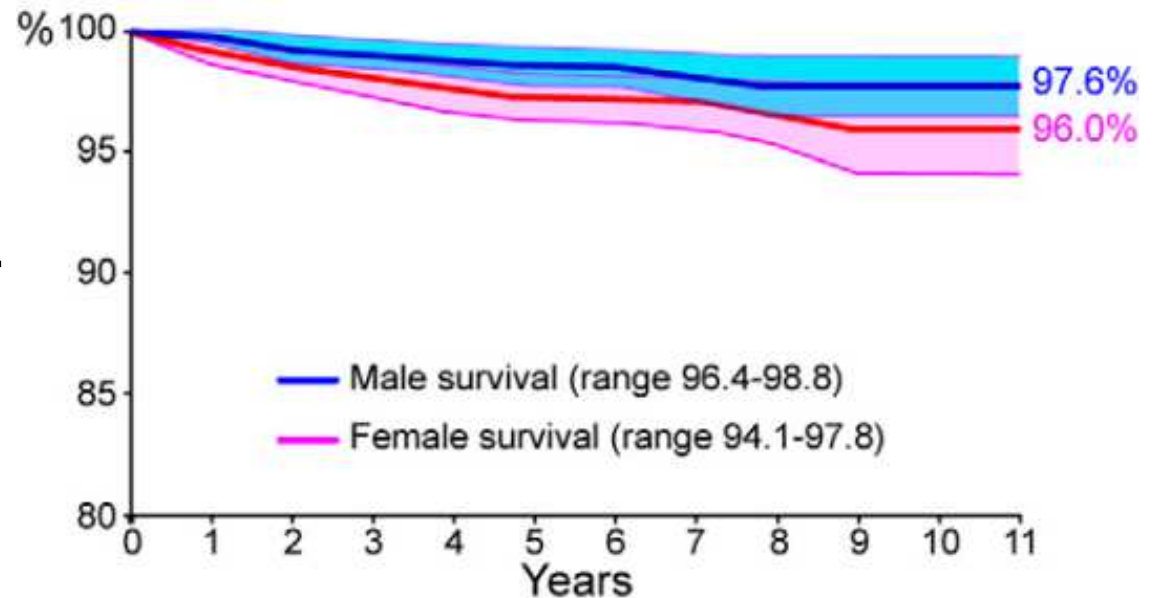
San Francisco, March 10-14, 2004



# Clinical basis

## Sex Differences in Hip Morphology: Is Stem Modularity Effective for THR?

Francesco Traina, et al.  
JBJS Am 2009



### A. SURVIVORSHIP

(estimated cumulative survival rate at 11 years)

All hips:	96.8%	at 11 years	(95% CI: 95.7- 97.9%)
Women:	96.0%		(95% CI: 94.1- 97.8%)
Men:	97.6%		(95% CI: 96.4- 98.8%) p = 0.07 (not stat.sign.)

# Clinical basis

Five- to 10-Year Results Using a Noncemented Modular Revision Stem Without Bone Grafting. Köster et al. J. of Arthrop. 2008

## Number of revision stems (profemur R)... 73

Follow up ...	mean 6,2 years (range 5 – 10)
HHS ...	increasement from 40 to 75 p.
Radiological remodelling ...	complete 70% , partial 30%
Subsidence ...	2 stems
Infection ...	1 case
Neck Fx, dislocations ...	NONE
Cumulative survivorship ...	96 @ 10 years ,

2012

# Survivorship Rate of THR with Modular Necks: a multicentric study



F. De Meo \*, M. Ribas \*\*, F. Ciccolo \*, C. Cardenas \*\*, P. Cavaliere \*



13th EFORT Congress 2012  
Berlin, Germany: 23-25 May

2012

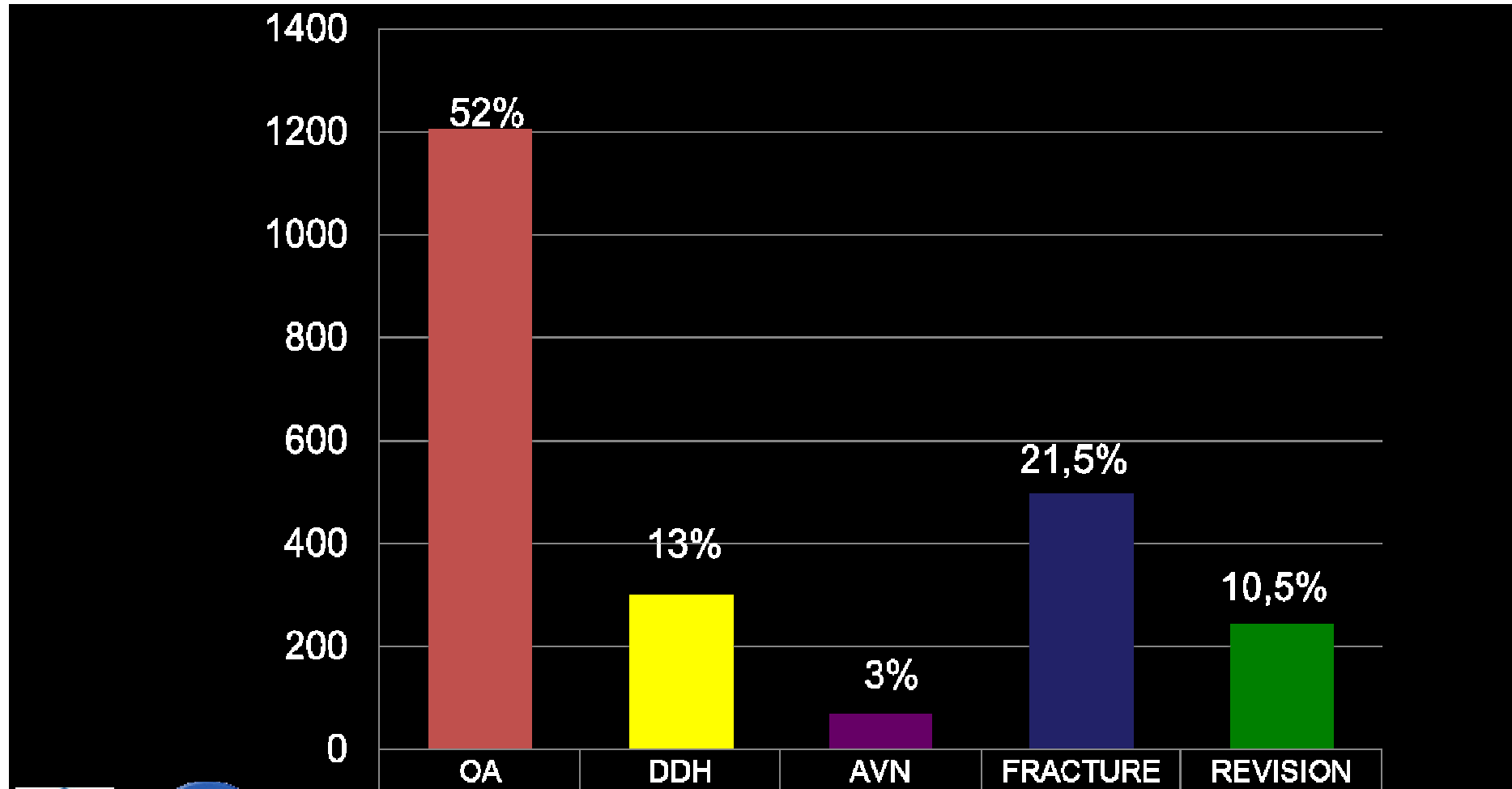
## Survivorship Rate of THR with Modular Necks: a multicentric study

2002 – 2009... **2314 THA**

- Gender 1109 male / 1205 female
- Age 68 y. (range 39-86)
- 3 surgeons JV, PC, MR
- approach postero-lateral
- Follow up 6,7 y. (range 3 - 10)
- Primary THA ... 2071 cases
- Revision ... 243 cases

2012

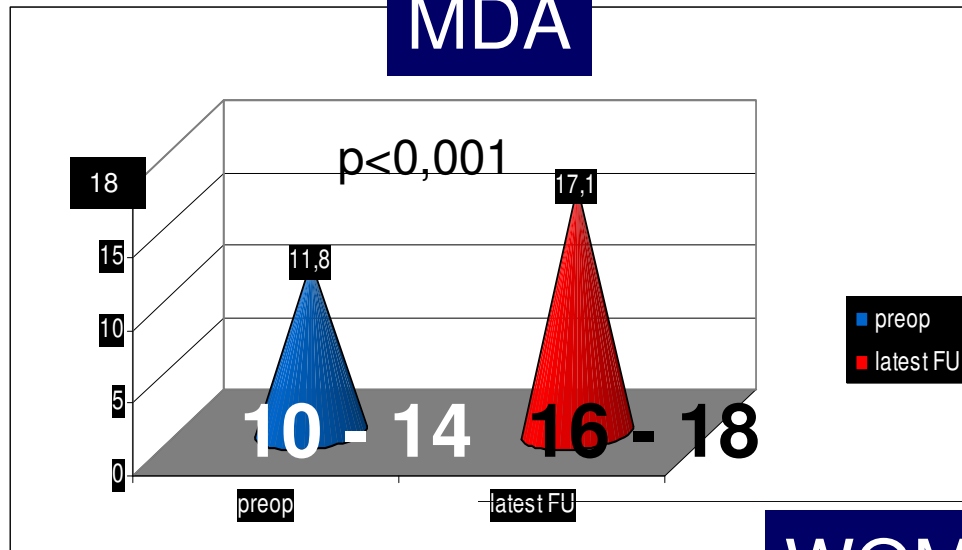
# Preoperative diagnosis



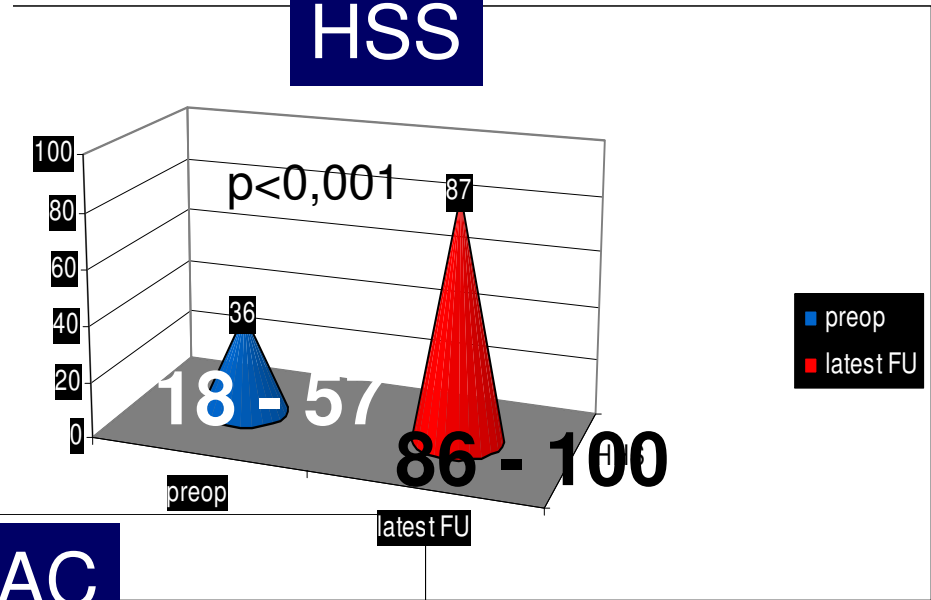
2012

# CF Results in primary THA (2071c)

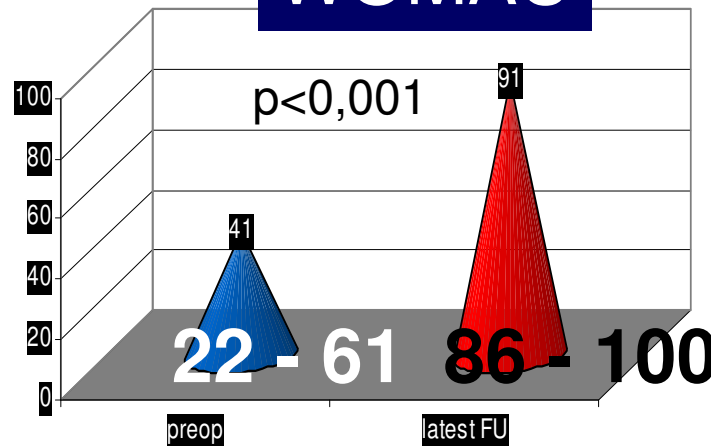
## MDA



## HSS



## WOMAC



2012

# Revisions: 41 / 2314 (1,77%)

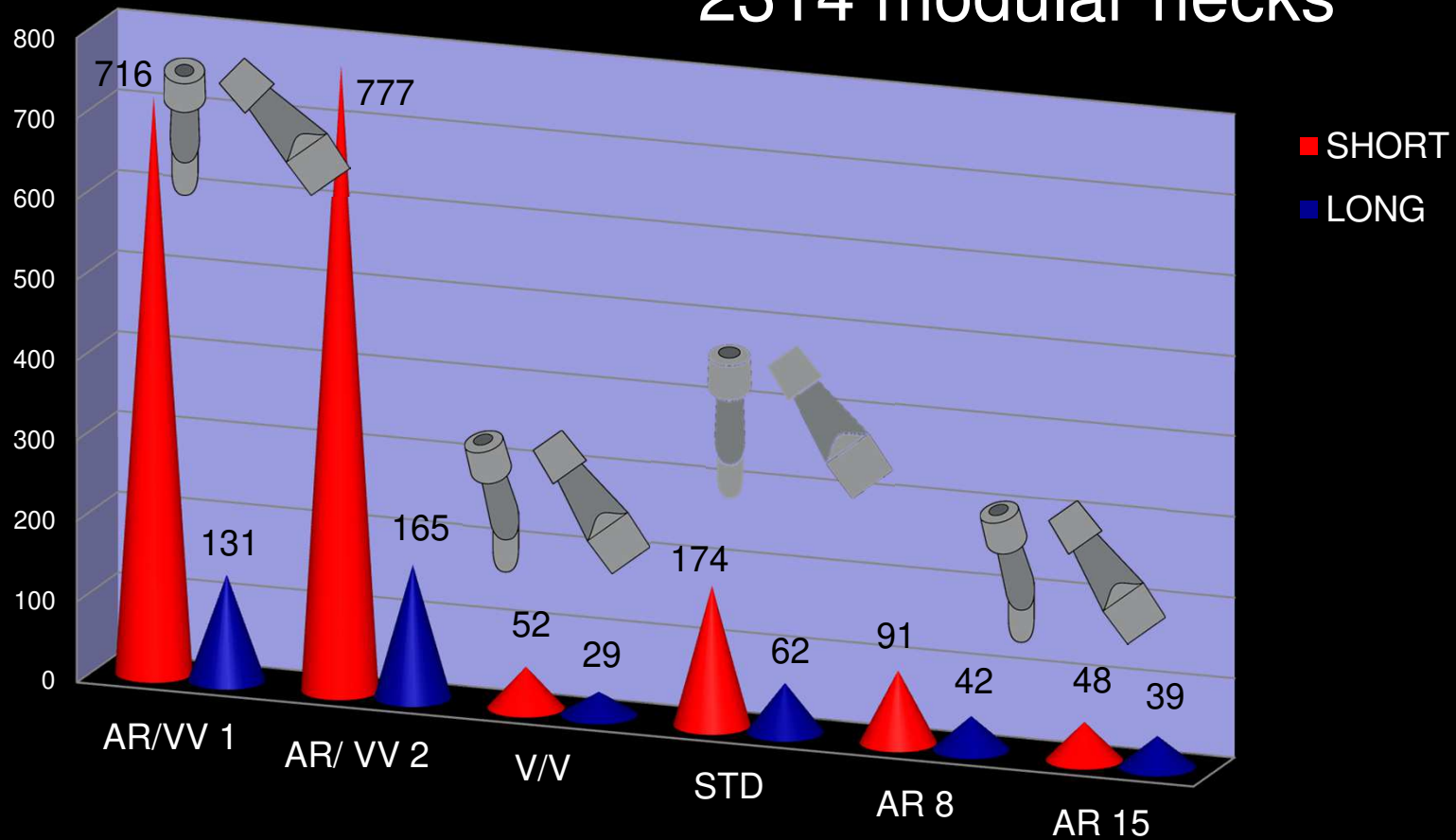
- Deep infection 18 (2 staged revision )
- Cup loosening 8
- Subsidence 3
- **Dislocation 5 /2314 (0,21 %)**
- Squeaking 2
- **Neck fracture 1 /2314 (0,04 %)**
- **Bearing couple exchange 4 /474 (0,84 %)**



