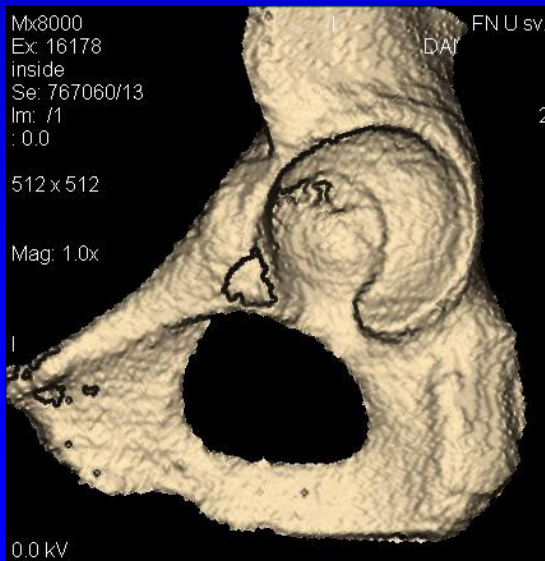
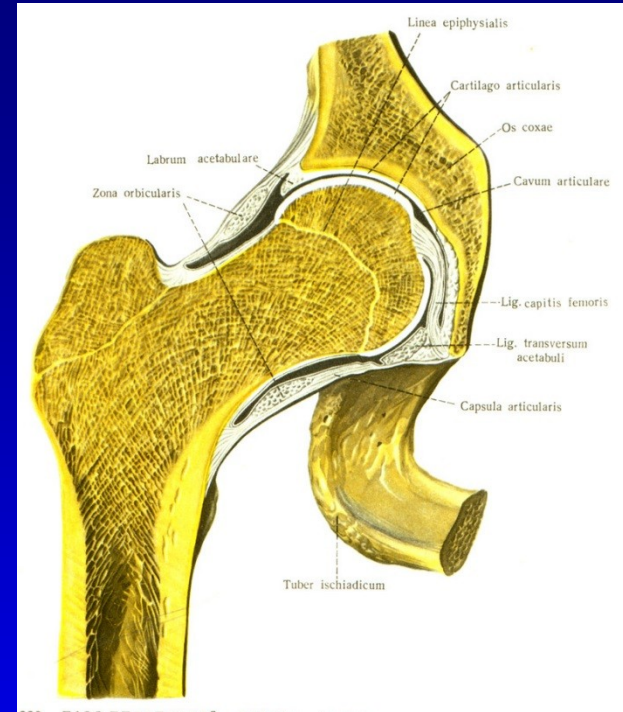


# Total hip arthroplasty

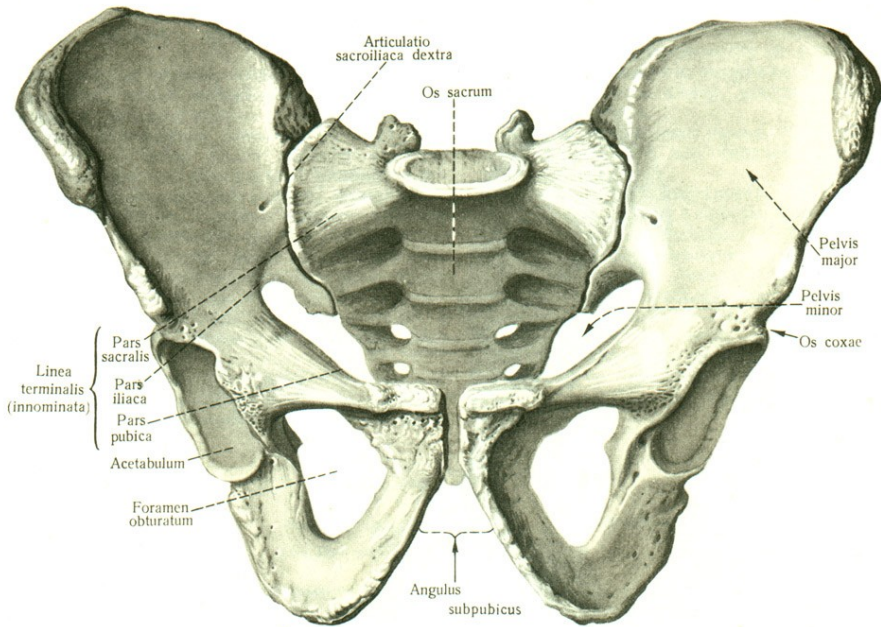
Z. Rozkydal

# Hip joint

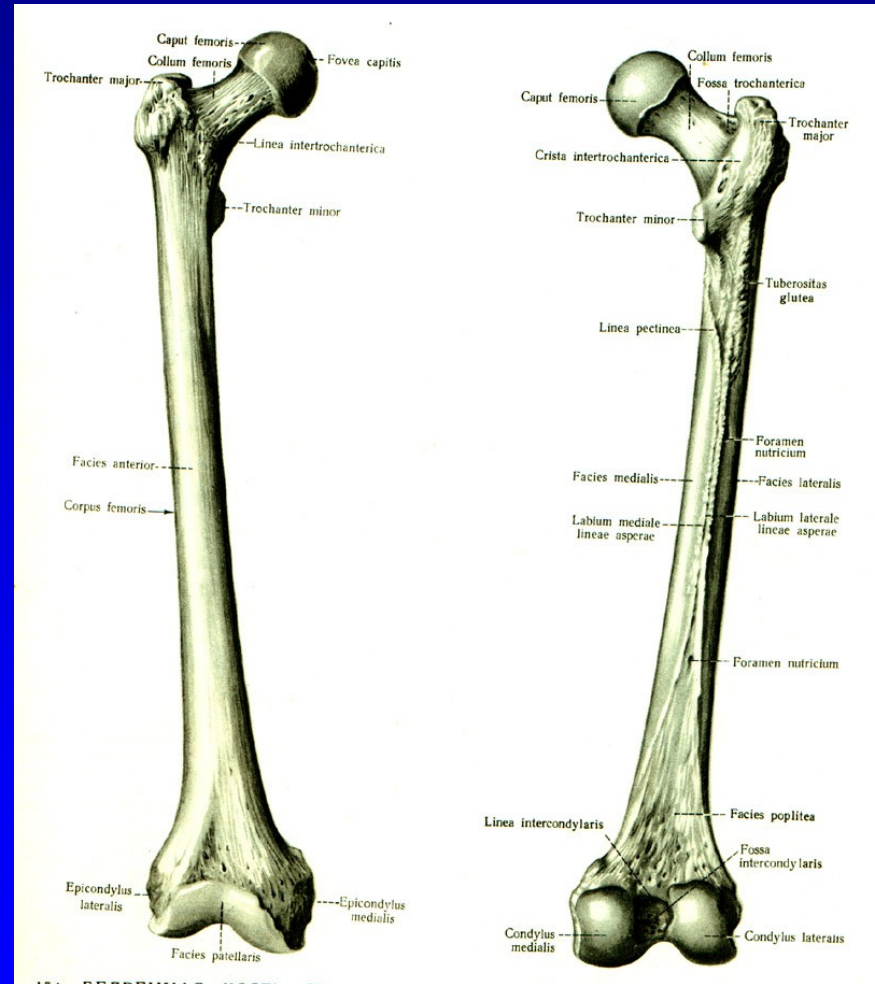
## Enarthrosis



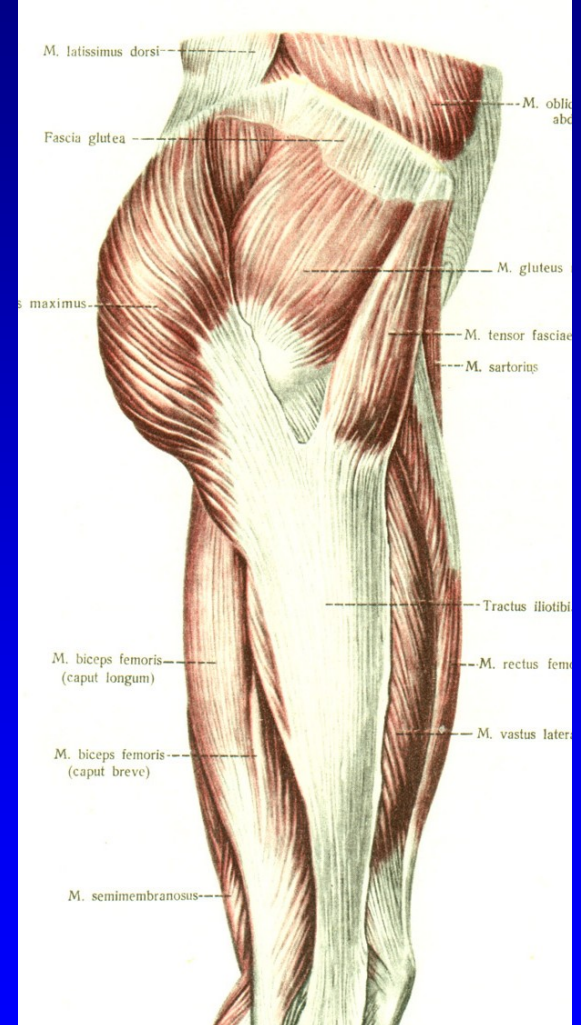
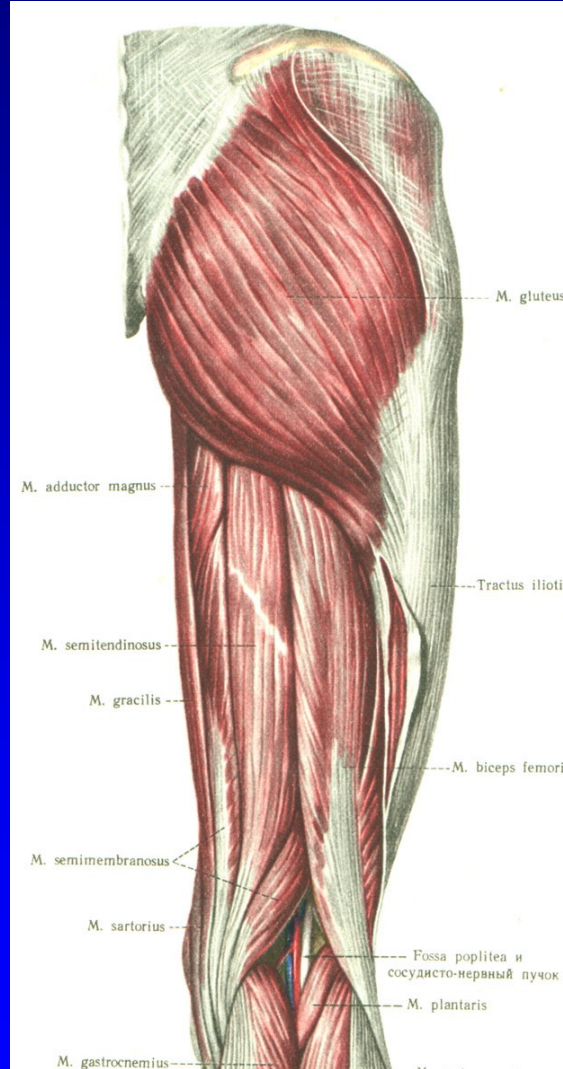
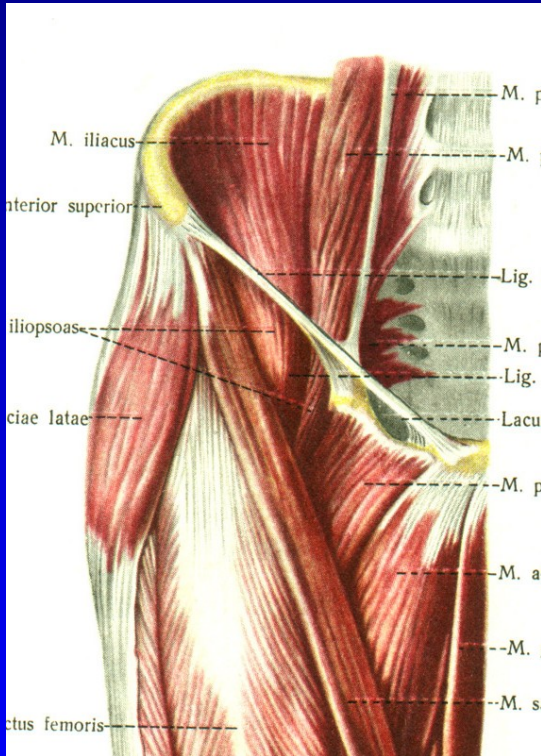
# Pelvis



