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# Total joint replacement – TJR

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- **Resection of destroyed joint surfaces** – cartilage and subchondral bone and replacement with metal implants
- Return patients back to **pain free life**, active lifestyle, improvement of mobility, ROM
- **Hip, knee**, shoulder, small joints hand/foot, ankle, elbow, wrist



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# Indication

Osteoarthritis - primary / secondary



Rheumatic diseases- RA, autoimmune arthritis

Athropathy - neuroarthropathy, DM, haemophilia, crystal arthropathy

/gout/

Potraumatic destruction of the joint surface

- **1. Total Hip Replacement**

- **Coxarthrosis**

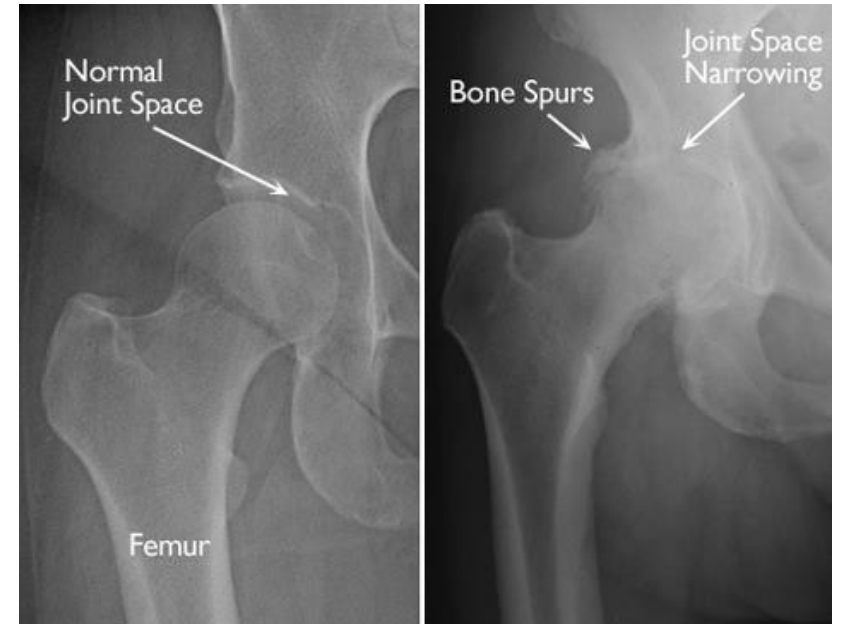
degeneration and destruction of the cartilage

- **Femoral neck fracture**

Subcapital fracture, no chance for

ORIF/osteosynthesis

implantation of CCEP / THR



Total Hip Replacement



X

Cervicocapital prosthesis CCEP



# Coxarthrosis

□ **Primary** – genetic predisposition

**degeneration of joint surface** –

cartilage and subchondral bone +

periarticular soft tissues changes

□ **Secondary** – **underwent pathology** of the hip joint

/ trauma, DDH, m. Perthes, CVA,.. /

Osteoarthritis

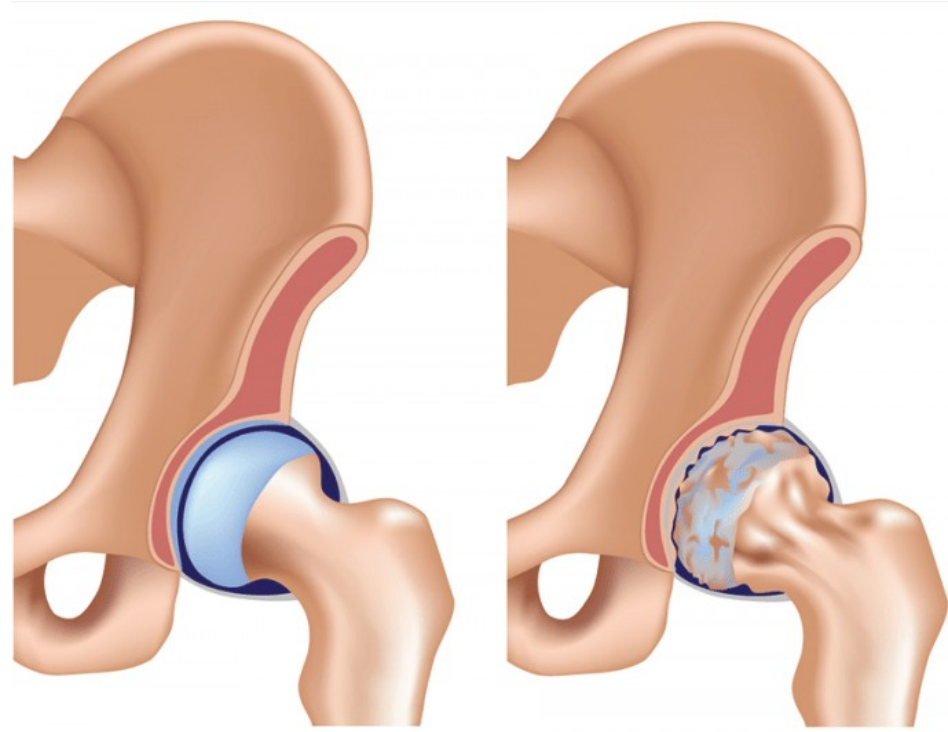


□ Narrowing of joint space

□ Subchondral sclerotization

□ Osteophytes

□ Soft tissues changes



Healthy hip joint

Osteoarthritis

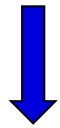




**pain**, over GT and groin pain

Stress pain → rest pain

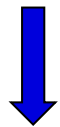
Contracture of soft tissues



**stiffness + reduction of ROM**

Morning stiffness

Pain at night



Lower quality of life



## Epidemiology

more in **women**

primary : secondary

45% : 55%

Caucasian, european population

- > 65 years of age - 50% of people
- > 75 years of age - **80% of people**



## Risk factors

- Age
- sex – women
- Genetics
- Obesity
- Trauma of the hip joint
- Geography



# X ray classification

Kellgren – Lawrence 1957

Table 1

## Kellgren-Lawrence Grading System for Osteoarthritis

Grade	Radiologic Findings
I	Doubtful narrowing of joint space and possible osteophytic lipping
II	Definite osteophytes and possible narrowing of joint space
III	Moderate multiple osteophytes, definite narrowing of joints space, some sclerosis, and possible deformity of bone contour
IV	Large osteophytes, marked narrowing of joint space, severe sclerosis, and definite deformity of bone contour

# Coxarthrosis – therapy

1. Non-farmacological - weight reduction, RHB, fysio, swimming, excersises

2. Farmacological -

*Analgetics* / Paracetamol /

*NSAiDs* / COX inhibitors /

*SYSADOA* – chondroprotectives, viskosupplementation

/glukosamin, Hylauronic acid/

3. Surgical – total joint replacement

**Subjective complaints + X ray finding**

**Conservative treatment without effect**

**→ indication of THR**

**Cemented/ Noncemented / Hybrid**

In Czech Republic **10.000 / year**

University Hospital brno **400 / year**



# 1. Cemented THR

- UHMWPE - Polyethylen cup

/sir. John Charnley, 1962 /

- polished hip stem/ Co-Cr-Mo, Ni, Ti,.../

7.5, 10, 12.5, 15, 17.5

- fixation with bone cement —

/ PMMK, Haboush 1953 /

- metal head





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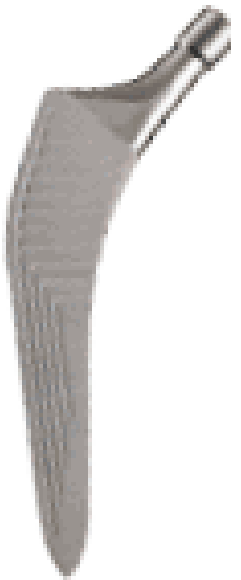
## 2. non-cemented THR



□ Metal cup + polyethylen / ceramic / insert

□ „rough“ stem, covered with hydroxyapatit layer →

„Press-fit“ technique – osteointegration of the metal to the bone  
different sizes of the stem – femoral canal



□ Metal / ceramic head



## CUP

Metal or polyethylene  
*Cementless or cemented*



## LINER

Ceramic or polyethylene



## HEAD

Ceramic or metal



## FEMORAL STEM

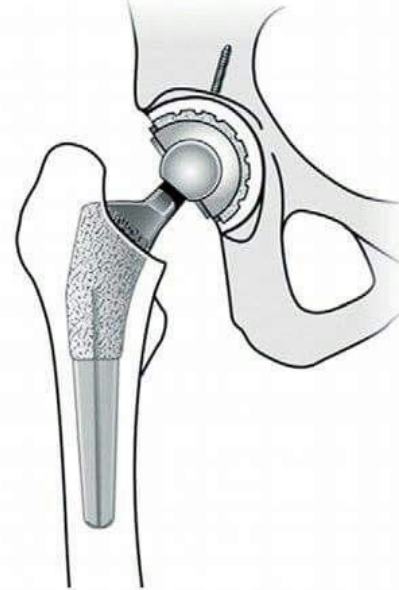
Metal - *Cementless or cemented*



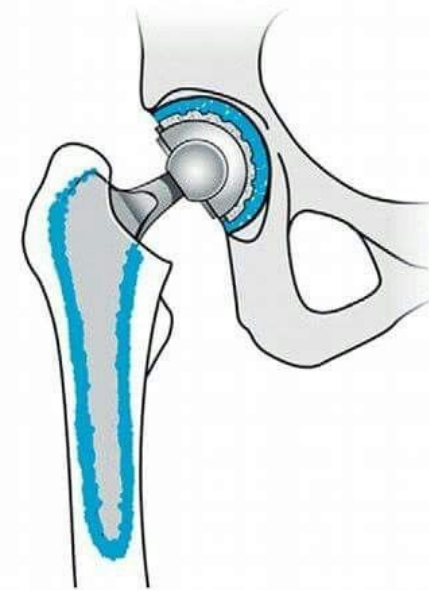
### 3. Hybrid THR

- Noncemented metal cup  
+ insert – polyethylen / ceramic
- Cemented stem
- ceramic / metal head

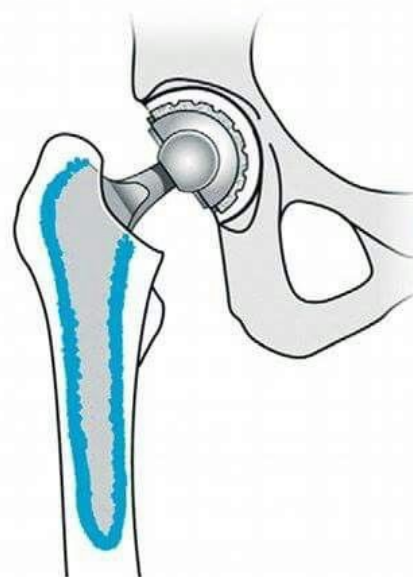
A Cementless



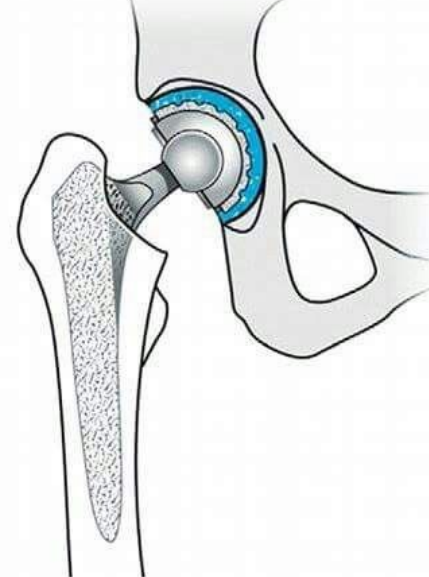
B Cemented



C Hybrid



D Reverse hybrid



# Articular surfaces – Tribology : friction, wear, abrasion

1. polyethylen insert – metal head
2. polyethylen insert – ceramic head
3. ceramic insert – ceramic head
4. ~~metal insert – metal head~~  
abrasion of metal particles - metallosis