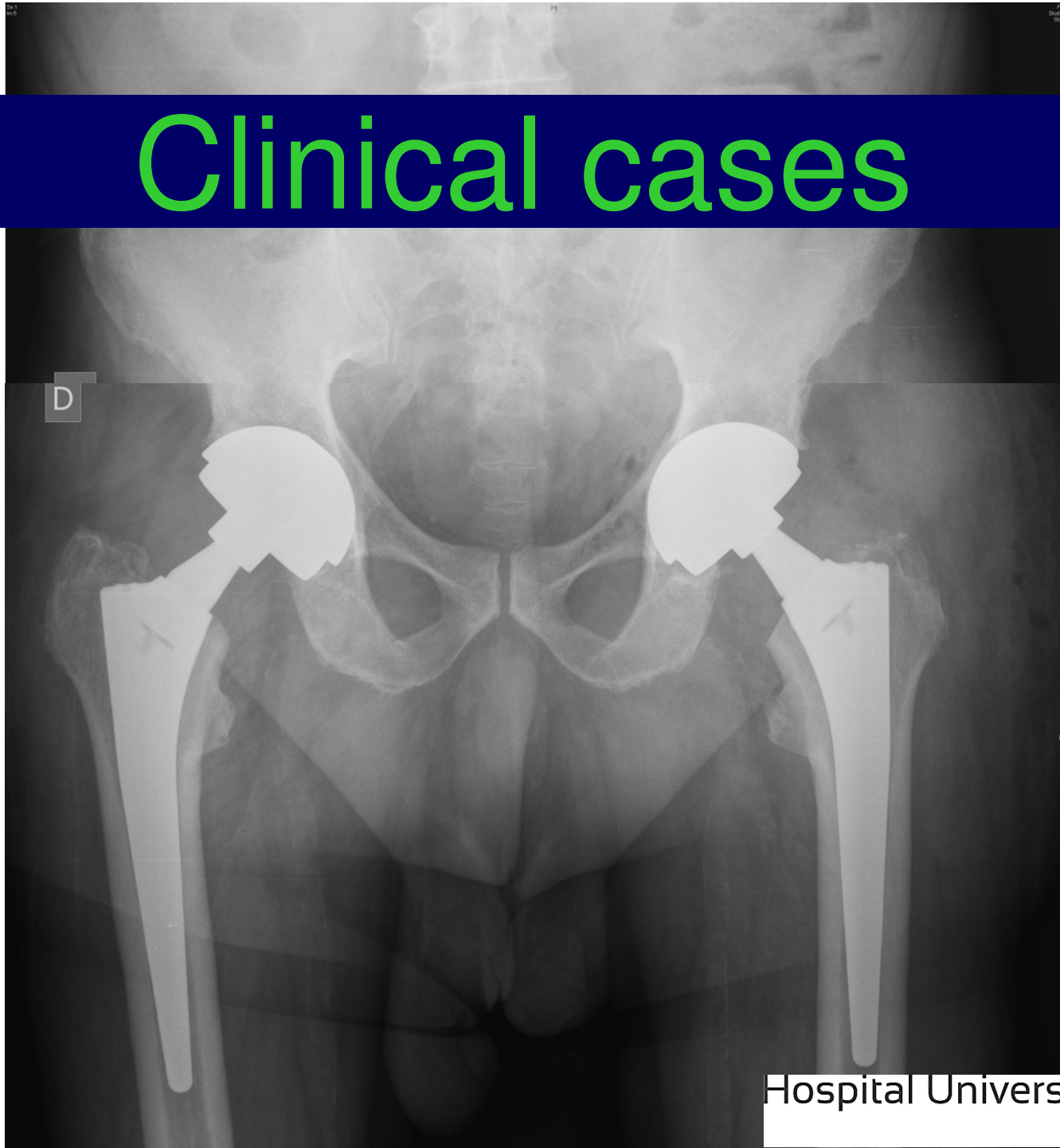
2012

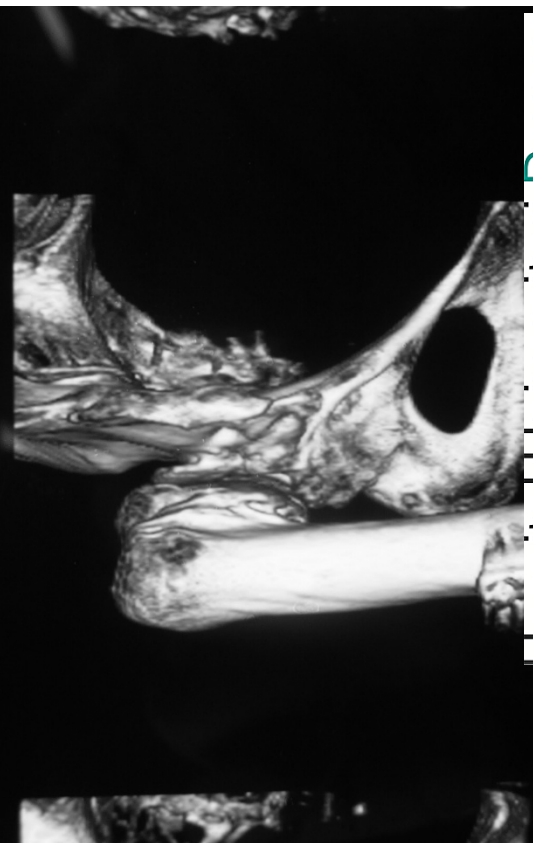
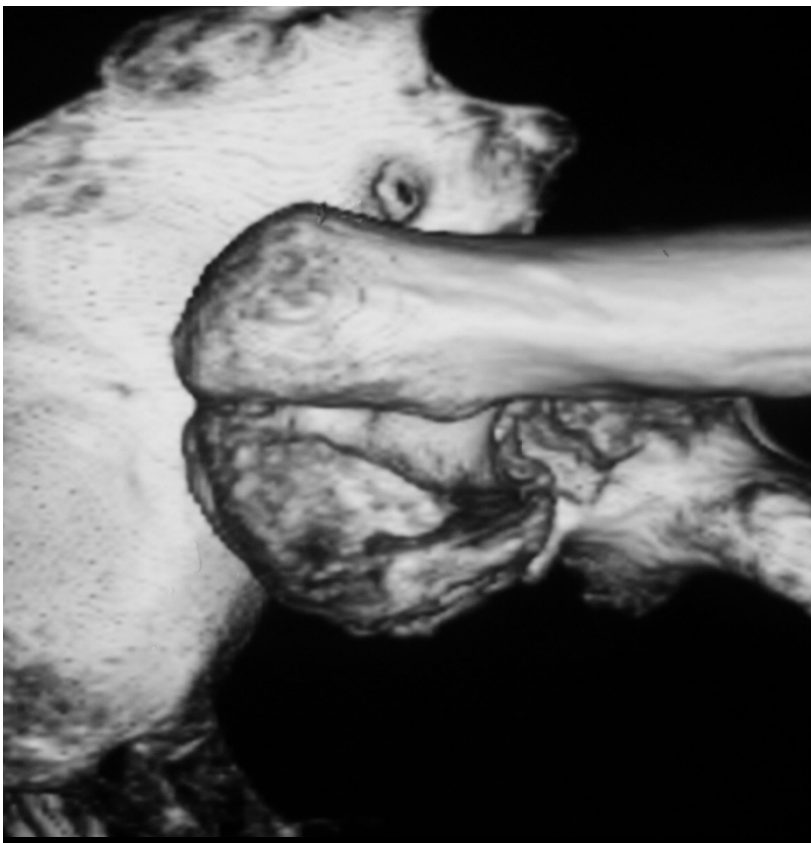
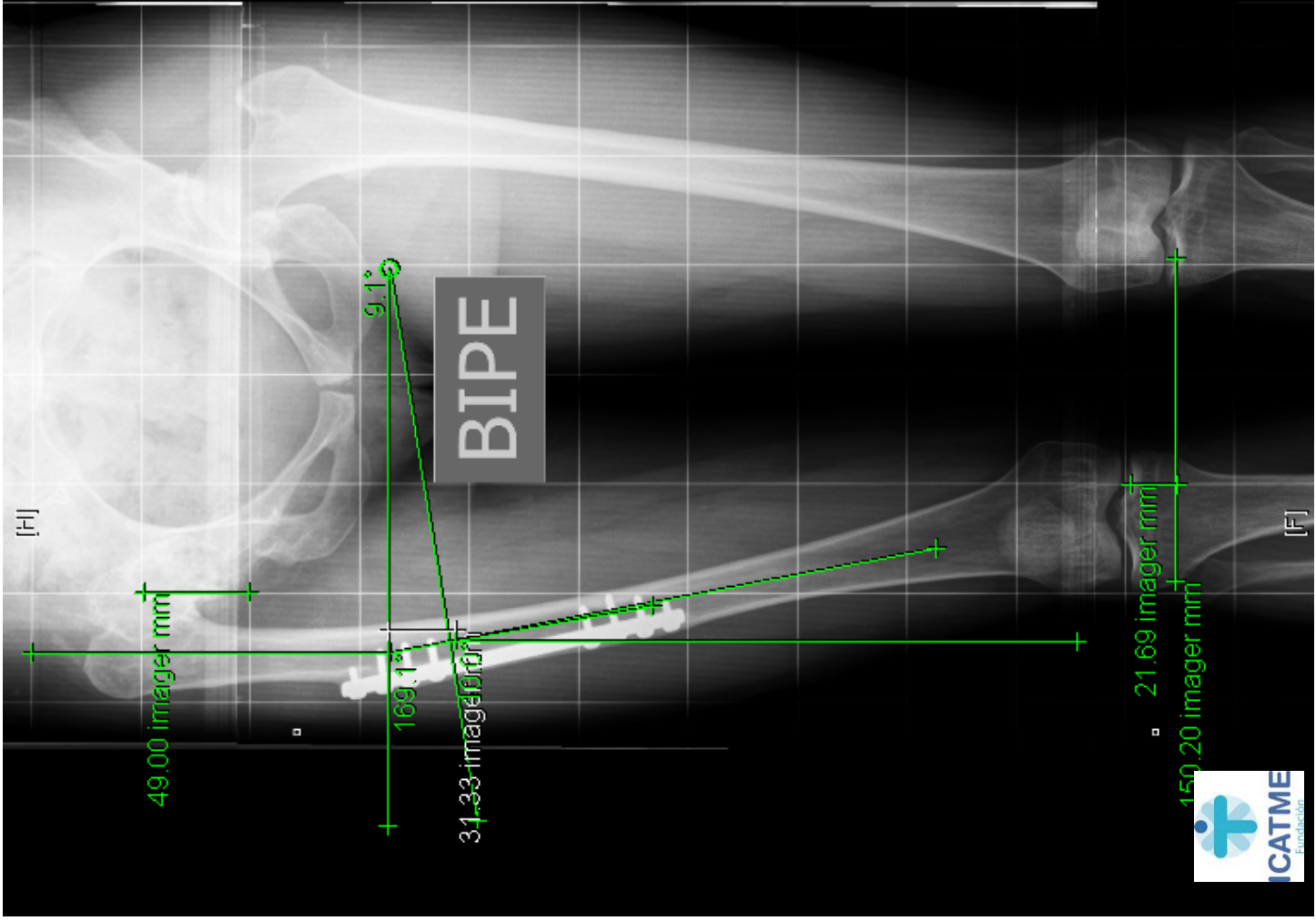
# Survivorship Rate of THR with Modular Necks: a multicentric study. Modular necks used

2314 modular necks

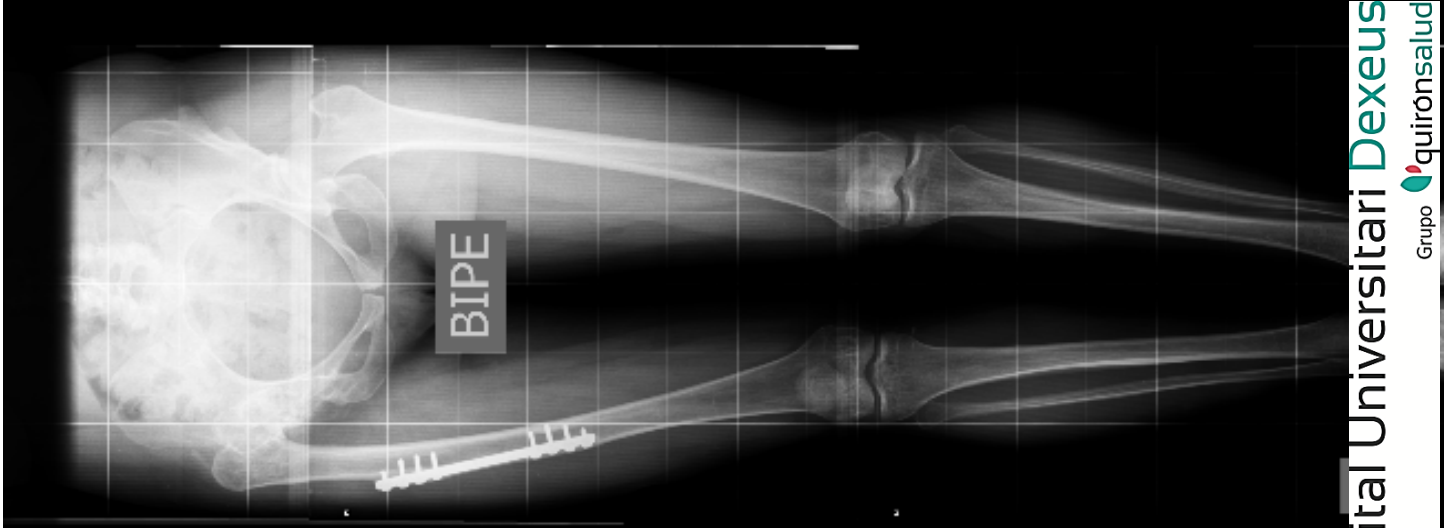
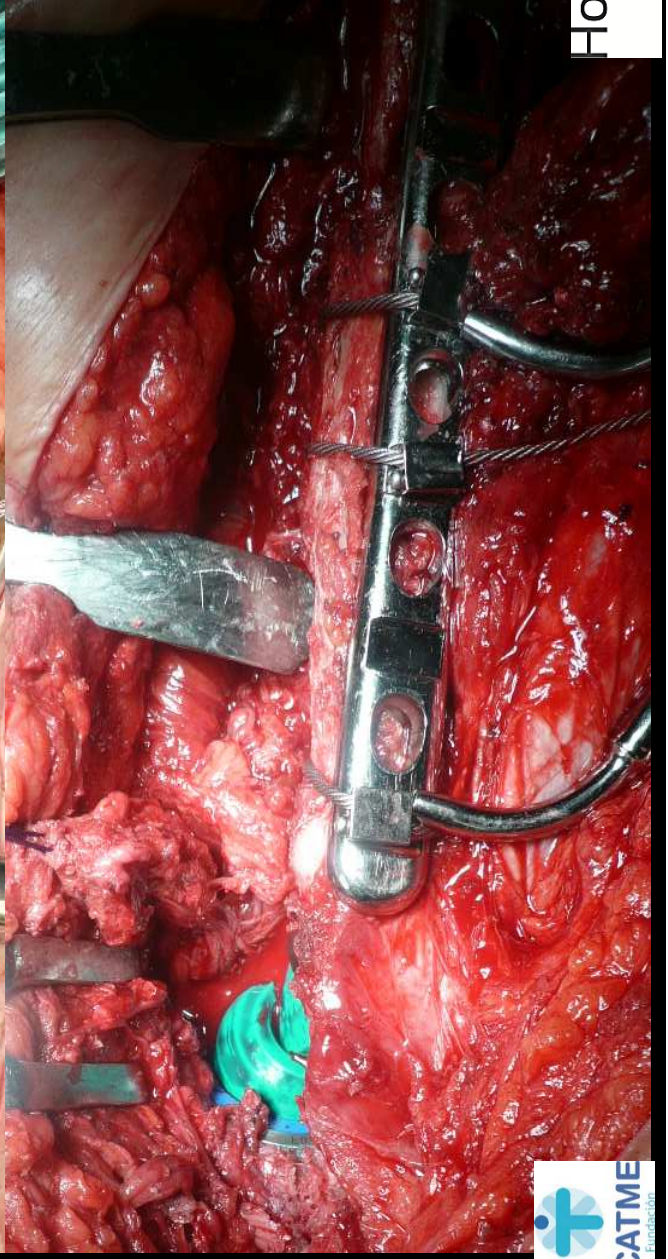
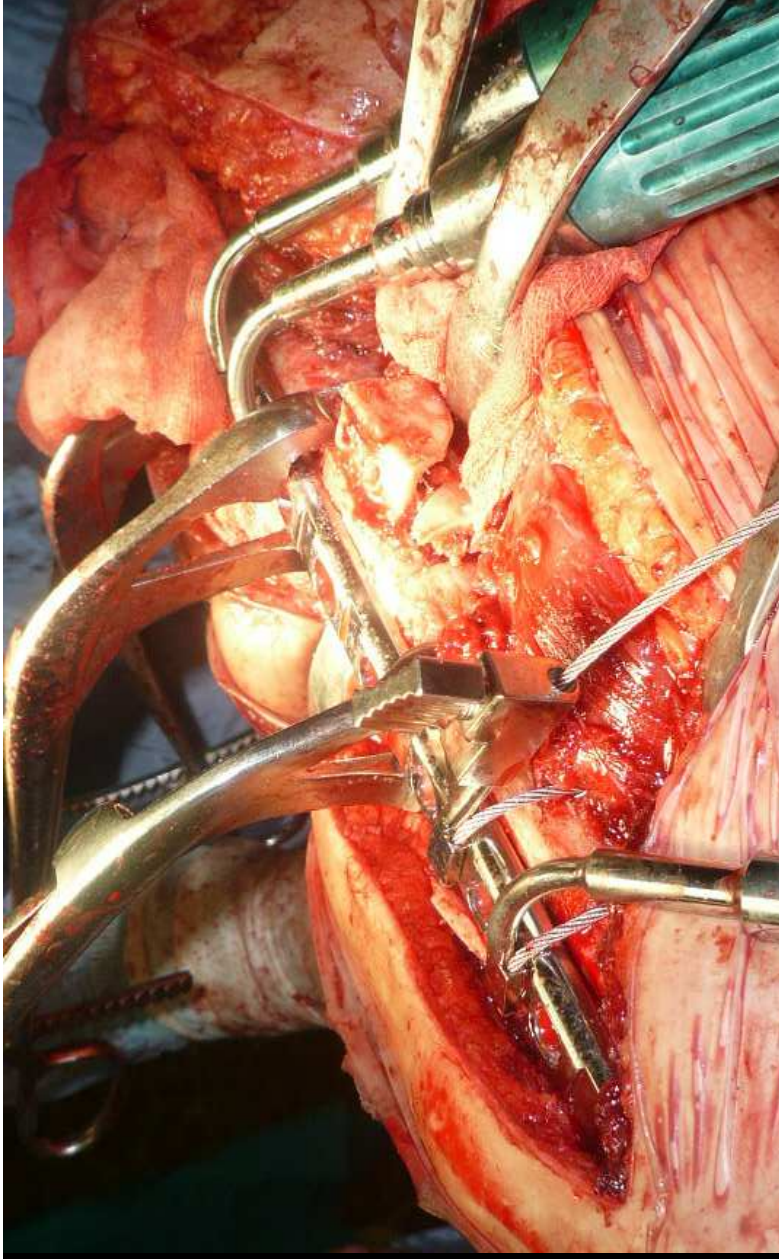


