REVITAN system

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We try to learn something from the literature

... something new ?

... experiences of colleagues ?

... trends actually ?

Projections of primary & revision arthroplasty

Kurtz & al. JBJS(A), 2007

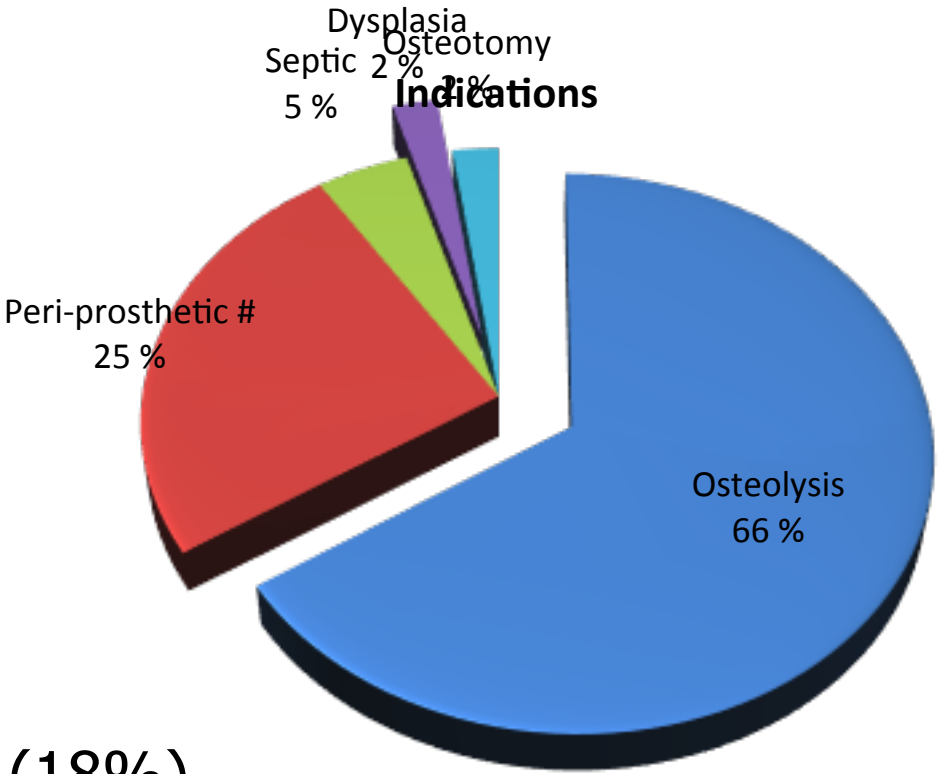
U.S.A. projections	HIP	KNEE
Primary	174 %	673 %
Revision	137 %	601 %

… we can expect more & more revision cases?

Revision THA indications

- Femoral periprosthetic
  - Loosening
  - Osteolysis (wear/infection)
  - Fractures

Personal series



- 2007-2008
- 44 cases
  - Male n= 8 (18%)
  - Female n= 36 (82%)

- Mean age 75 (43-89)

Which age for revision in THA ?

Parvizi & al. JBJS(A), 2007

	n	FU	HHS	Periop. Complic.	Re-revision	Dislocation	Mortality (5y)
> 80y	170	7y	47…85	22%	17	4	59%
< 70y	170	6y	44…88	15%	29	16	7%

Revision in octogenarians:

- Higher (NS) perioperative complications
- No more re-revision rate
- Less rate of dislocation
- Higher mortality (medical co-morbidity)

Why revision THA fails ?

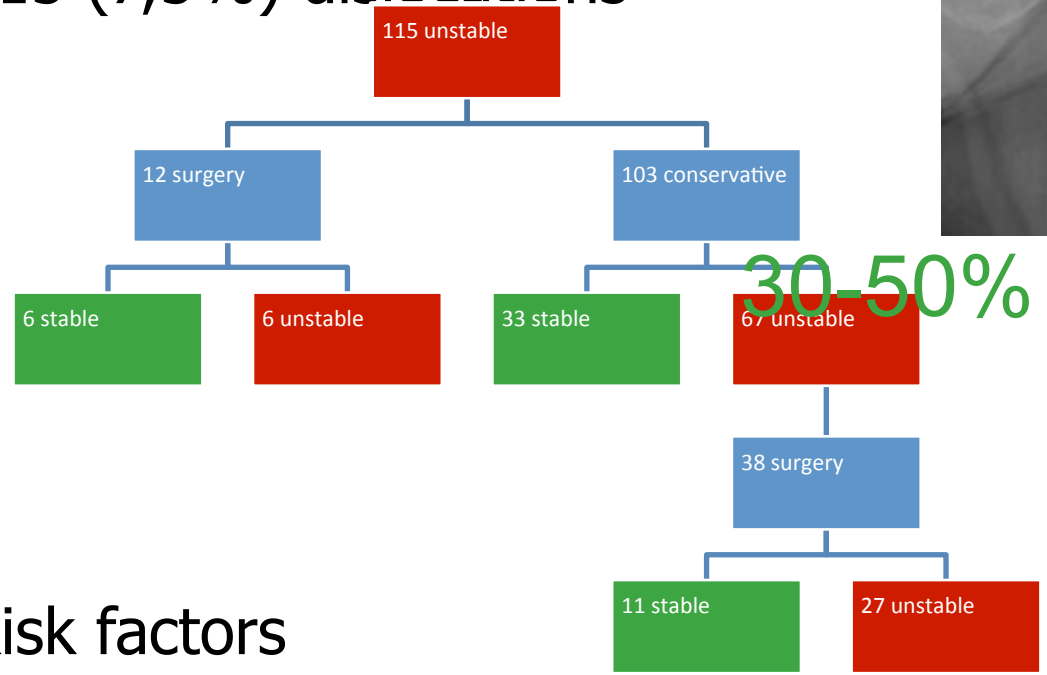
Springer & al. Hip Soc Meeting, 2008

- 1100 revision THA (mean 6y FU)
  - 87% NO need re-revision
  - 13% Re-revision at 3,7y
    - 32% (↓) Instability
    - 30% (=) Aseptic loosening
    - 12% (↑) Osteolysis &/or wear
    - 12% (↓) Infection
    - 5% Others
    - 2% (↑) peri-prosthetic fractures
- Survivorship for re-revisions
  - 82% at 10y
  - 18% failures for aseptic loosening or instability