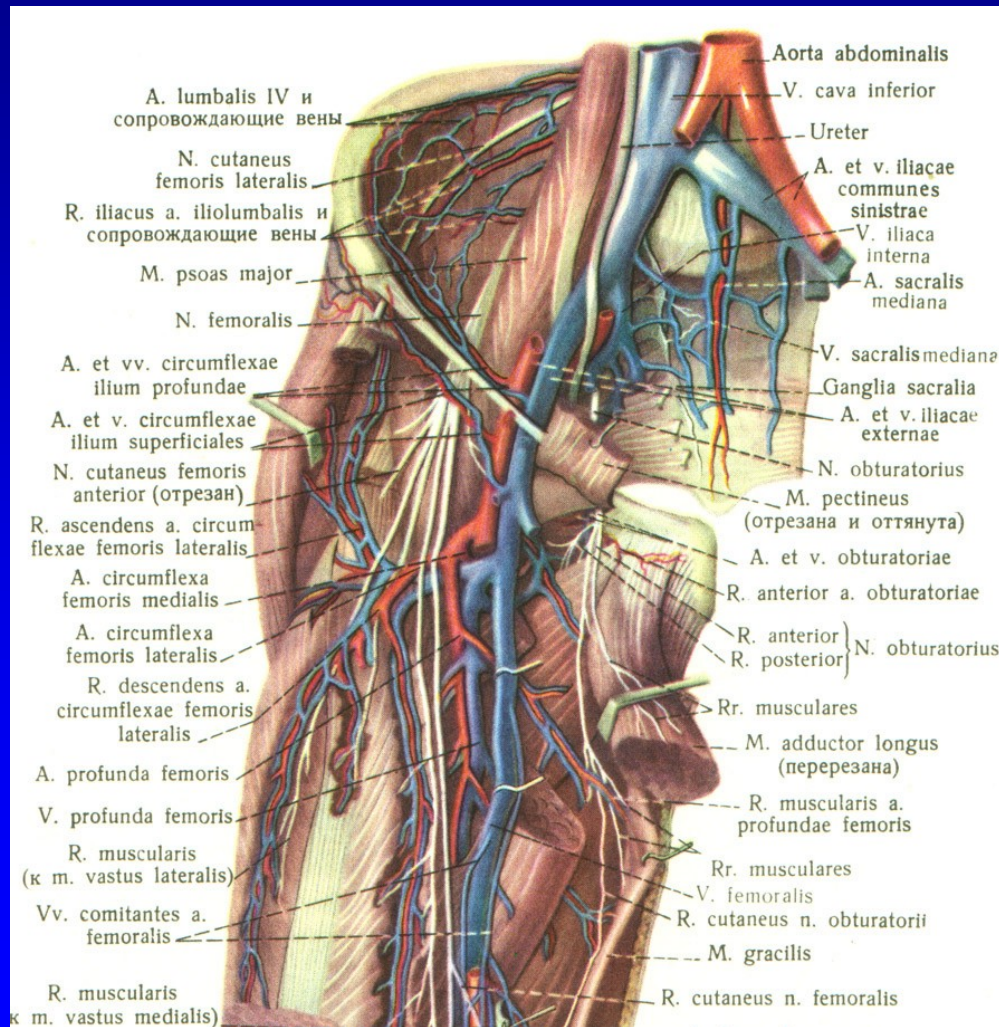
# Femur



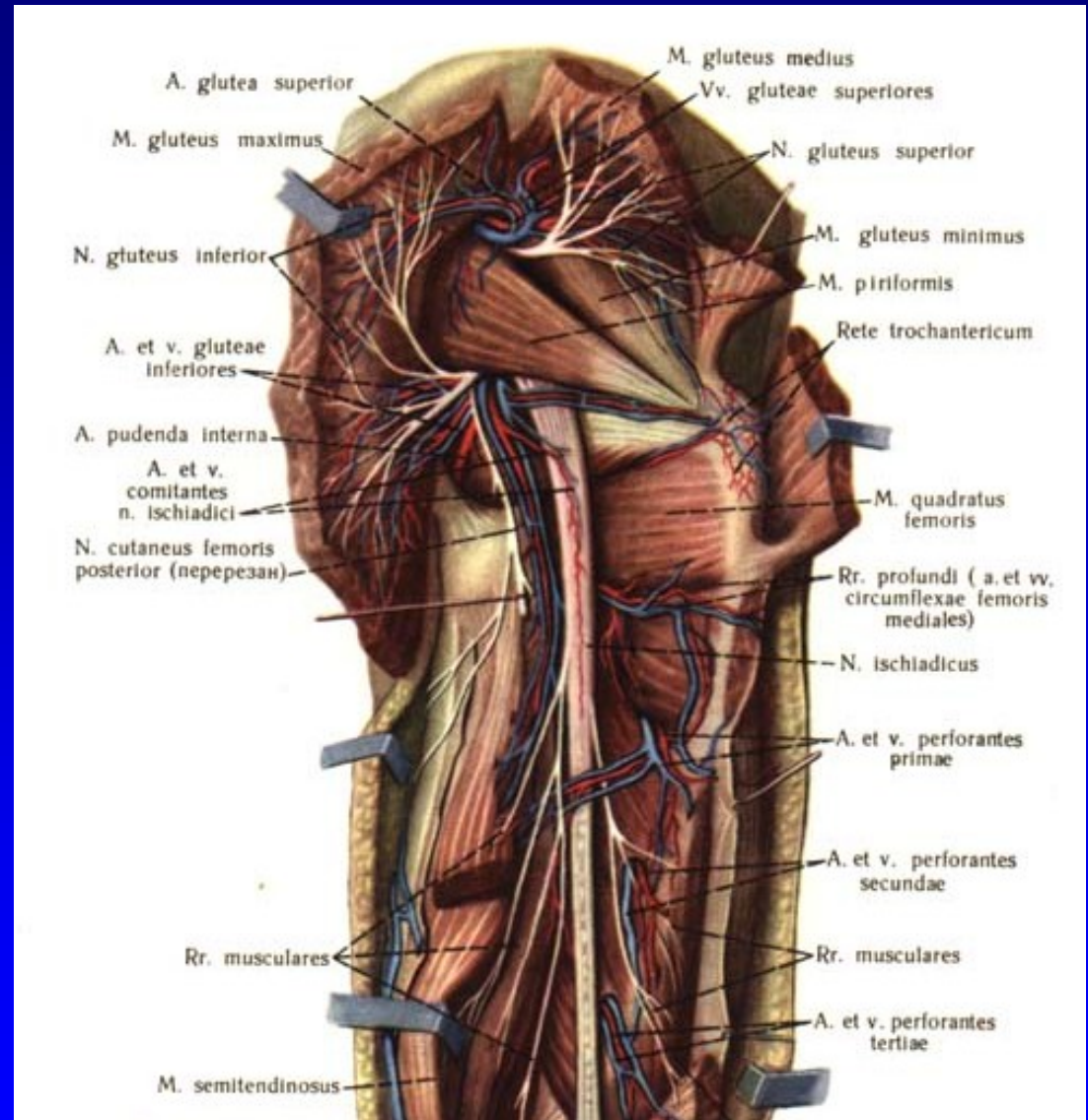
# Muscles



# Femoral nerve



# Sciatic nerve



# Indication for THA

- Painful condition  
+ unsuccessful conservative  
treatment

Dyscomfort



# Indications

Primary osteoarthritis

Secondary osteoarthritis:  
congenital, posttraumatic,  
after infection

Rheumatoid arthritis

Psoriatic arthropathy

Avascular necrosis  
of the femoral head



Primary osteoarthritis



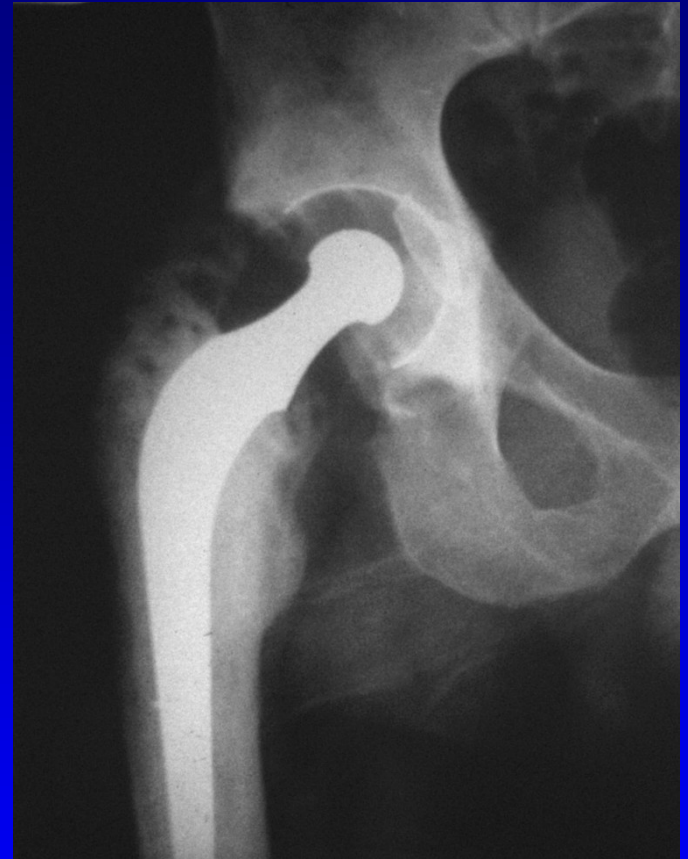
# Historie

Sir John Charnley  
Low friction arthroplasty  
Acrylic dental cement

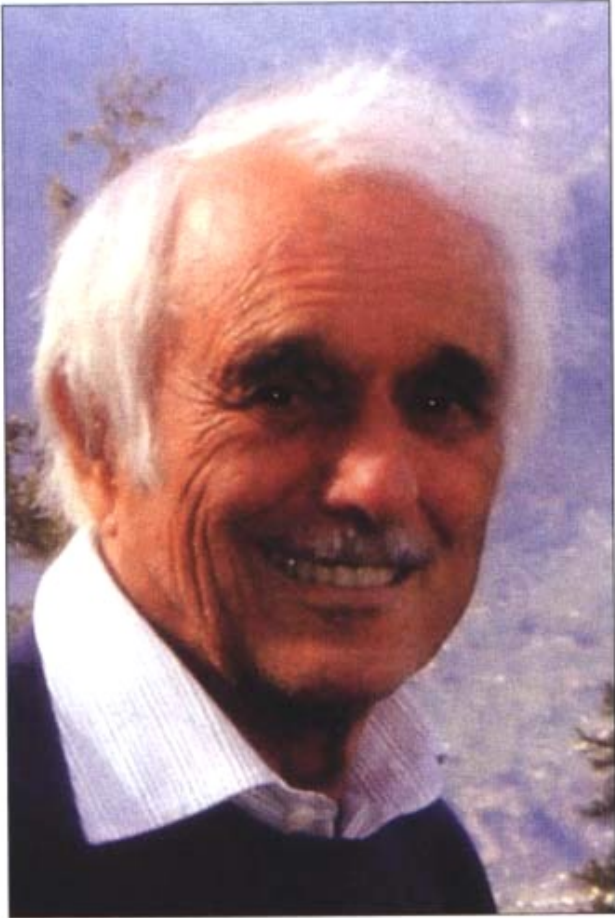
Polymethylmetacrylate  
– bone cement



1962



Low friction arthroplasty

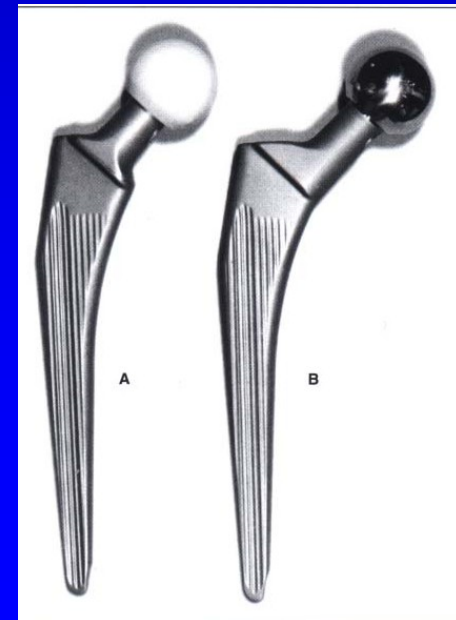


Prof. M. E. Müller

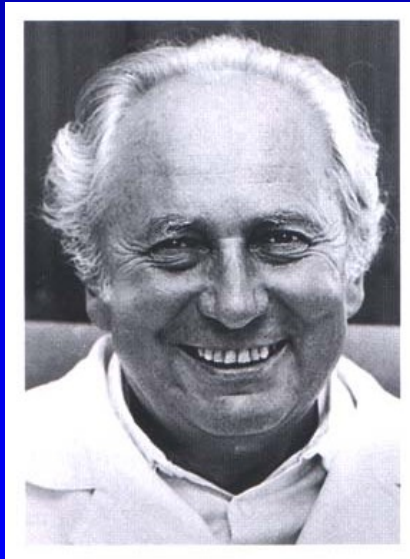


1964 -1965  
Setzholzprothese

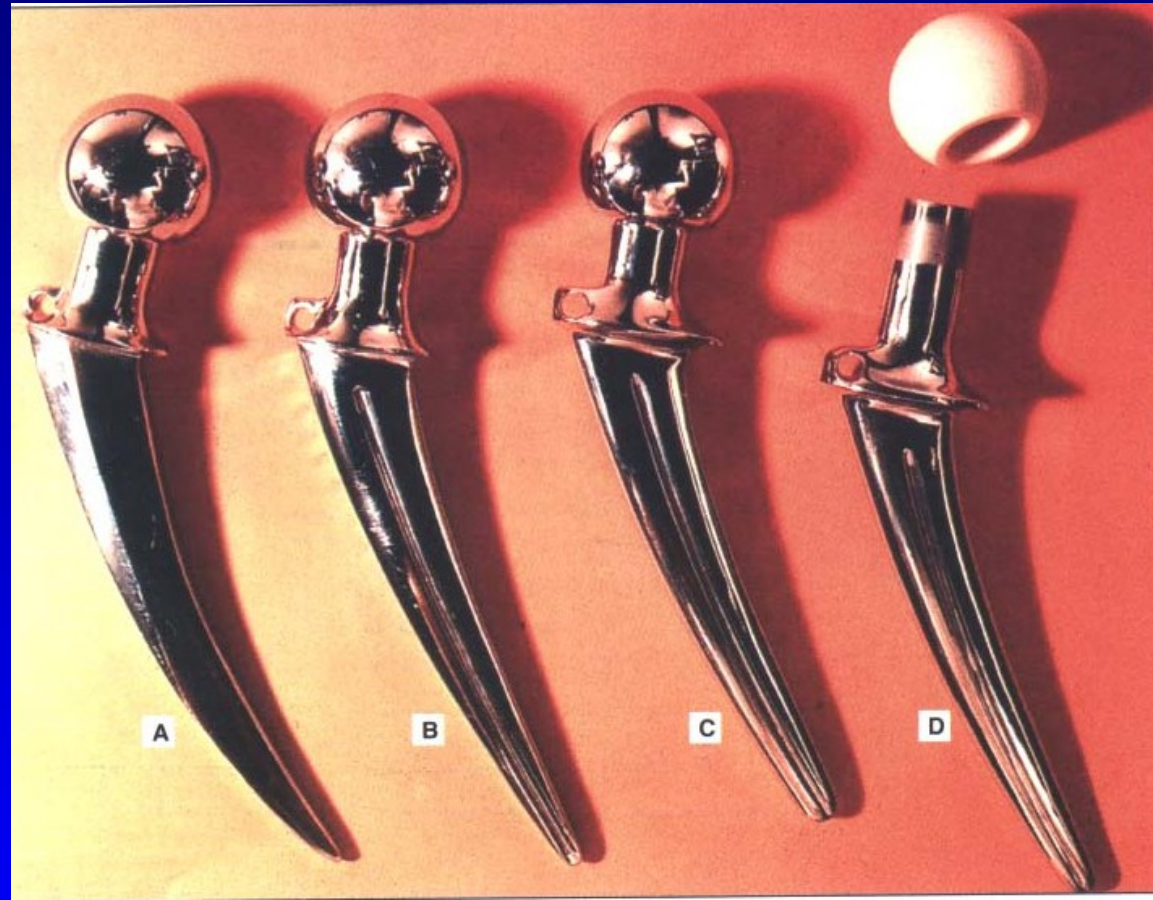
1966  
Banana - shaped



1977  
Geradschaftprothese



Prof. MUDR. Oldřich Čech, DrSc.