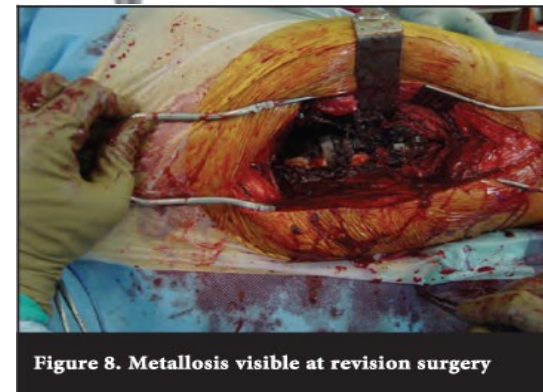


Figure 8. Metallosis visible at revision surgery

# Surgical approaches

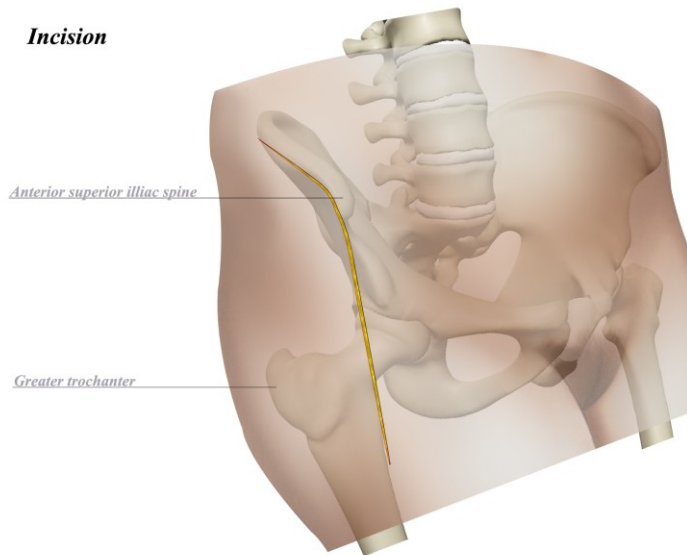
anterior, anterolateral, lateral, posterior

[www.orthobullets.com](http://www.orthobullets.com)

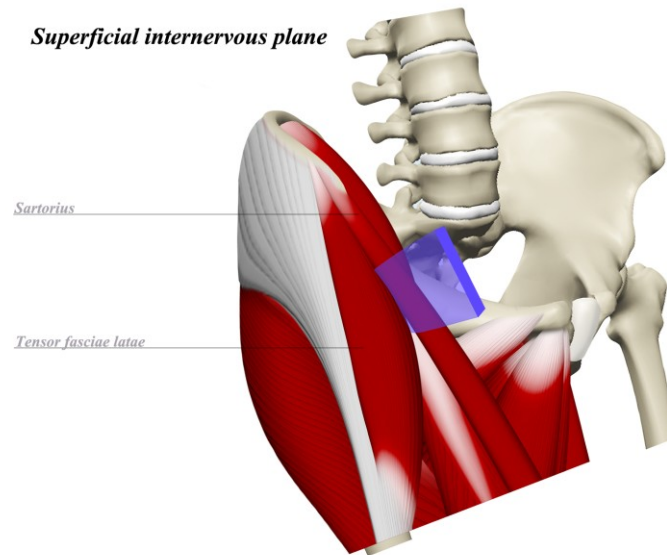
## 1. Anterior approach – Smith Petersen

*Septum : M. tensor fasciae latae - M. Sartorius*

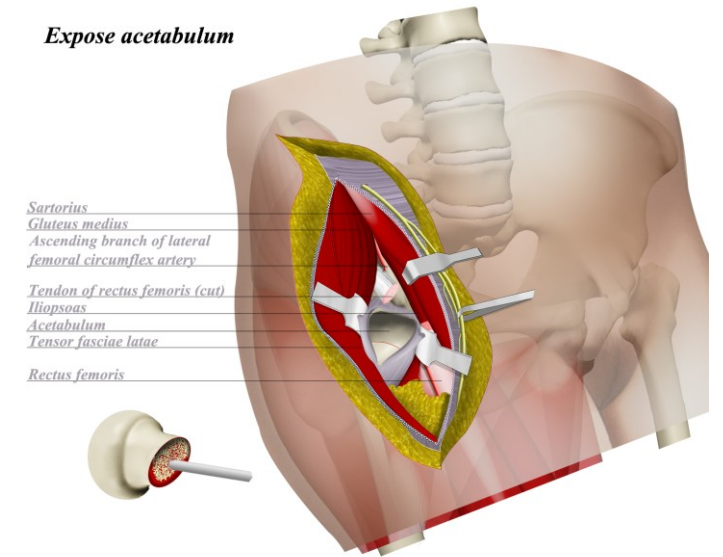
*Incision*



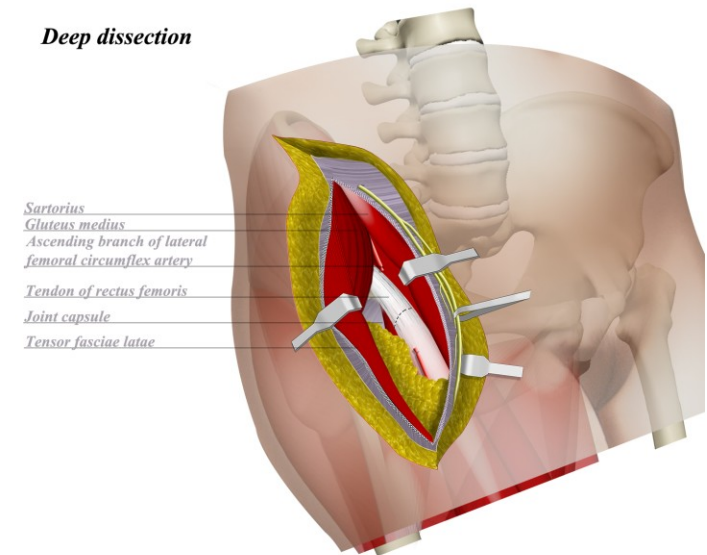
*Superficial internervous plane*



*Expose acetabulum*



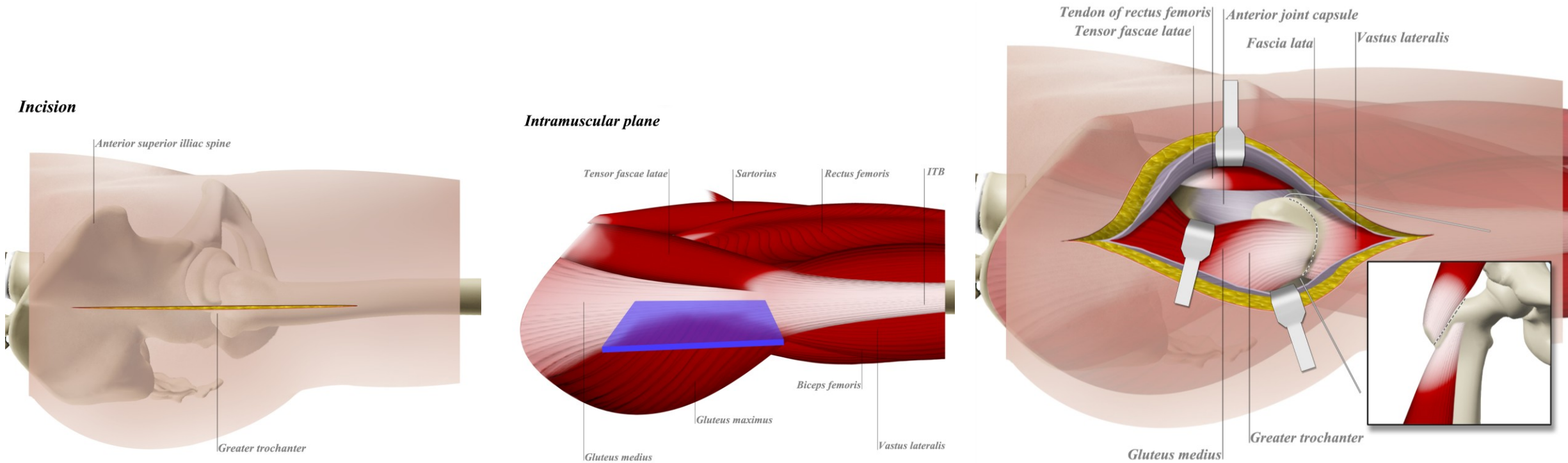
*Deep dissection*



## □ 2. Anterolateral – Watson – Jones

supine position

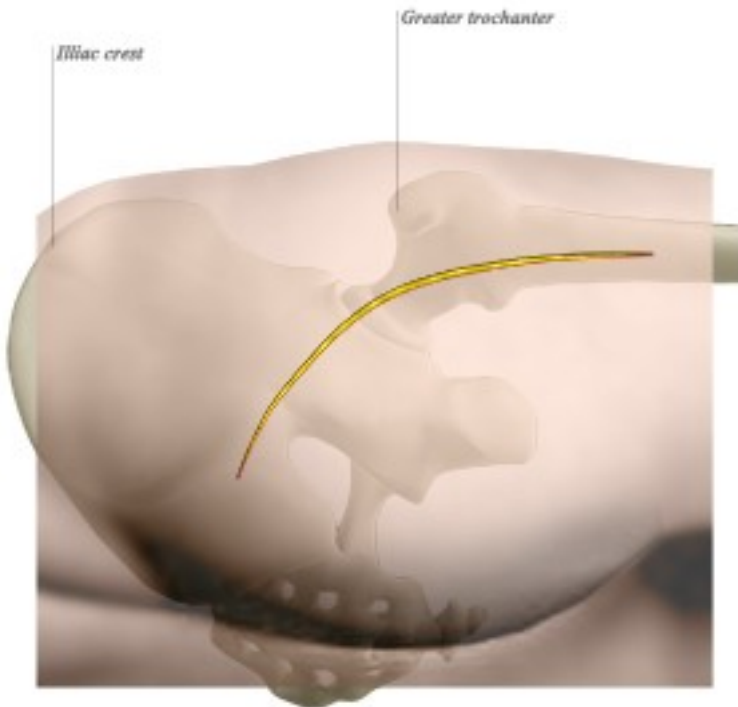
*Septum : M. Gluteus med et min – M. vastus lateralis*



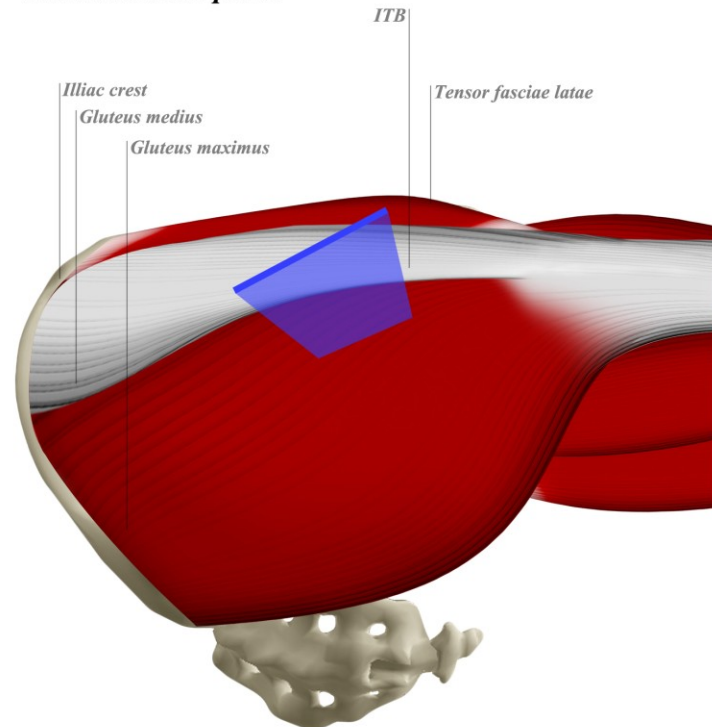
### □ 3. Posterior approach – Southern, Moore / UK, USA /