Dislocation after revision THA

Alberton & al. JBJS(A), 2002

- 1548 revision THA (mean 8y FU)
  - 115 (7,5%) dislocations



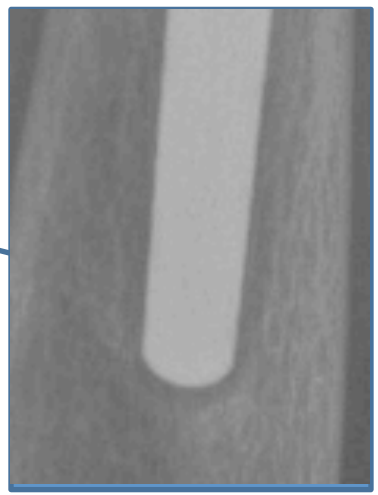
30-50%

  - Risk factors
    - No RIM acetabular modular component
    - < 32mm ø head
    - Trochanteric non-union
    - Large soft tissues dissection; capsular resection

Tree points anchorage = unstable stem

Fink & al. Arch Orthop Trauma Surg, 2008.
Smith & al. J Arthroplasty, 1997.
Iwana & al. Int Orthop, 2008

- Aseptic loosening
  - Undersized stem
  - Axial subsidence
  - Distal (end-point) anchorage
  - Thigh pain



Tree points anchorage = unstable stem

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- Aseptic loosening
  - Undersized stem
  - Axial subsidence
  - Distal (end-point) anchorage
  - Thigh pain

  - Distal end stem pedestal
  - Proximal cortical stress shielding

Revision straight stem, EM diaphyseal fit, results

Böhm & al. JBJS(A), 2001
Paprosky & al. J Arthroplasty, 2002
Weber & al. Int Orthop, 2002
McInnis & al. J Arthroplasty, 2006
Gutierrez & al. J Arthroplasty, 2007

	n	FU	Survival	Bone loss	Bone healing	Subsidence	Re-revision	Dislocation	Intraop. #
Böhm (Wagner)	129	5 y	93 %	31 %	86 %	54 % (6mm)	4,6 %	1 %	30 %
Paprosky		14 y				22 %			
Weber (Wagner)	39	3 y	92 %	65 %	55 %	20 % (5mm)	5 %	12 %	30 %
McInnis (PFMR)	70	4 y	87 %	51 %	56 %	84 % (10mm)	4,3 %	10 %	24 %
Gutierrez (Wagner)	79	5 y	92 %		84 %	19 % (10mm)	1, 3 %	14 %	11 %

Revision straight stem, EM diaphyseal fit, results

Böhm & al. JBJS(A), 2001
Paprosky & al. J Arthroplasty, 2002
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McInnis & al. J Arthroplasty, 2006
Gutierrez & al. J Arthroplasty, 2007

	n	Follow-up	Survivorship	Bone loss	Bone healing	Subsidence	Re-revision	Dislocation	Intra-op #
Mean		8 y	90 %	40 %	60 %	40 % (8mm)	4 %	10 %	28 %

REVITAN modular system

Fink & al. Arch Orthop Trauma Surg, 2008.

- 2 models
  - Straight stem
  - Curved stem

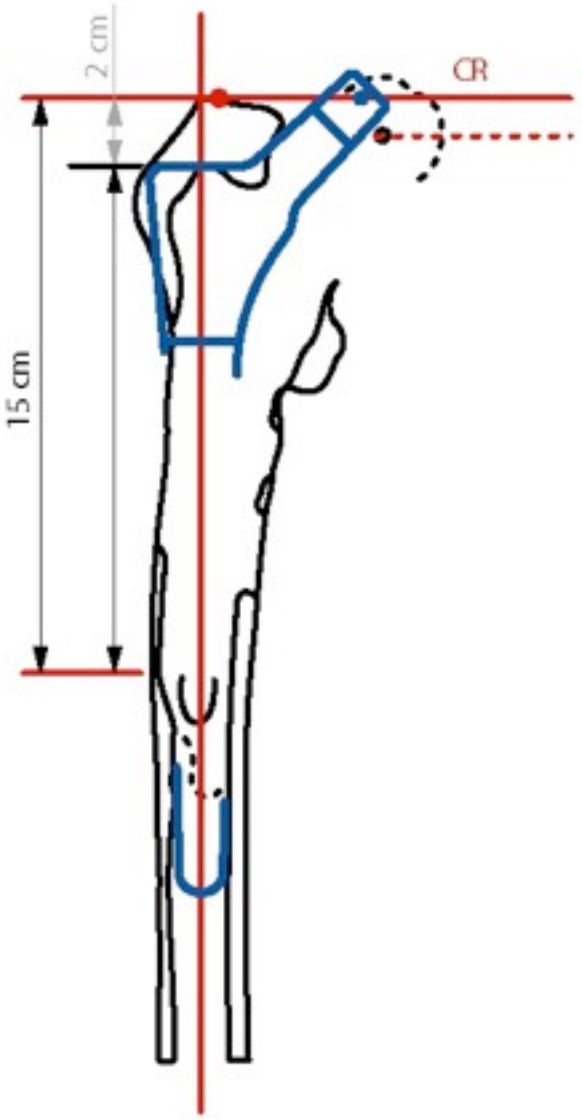
- Uncemented
- Diaphyseal fixation
- Modular system
  - 1st implant distal fixation
  - 2nd correction length/stability
- Distal locking (curved)
- Approach
    - Endofemoral
    - Transfemoral

REVITAN modular system

Fink & al. Arch Orthop Trauma Surg, 2008.