1972

1986

Stems Poldi- Čech

# Fixation in the bone

## Types of THA



Cemented



Hybrid



Uncemented

# Primary THA

Polyethylene cup



Head

Neck

Stem

# Revision THA



# For tumors



# Femoral head prosthesis

## Thompson





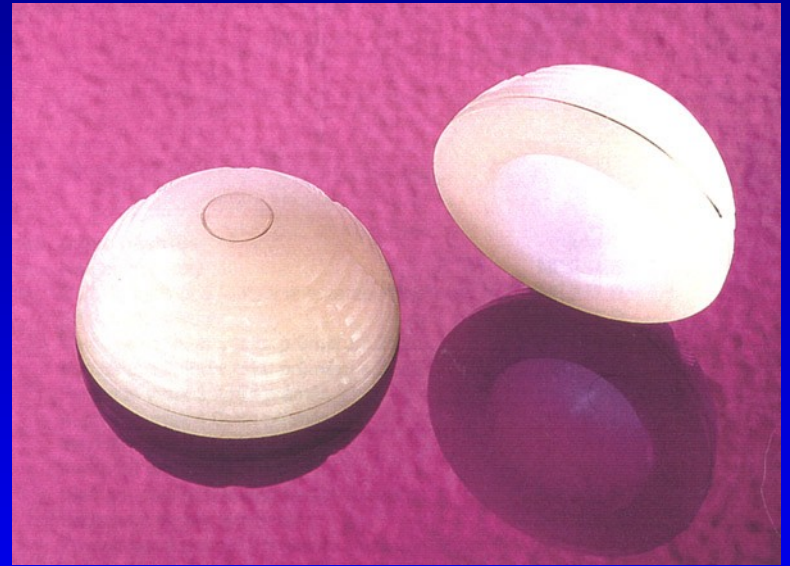
# Metal

- Steel
- Cobalt - chromium-molybdenum alloys
- Titanium alloys



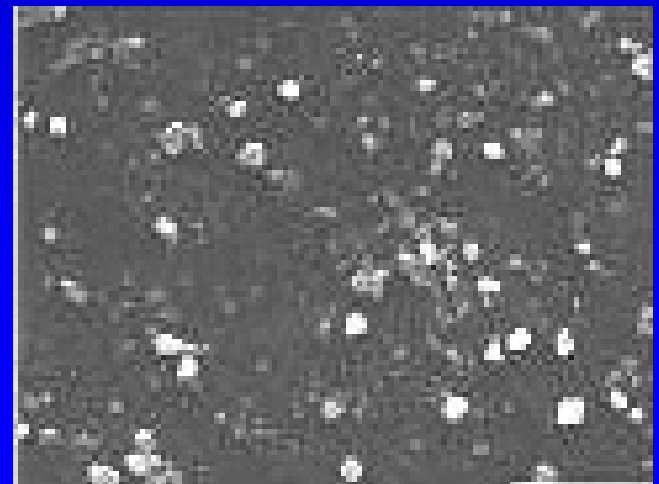
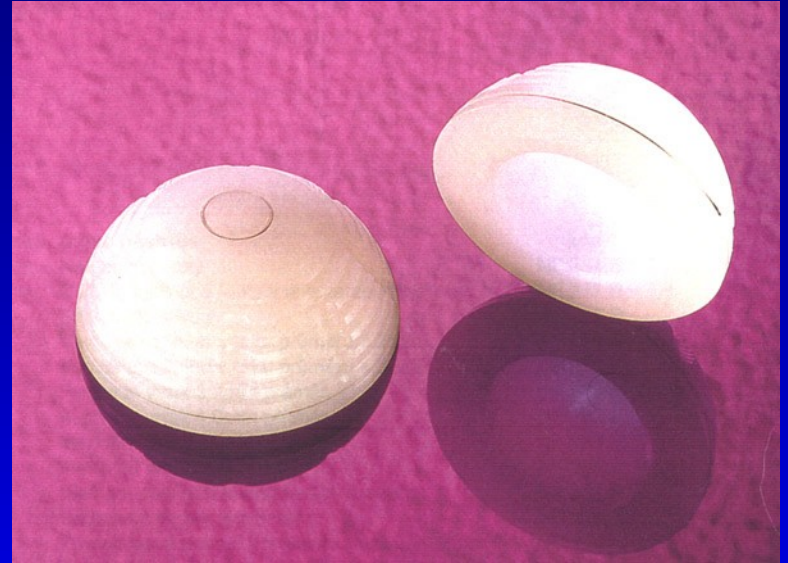
# Polyethylen

- UHMWPE :  
ultra- high- molecular-  
weight- polyethylen



# Polyethylen

- Linear wear 0,1 - 0,2 mm / year
- Volumetric wear 0,3 - 10 mg / year
- Cold flow – plastic deformation
- Abrasion and delamination
- Oxidative degradation
- Modern trends:  
highly crosslinked polyethylen
- with vitamin E

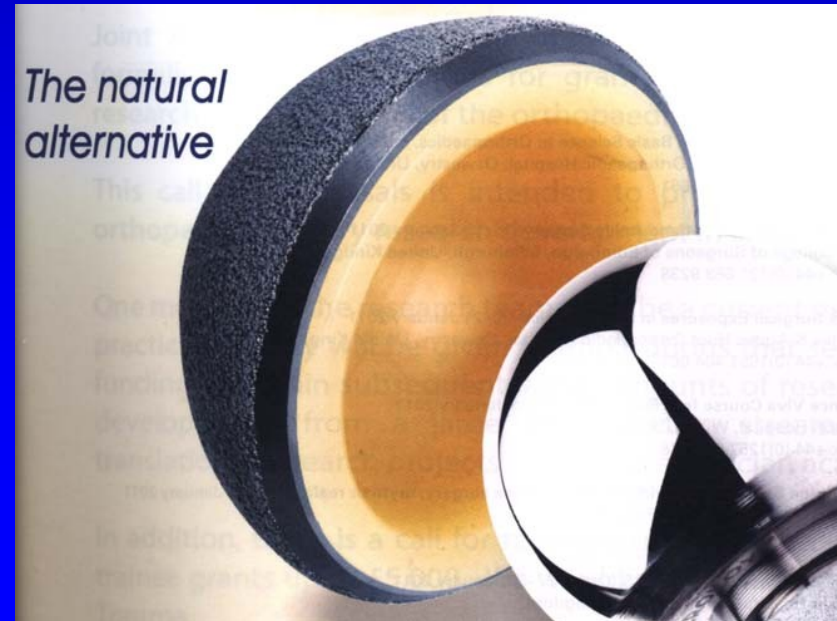


PE wear particles, 1 um

# XPE- highly-cross-linked polyethylen + vitamin E

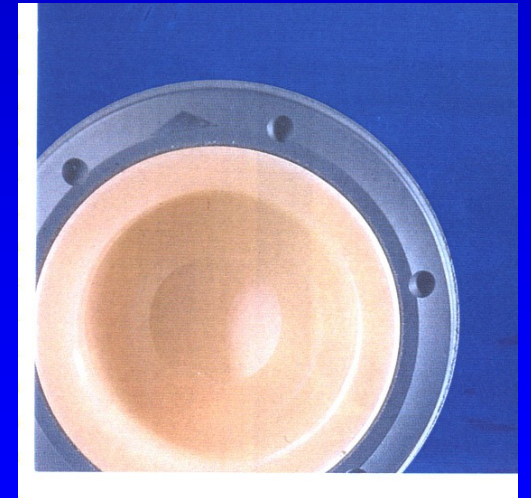
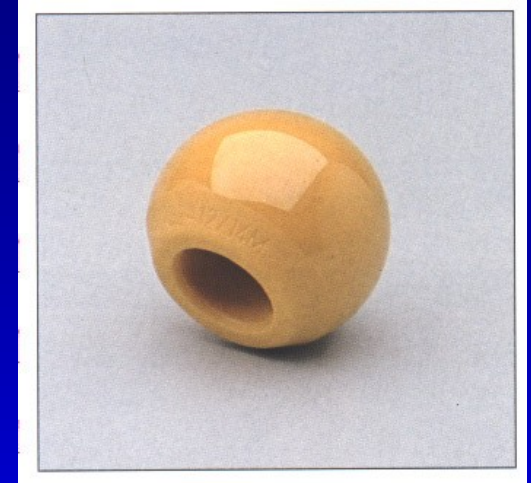
Antioxidant