- Lateral decubitus position
- Through muscle fibres of M. Gluteus Maximus
- CAVE!! – n. Ischiadicus

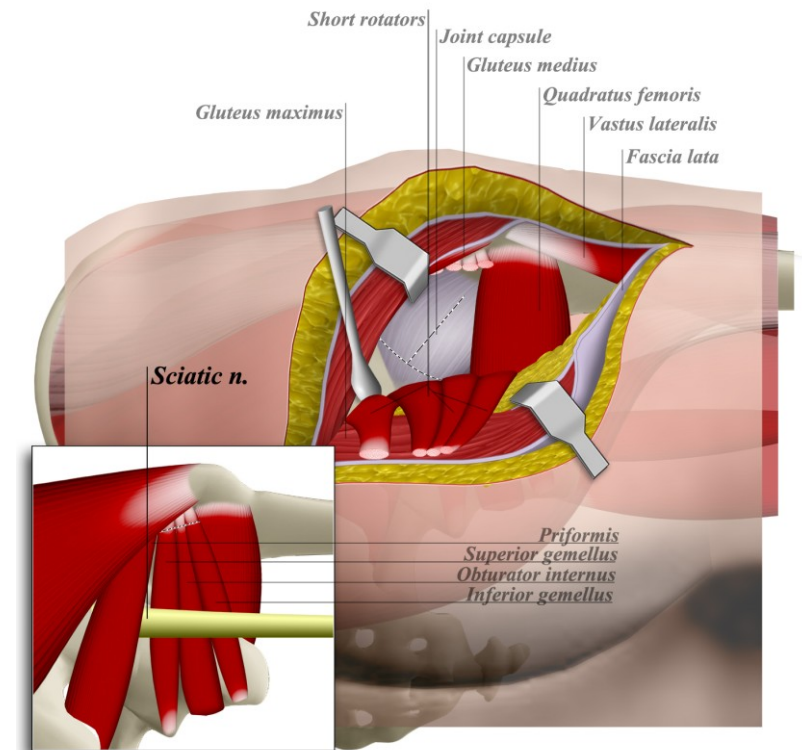
**Incision**



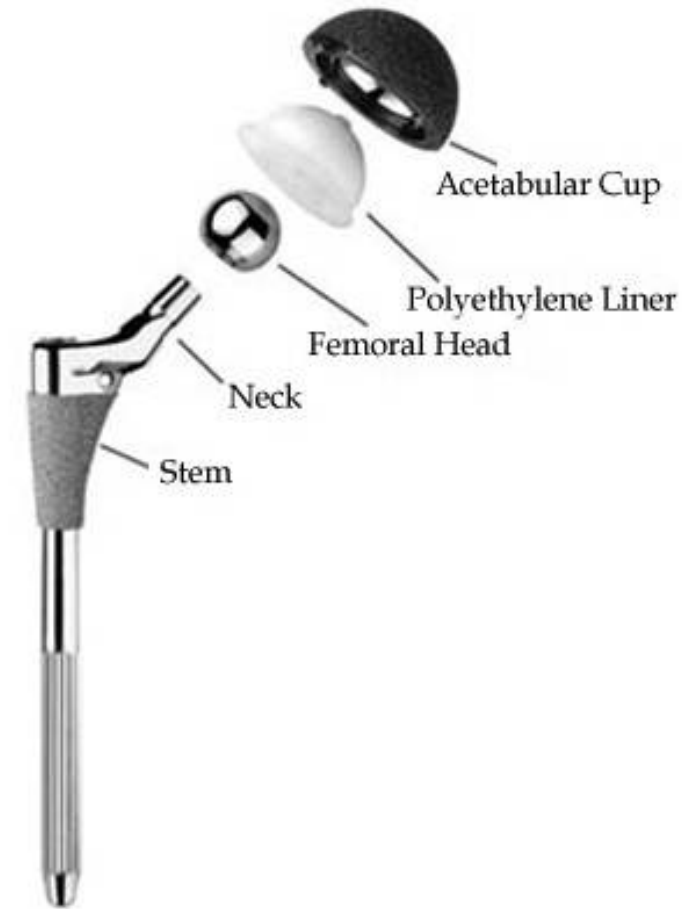
**Intramuscular plane**



**Incise joint capsule**



- 1. surgical approach
- 2. reaming and **cup insertion** /cemented, noncemented/
- 3. preparation of the femoral canal for **the stem**  
/cemented, noncemented /
- 4. neck + head /M,L,XL,XXL/
- 5. check **stability, leglength, ROM**
- 6. definitive implantation of components
- 7. poop RHB, 3/12 PWB with crutches → **FWB**





# Complications

1. Pain - pathology of lumbo-sacral spine

- aseptic loosening

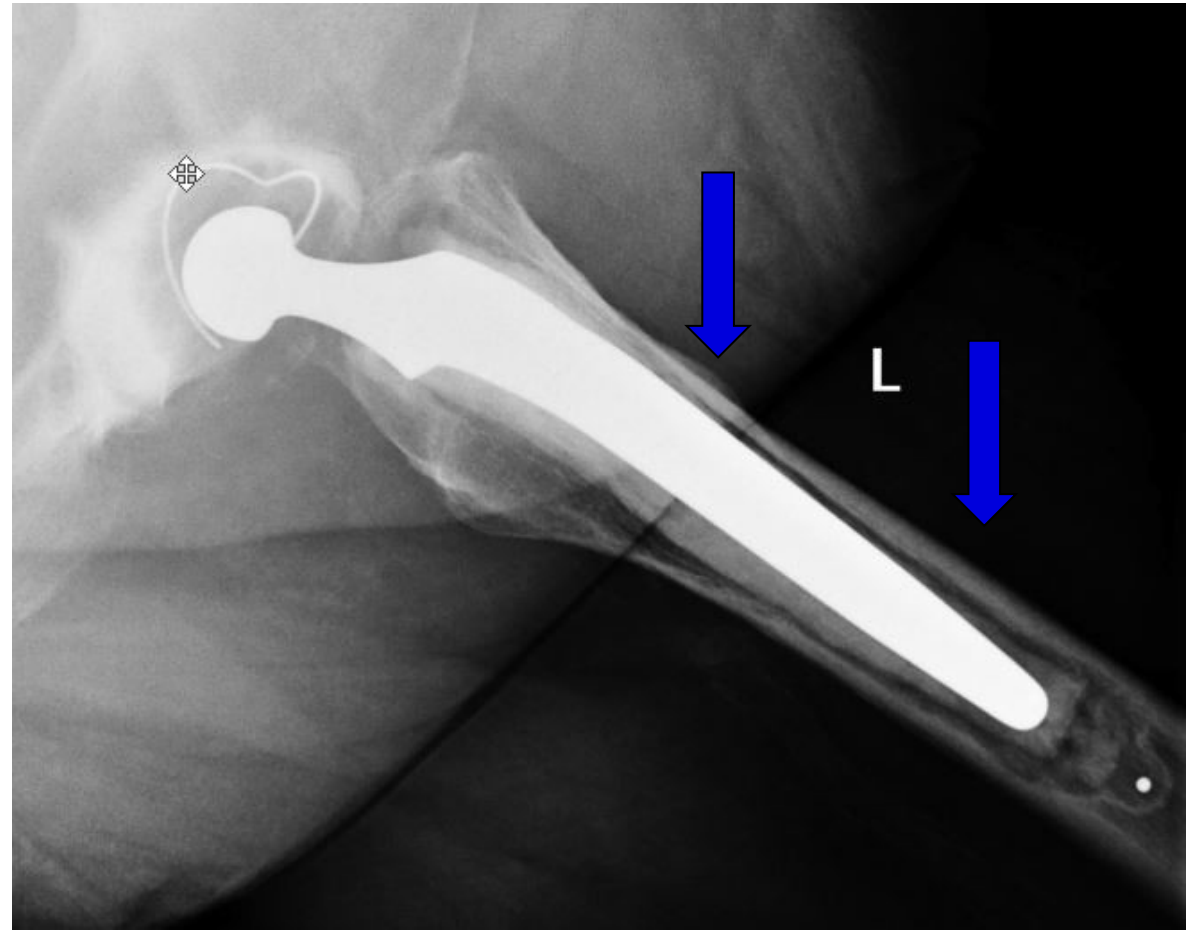
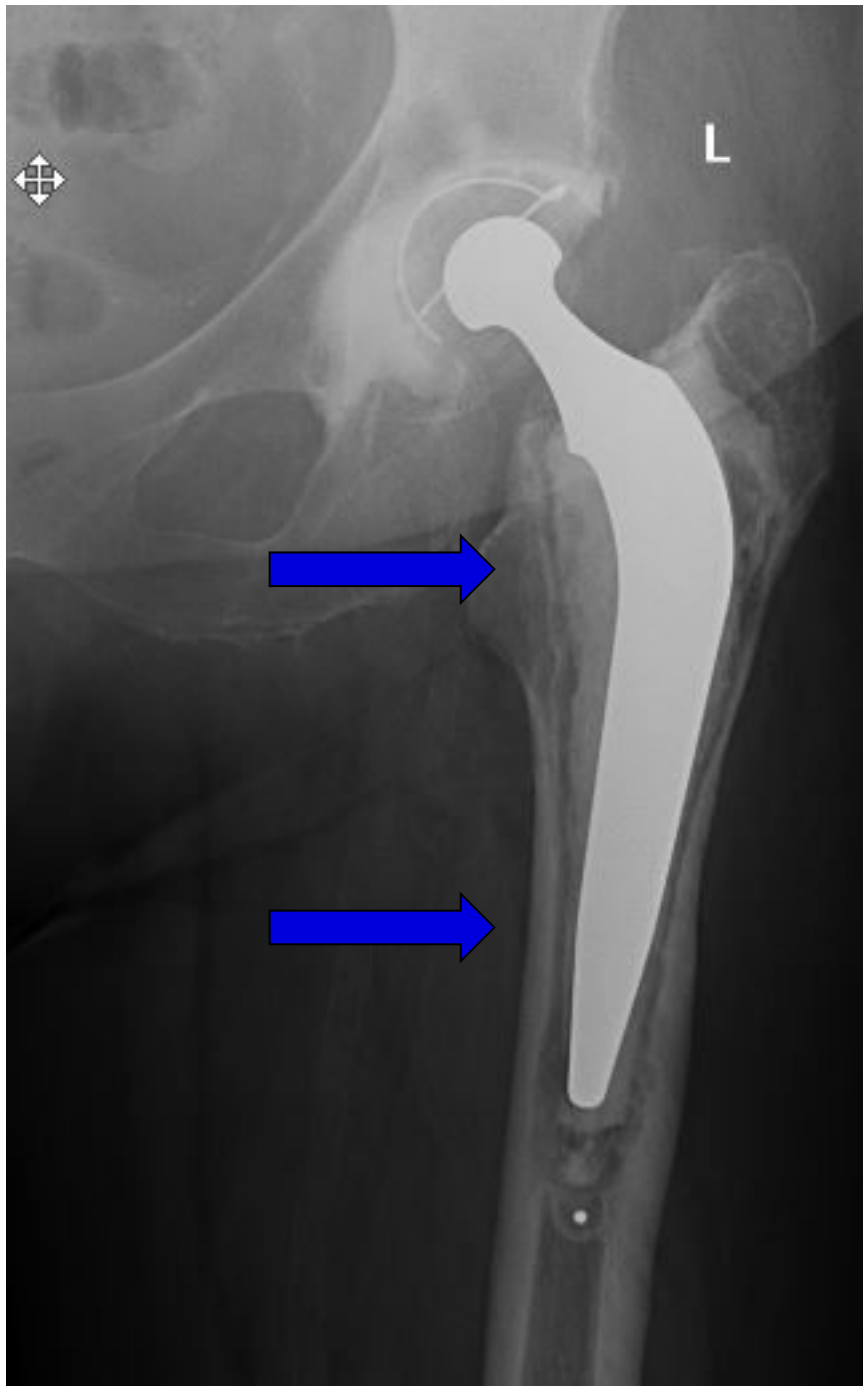
- infection