# Clinical cases

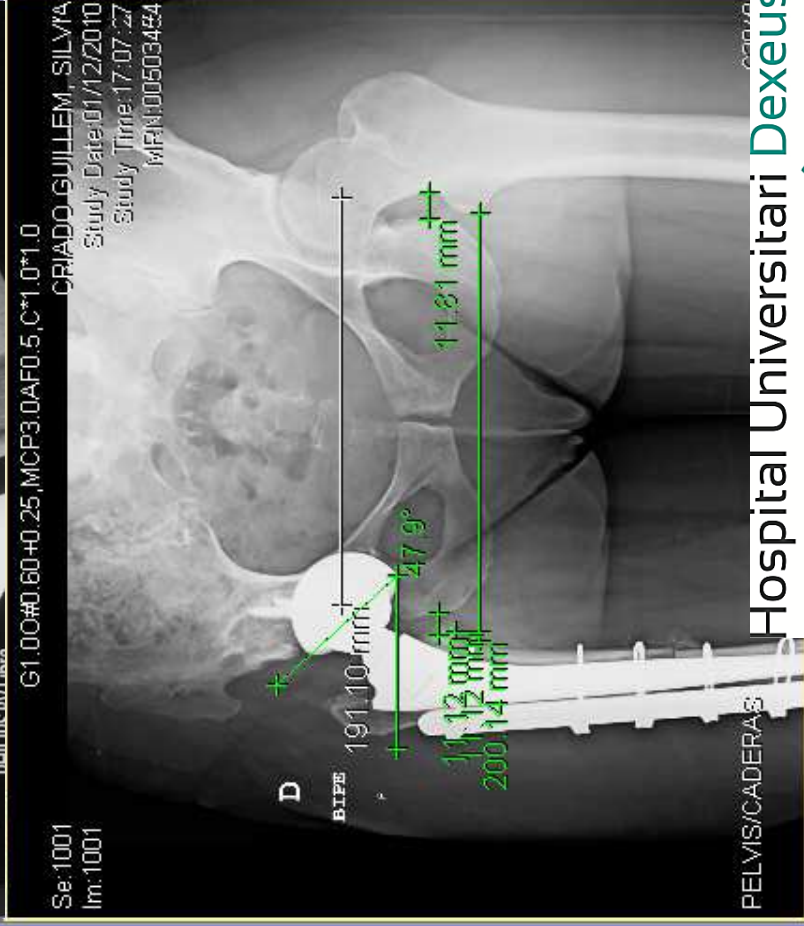
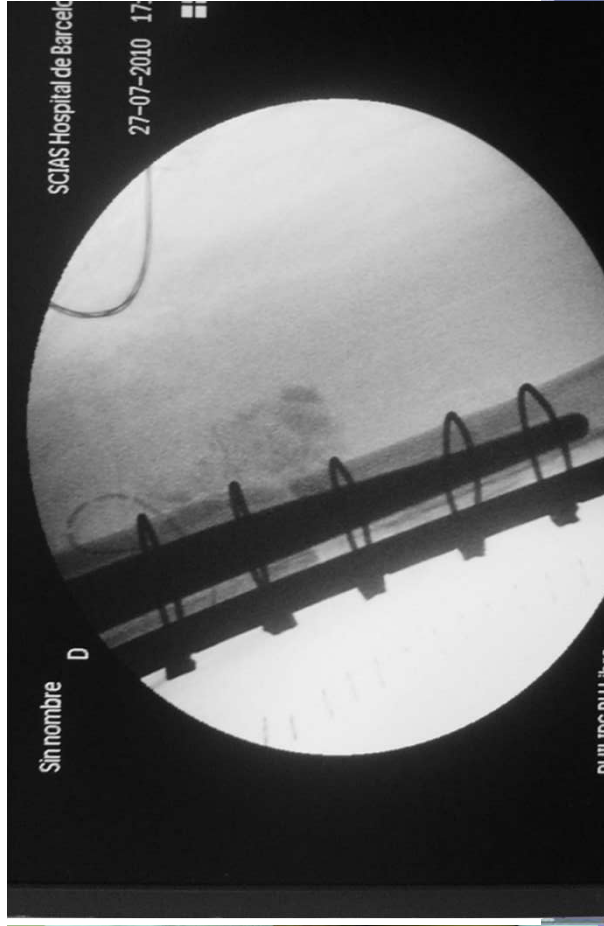










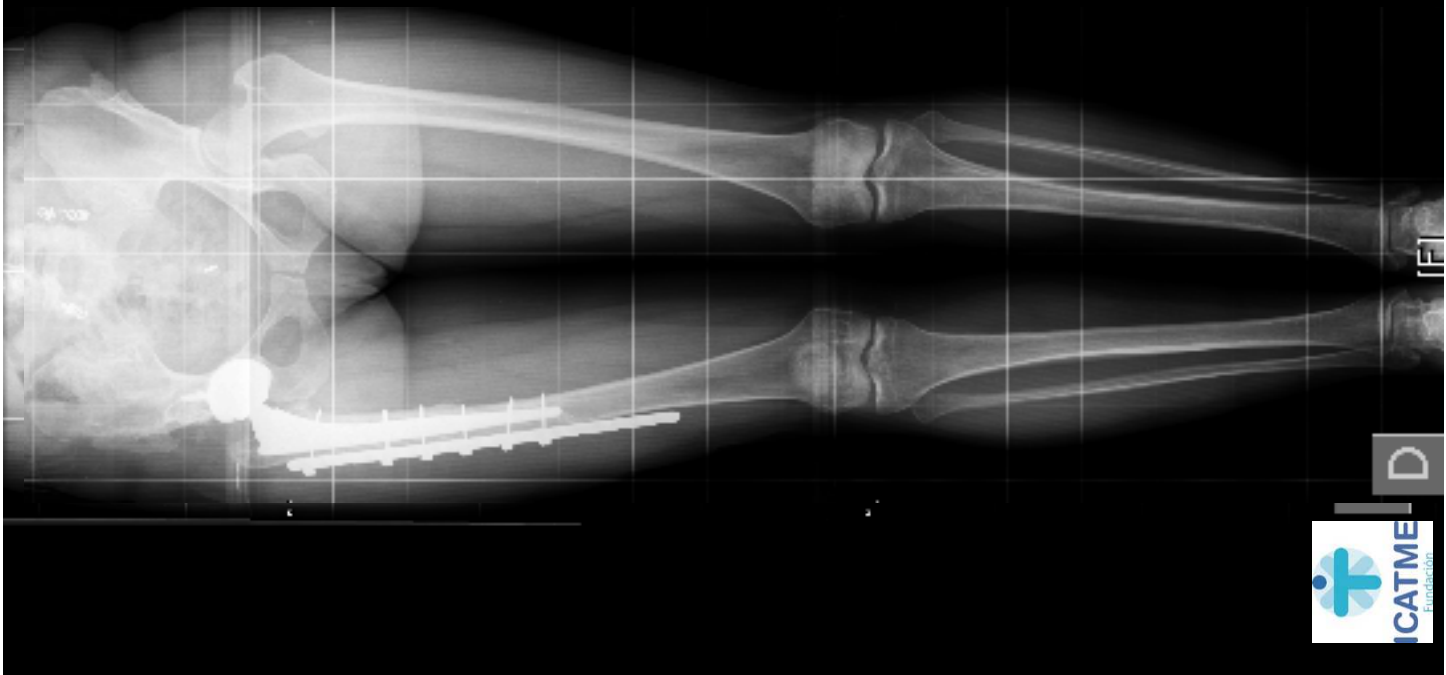


Listo

Intranet local

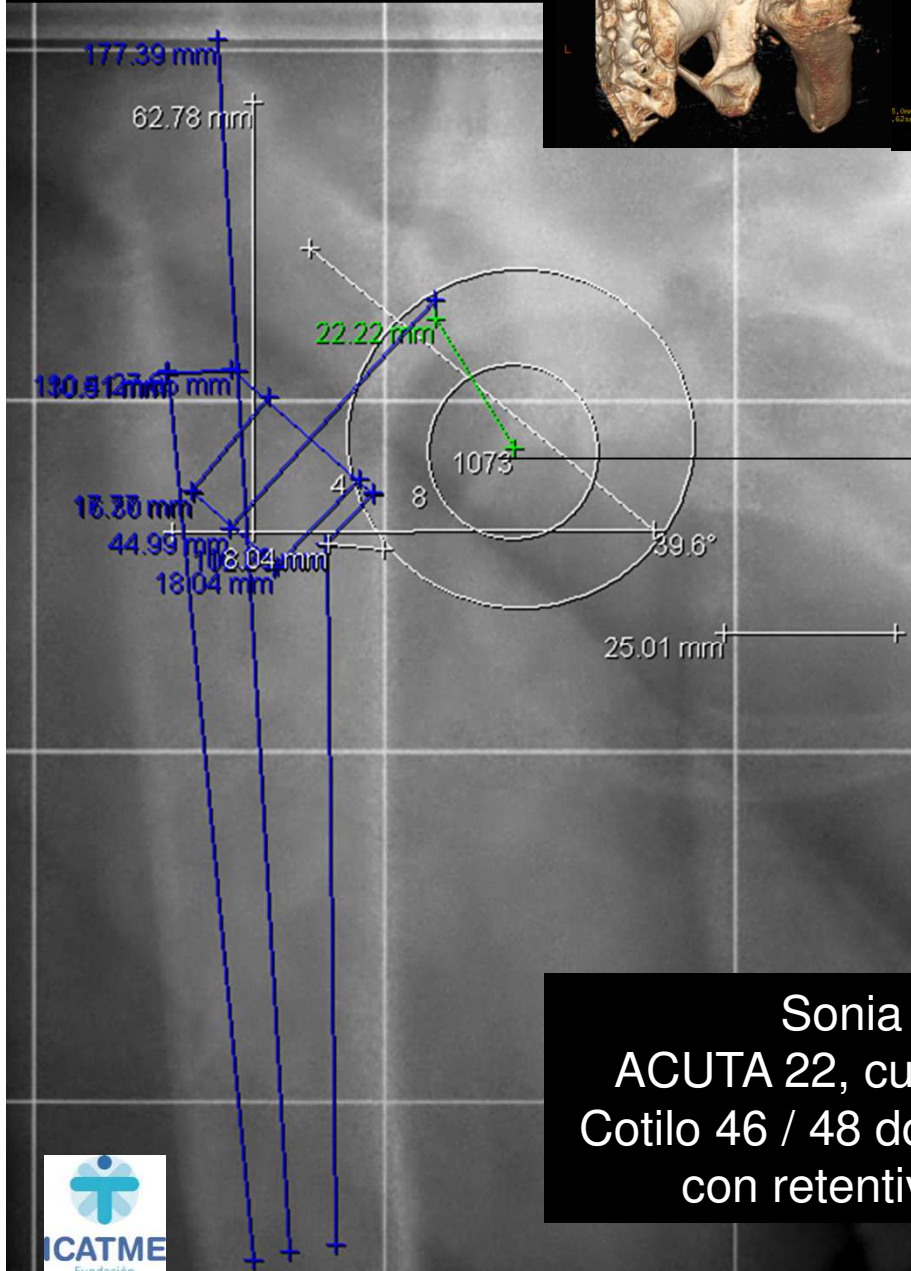
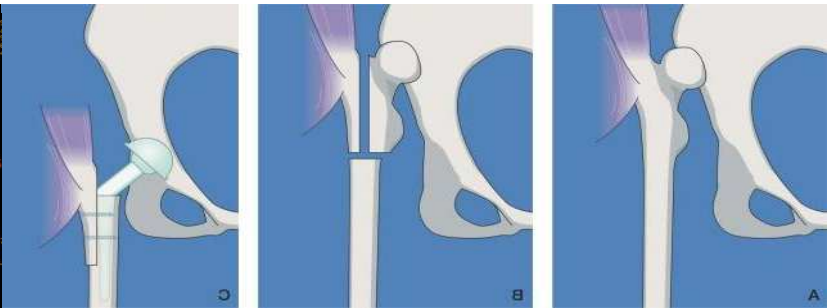
100%





D

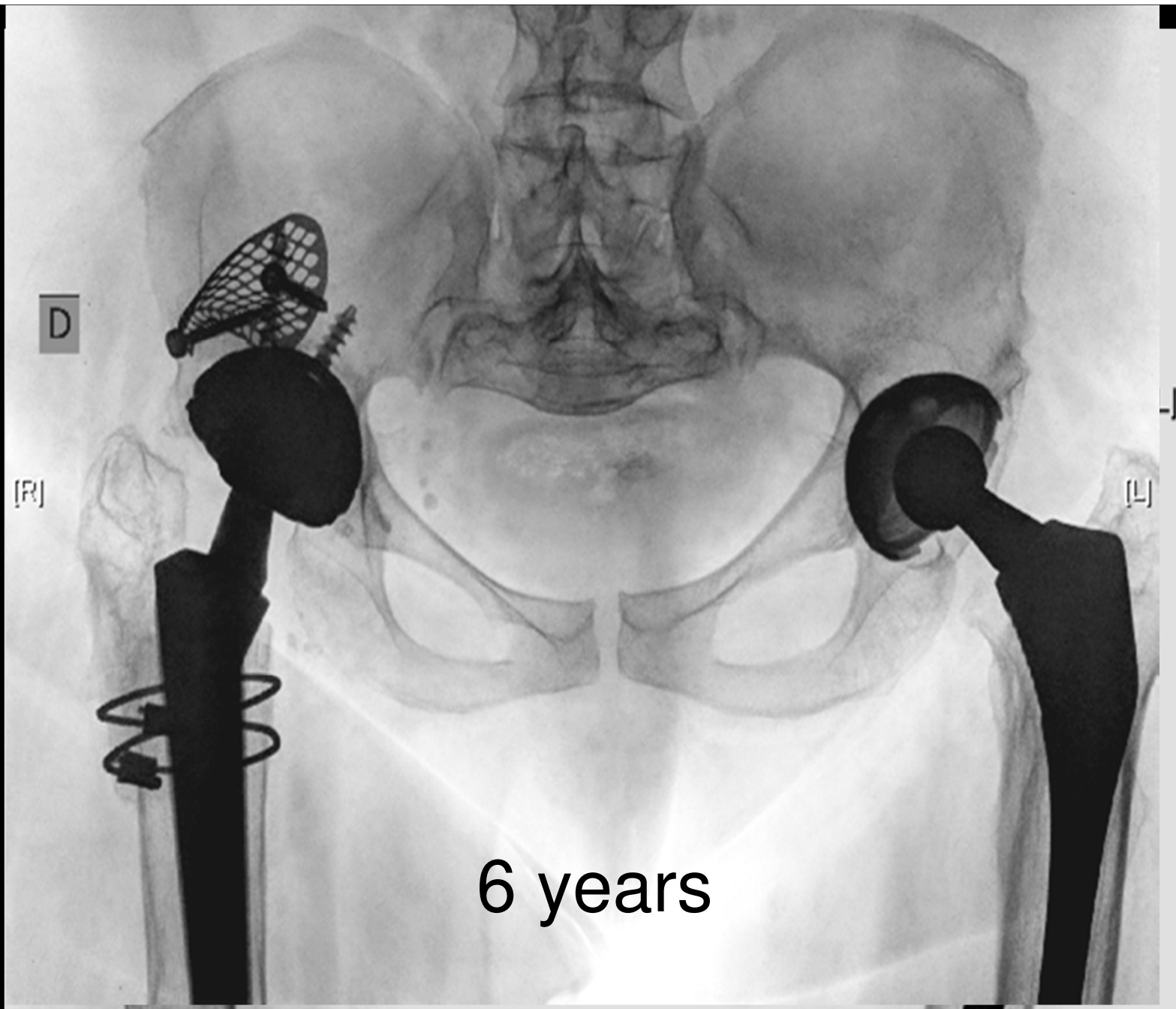
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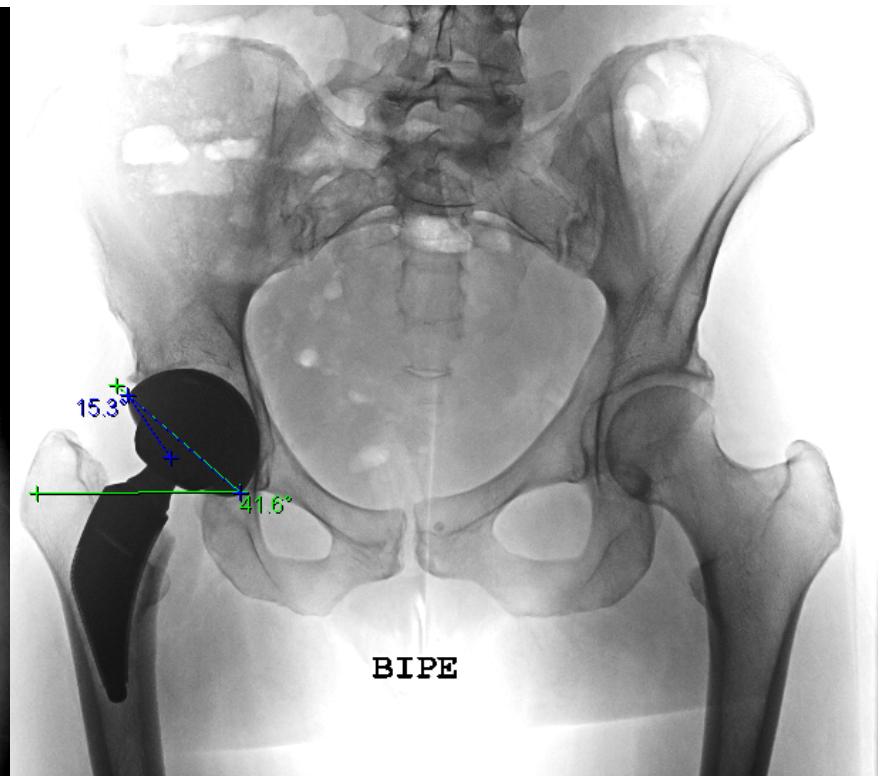
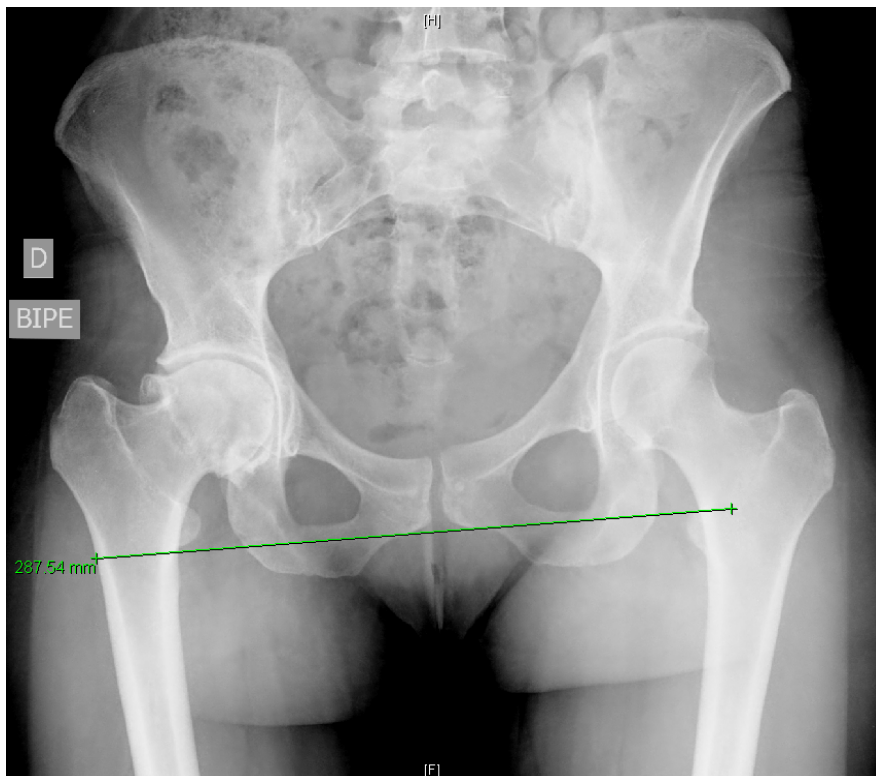