Increases mechanical properties  
of PE



# Ceramic

- Corundum or Zirconium  $AL_2O_3$
- Smooth surface
- Less wear: 0,005 - 0,15 mm / year



# Ceramic

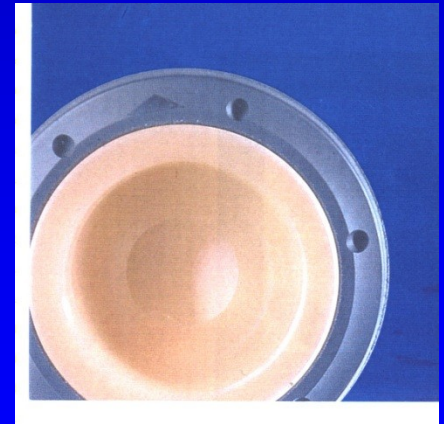
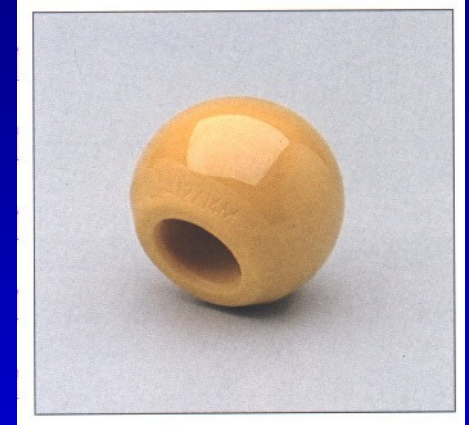
Smoother surface

Less amount of wear of particles

Particles are bioinert

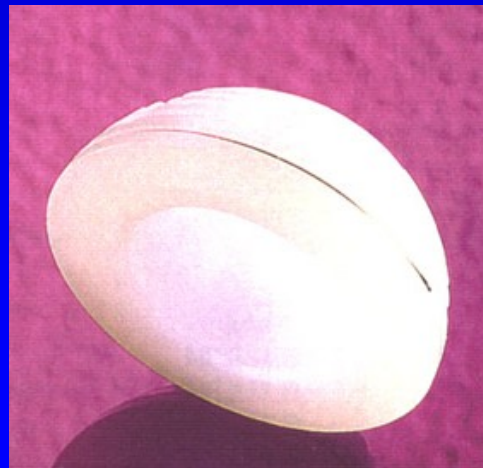
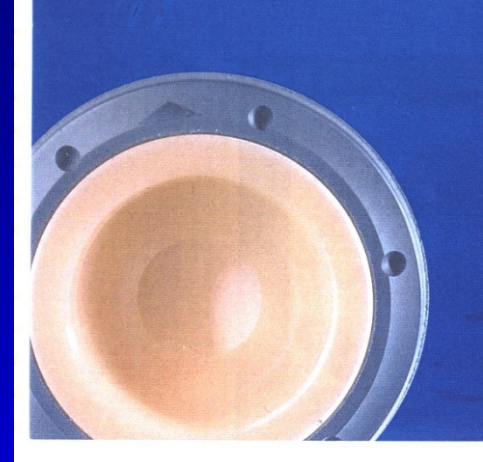
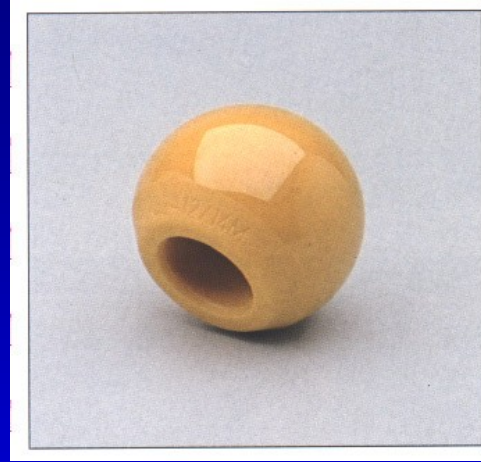
Wear of head/PE cup  
under 0,15 mm/ year

Wear of ceramic head/ceramic insert  
under 0,002 mm/ year



# Contact : head - cup

- Metal- polyethylen
- Ceramic- polyethylen
- Ceramic -ceramic



# Diameter of the head

22, 28, 32, 36, 38, 40 mm

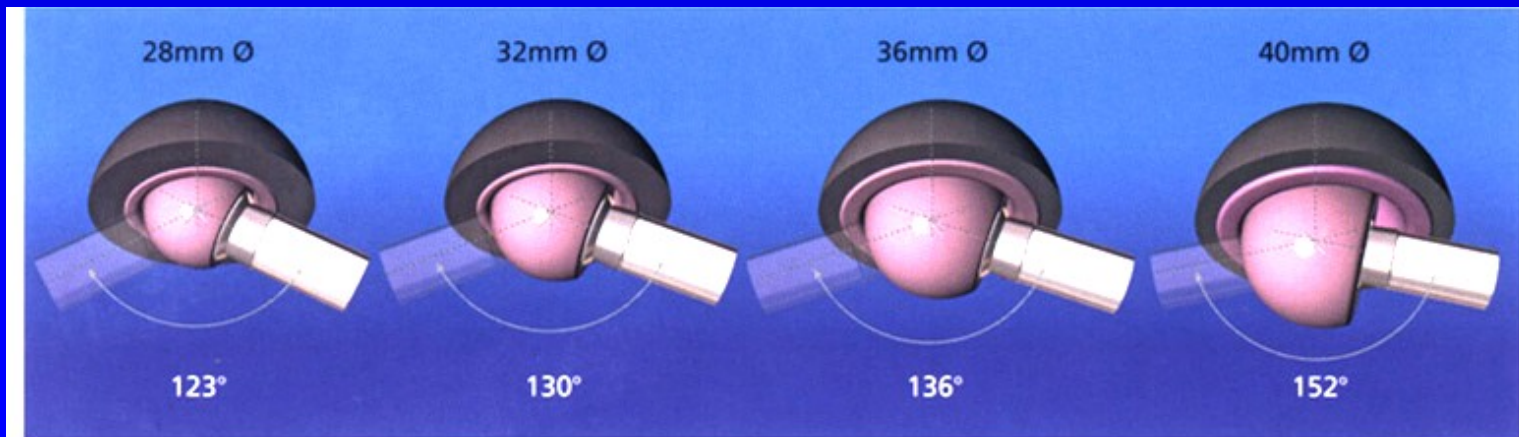


Advantage of 36 mm head:

Higher stability

Greater range of motion

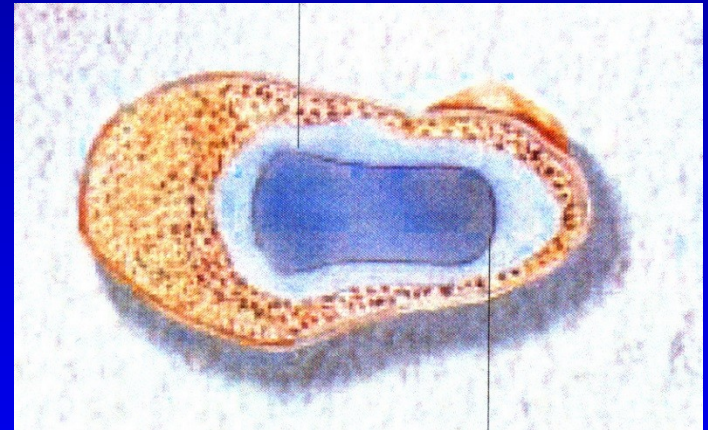
Less impingement neck- edge of the cup



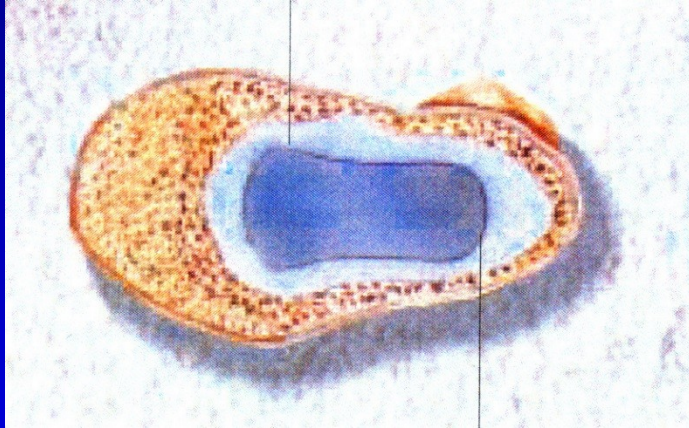


# Bone cement

- Polymethylmetacrylate
- Powder polymer, fluid monomer
- Exothermic reaction 83- 100 C
- Hardening in 10 min.
- Adverse effects: hypotension, coagulation of proteins, cytotoxicity

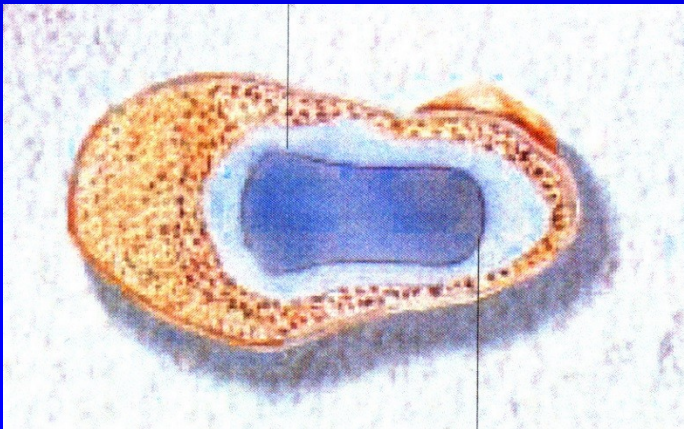


# Cemented THA



# Cementing technique

- Interdigitation into bone trabeculae
- Regular layer:
  - under the cup 3 mm
  - around the stem 2- 7 mm

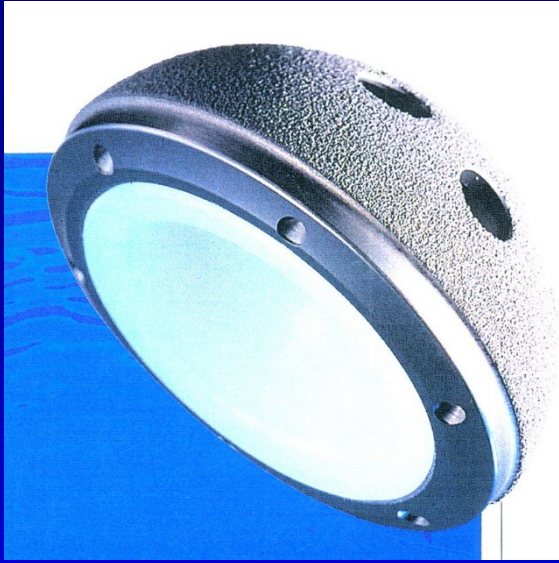


# Acetabular component

- Cemented: polyethylen
- Noncemented: metal- backed  
with PE insert  
with ceramic insert