- Preoperative planning
  - Straight stem
  - Curved stem

- Osteotomy needs?
- Osteotomy level
- Type of fixation
- Plan proximal reconstruction



REVITAN modular system

Fink & al. Arch Orthop Trauma Surg, 2008.

- **Transfemoral** fixation
  - Straight reamer of a conical endomedullar diaphyseal zone for distal fixation
  - "press-fit" stem distal fixation

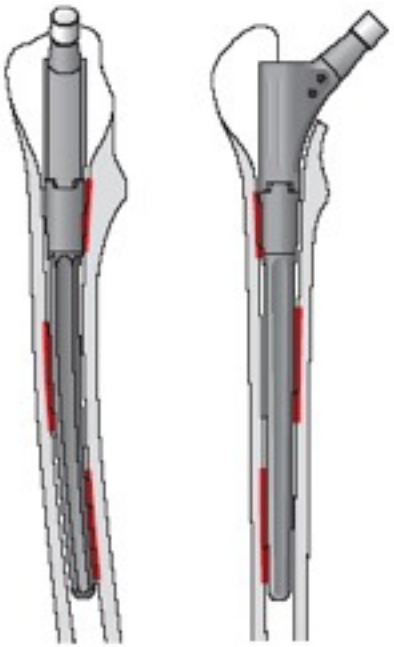
REVITAN modular system

Fink & al. Arch Orthop Trauma Surg, 2008.

- **Endofemoral** fixation

  - Flexible reamer of (intramedullar metaphyseal & diaphyseal) 3 contact zones

  - "press-fit" stem distal fixation

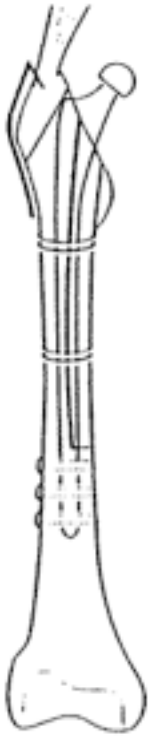


REVITAN modular system

Fink & al. Arch Orthop Trauma Surg, 2008.

- Types of fixation:
  - Diaphyseal "press-fit"
  - Distal locking screws
    - optional in curved stems

Distal locking screws use

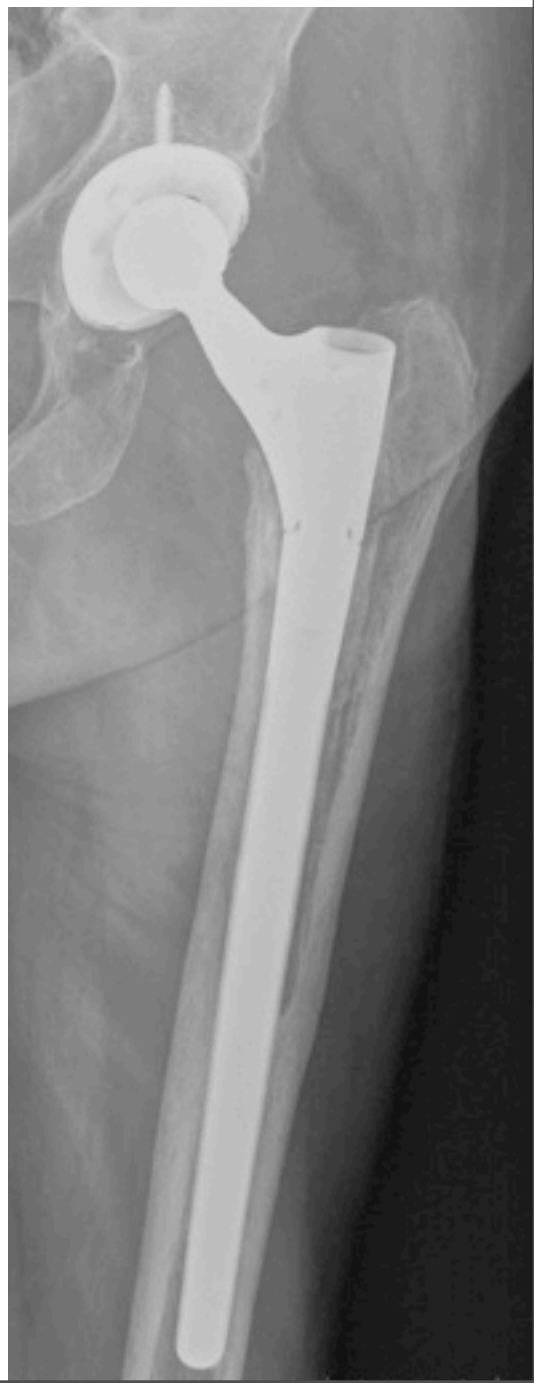


Fink & al. Arch Orthop Trauma Surg, 2008.

- Large metaphysis (III B-IV-PP#)
- Wide osteoporotic bone
- Less than 5cm distal stem fixation
  - Prevent subsidence
  - Enhances stem stability

Sotereanos & al. JBJS(A), 2006

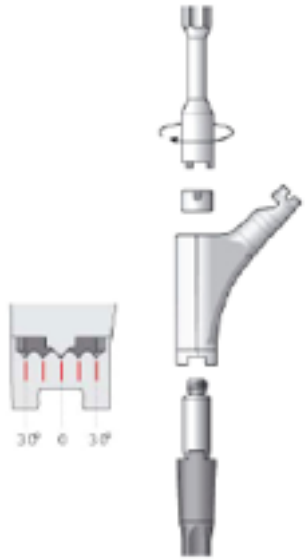
- 17 revision THA with only distal screws fixation
  - 5,3 y FU
  - 16 clinical & radiological stem stability obtained
  - 1 screw #