- **periprosthetic fractures** / growing of incidence/

2. Aseptic loosening

- mechanical wear, osteolysis  lost of fixation

- need of revision / aprox. 60 / year



### 3. Infection

**Perop – postop** (haematogenous way from infected focuses)

/ GIT, lungs, urogenital, skin infection, ulcer of the shin ../

**Strict asepsis in Operation theatre + all infection focuses must be cured!!!**

Th – long-term ATB iv / min. 3 months /

**Infected TJR – need for revision, „two-stage“**

1. Extraction of THR and spacer implantation + iv. ATB



2. reimplantation THR

#### 4. THR luxation 1-5%, / revisions up to 20% /

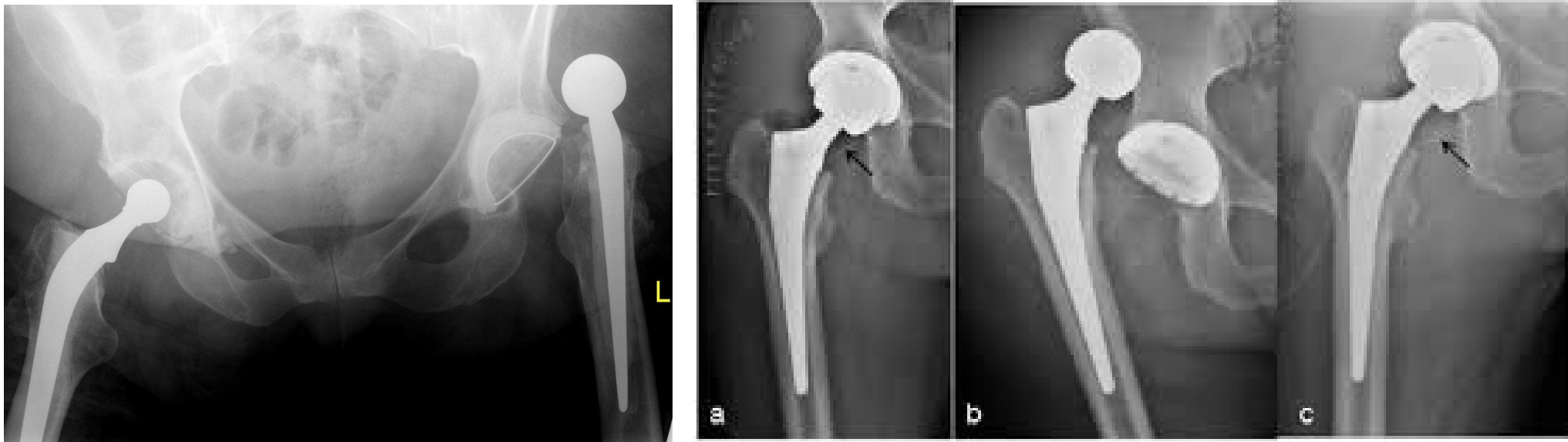
##### - Per-op technique failure –

malposition of components, impingement – bony osteofytes, soft tissues

##### - Post-op. Luxation prevention

Th - reposition with / without GA, hip brace for 6 weeks

>3 luxation → op. revision



## 5. Periprosthetic fractures /around THR/

### □ Perop

3,5 % uncemented THR

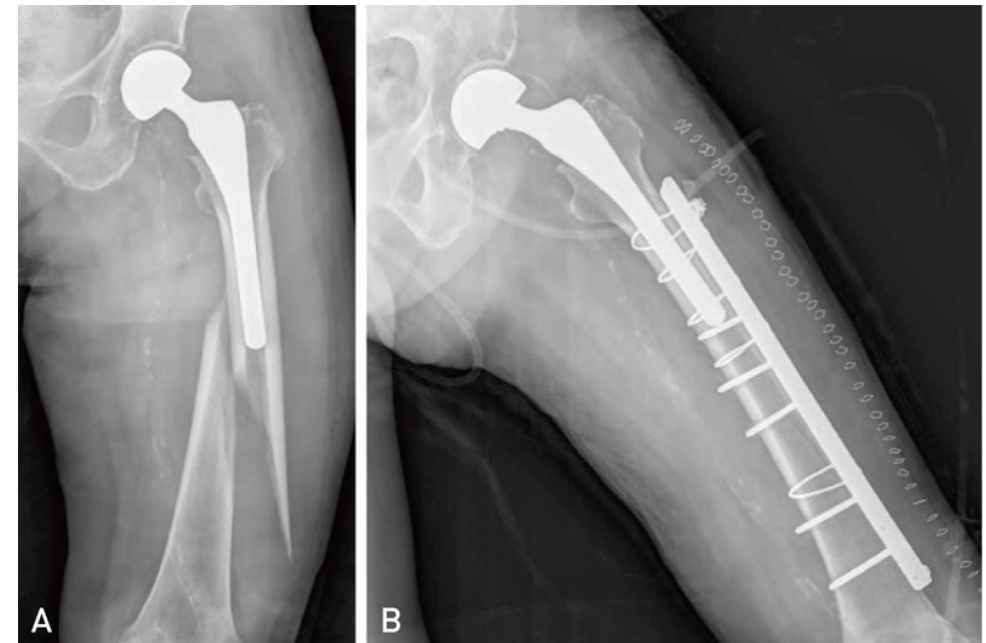
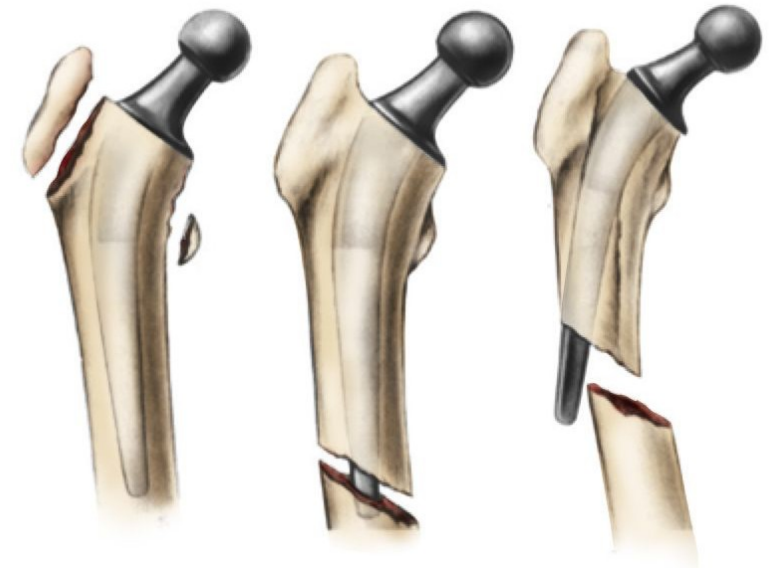
0,4 % cemented THR

### □ Postop /fall/

**0,1 – 4 % growing incidence**

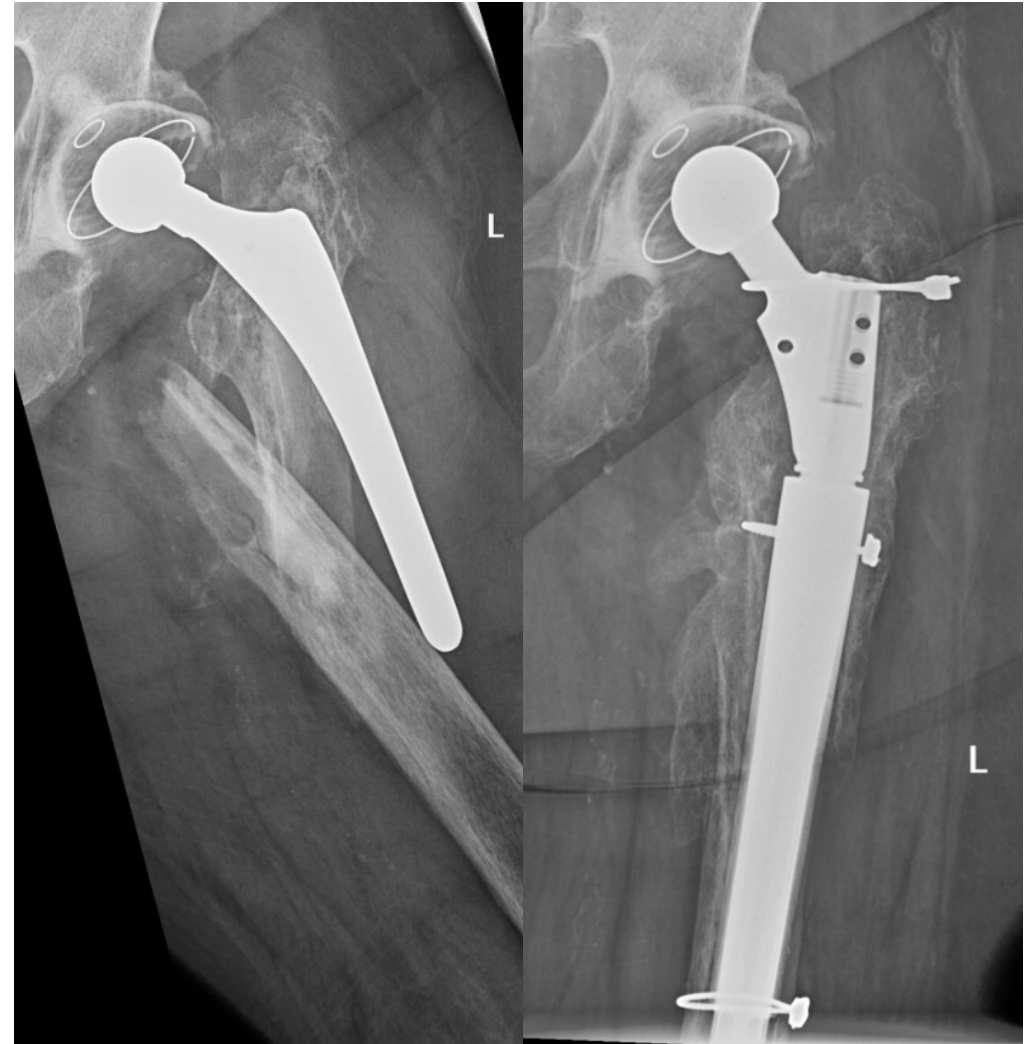
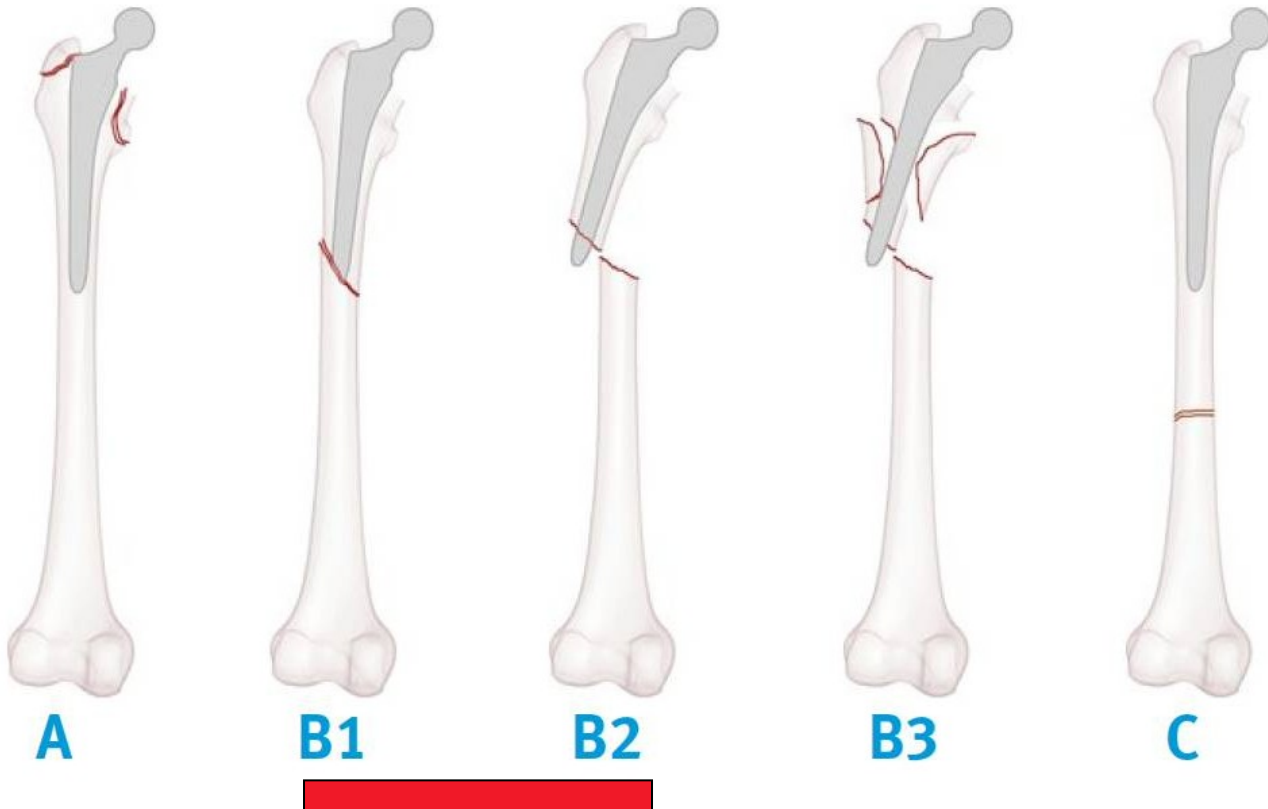
most often around the stem