Sonia José Abril HC 580839  
 ACUTA 22, cuello corto neutro cabeza larga  
 Cotilo 46 / 48 doble movilidad VS placa GAP III  
 con retentivo de 44 O Tritanium MDM

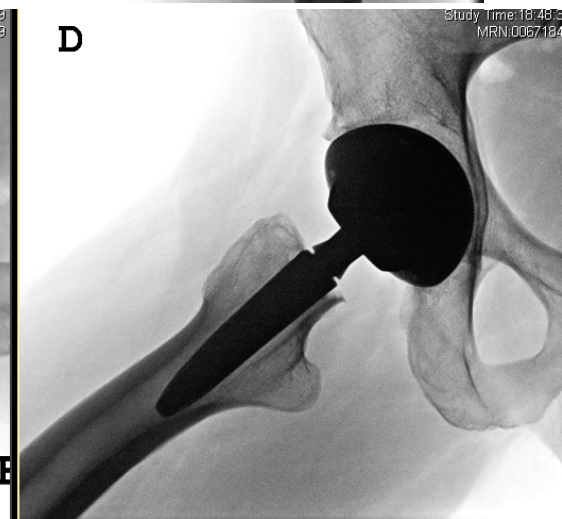
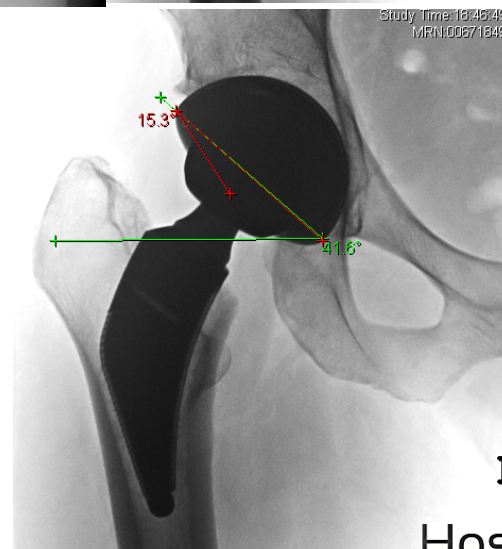