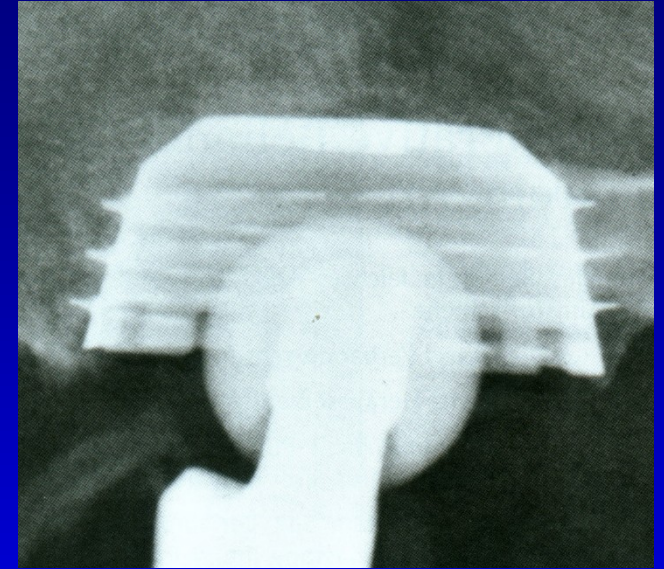
# Uncemented cup



Press - fit



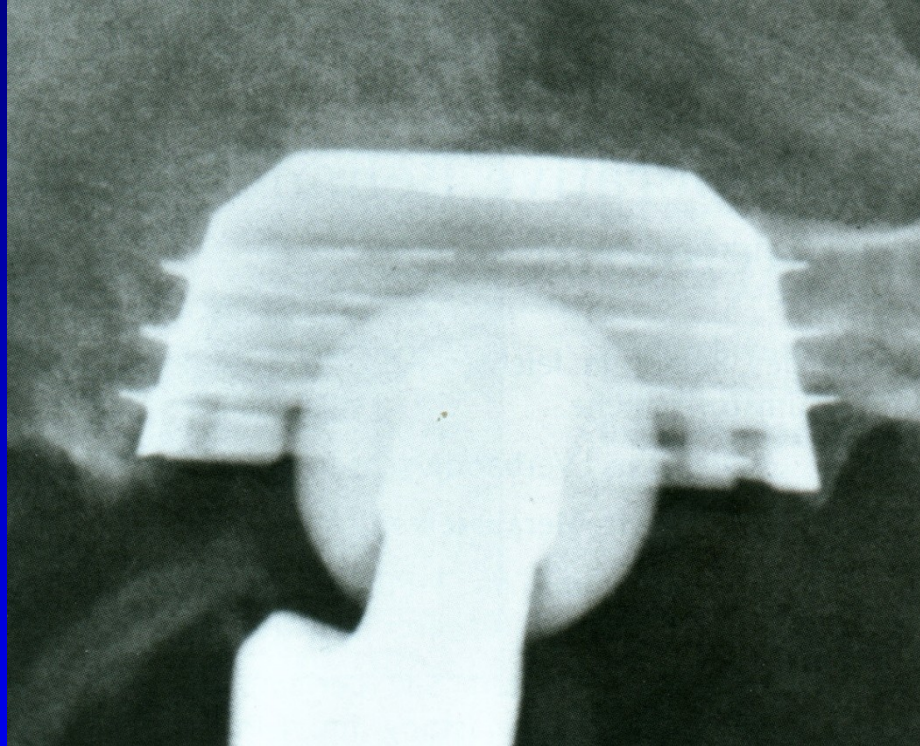
Expansion



Threaded

Primary fixation: mechanical anchorage in the bone

# Uncemented cup



Secondary fixation: osteointegration of the implant on the surface of bone

# Surface of cementless implant

Macroporosity

Microporosity

Pores on the surface  $5\ \mu\text{m}$  -  $600\ \mu\text{m}$

Pores above  $800\ \mu\text{m}$ - fibrous tissue

Adhesive surfaces:

Trabecular Metal

Trabecular Titan

Pores  $300\ \mu\text{m}$

High initial stability



# Hydroxyapatite surface

Bioactive

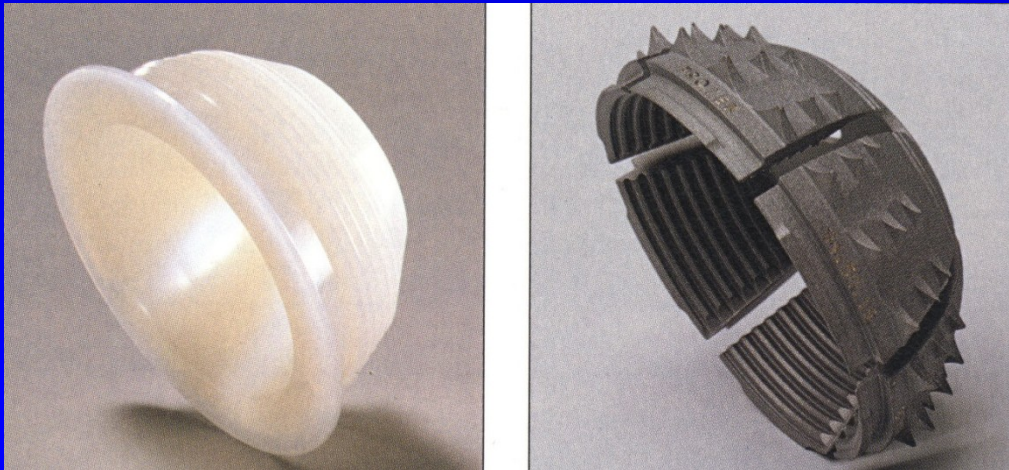
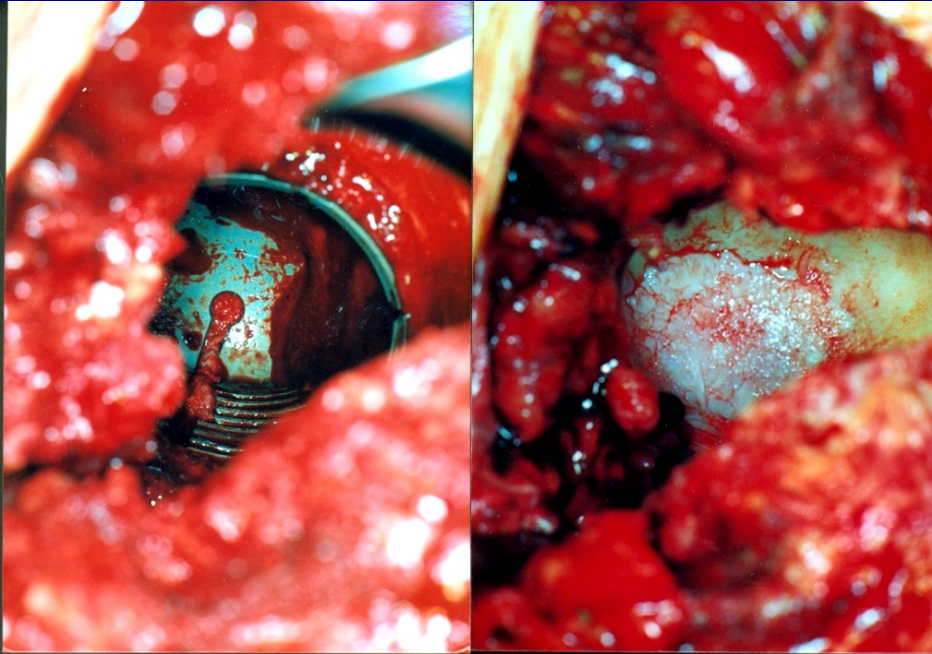
Osteoconductive

Chemical bonds bone- hydroxyapatite





# Expansion cup- CLS

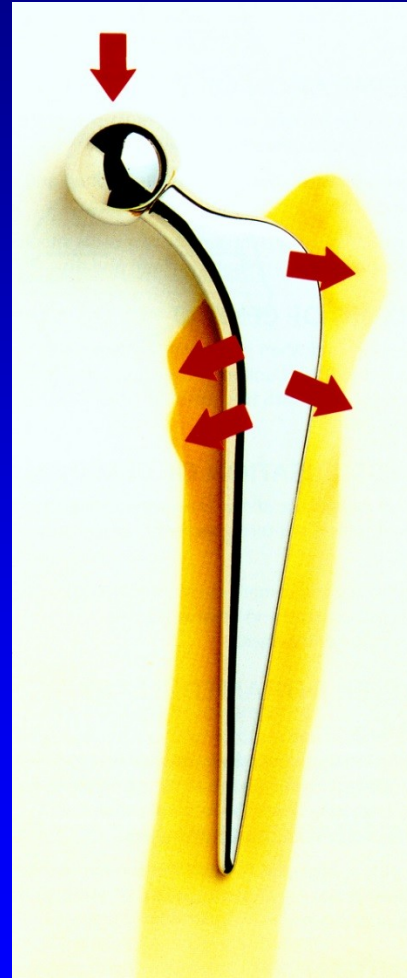


# Bicon – Zweymüller cup



# Femoral component

- High polished surface for cementing fixation
- Porous surface for cementless fixation



Cemented

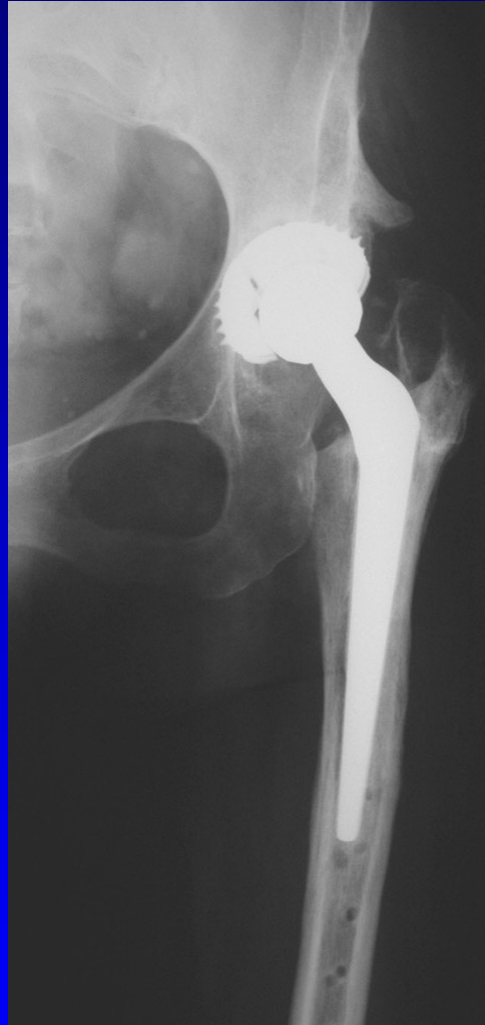


Cementless

# Morscher, Spotorno MS – 30 stem cemented



# Uncemented stems



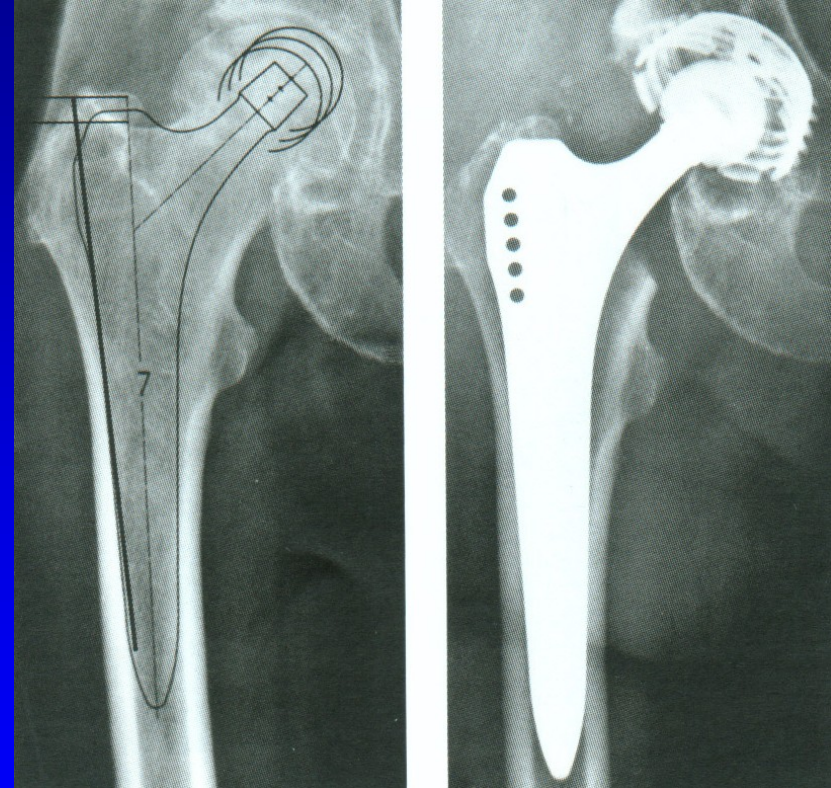
Proximal fixed



Distal fixed

# Uncemented stem

- Primary fixation:
- Mechanical anchorage in the bone
- Secondary fixation of the implant on the bone surface

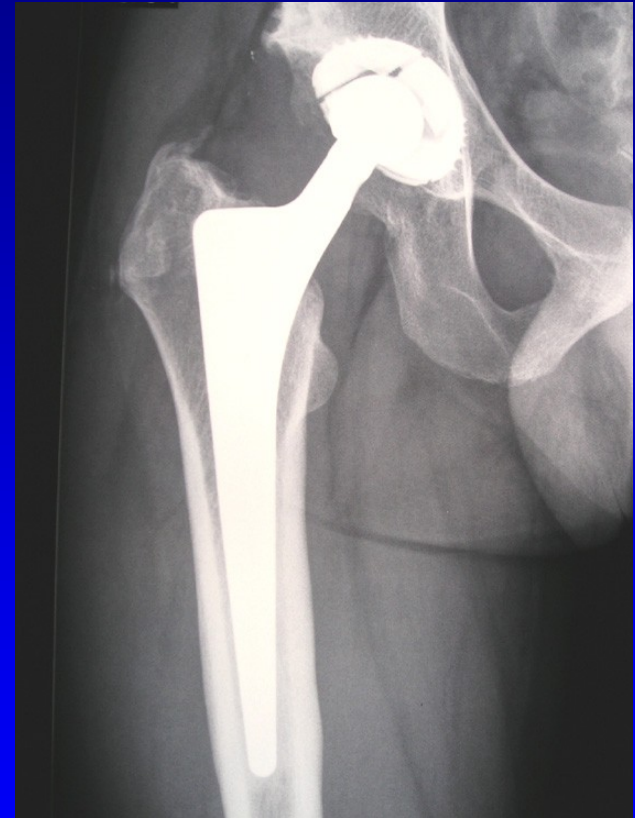


# Indication scheme

- Uncemented to 60 y.
- Hybrid 61 - 70 y.
- Cemented over 70 y.