th - ORIF – open reduction internal fixation



# THR periprosthetic fractures

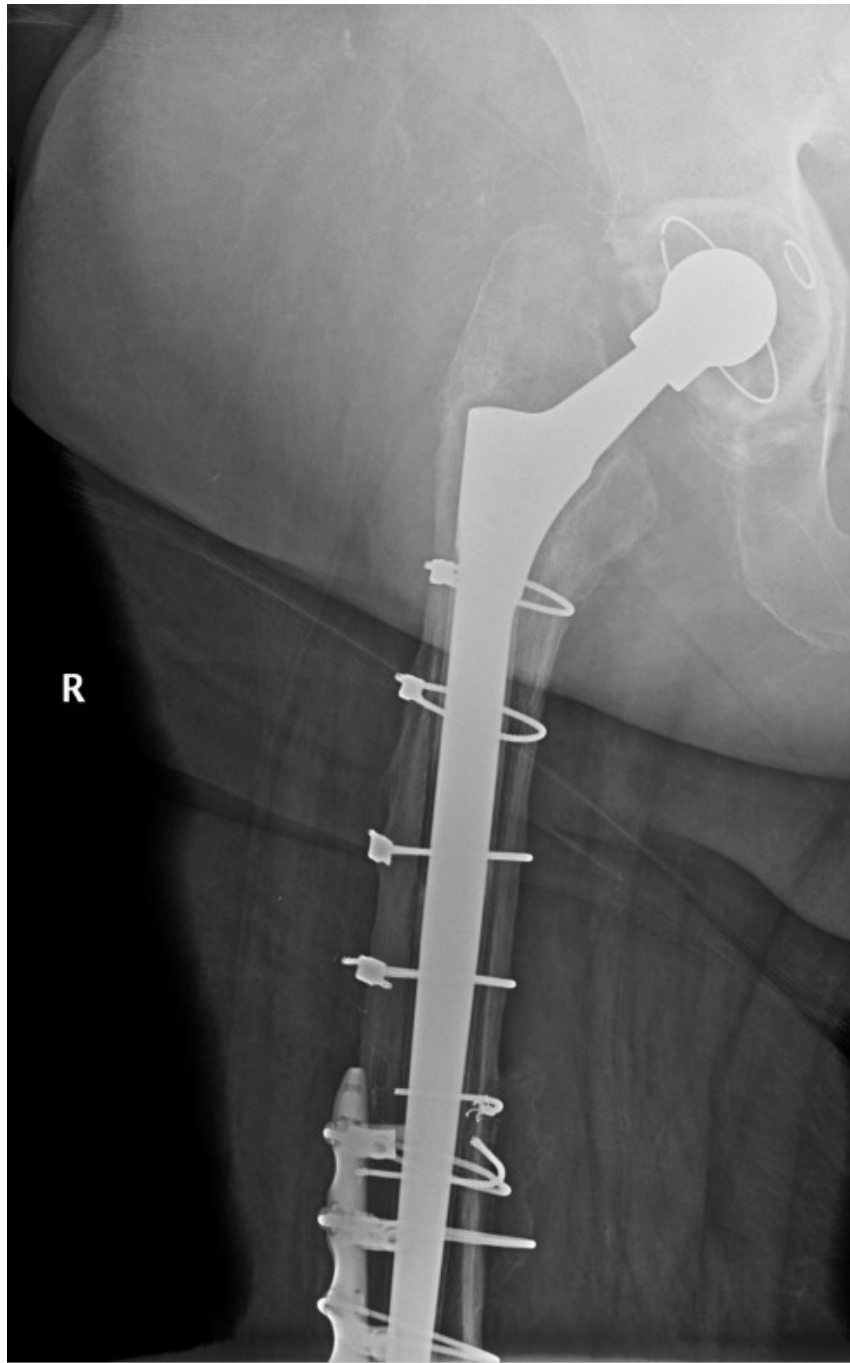
## Vancouver classification





Femur  
Plate System

Surgical Technique



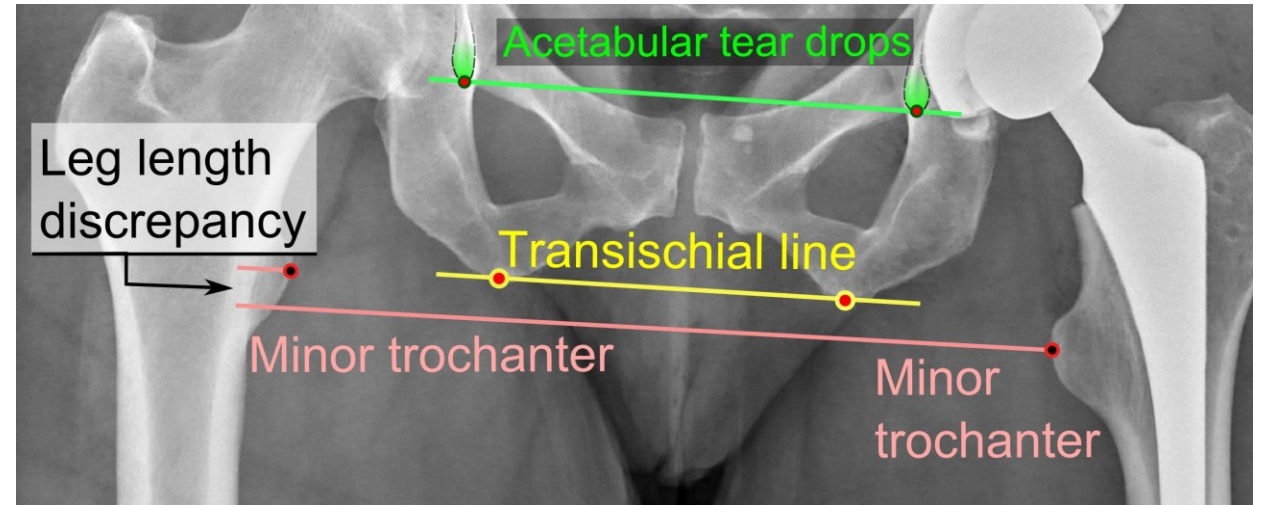
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## 6. Leg-length discrepancy

18-32% leg prolongation

th - shoe inserts, orthopaedic shoes

THR on the contralateral side



## 7. Neurovascular injury

a. **femoralis** – CAVE per-op. injury!!

n. **ischadicus**, n. **femoralis** – **perop. injury x haematoma/dragging of the nerve**

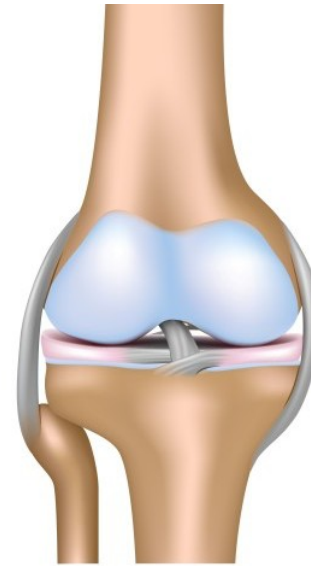
th – anti - oedema therapy, EMG, US, MRI

**spontaneous reparation in 6 weeks x revision**

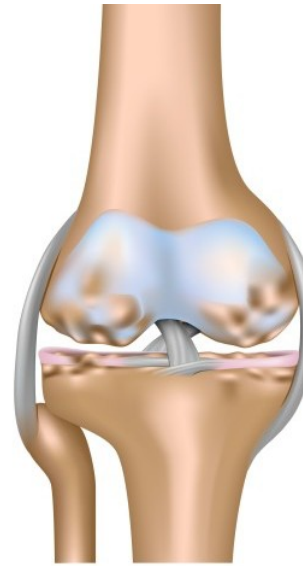


## 2. TEP genus, Total Knee Replacement

- **Gonarthrosis**
- RA, arthropathies
- post-traumatic degeneration



Healthy knee joint



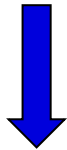
Osteoarthritis



- Destruction of joint cartilage
- Subchondral bone sclerotisation
- Osteophytes, Synovialitis, soft tissues changes