34 y. female HC  
 Coxa vara brevis  
 shortened RIE  
 Tipor – parva – Ce/Ce

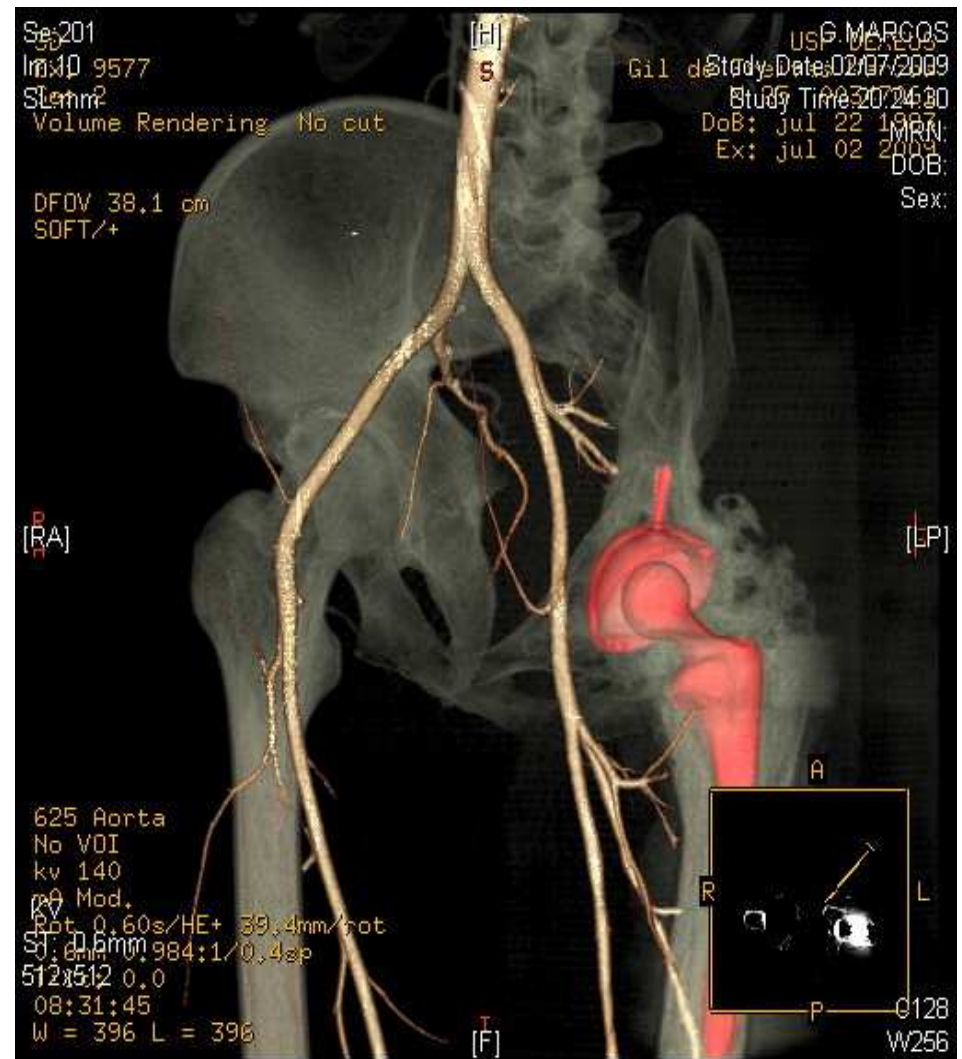


# clinical cases

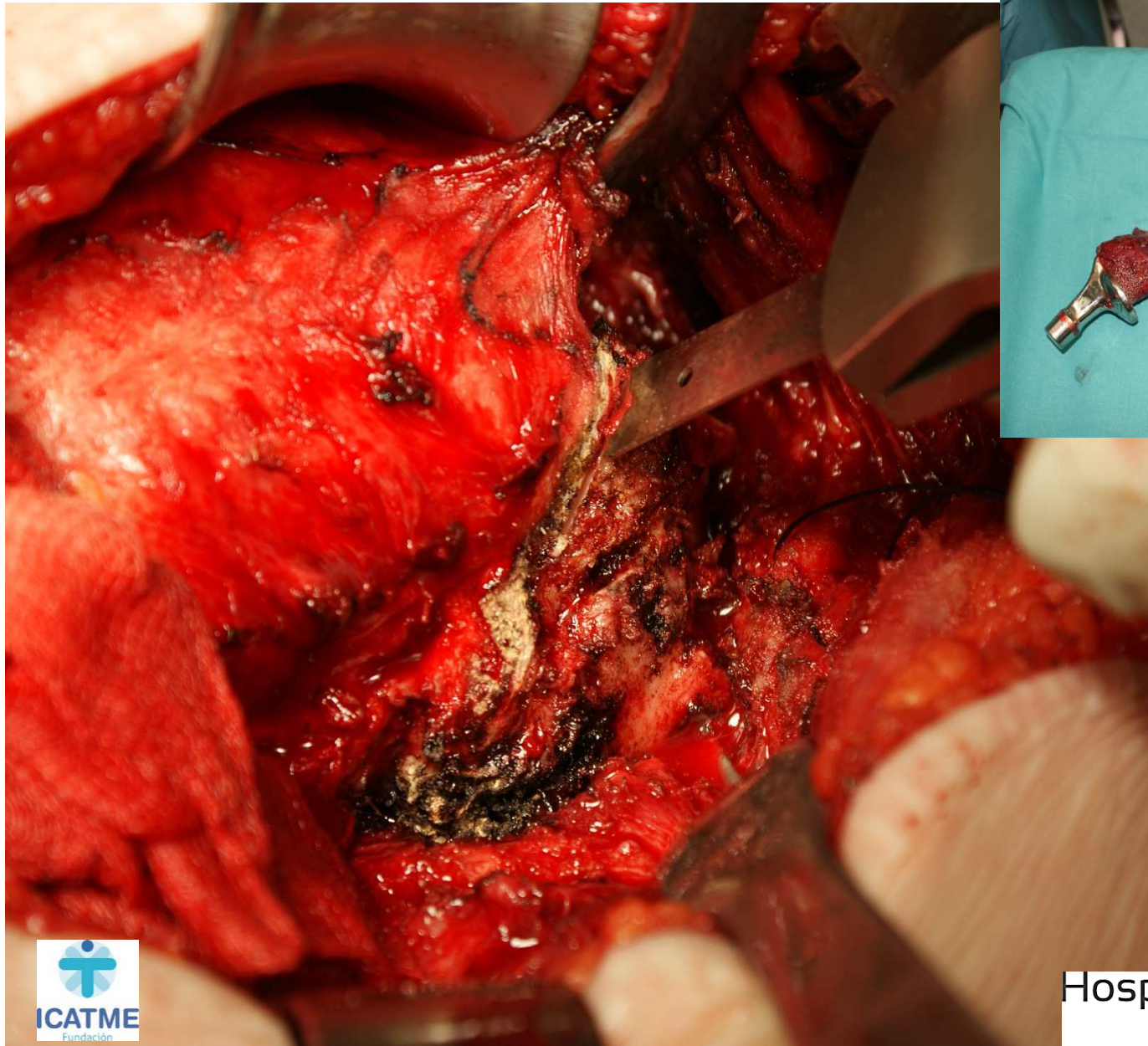




# clinical cases

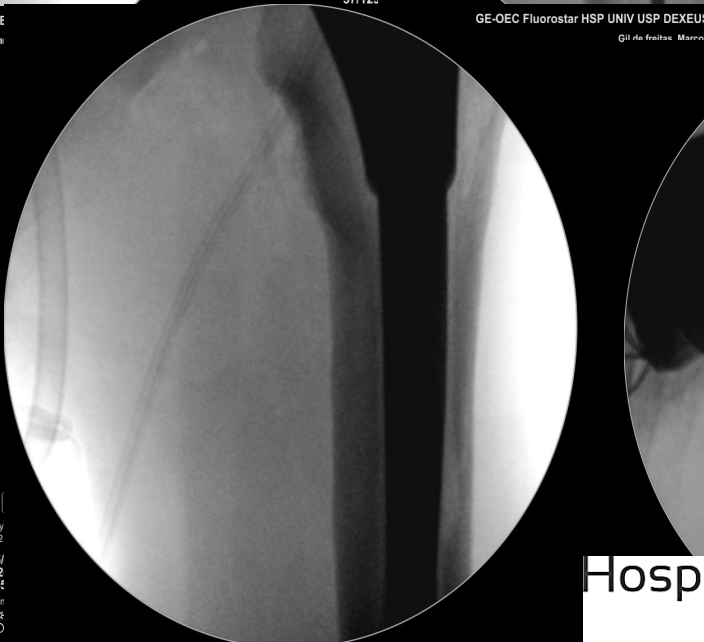


# clinical cases





# clinical cases



# clinical cases



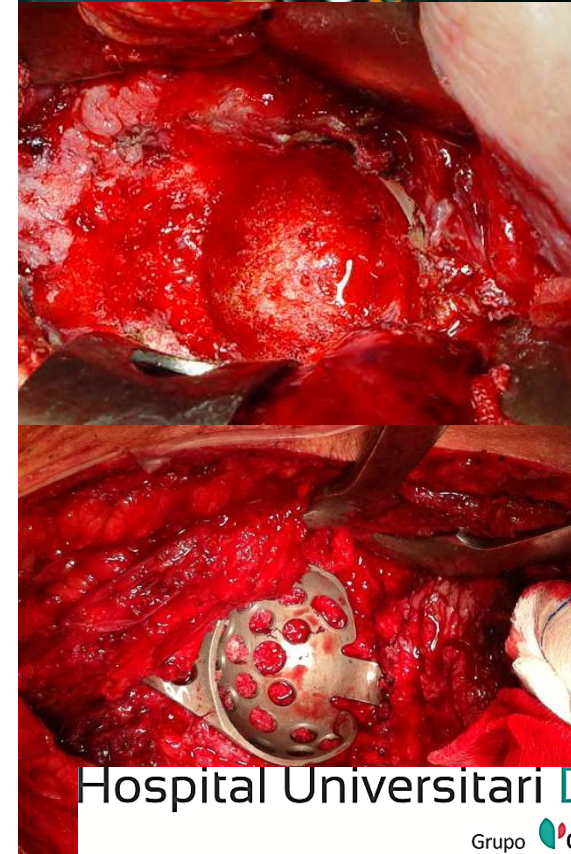
9 years



# clinical cases

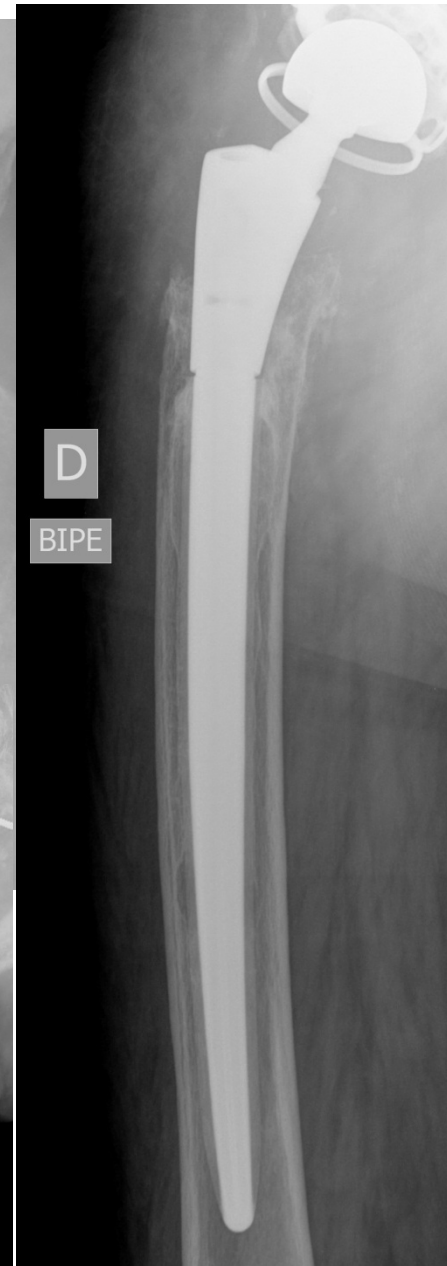
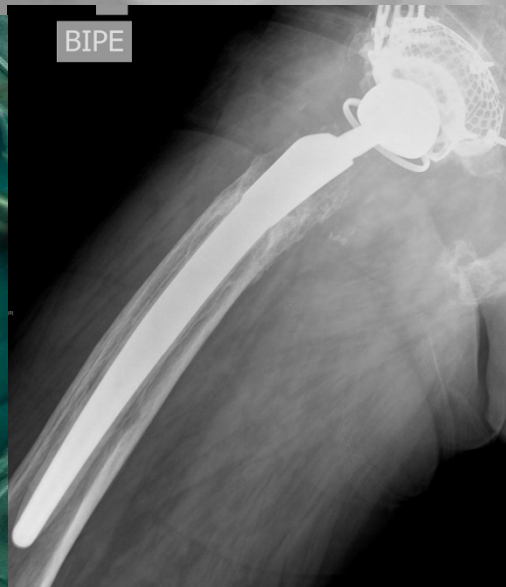
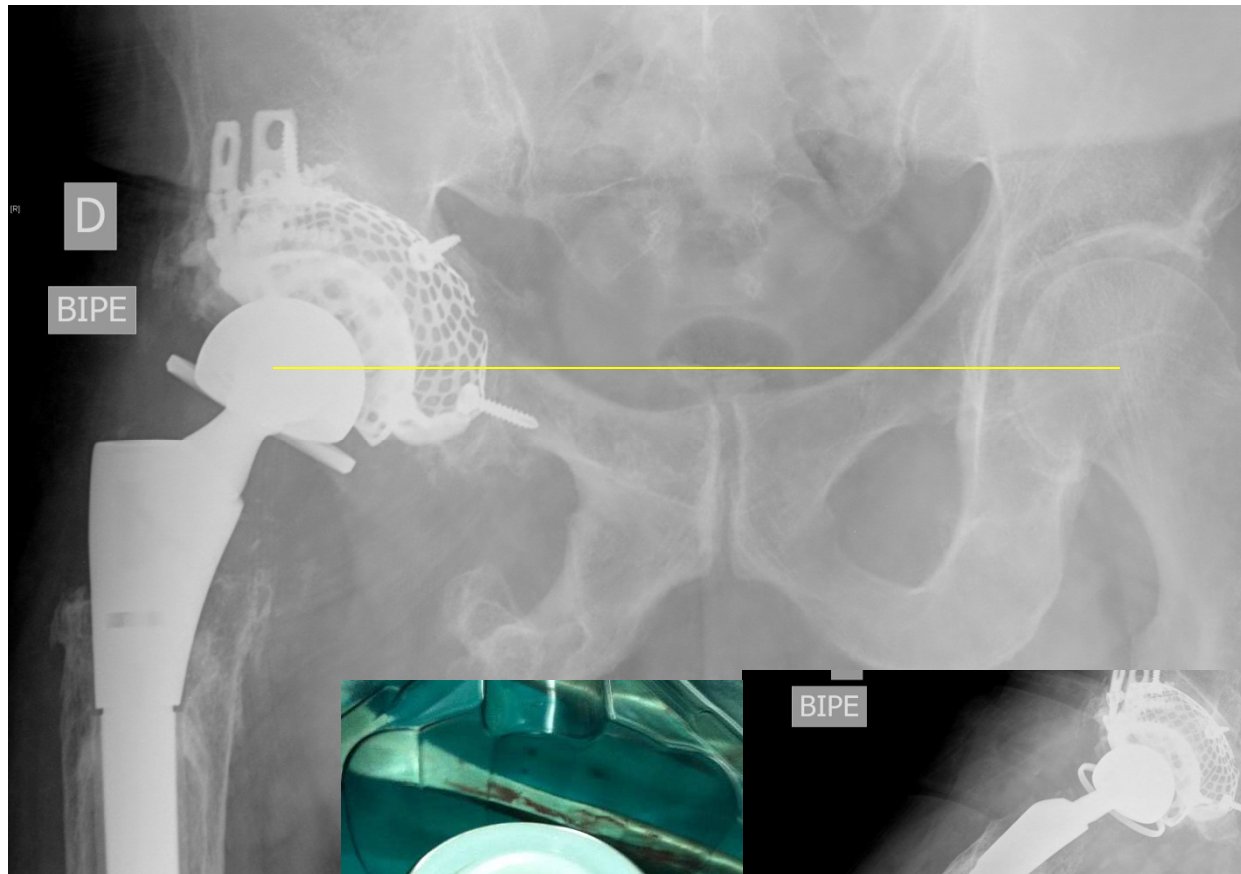


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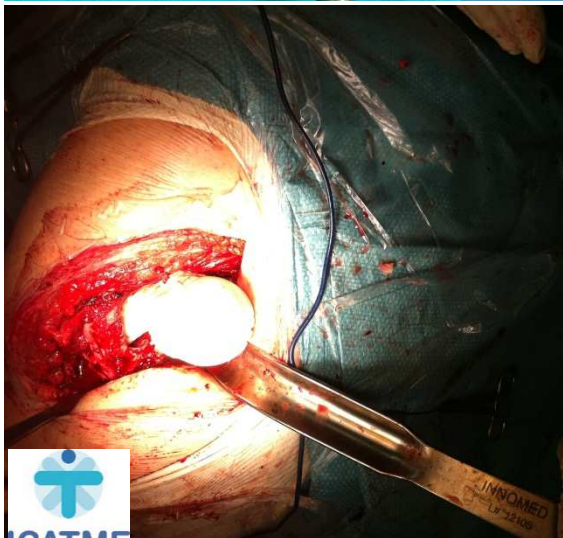
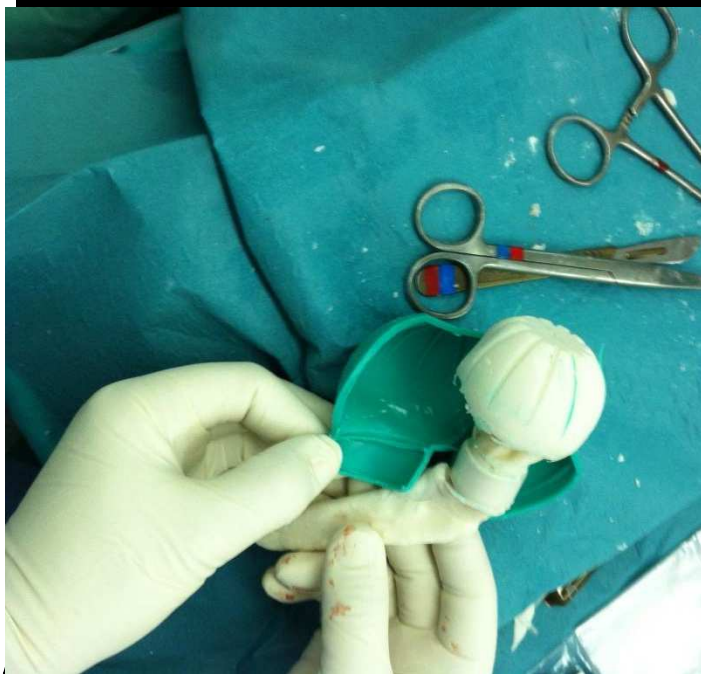




# clinical cases



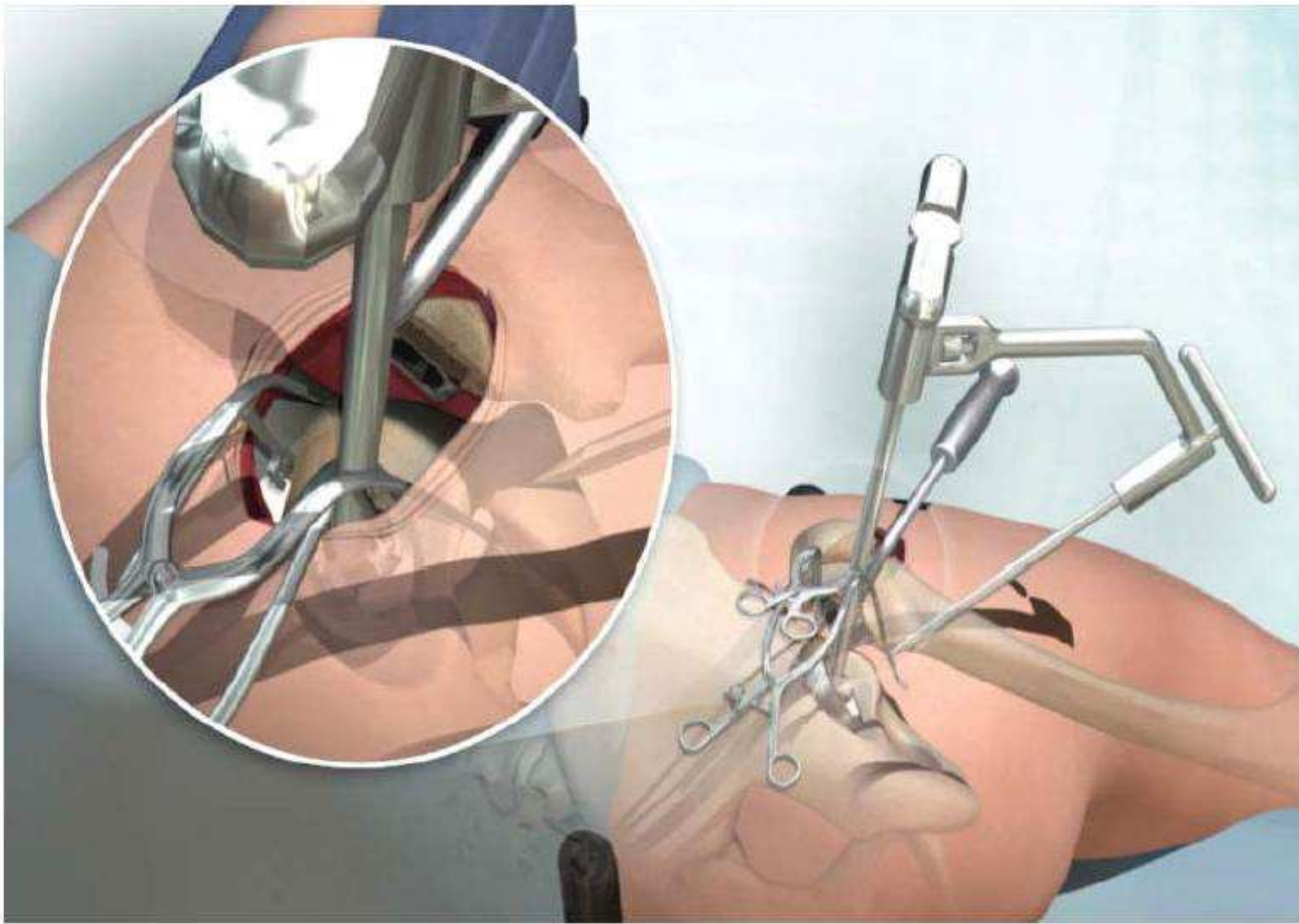
# clinical cases





# clinical cases





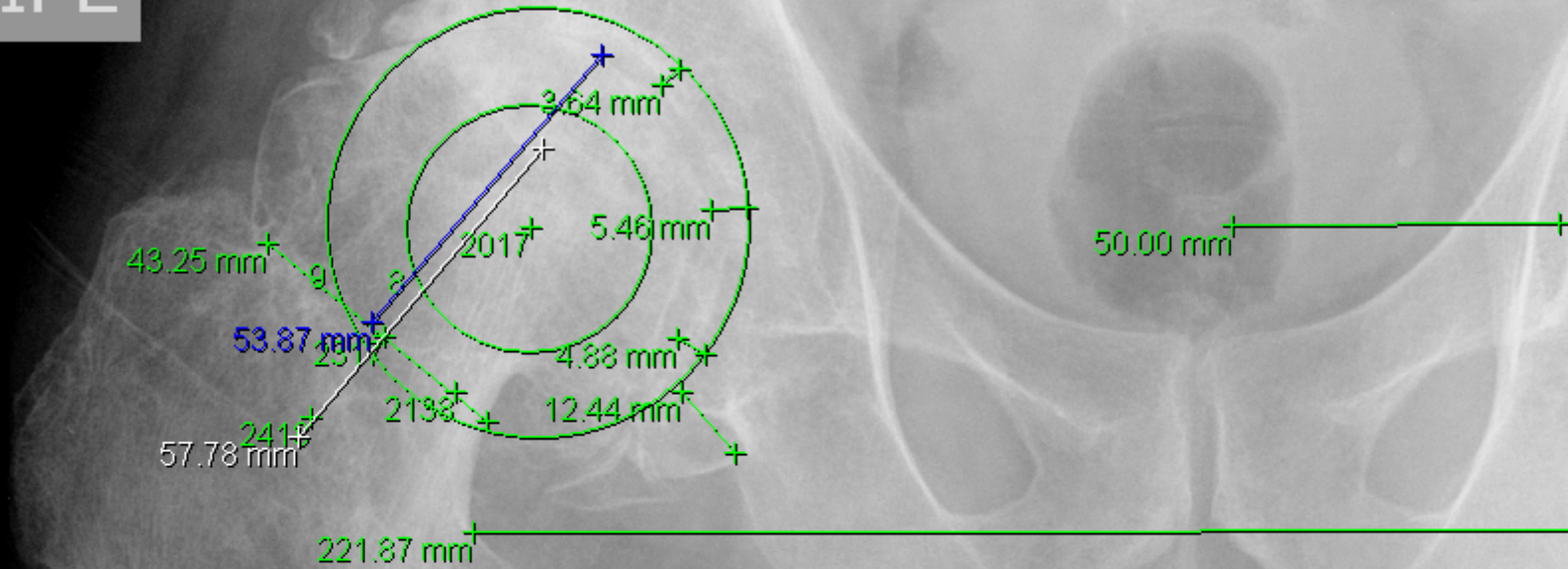
Se:1  
Im:1

D

[H]

BIPE

[R]



VASTAGO PRESERVE  
CORTE CABEZA 47  
DISTANCIA CALCAR 5  
Cotilo 54 inclinació 43°