# Prerequisite for good result

Choice of the patient  
Preop. examination  
Prevention of infection  
Choice of the implant  
Operative technique  
Postop. management  
Activity of the patient  
Regular follow- up  
Prevention of infection  
Prevention of aseptic loosening



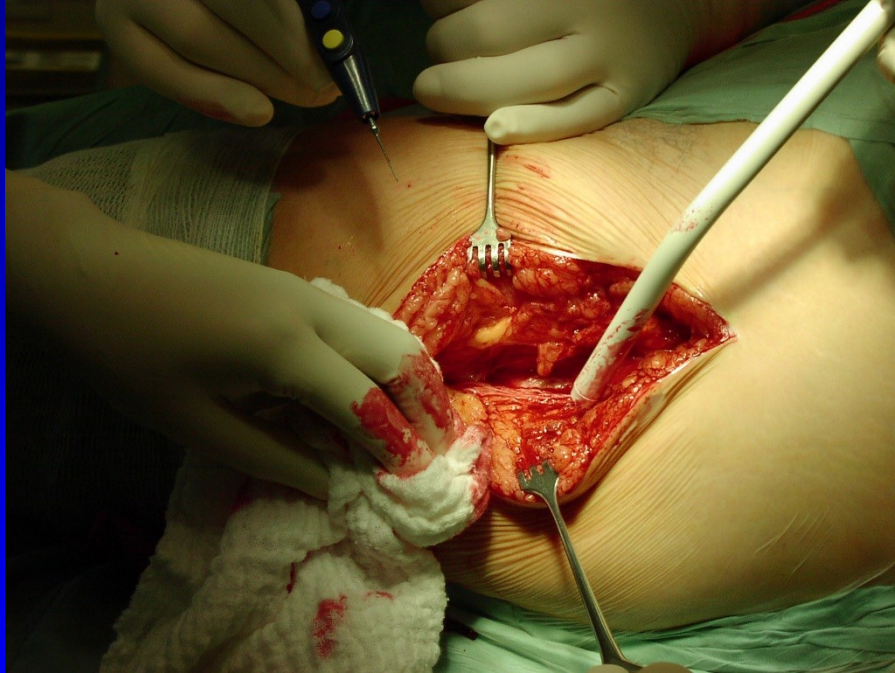


# Contraindication

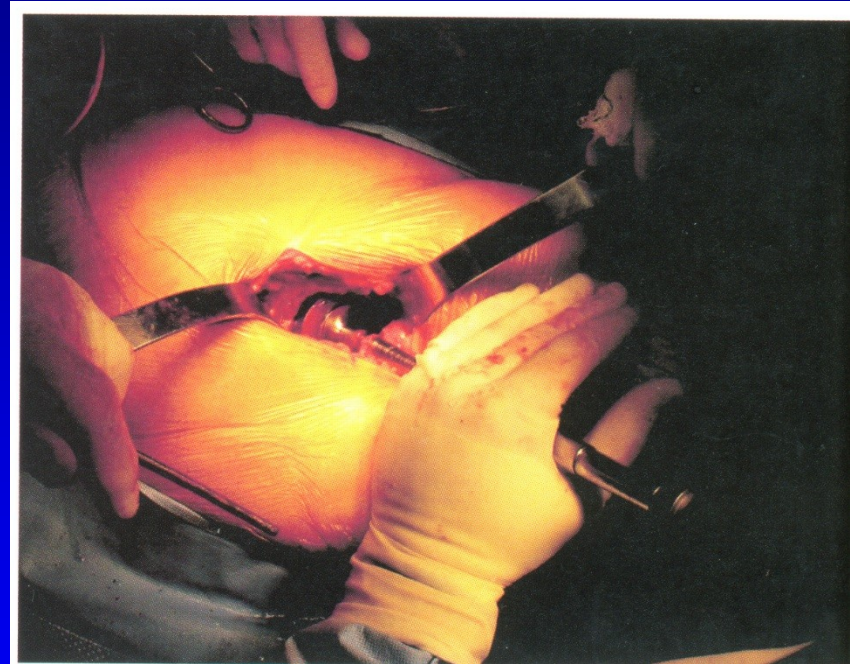
- Active infection of the hip
- Infection in the body
- General condition not good
- Neurogenic arthropathy
- Extreme low bone quality
- No cooperation of the patient
- Relative: age over 80 y.  
elevated ESR



# Approaches



# MIS- mini invasive surgery



# Physiotherapy

1. In bed
  2. Sitting, drainage ex
  3. - 5. walking
  6. + stairs
- 7-21 – in physiotherapy dpt.  
3 months- spa resort

Full weight bearing. Cemented THA after one month  
Uncemented after 12 weeks

Fast track physiotherapy, discharge 3-4 days, home care

# Operative technique

Femur – brush

pulsatile lavage

sealing of medular cavity prox.- dist.

drainage of the femur

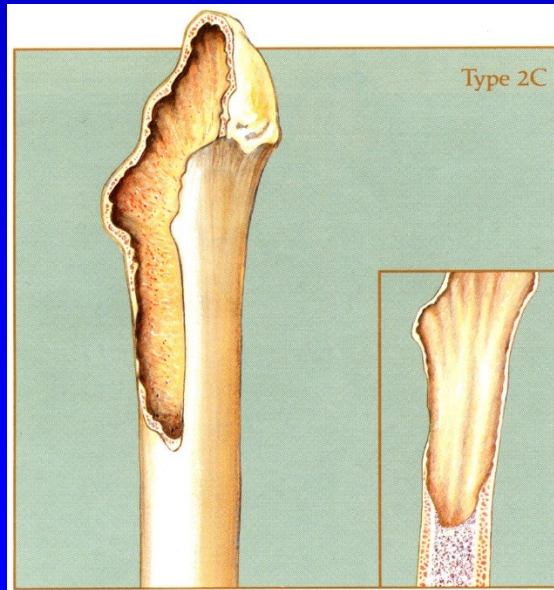
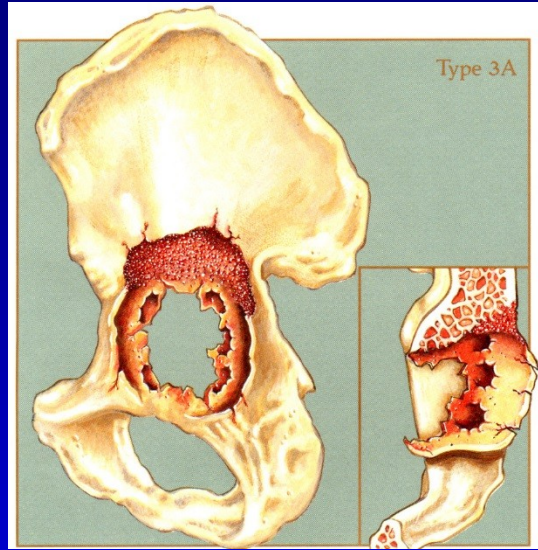
Vacuum mixing of bone cement