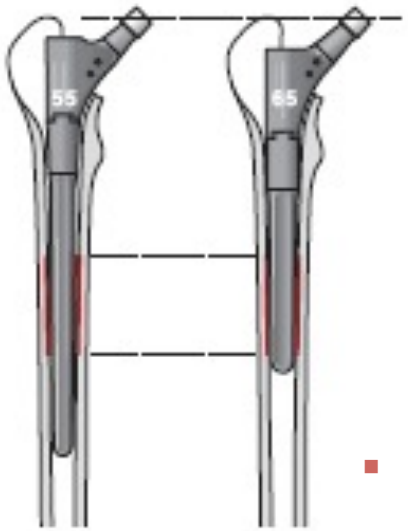


REVITAN modular system

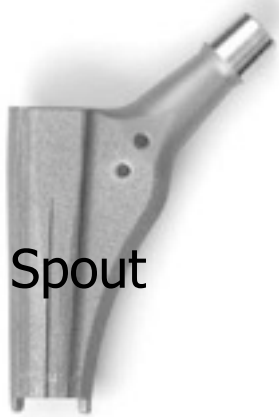
Fink & al. Arch Orthop Trauma Surg, 2008.

- Metaphyseal correction
  - "In situ" tests of:
    - Leg length correction
    - Proximal optimal fill



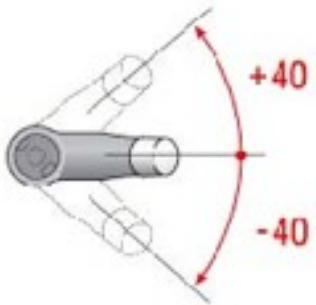


Cilindrical

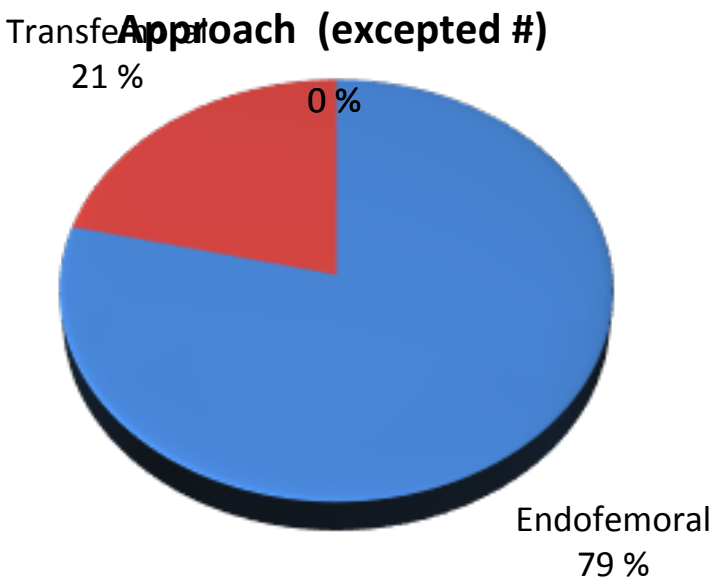


Spout

- Choice of anteversion



Approach… Transfemoral? Endofemoral?



Endofemoral reconstruction… when?

- In good bone stock
- In straight femur
- If you can remove proximally
  - Prosthesis
  - Cement (adequate instruments)
- First fit diaphysis
  - Straight
- Then fit metaphysis
  - Cylindrical
    - Straight / dysplastic femur
  - Spout
    - Proximally wide femur

Transfemoral reconstruction… when?

- In cases of poor bone stock
- In curved femora
- If you cannot remove proximally
  - Prosthesis
  - Cement
    - important amount
    - pressurized
  - Osteolysis

- First fit diaphysis
  - Curved
- Then fit metaphysis
  - Cylindrical (straight femur)
  - Spout (curved or large femur)

Longitudinal femoral osteotomy

Kronick & al. AAOS, 1997.

Fink & al. CORR, 2007.

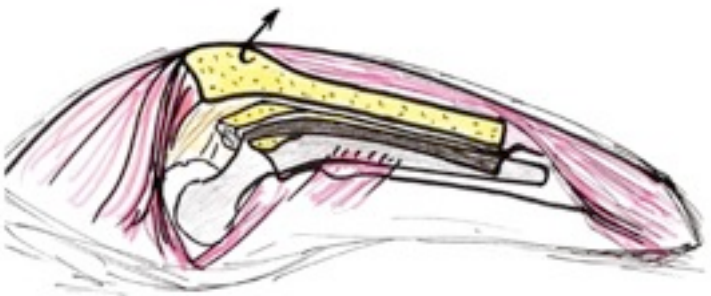
- Needed in deformed femora
- Deformity of the proximal femur:
  - in 25% of femoral revisions

    Kronick & al. AAOS, 1997.
  - 37% proximal femoral varus

    Fink & al. CORR, 2007.

Longitudinal femoral osteotomy

- If impossible to remove proximally the old stem
- In straight femora with cavitary osteolysis
- If important amount of bone cement to remove
- If periprosthetic fractures
- In fragile or cavitary femora
- If curved femur:
  - Simple
  - Double osteotomy



- Be not in relationship with the implant morphology
- You need adapt the femur to the implant… no to adapt the implant to the femur

Osteosyntesis of femoral osteotomy

- Cerclage wires 1,2 mm ø mínimum
  - Single wires
    - More wires needed
  - Double wires
    - More mecanical strength

- Mean of 4 cerclage wires for close the femoral osteotomy (each 3-4 cm)

Transfemoral approach advantages

- Reduction of "total" surgical time
- Direct access to the medullar canal
  - Easy to clean
  - Easy diaphyseal "press-fit" control
  - Easy management of potential #
- More sure bone healing
- Reduction of intraoperative femoral #
- Control of abductor muscle tension if necessary
  - by means of trochanteric distal translation

Intraoperative femoral fractures

Meek & al. JBJS(A), 2004

- 211 revision THA with diaphyseal fitting
- Risks factors
  - Substantial degree of preoperative bone loss
  - Low femoral cortex-to-canal ratio
  - Underreaming
  - Large diameter stem
    - Related to poor bone quality
    - Mistake