am Fundación las AP

Hospital Universitari Dexeus

Grupo quirónsalud





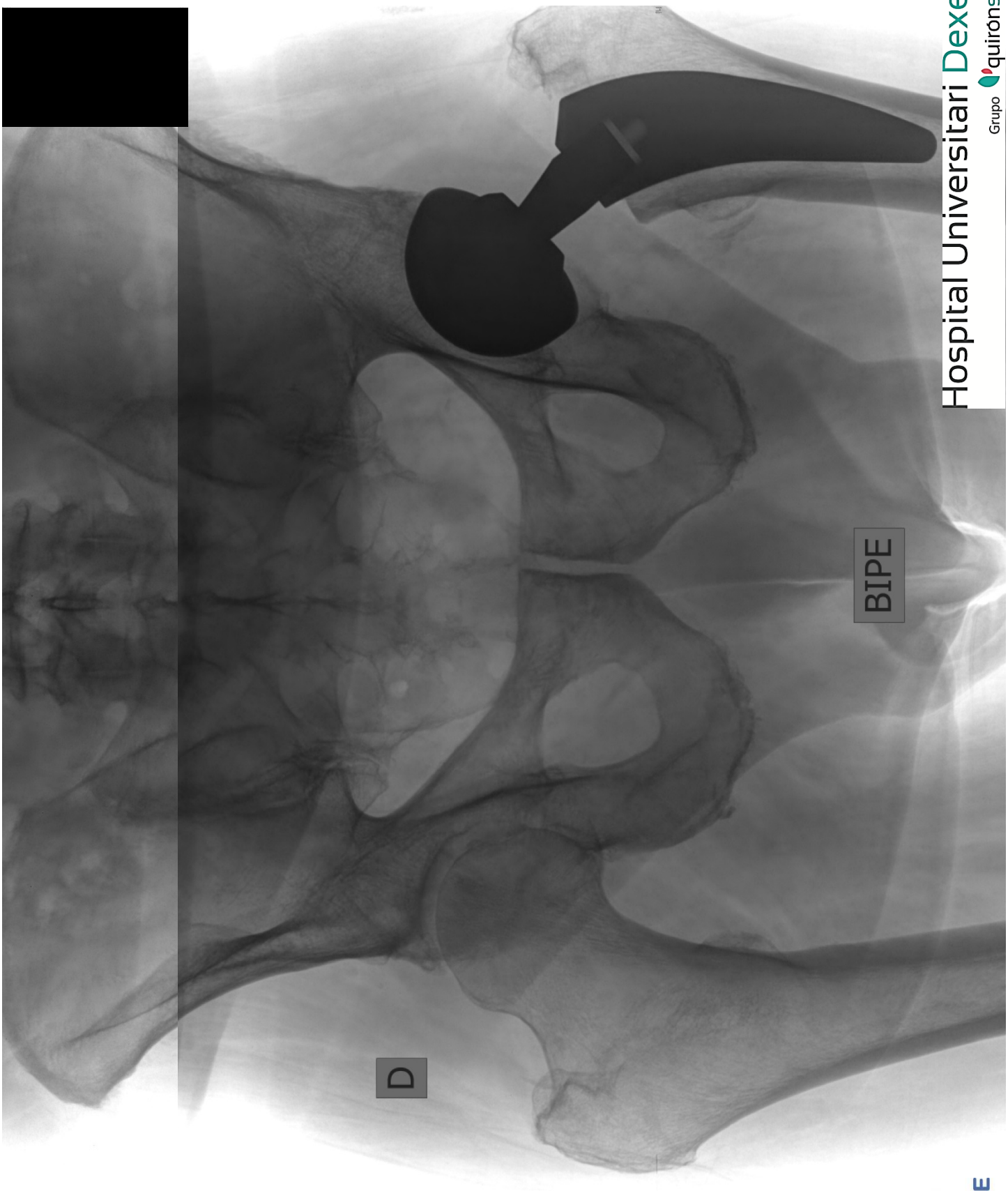
Rev. 1/02

IP1

D

**BIPE**

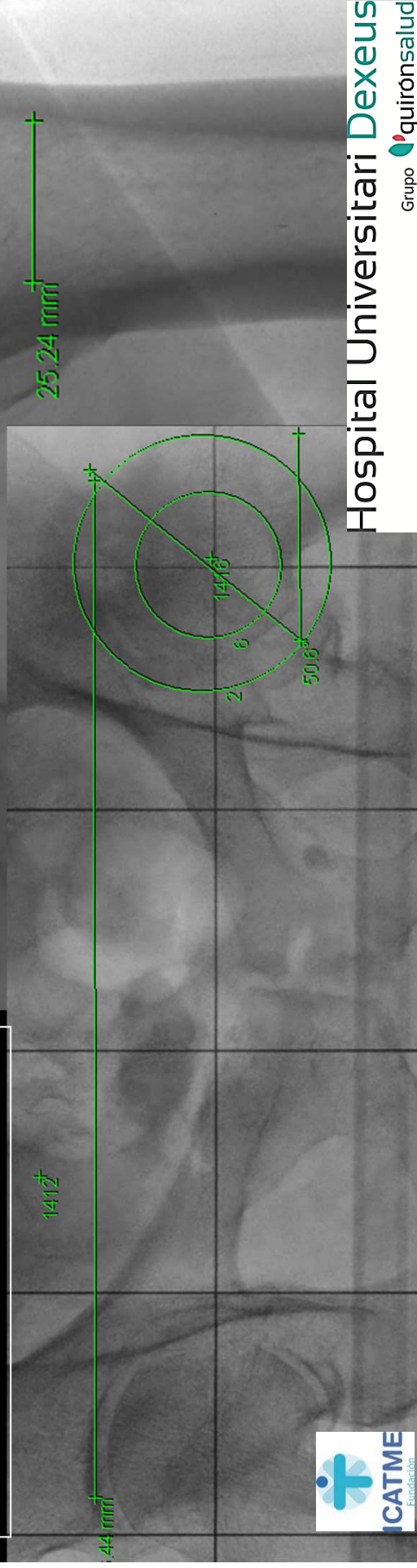
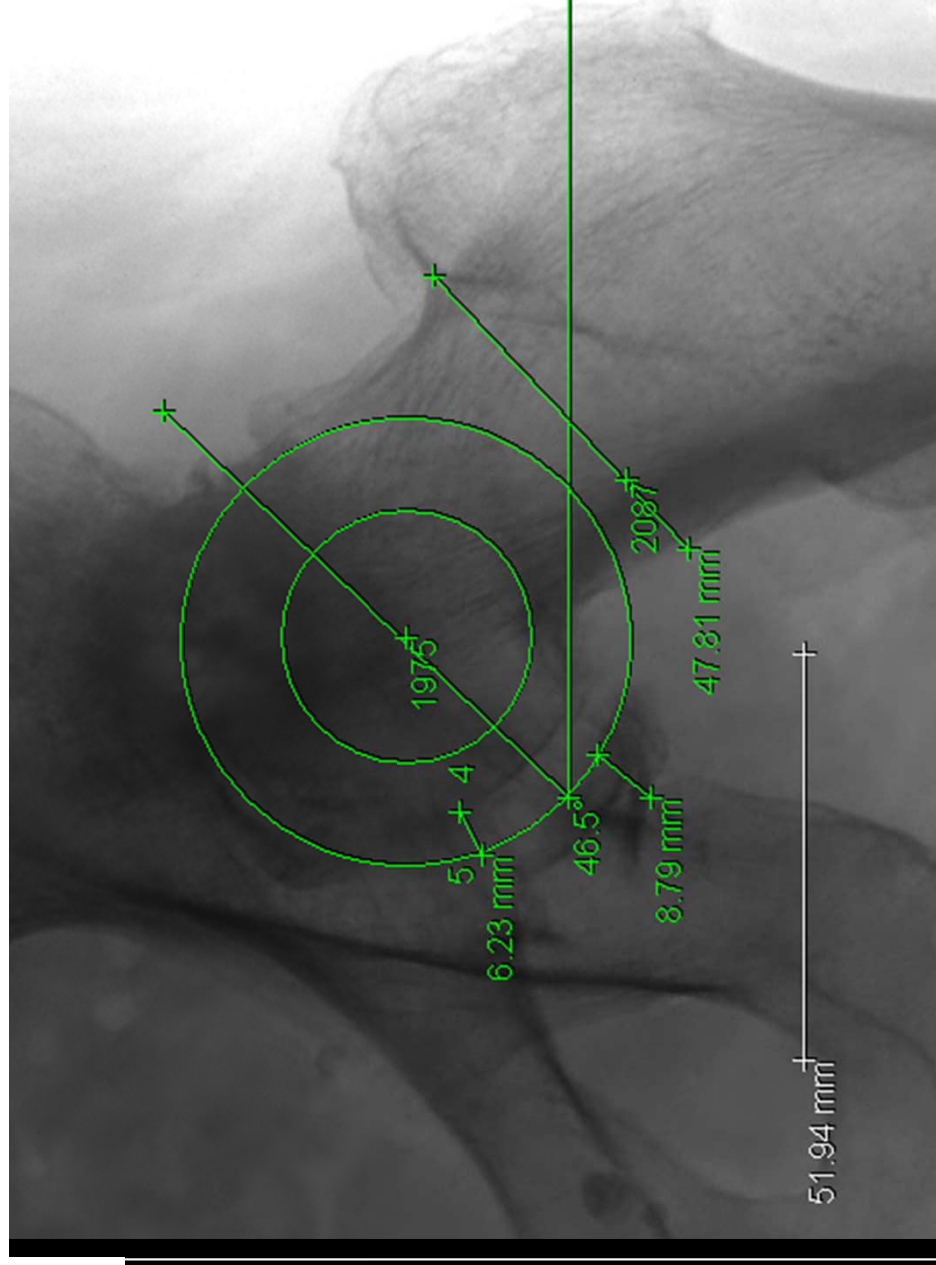




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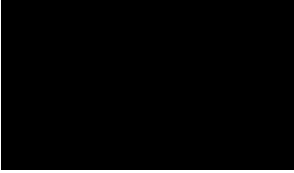
- Preserve 9 Tm 18, calcar 11,5 mm
- Procotyle 52 a 45 inclinació – comprobar escòpia
- Coll llarg varus ARV2 ó
- Allargament permès 5 mms
- Cap coll curt ó mig biolox
- Insert biolox
- Tall de cap 61mms, profunditat 5mms,
- Fosa infaacetabular 6 mms





Sx4 Sx3  
An1 An1

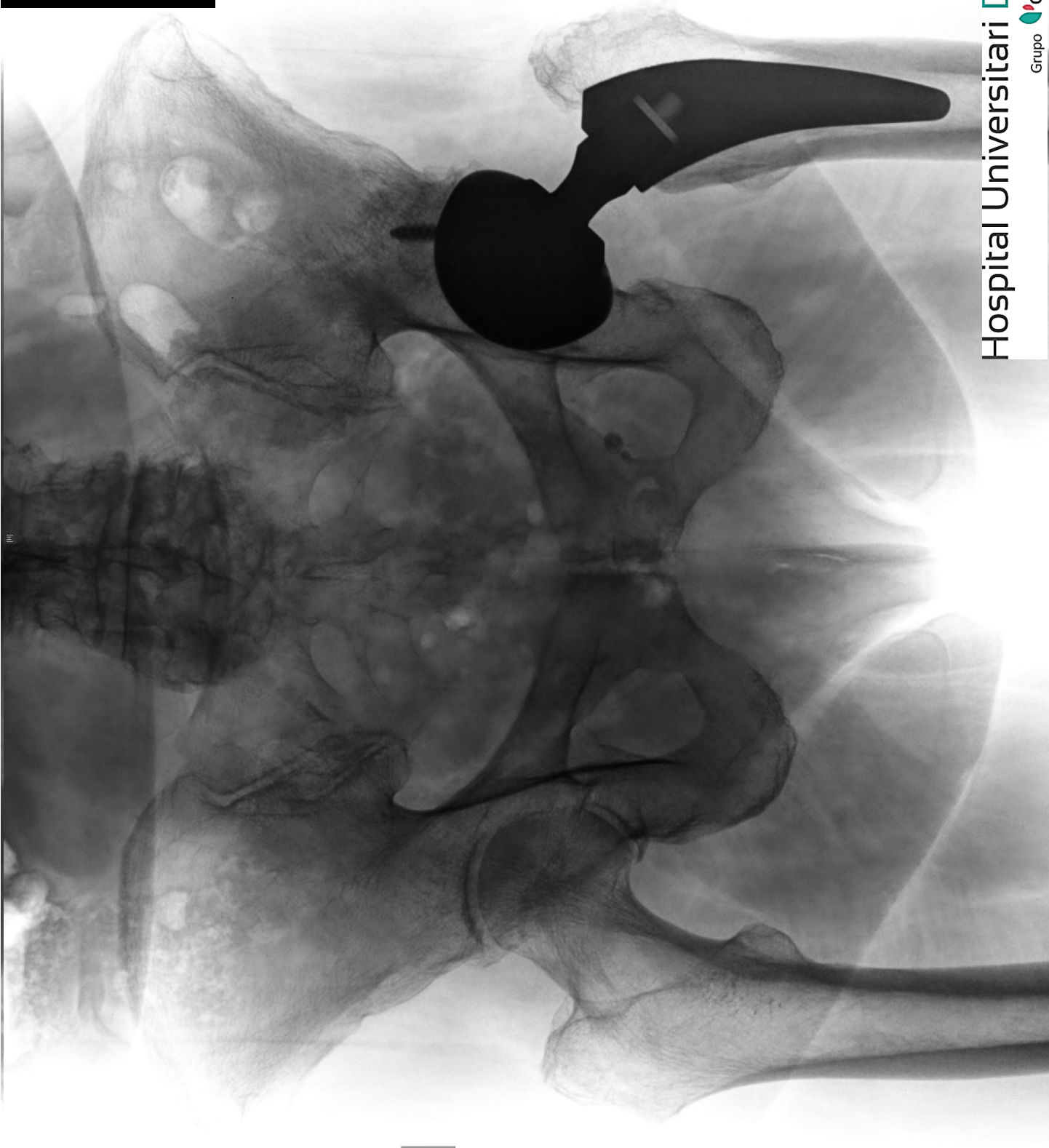
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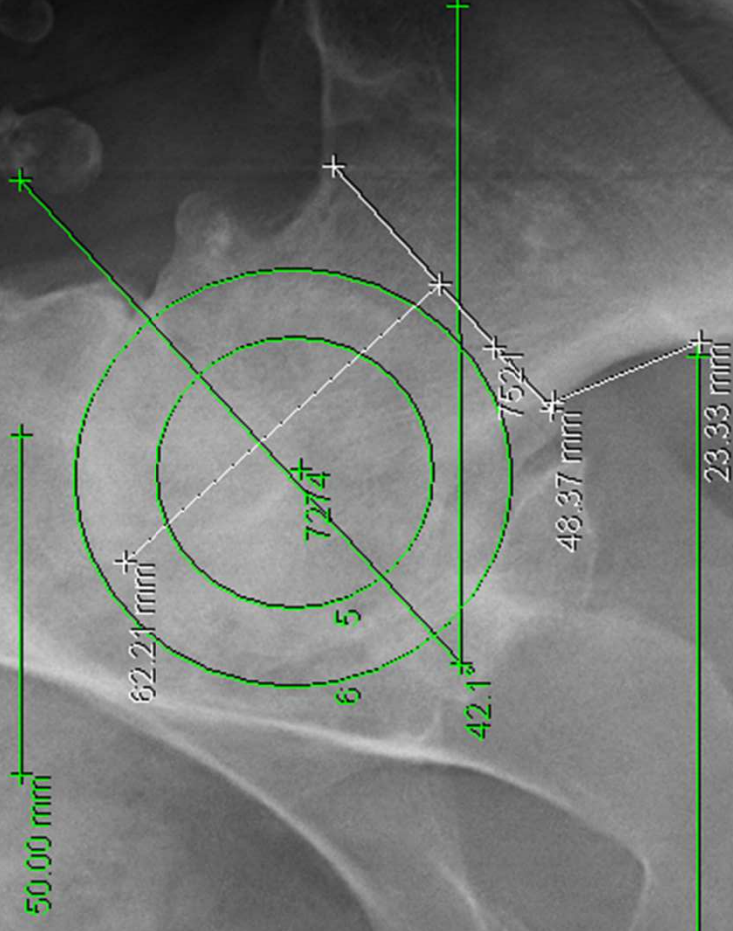
D

(P) (P)

(P)



01.16#0.80+0.40.MCP2.0AF0.5



- Cotilo 54 procotyl
- Cabeza biolox 36 cuello corto y medio,
- Vástago 7/8, cuello ARV2
- Trocen: cabeza 54, calcar 12, troc.men. 21
- Acción acetabular 42





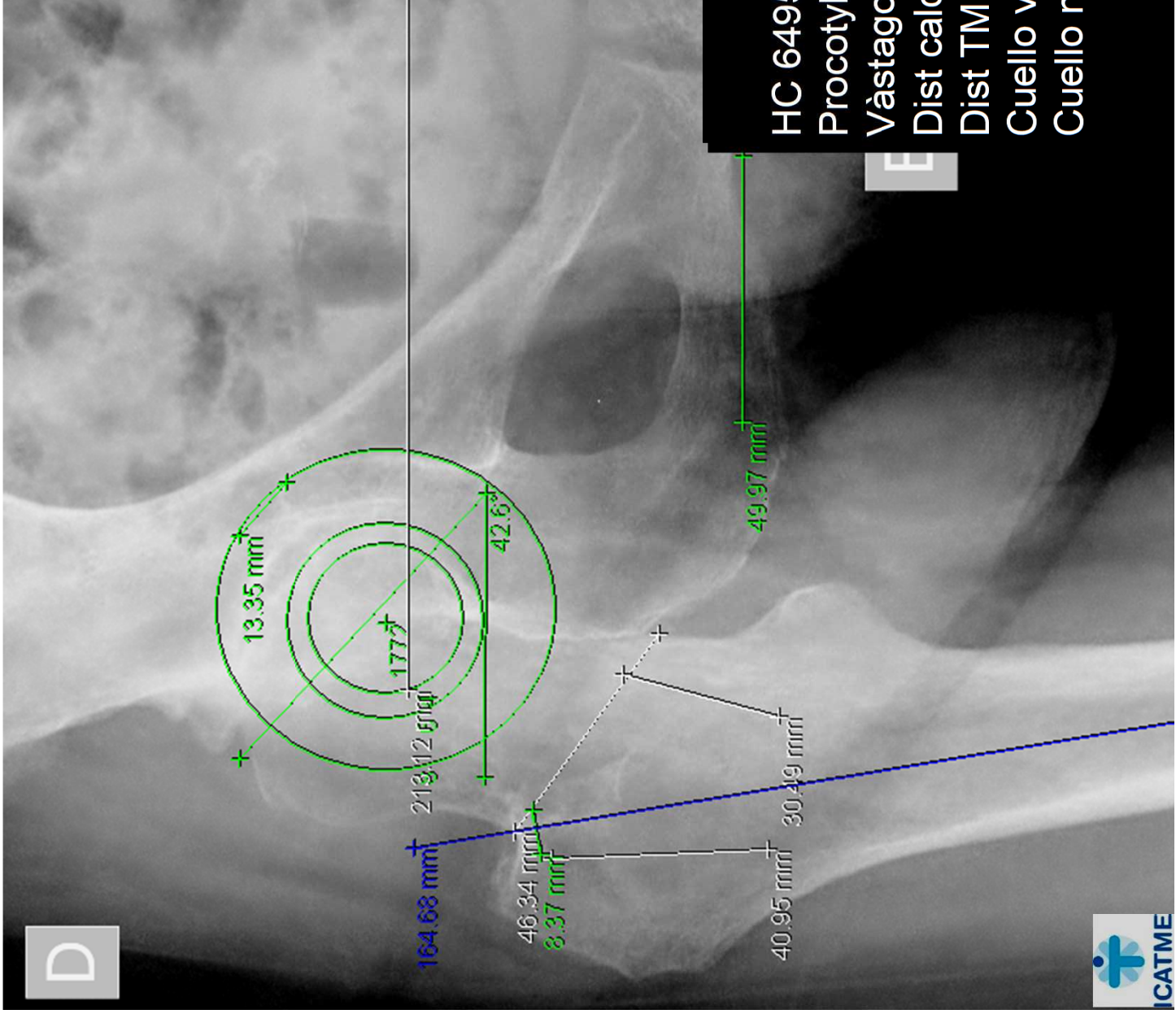
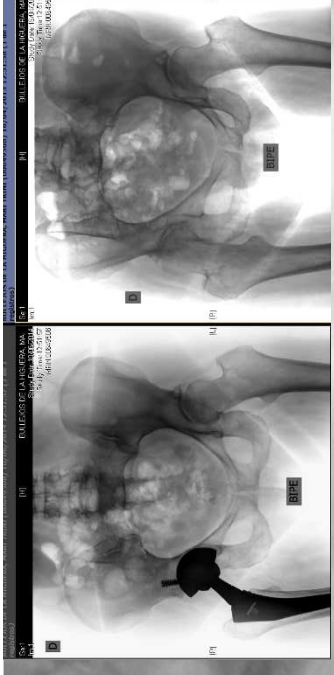


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BIPE

RU

RU



HC 649508  
 Procotyle 50 mms 42°  
 Vástago profemur L 5  
 Dist calcar 8mms  
 Dist TM 13 mms  
 Cuello valgo largo cabeza corta  
 Cuello normo largo cabeza media