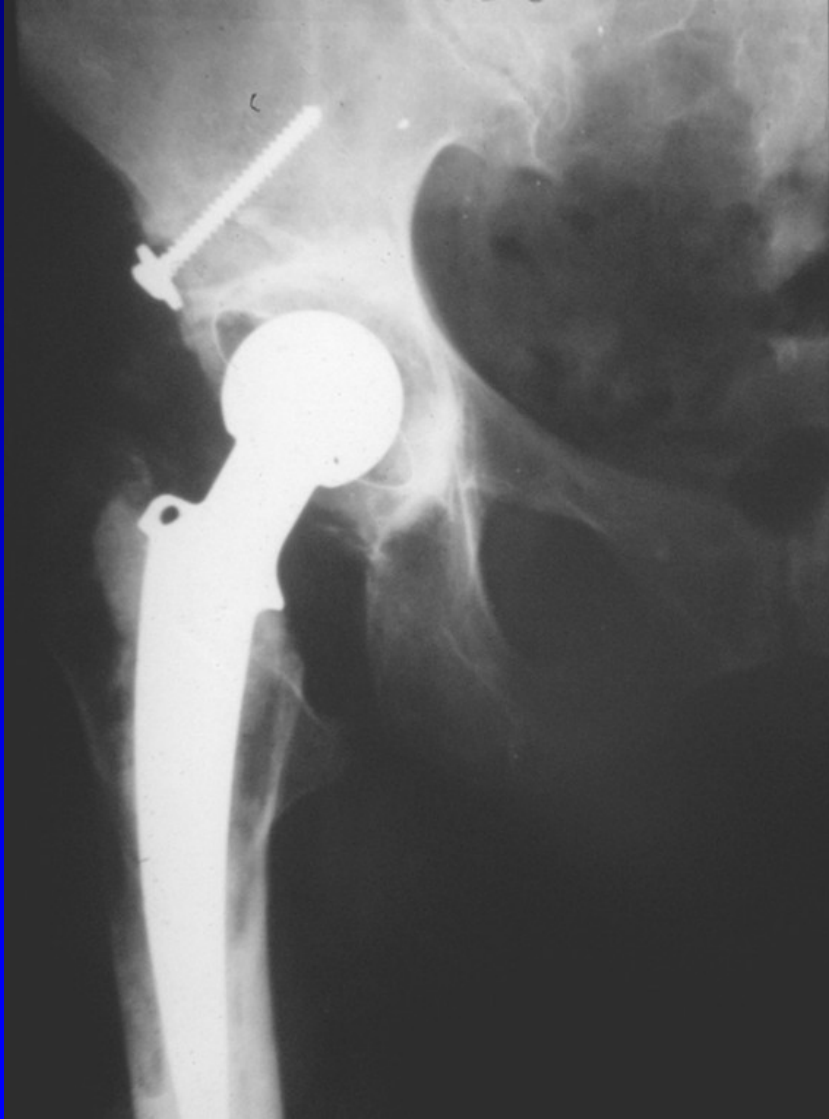
Pressurisation of bone cement

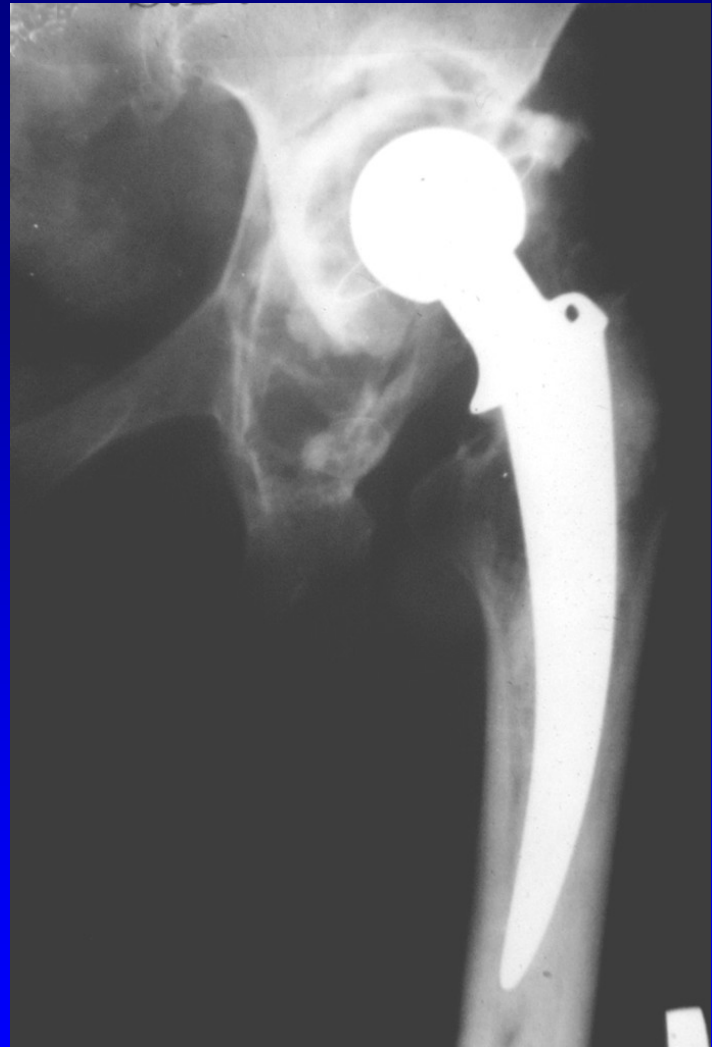
Timing of insertion of the stem

Continuous pressure

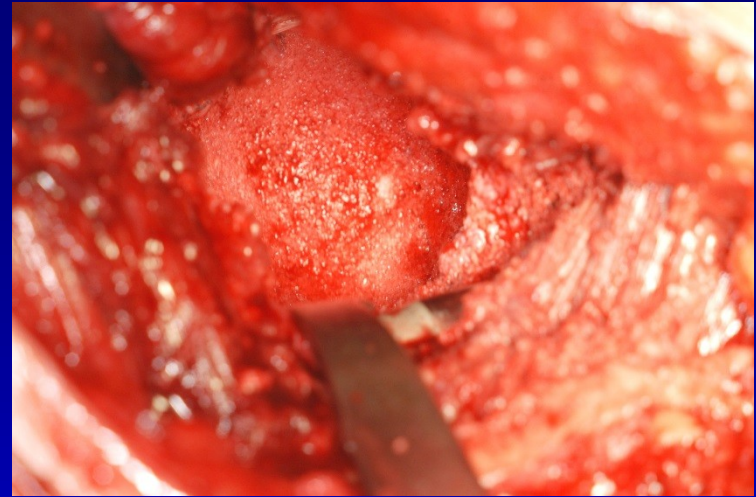
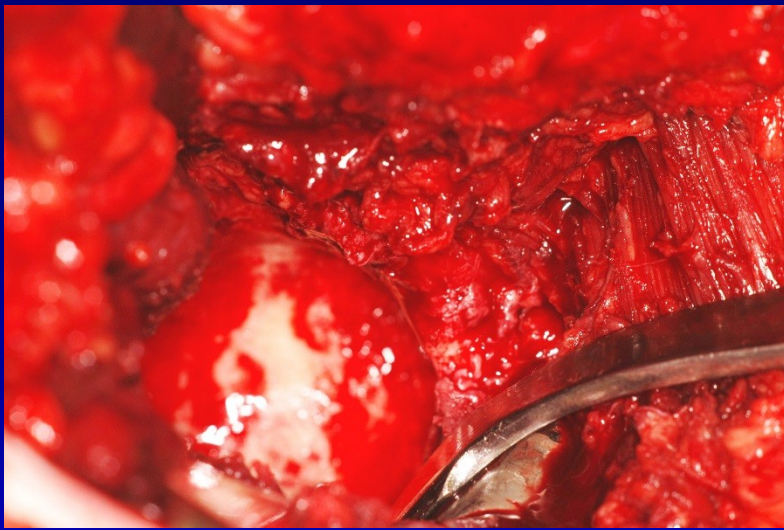
# Revision THA