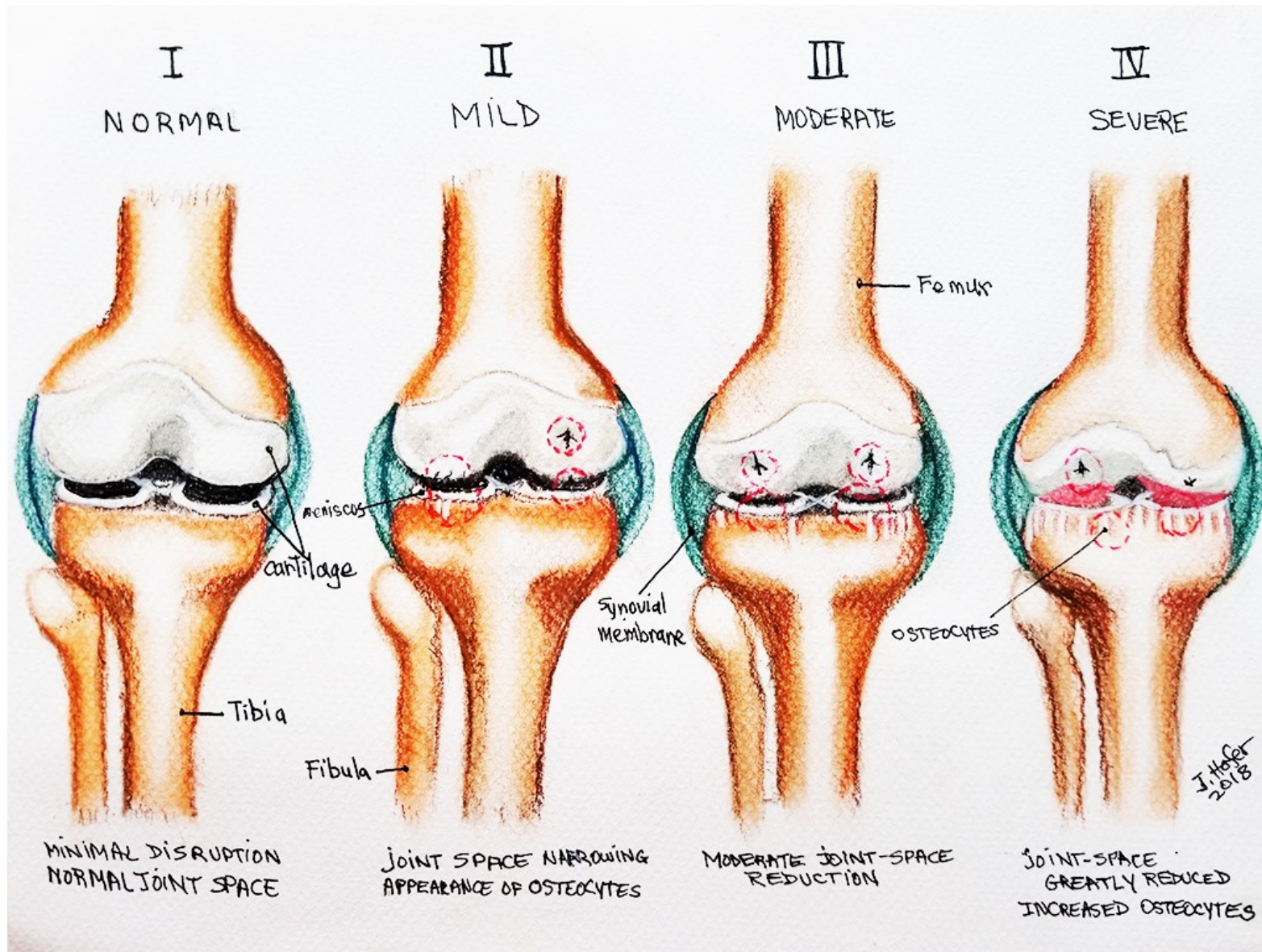
- Narrowing of joint space
- Leg axis deterioration → worsening



**pain, stiffness, limited ROM**



# Classification: Kellgren – Lawrence, ICRS, Outerbridge



## Types of TKR:

□ CR – Cruciate retaining, PCL reserved

□ PS – Posterior stabilized

/PCL resected/

□ **Revision TKR** - CCK Condylar Constrained knee

- RH Rotating hinge knee

/tumour resection, loose colletaral ligaments/

CR



PS



CCK



RH



## fixation

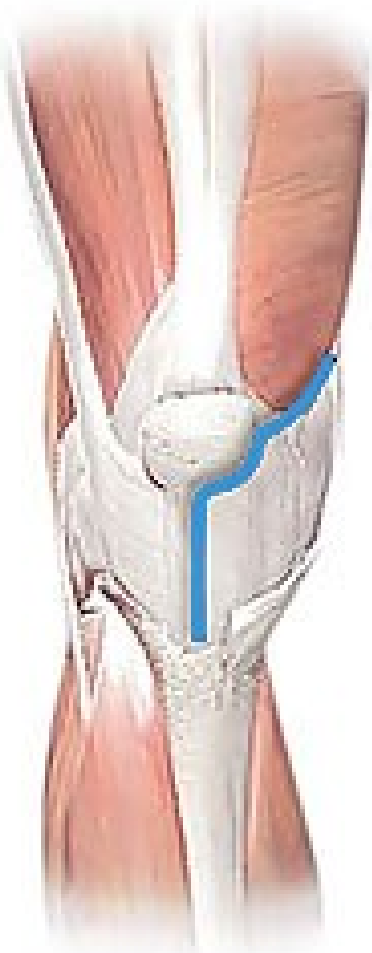
- **Cemented** – „gold standard“, most of TKRs
- **Noncemented** – higher risk of revisions, technically demanding revisions
- **Hybrid** – femoral component noncemented, tibial fixated with cement, unsure results

# Approach

**Medial parapatellar**

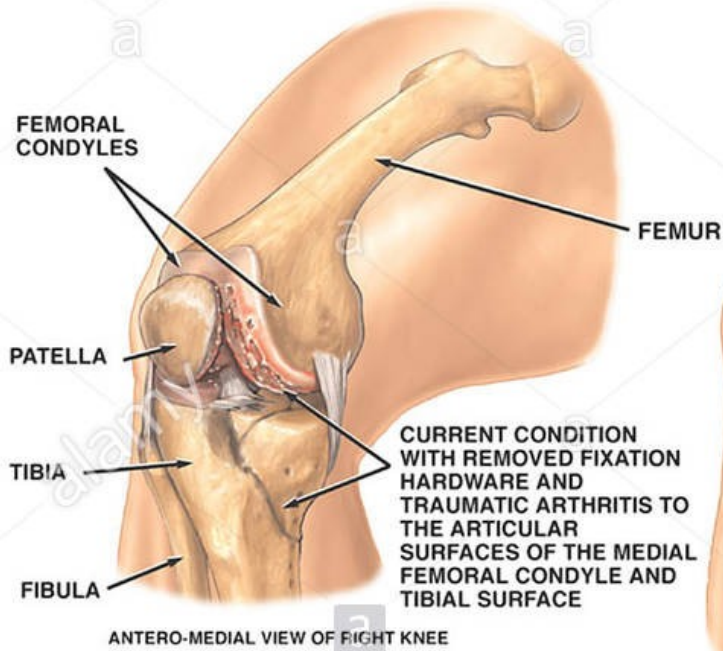
Midvastus

Subvastus

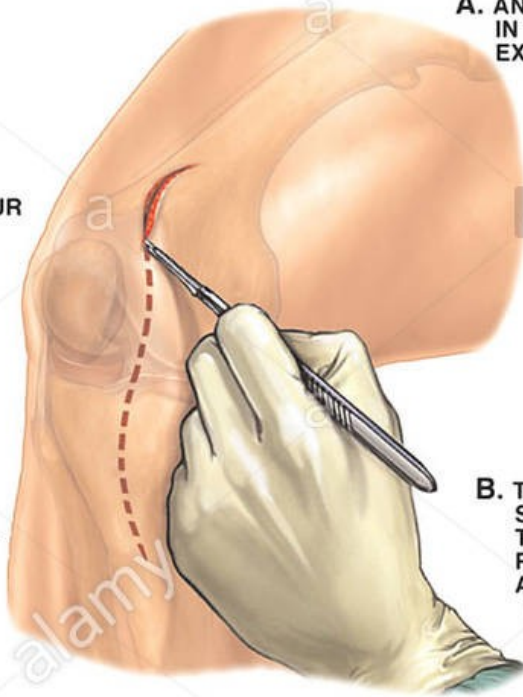


1. Approach
2. Menisci and Hoffa fat pad resection, synovectomy, medial release /varus knee/
3. IM femoral guide, distal femur resection
4. EM tibial guide, tibial plateau resection
5. Femur sizing and resection via template
6. Soft tissues balancing
7. Insert trial, full ROM, flexion and extension gap
8. Cementing of components
9. PF removal of osteophytes, denervation
10. RHB, physio, ROM, PWB with crutches, then FWB
11. DVT prophylaxis 5/52

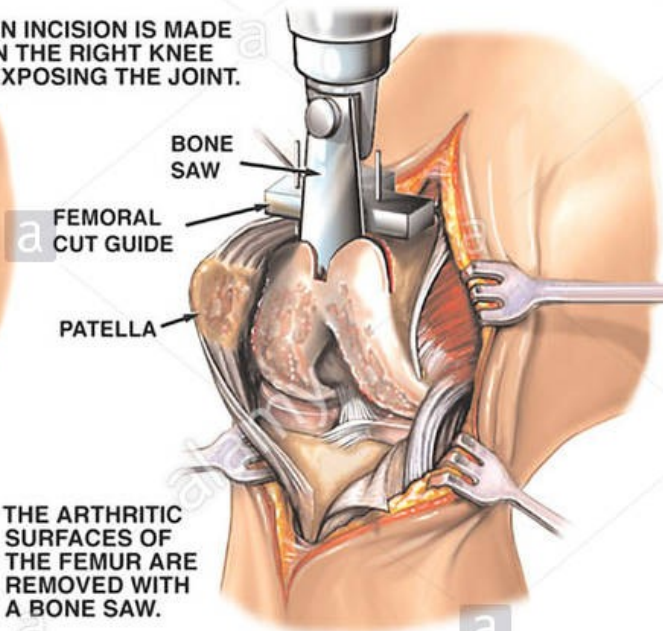




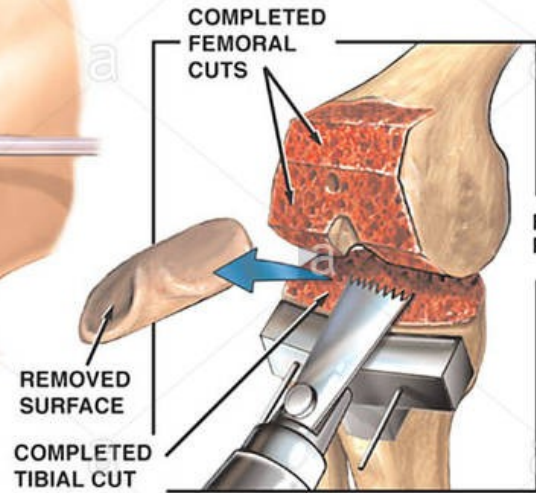
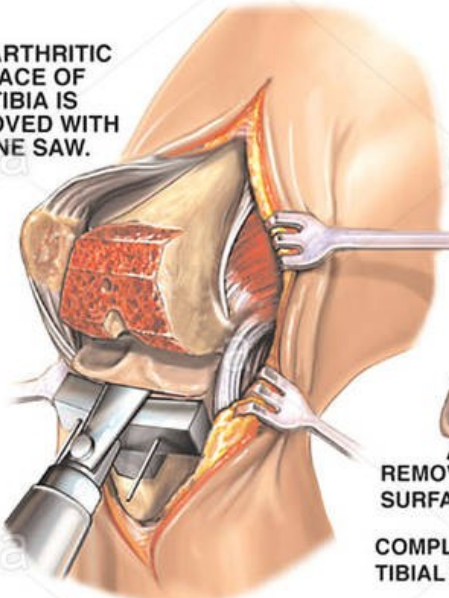
A. AN INCISION IS MADE IN THE RIGHT KNEE EXPOSING THE JOINT.