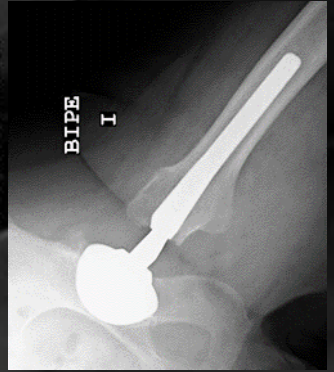
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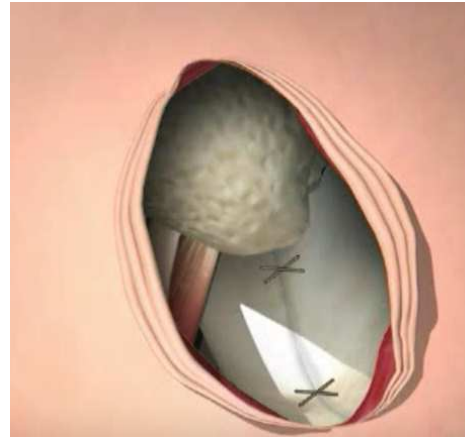
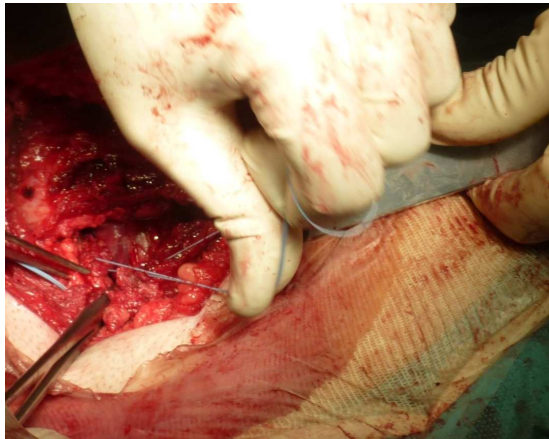
D

BIPE





# Superpath ® or DSA: only superior capsule suture is required




1 Hour Post-OP



2 Weeks P-OP



# look into “failures in modular necks .....”

1. **A Case of Disassociation of a Modular Femoral Neck Trunion After Total Hip Arthroplasty**  
Scott M. Sporer, Craig DellaValle, Joshua Jacobs, Markus Wimmer  
*The Journal of Arthroplasty*  
September 2006 (Vol. 21, Issue 6, Pages 918-921)  
[Abstract](#) | [Full Text](#) | [Full-Text PDF \(294 KB\)](#)
2. **Total Hip Arthroplasty Modular Neck Failure *Corrected Proof***, 12 April 2010  
Jack G. Skendzel, J. David Blaha, Andrew G. Urquhart  
*The Journal of Arthroplasty*  
DOI: 10.1016/j.arth.2010.03.011  
[Abstract](#) | [Full Text](#) | [Full-Text PDF \(140 KB\)](#)
3. **Failure of the Modular Neck in a Total Hip Arthroplasty** , 19 October 2009   
Chris J. Dangles, Carl J. Altstetter  
*The Journal of Arthroplasty*  
October 2010 (Vol. 25, Issue 7, Pages 1169.e5-1169.e7)  
[Abstract](#) | [Full Text](#) | [Full-Text PDF \(351 KB\)](#)
4. **Influence of Technique With Distally Fixed Modular Stems in Revision Total Hip Arthroplasty** , 03 September 2009  
Preetesh D. Patel, Alison K. Klika, Trevor G. Murray, Karim A. Elsharkawy, Viktor E. Krebs, Wael K. Barsoum  
*The Journal of Arthroplasty*  
September 2010 (Vol. 25, Issue 6, Pages 926-931)  
[Abstract](#) | [Full Text](#) | [Full-Text PDF \(507 KB\)](#)

# No systematic review of case series studies, only case reports

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## Fracture of a Modular Femoral Neck After Total Hip Arthroplasty

A Case Report

By Commander Geoffrey Wright, MD, Scott Sporer, MD, MS, Robert Urban, PhD, and Joshua Jacobs, MD

*Investigation performed at the Department of Orthopedics, Rush University Medical Center, Chicago, Illinois*

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## Early Failure of a Modular Femoral Neck Total Hip Arthroplasty Component

A Case Report

By David A.J. Wilson, MASC, BEng, Michael J. Dunbar, MD, FRCSC, PhD, John D. Amirault, MD, FRCSC, and Zoheir Farhat, PhD, PEng

*Investigation performed at QEII Health Sciences Centre, Halifax, Nova Scotia, Canada*

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## Corrosion-Induced Fracture of a Double-Modular Hip Prosthesis

A Case Report

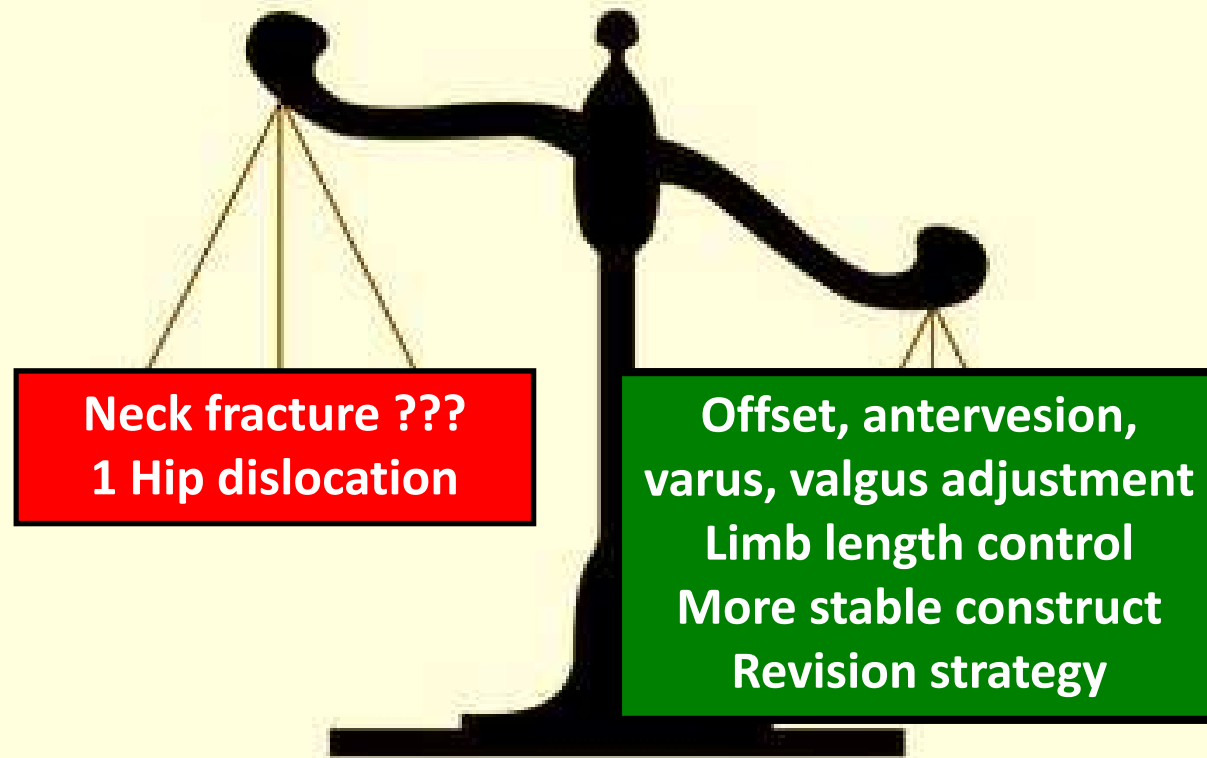
By Sara A. Atwood, MS, Eli W. Patten, MS, Kevin J. Bozic, MD, Lisa A. Pruitt, PhD, and Michael D. Ries, MD

*Investigation performed at the University of California at Berkeley, Berkeley, California*

# “Take-home” messages

- Survivorship > NICE BENCHMARK (95%@10y)
  - 98,23% in primary THA with modular necks
- 1 dislocation 0,16%
- No neck fractures.
- 15 / 589 revisions ( 2,54% ): 4 loosening,  
6 / 261 MOM bearing exchange
- Planning is essential.
- Rectangular modular necks with oval edge : very low fracture index, none in our serie ( > 25 y validity).

# “Take-home” messages



**6After > 2000 primary THA with modular necks  
& >200 revision stems..... We go on using modular necks**



**1. Indication**

**Key to Success**

**2. Planification**

**3. Skills**



**SAVE YOUR DATES!**

**BHBM'20**

BACK TO THE FUTURE!



barcelona **HIP**  
meeting 2020

20 – 21 – 22 April

2<sup>o</sup>

**EUROPEAN  
HIP SPORT  
MEETING**

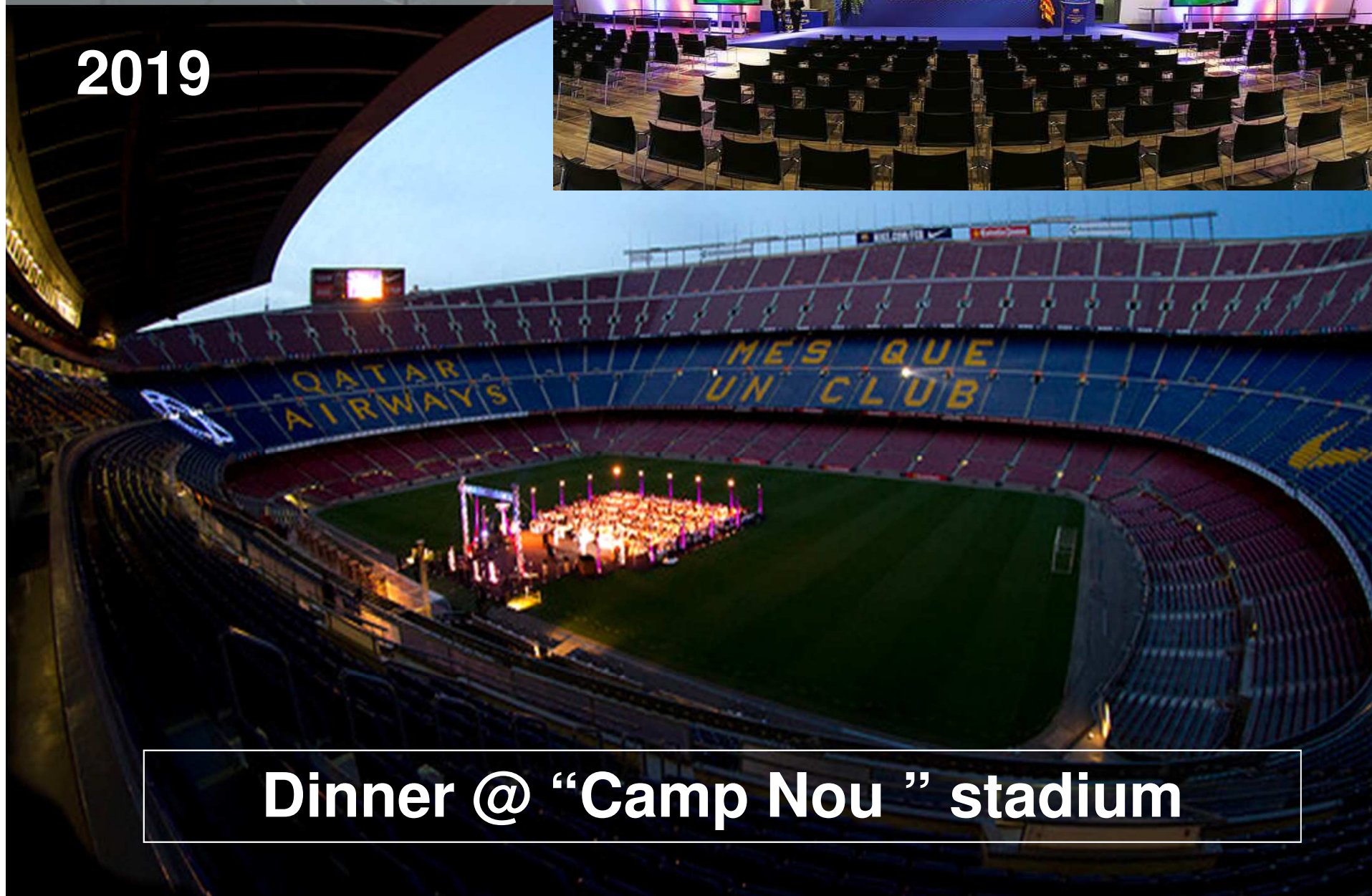
F.C.Barcelona  
facilities  
Barcelona, Spain  
Auditorium 1899  
June 20th-21th,  
**2019**





FCBARCELONA  
MEETINGS & EVENTS

2019



Dinner @ “Camp Nou” stadium









Merci beacoup / Thank you

















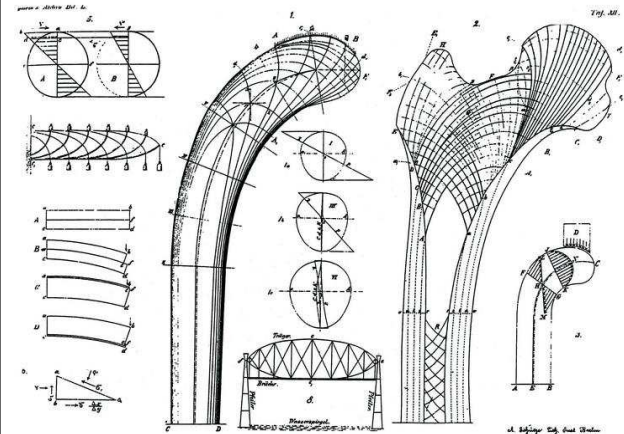




Julius Wolff . *“The Law of the transformation of the bone”*. 1892

**Cargas normales = huesos normales**  
**Cargas anormales = huesos anormales**

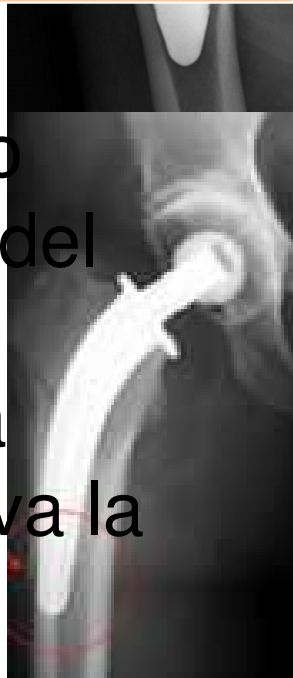
*"As a consequence of primary shape variations and continuous loading, or even due to loading alone, bone changes its inner architecture according to mathematical rules and, as a secondary effect and governed by the same mathematical rules, also changes its shape."*



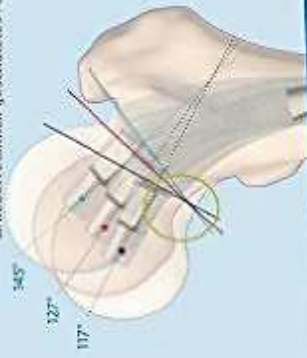
*“ Dios siempre perdona, el hombre sólo a veces, pero la naturaleza jamás”.*

*Miguel De Cervantes*

- Op demandante
- Planificar obligado
- Selección exacta del nivel de corte
- No esperar que la naturaleza resuelva la imperfección.



Urheberrechtlich geschütztes Material

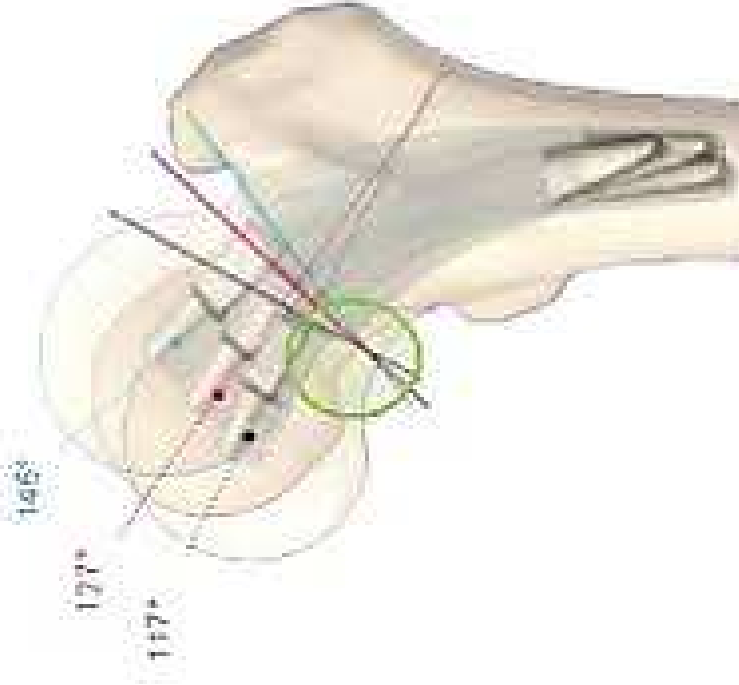


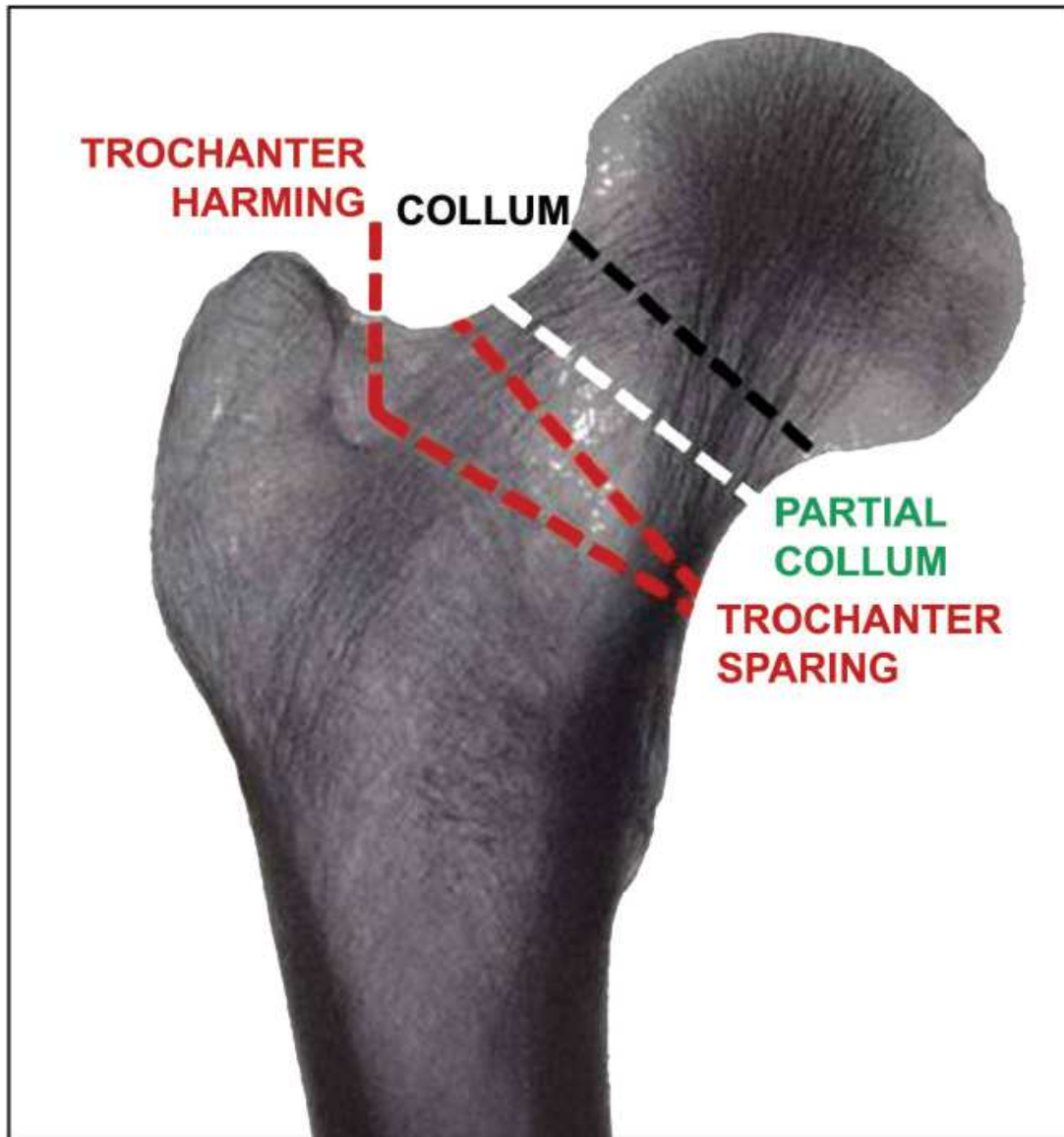
Jörg Jerosch Hrsg.