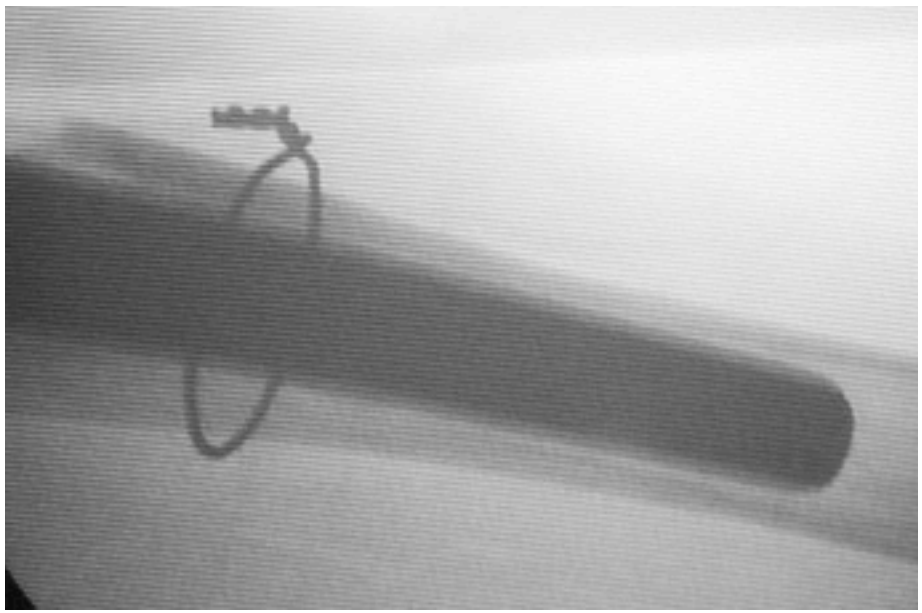
Intraoperative femoral fractures

Meek & al. JBJS(A), 2004

- 211 revision THA with diaphyseal fitting
  - 64 intraoperative femoral # (30%)
    - # location
      - Distal end (cement removal)
      - End of femoral osteotomy (stem insertion)
      - Use of long stems (endomedullar approach)

How to avoid fractures working medullar canal

- Use adequate/specific osteotomes & curettes
- Use pulse lavage and completely take out debris
- Use stainless steel cable wires
  - 1,2 mm ø minimum
  - Mean 4 wires for osteotomy window stabilization
  - + protection distal wire at 2cm distal to the osteotomy end prior to final stem implantation



Intraoperative femoral fractures

Meek & al. JBJS(A), 2004

- No significant effect on
  - Bone ingrowth
  - Functional outcome

Transfemoral approach results

	Publication	n	F-U (y)	Osteotomy healing 1y(%)	Subsidence %	Dislocations %
Peters	1993	21	3,7	100		4,8
Kolstad	1996 *Acta Orthop Scand*	31	3	96,7	19	16
Aribindi	*1999*	122	2,6	100		10,6
Wagner	1999 *Oper Orthop Traumatol*	69	6,2	94	10	3
Chen	2000	43		97,6		11,6
Isacson	2000 *Int Orthop*	42	2,1	97,6	31	
Miner	2001	166	3,9	98,7		10,2
Huffman	2003	42	1,4	100	2,4	7,1
Morshed (INF)	2005	13	3,3	100	23	30,8
Mardones	2005	74	2	98,6	1,4	
Sieber	2005 *Mod. Rev.Hüft. Springer Verlag*	152	3	98		5
Fink (transfemoral modificado)	2007 *CORR*	68	2	98,5	8,8	

Transfemoral approach results

	Publication	n	F-U (y)	Osteotomy healing at 1y (%)	Subsidence %	Dislocations %
Mean			3	98	13	11
Expected			5	98	< 6	< 6

Transfemoral approach

- No significant effect on
  - Functional outcome
  - Bone ingrowth or fracture healing (3-6 months)

Bone remodeling (cavity defects)

Iwana & al. Int Orthop, 2008

- 50-80 % bone healing with transfemoral approach
- 30-40 % bone healing with endofemoral approach

Bony remodeling (cavity defects)