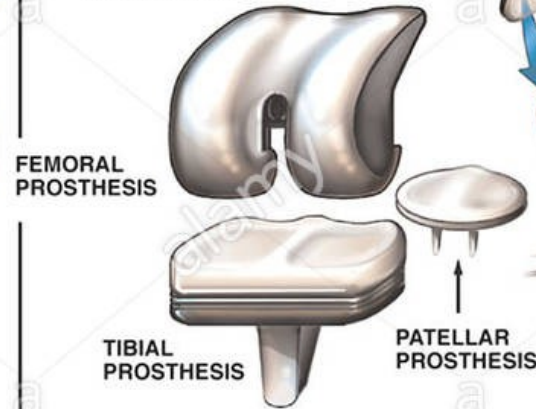
B. THE ARTHRITIC SURFACES OF THE FEMUR ARE REMOVED WITH A BONE SAW.



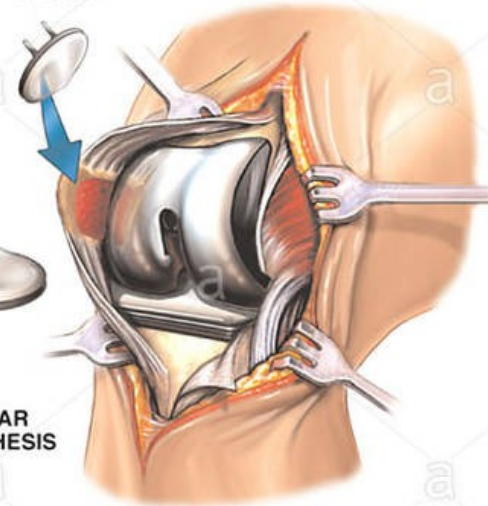
C. THE ARTHRITIC SURFACE OF THE TIBIA IS REMOVED WITH A BONE SAW.



D. THE FEMORAL AND TIBIAL PROSTHESES ARE PUT INTO PLACE.



E. A BUTTON IS PLACED OVER THE BACK OF THE PATELLA AND THE WOUND IS CLOSED.



# Complications

1. Operating mistake – malrotation of components, „nonbalanced“ knee
2. Pain – up to 10% unknown reason
3. Per/postop infection → two-stage replantation
4. Aseptic loosening → one-stage Replantation of TKR
5. Periprosthetic fractures → **growing incidence**  
th. ORIF – plate, cables x revision TKR
6. Neurovascular injury – a. poplitea, n. peroneus

# 3. TEP omi, Shoulder replacement

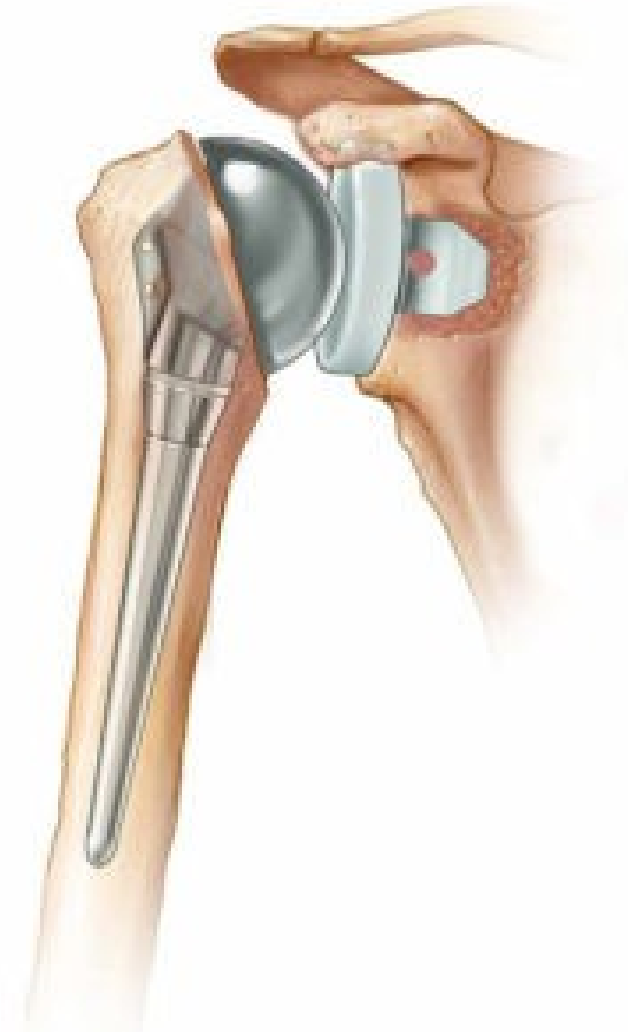
1893 J.E. Peán

- Proximal humeral fracture – comminutive

Impossibility of ORIF or conservative treatment

- Omarthrosis, RA, arthropathy

➡ pain, ROM restriction



## Types of implants:

### □ 1. Resurfacing Omi

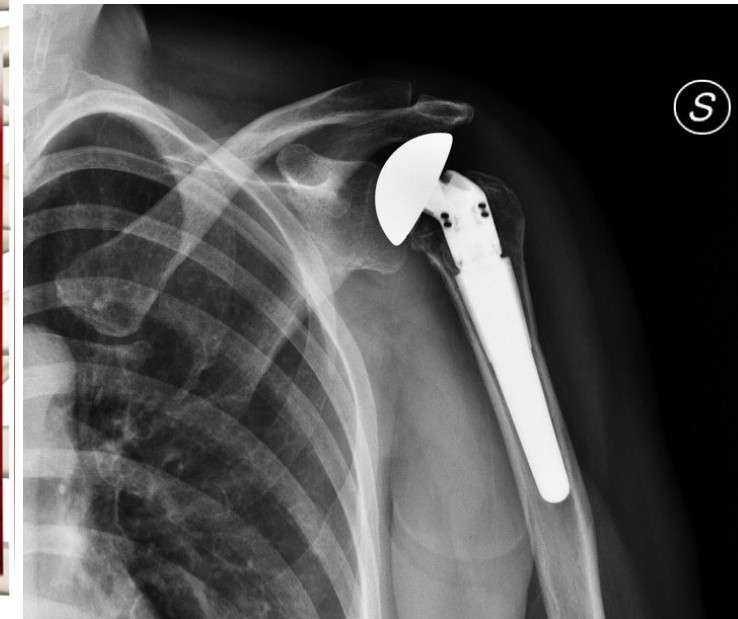
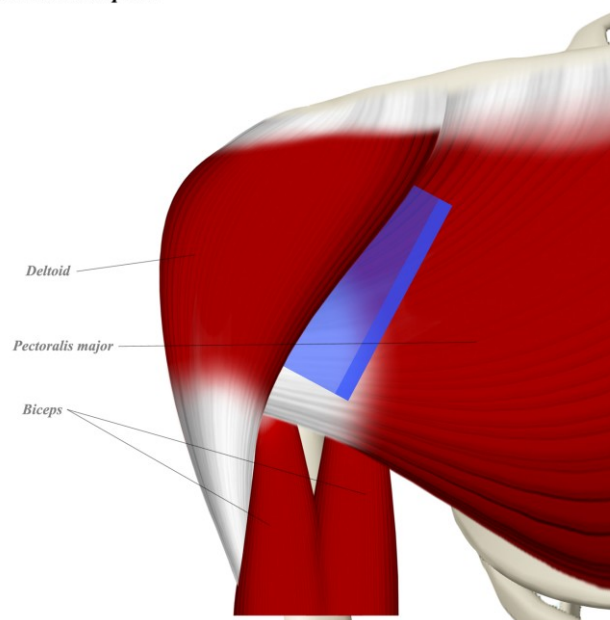
degeneration of cartilage and subchondral bone of the humeral head / necrosis, **rotator cuff must be intact!!**



### □ 2. Hemiarthroplasty – CCP

older patients, fracture of humeral head, ventral deltoideopectoralis approach

*Internervous plane*



### 3. Total Replacements

- **convetional** – glenoid reaming - **cup**  
prox. Humerus - **stem and head**

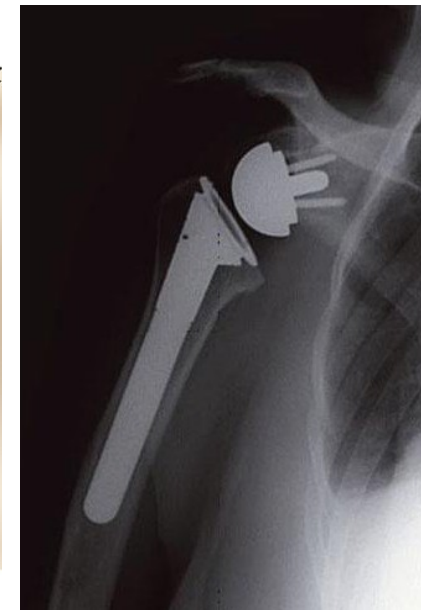
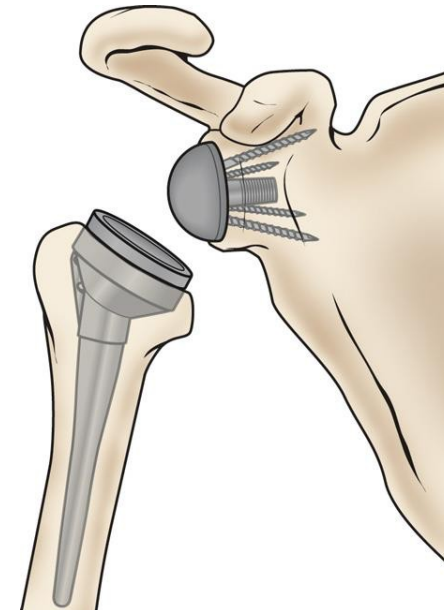
Rotator cuff must be intact !!

migration of the prosthesis **up**



- **reverse TJR** - prox. Humerus - **stem and head**  
glenoid - **head**

indicated when RC is destroyed



# • 4. TEP cubiti, Elbow replacement

## □ Rheumatoid arthritis

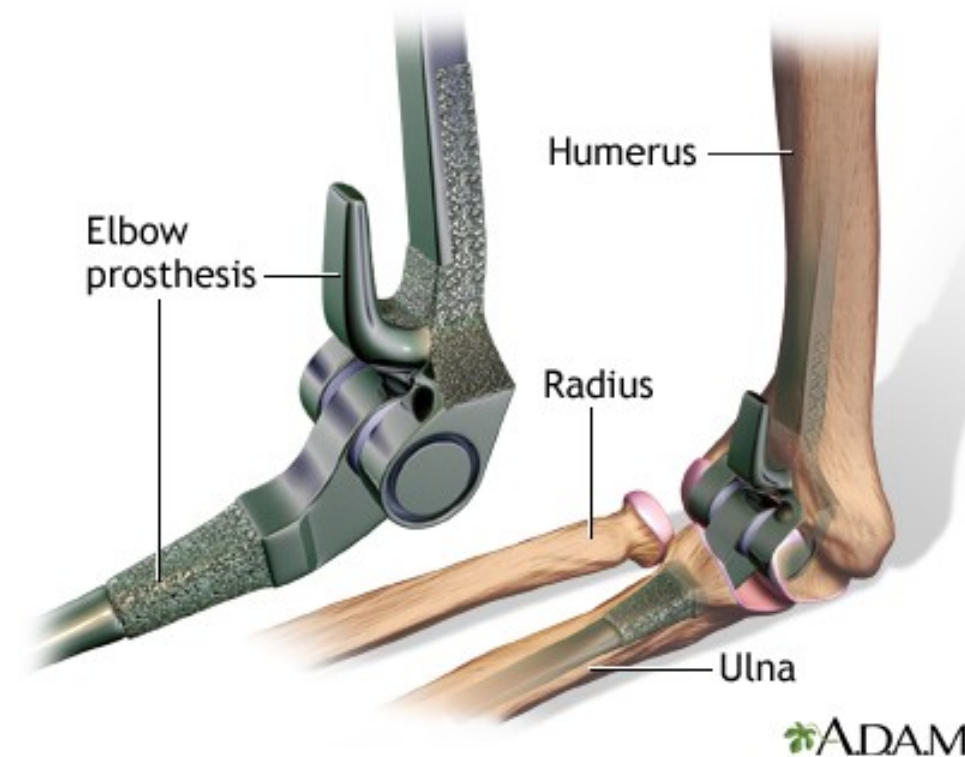
posttraumatic arthritis, tumour resection, bilateral ankylosis