# Kurzschaff- endoprothesen an der Hüfte

 Springer

Urheberrechtlich geschütztes Material





Falez F et al. Orthopaedics 2015



# Opciones



2012

# University Hospital Quirón-Dexeus . Barcelona, **primary THA**

2002 – 2009... 589 THA

- Gender 272 males / 317 females
- Age 76 y. (range 37-89)
- 3 surgeons JV, IG, MR
- Approach postero-lateral
- Followup mean 6,7 years (range 3 -10)
- Primary 513 Profemur E, Ancafit , Profemur Z
- Revision-profemur R 76 cases

2012

# University Hospital Quirón-Dexeus . Barcelona, **primary THA**

- Deep infection 3 (2 staged revision )
- Socket 2
- Stem subsidence 1
- Dislocation 1 / 513 no BFH (0,16 %)
- Squeaking 0
- Neck fracture 0 / 513
- Bearing exchange 4 / 261 BFH (1,53 %)

Since 2010 no more MOM BFH

**Survivorship : 98,23% @ 6,7 y FU**



2012

# University Hospital Quirón-Dexeus . Barcelona, Revision THA

2002 – 2009... 76 PROFEMUR R

- Gender 39 male / 37 female
- Age 68 y. (range 39-86)
- 3 surgeons JV, IG, MR
- Approach postero-lateral
- Follow-up mean 6,7 years (range 3-10)

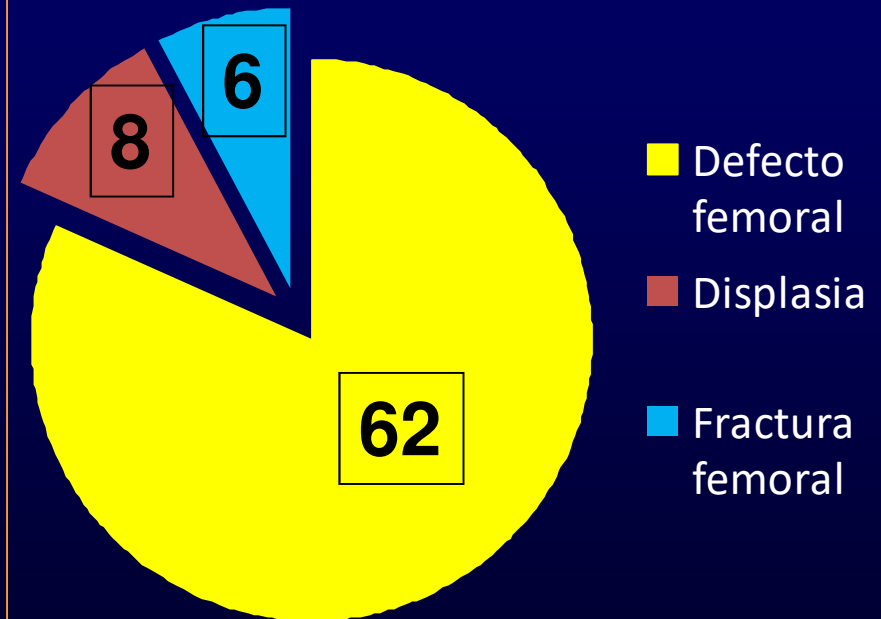
2012

# University Hospital Quirón-Dexeus . Barcelona, Revision THA

## According to Paprosky classification

- Grade I (n=24)
- Grade II (n=31)
- Grade IIIA (n= 7)
- Re-prosthesis ..... 4
  
- Primary Prosthesis + femoral subtroch. osteotomy DDH Grade III – IV Crowe (n=8)
  
- Periprosthetic fractures Vancouver B2 (n=4) , C =2

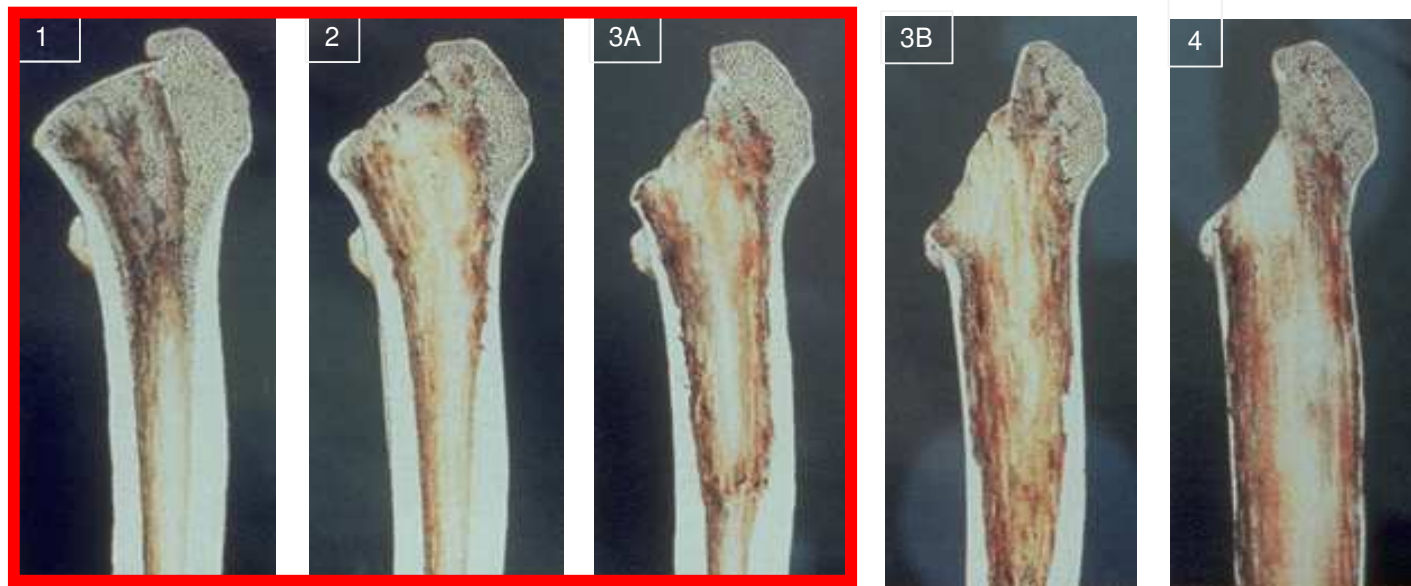
## Etiologia preoperatoria





# Indications

- Whatever cortico-dyaphyseal defect sufficient to provide distal support.
- Exception: Paprosky IV – Dorr III femoral revision



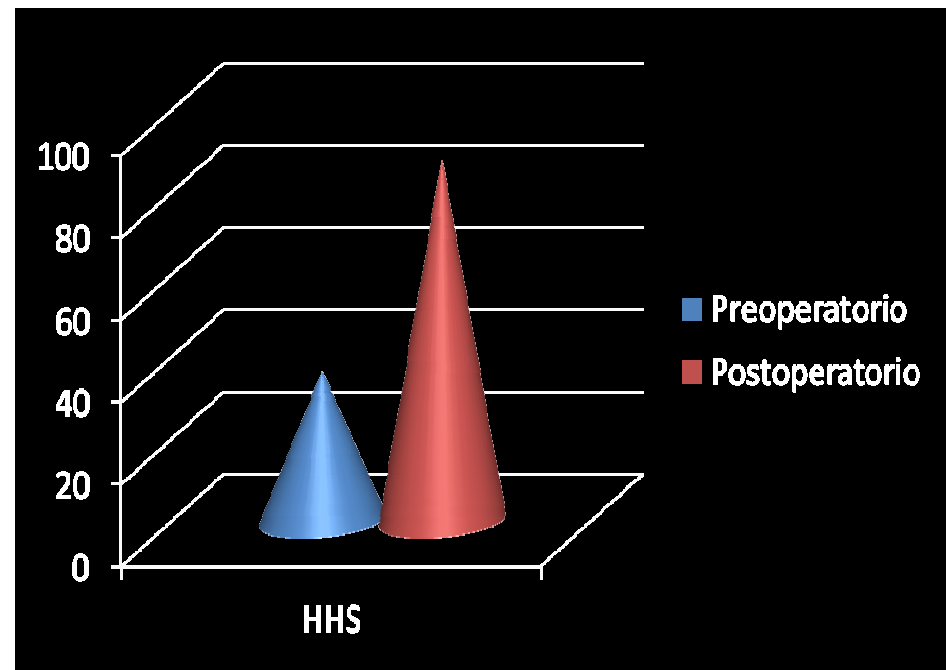
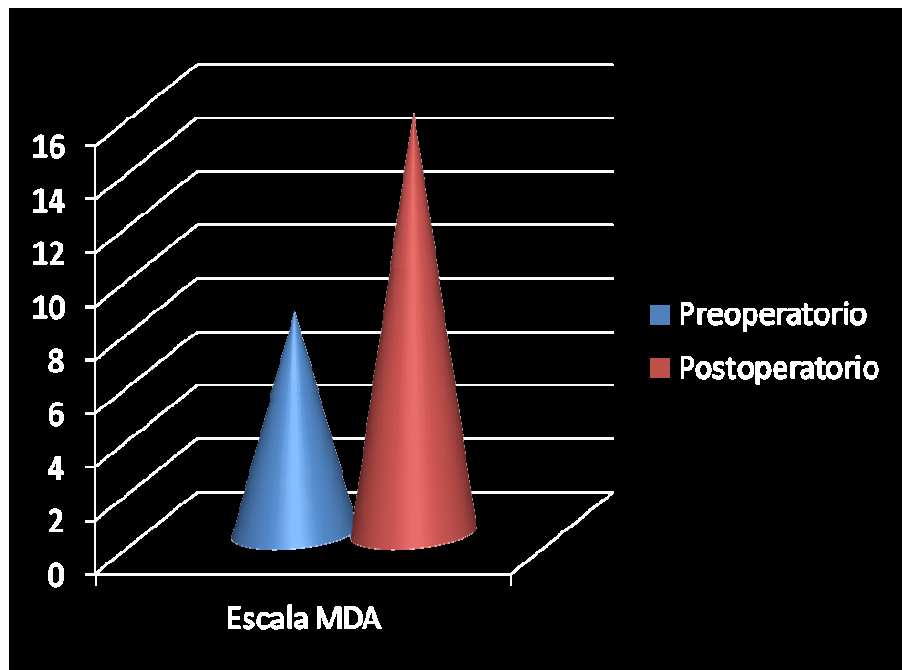
*Della Valle CJ, Paprosky WG. Classification and an algorithmic approach to  
Journal of Bone and Joint Surgery 2003; 85-A Suppl. 4: 1-6*

2012

# University Hospital Quirón-Dexeus . Barcelona, **Revision THA**

Mean **7.5** pts increasement in  
**Merle d´Aubigné Score**

Mean **51,6** pts increasement





2012

# University Hospital Quirón-Dexeus . Barcelona, Revision THA

- Deep infection ..... 1 case
- Subsidence ..... 1 case
- Dislocation..... no
- Squeaking ..... no
- Modular neck Fx ..... no
- Bearing couple exchange .. 2 cases

Survivorship 94,8% @ 6,7 y. mean FU

2012

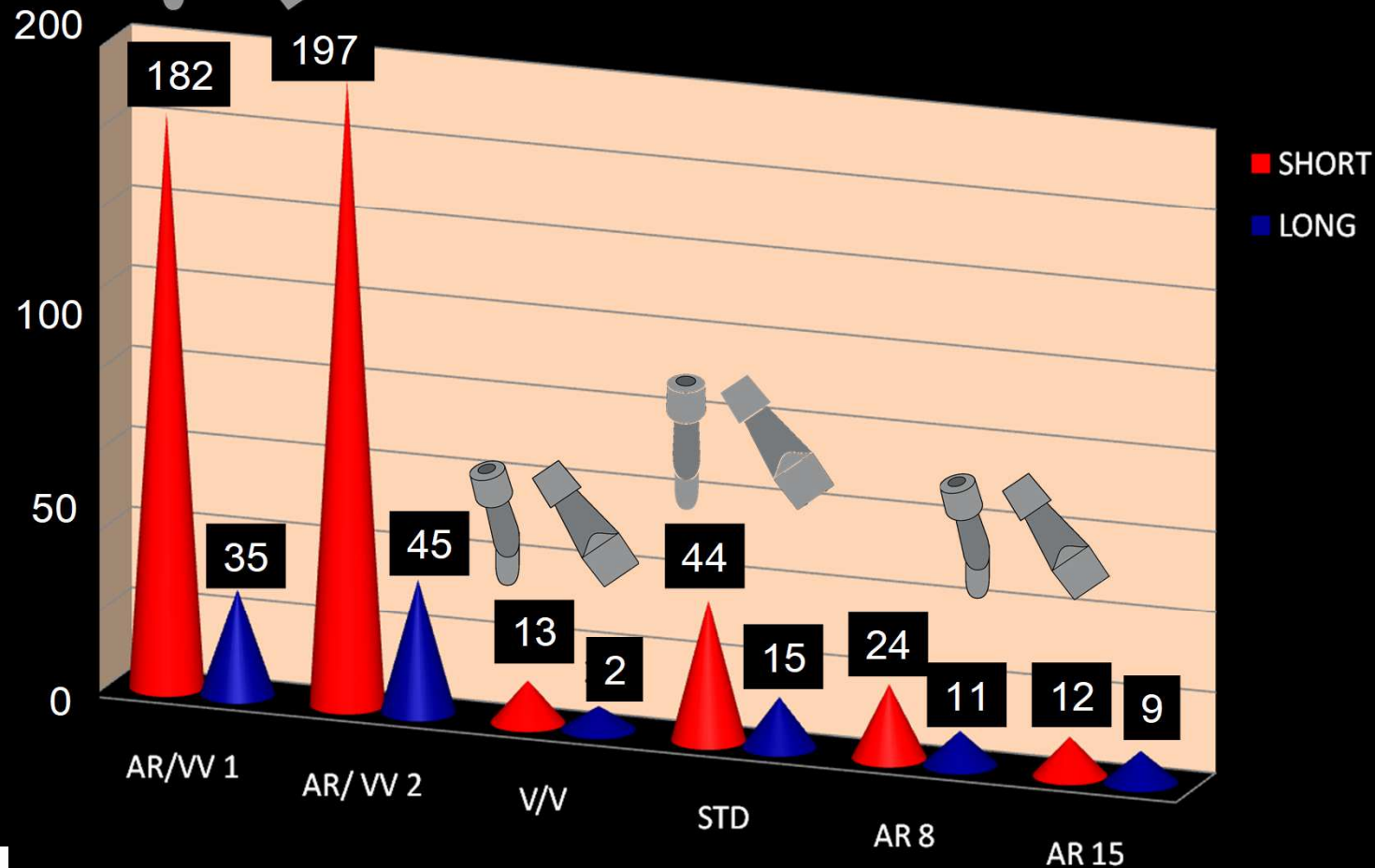
University Hospital Quirón-Dexeus .  
Barcelona, primary & revision THA

## Overall Results

- 97,46 % survivorship @ 7 y. FU
- 1 / 589 dislocations (0,16%)
- 0 neck fractures
- 15 / 589 revisions (2,54%)
- Loosening 4 / 589 (0,67)
- 6 Bearing exchange (1,01%)
- Infection 4

2012

# Barcelona, primary & revision THA



589 modular necks