REVITAN revision stem

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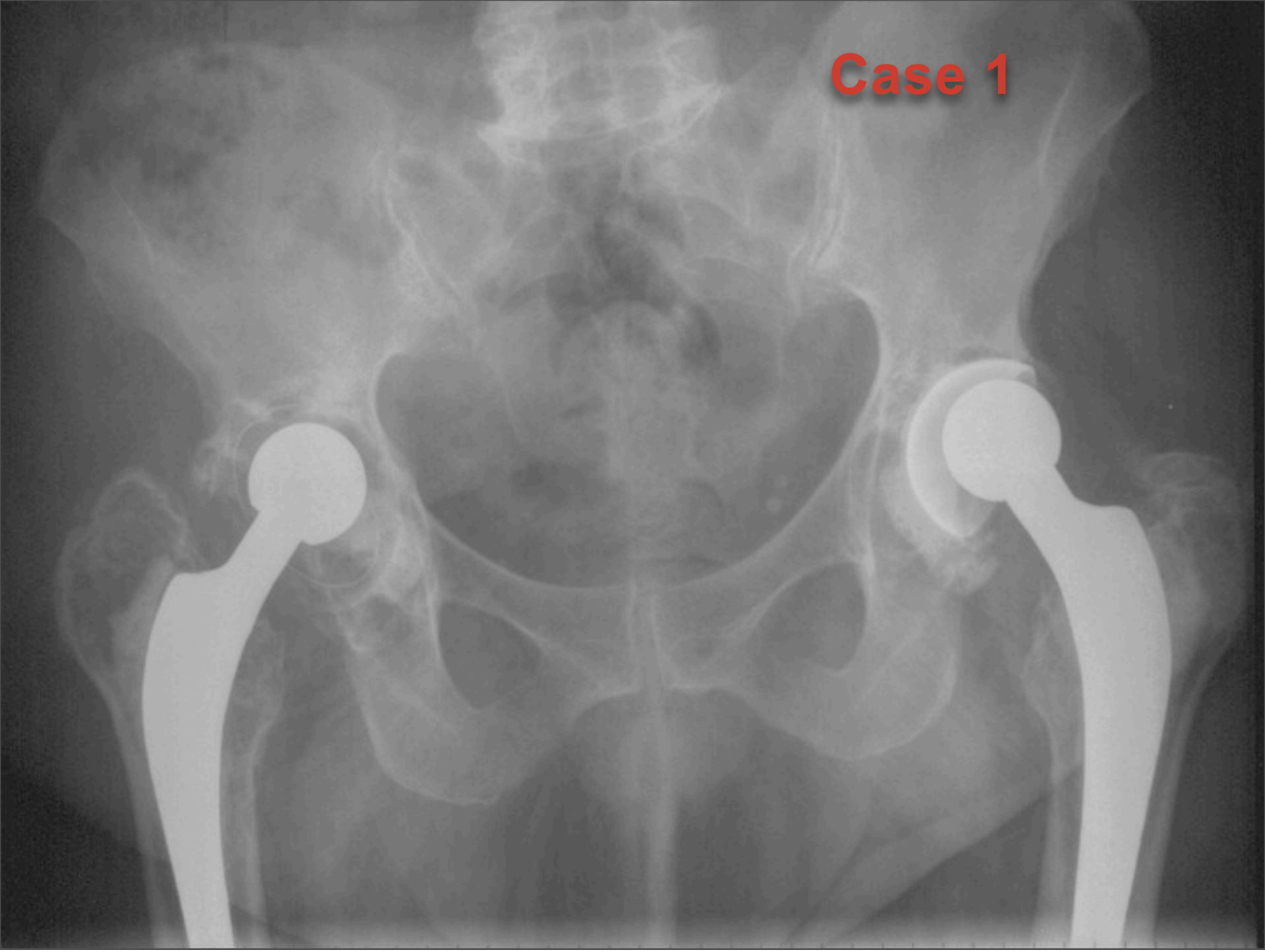