**Pain, restriction of ROM**

**Contraindication** – septic arthritis, infection

**→ arthrodesis**



## Types of implants:

□ Non-constrained

□ Semi-constrained

□ Constrained

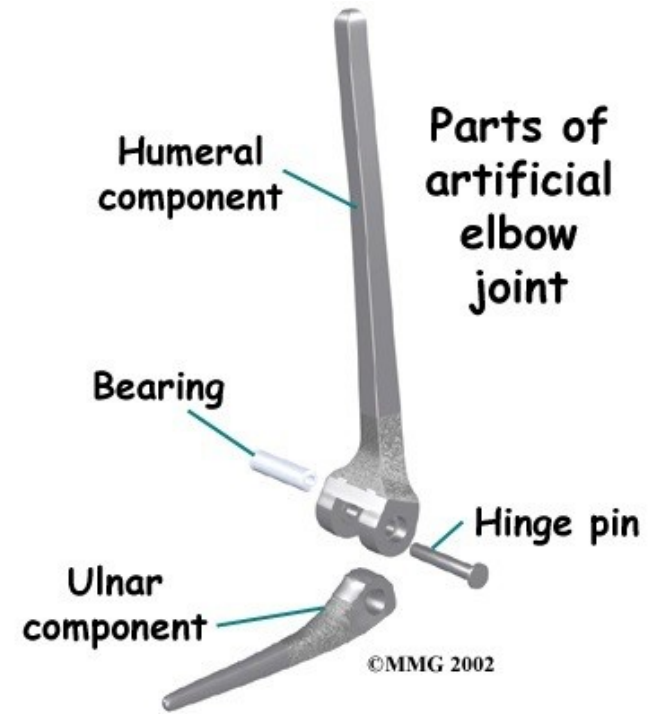
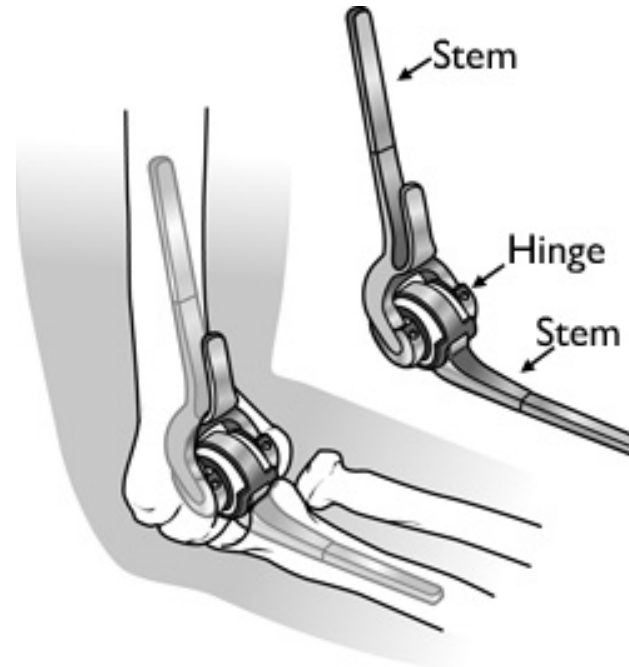


Figure 2:  
Semi-constrained total elbow replacement

- **5. Total ankle replacement art. Talocruralis – TAR**

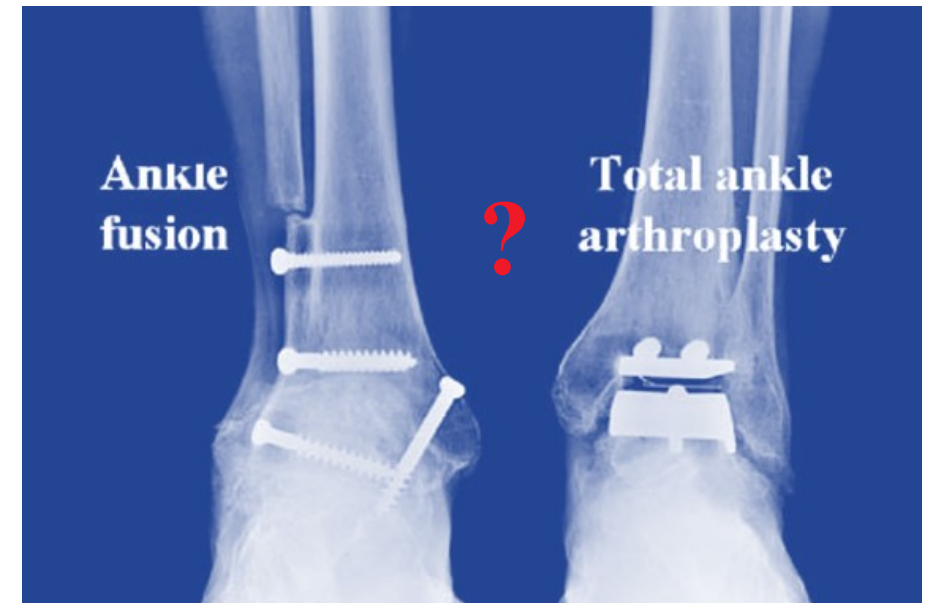
- Lord/Marrot 1970 – implantation THR into ATC 😊

- Arthrosis of T-C joint, **RA**, posttraumatic,

- Necrosis tali, osteochondrosis dissecans, arthropathies...

- cemented → **noncemented**

- ? **Arthrodesis x TAR** ... still unclear...





## 6. Hand/Foot joint replacements

□ wrist, MCP/ MTP, IP joints,...

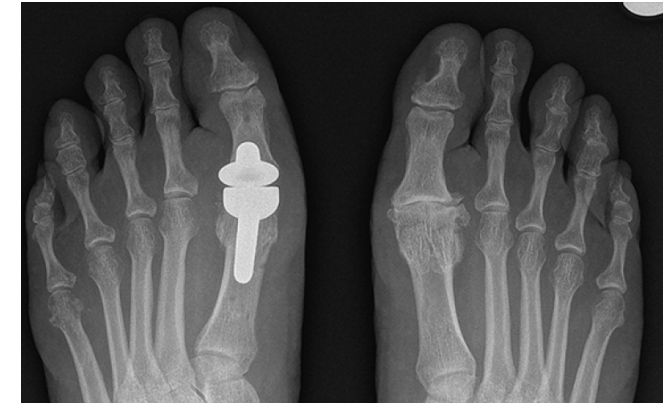
□ RA, arthrosis

uncertain results → **arthrodesis preferred**

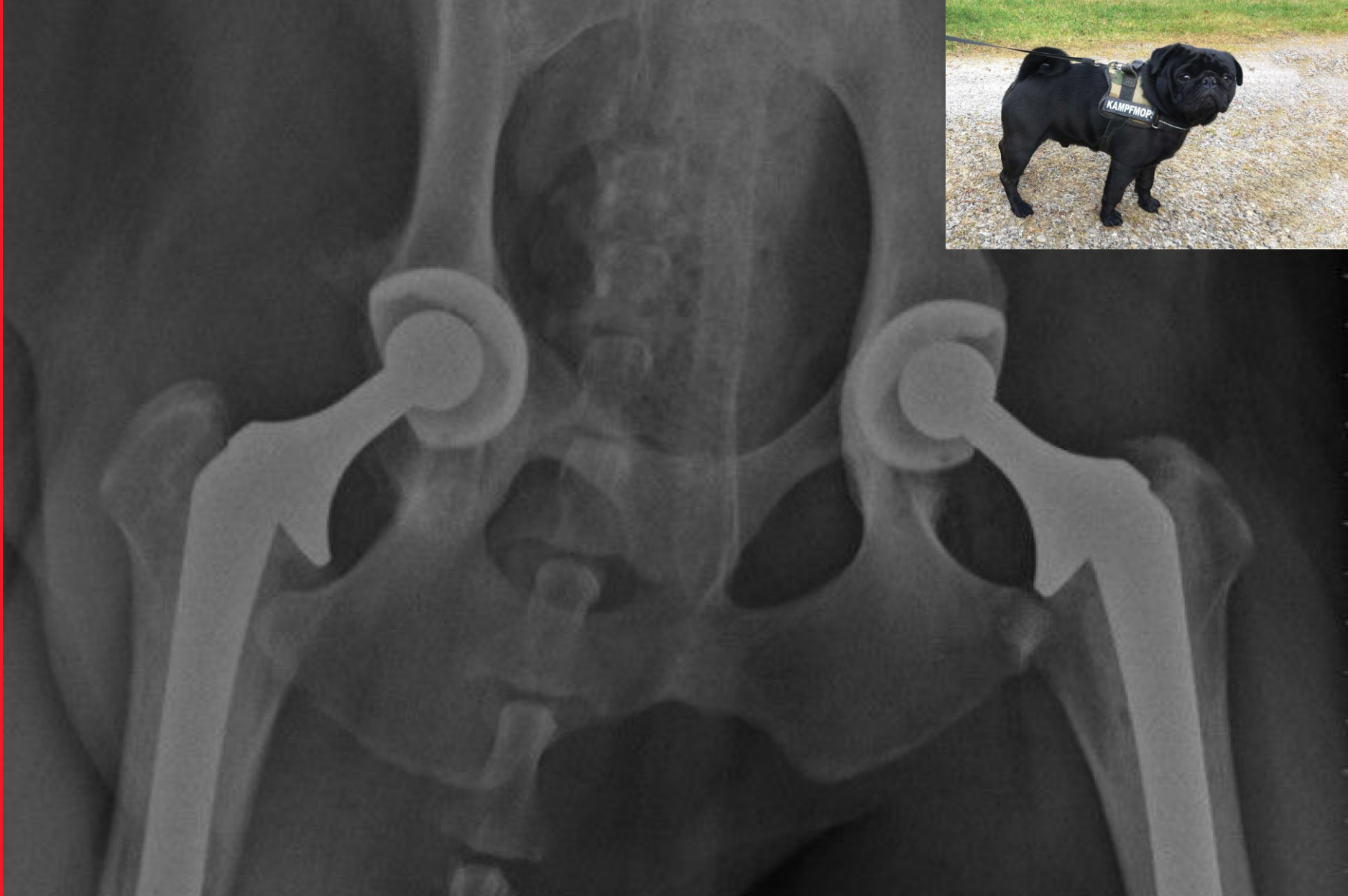
□ Ortk FN Brno –

**silastic prosthesis of I. MTP joint**

**/ hallux rigidus /**



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thank you for the attention

**M A S A R Y K O V A**  
**U N I V E R Z I T A**