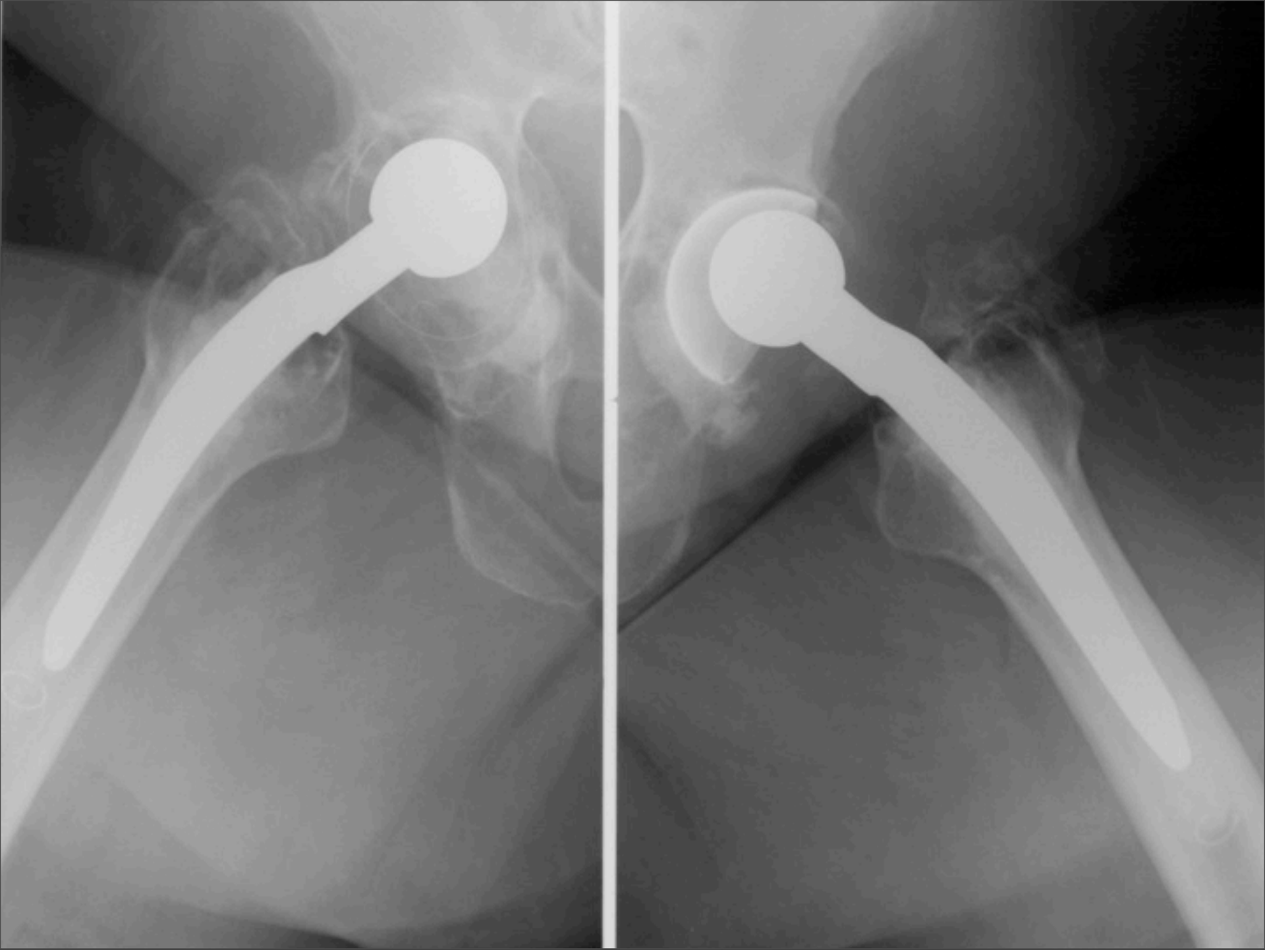
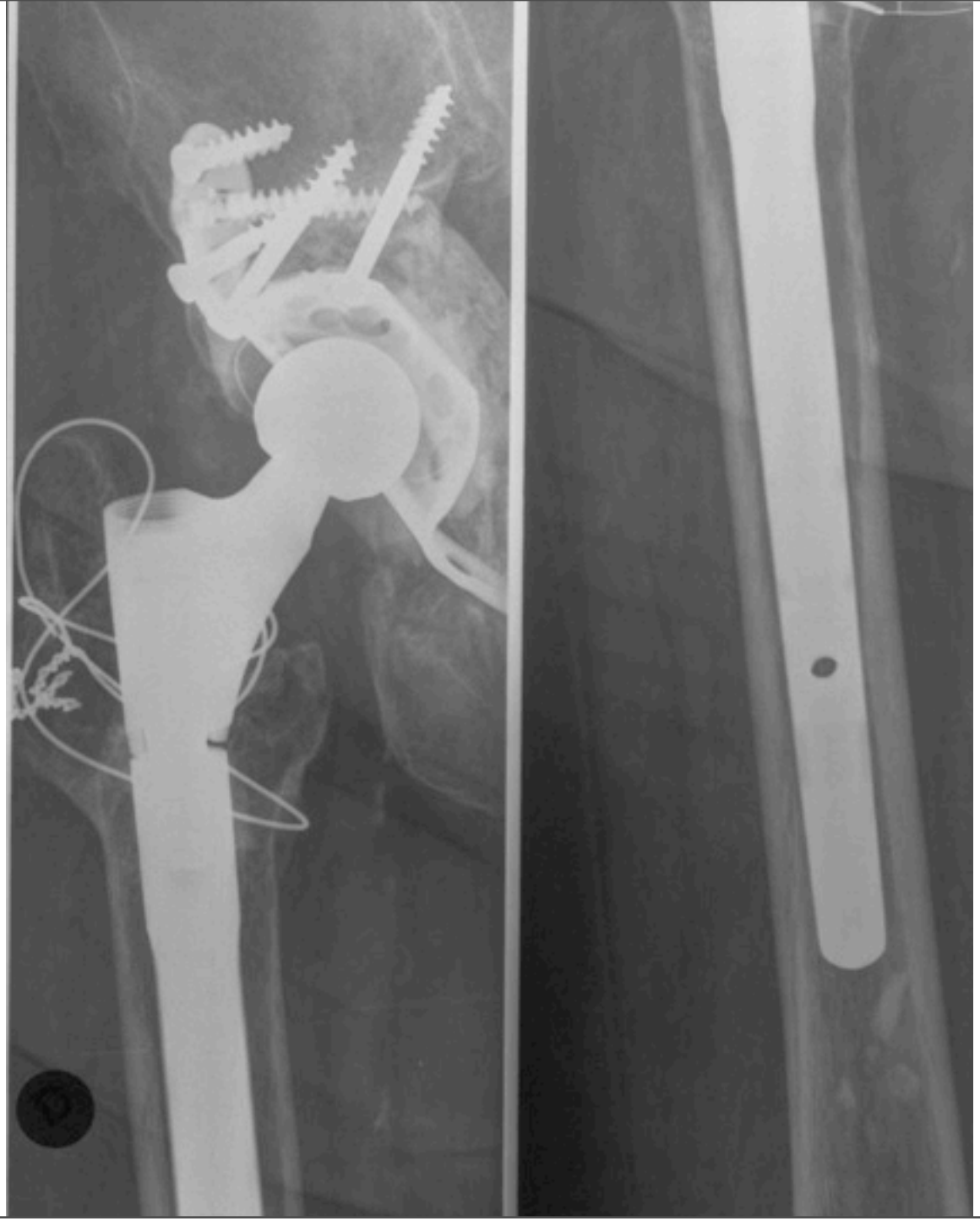
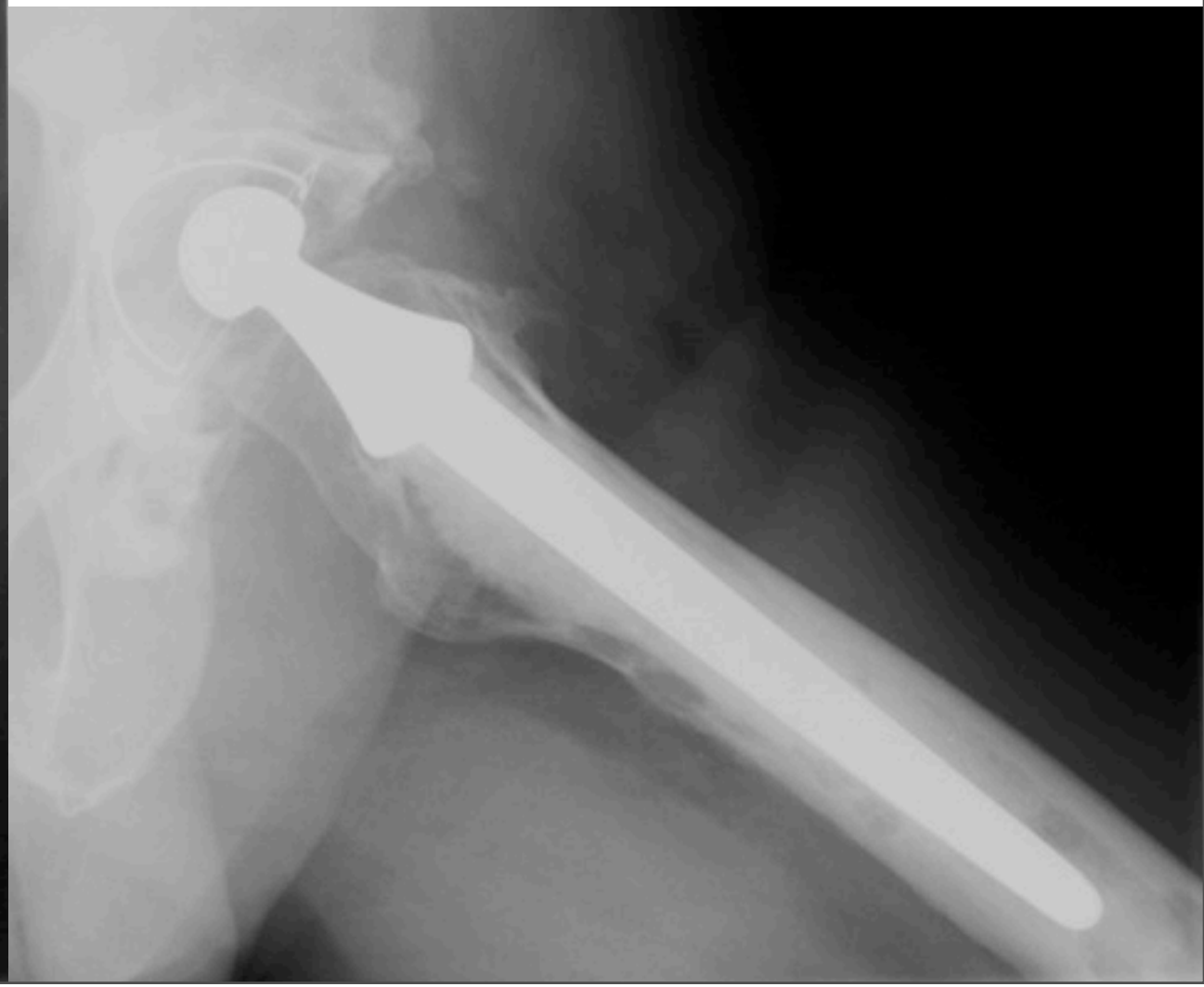

Case 1

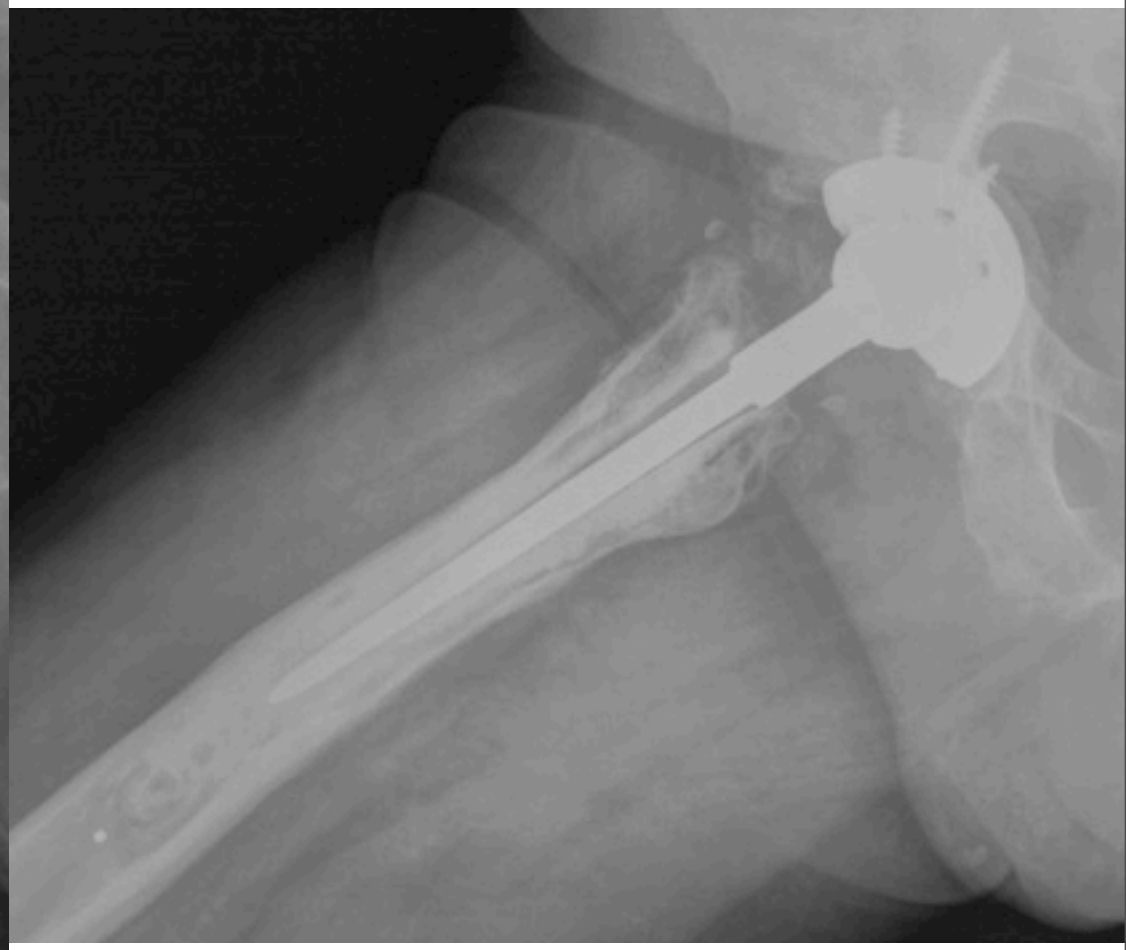




Case 2



Case 3



Take home message

- A good reconstruction needs preoperative planning
- Analyze the best approach for each case
- Soft tissues respect & reconstruction
- Modularity allows leg length & offset reconstruction
- Use large diameter heads reduce risk dislocation

Take home message

- Use distal screws if:
  - potentially unstable stem after reconstruction
  - Paprosky III B / IV / Periprosthetic #
- Mild term results are good if
  - Femoral morphology is "adapted" to stem
    - Do femoral osteotomy if needed
  - Stem fills the femoral canal
  - Stem distal fit obtained (not 3 points anchorage)
  - Proximal fit when possible, but not mandatory