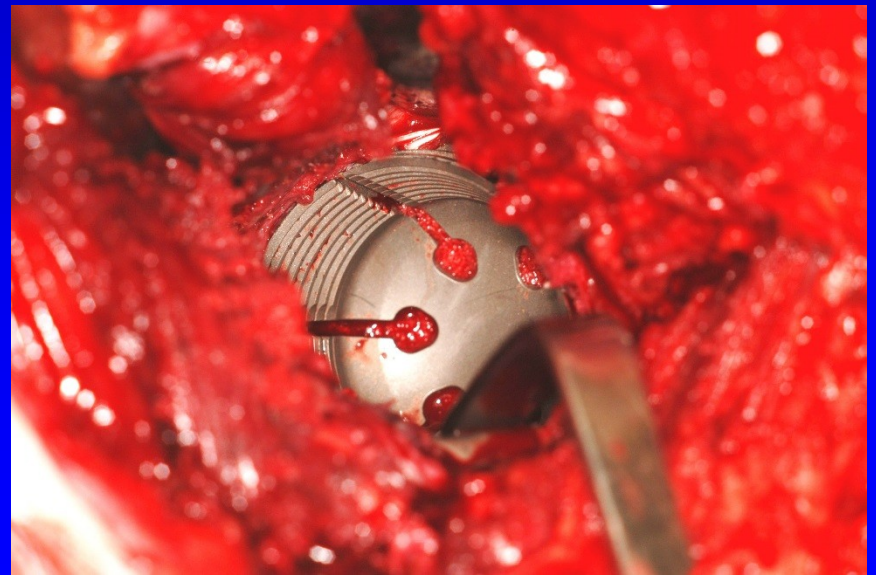




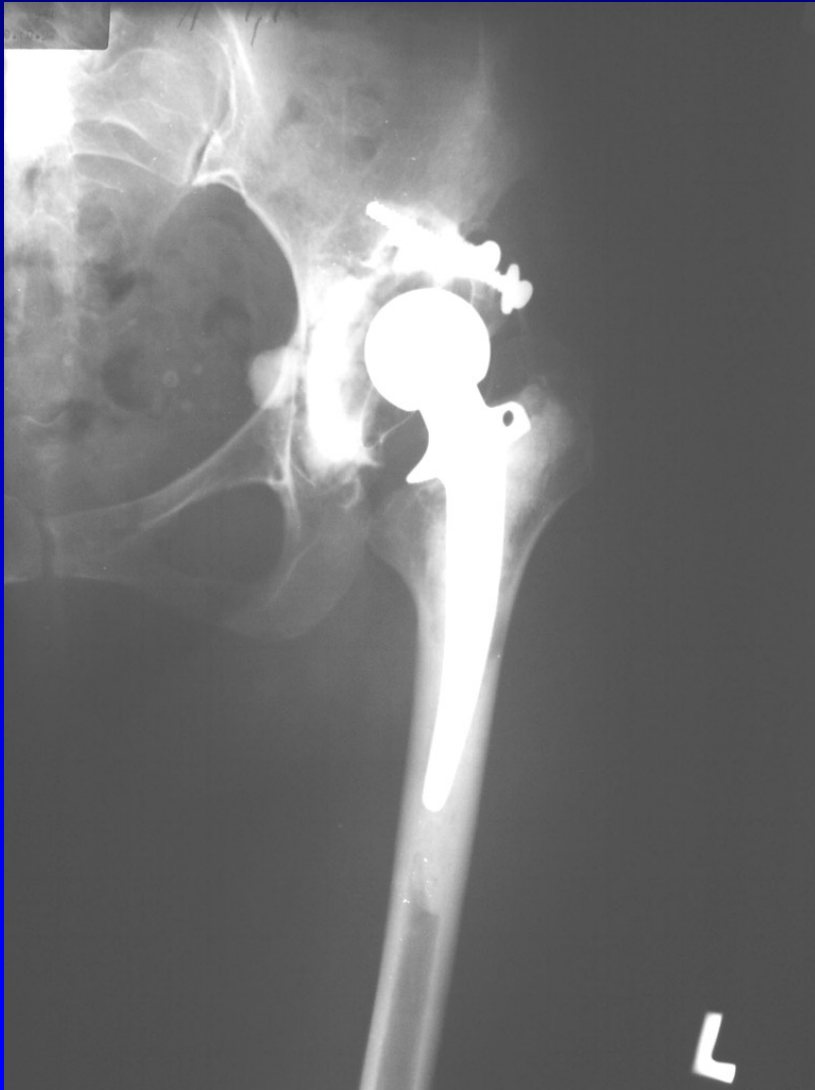


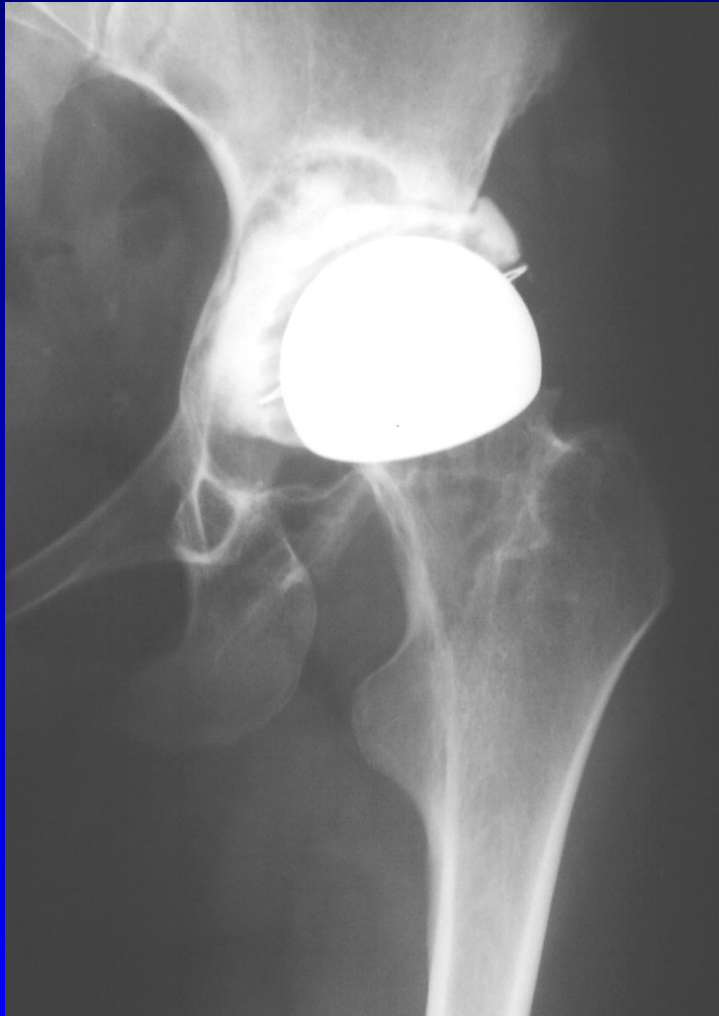


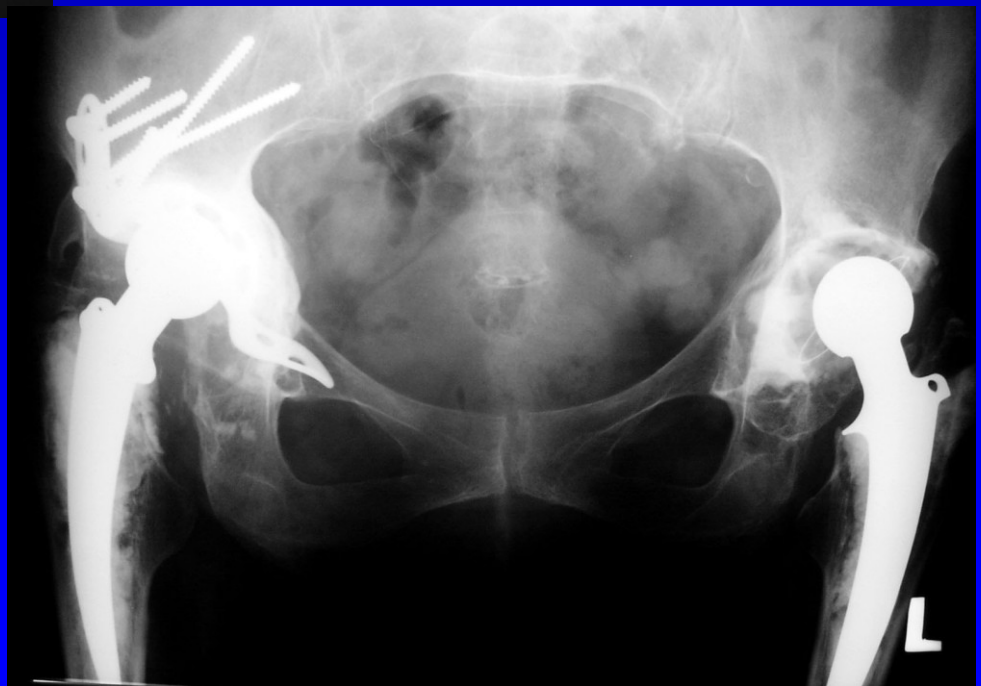
## Revision of the acetabulum



# Revision THA







# Periprosthetic infection

St. aureus

St. coagulase negative

Streptococci

Enterococci, others

MRSA, MRSE

Polyresistant G- bacteria

Sessile form and planktonic

Race for surface

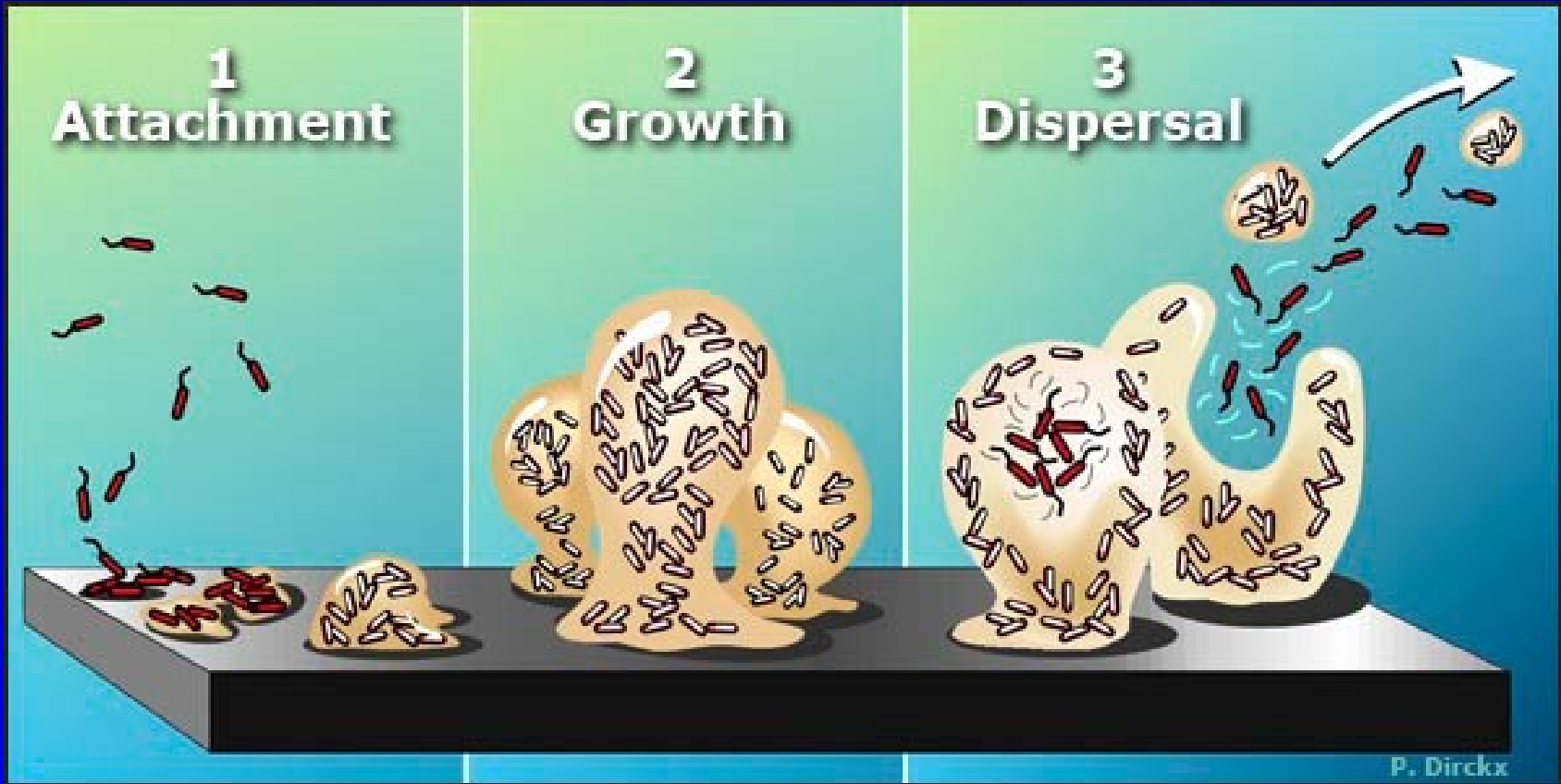
They produce glycocalyx- mucose substance  
of glycoproteins

It leads to high resistance  
to antibodies and antibiotics



Biofilm

# Biofilm



Adhesion of bacteria  
- reversible

Exopolymers  
- glycolalyx  
- extracelular matrix  
irreversible

Releas to surrounding  
tissue

# Periprosthetic infection- diagnostics

Clinicly

Labor: CRP, leu, ESR

aspiration of pus

X-ray- osteolysis, loosening

USG (abscesus)

Scintigraphy

Sonication of the implant

Bacteriological examination

Long cultivation



# Periprosthetic infection- PPI

Acute PPI

Chronic PPI

Late haematogenous PPI





# Management

To start treatment as soon as possible:  
10-14 days from the onset of symptoms

Prerequisite: cooperation of the patient  
informed physician

# Periprosthetic infection-treatment

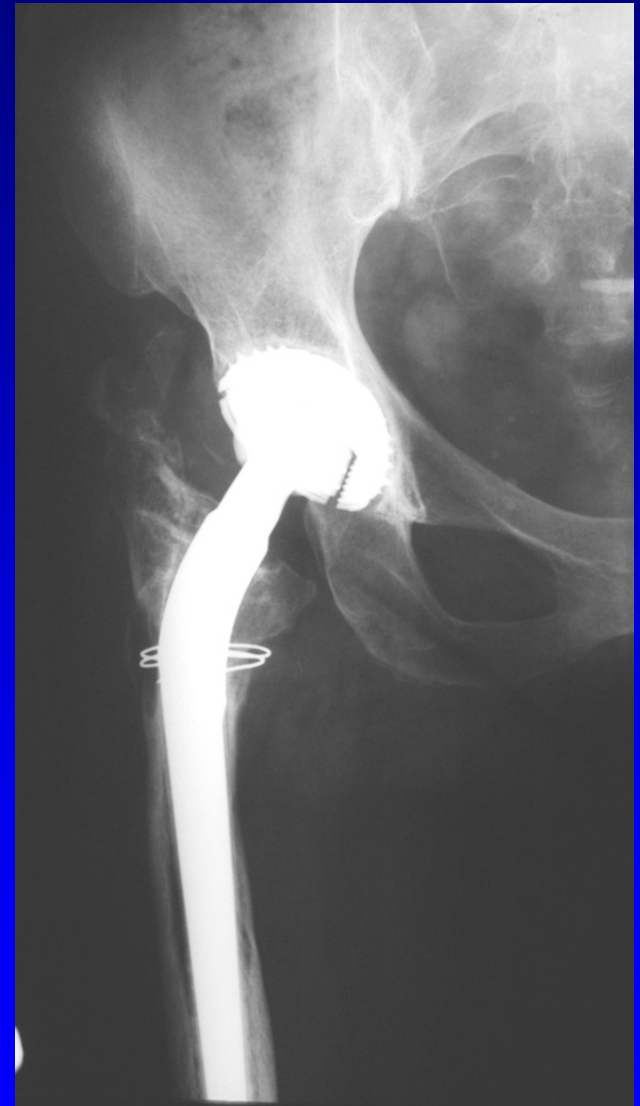
Debridement

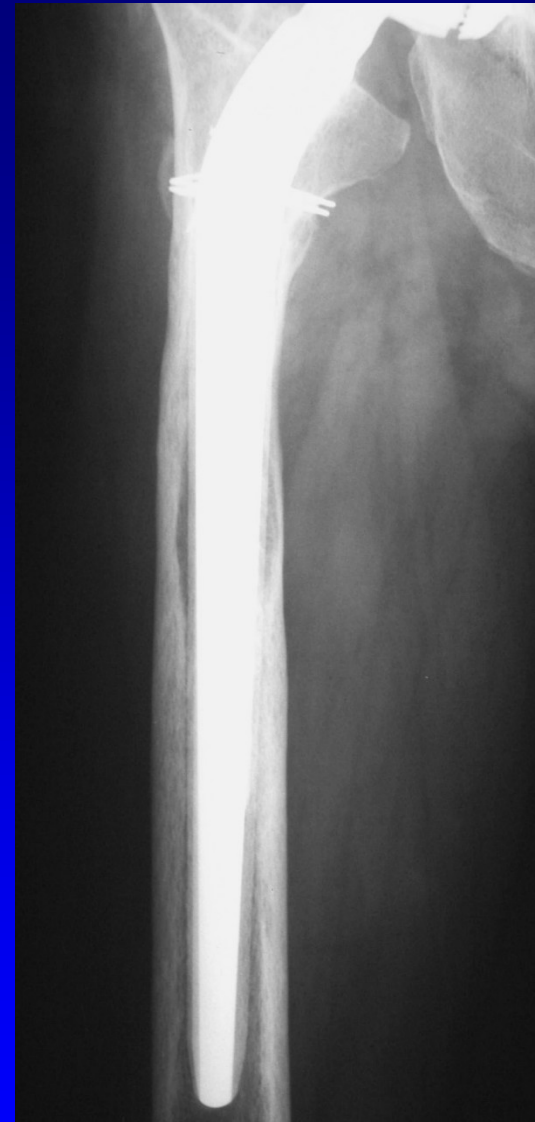
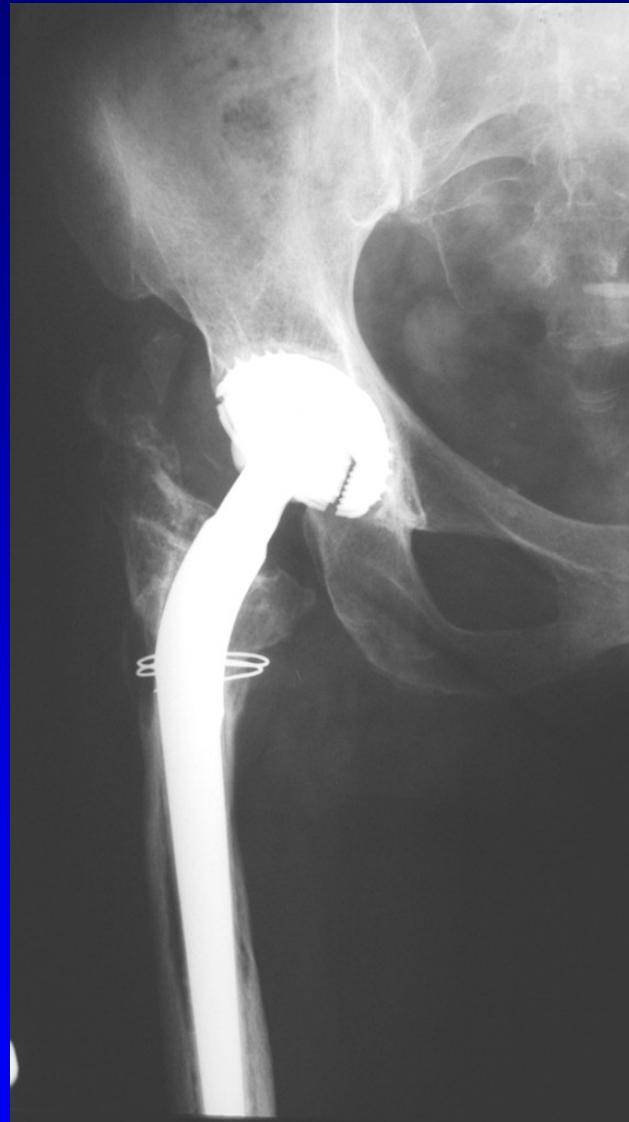
One stage surgery

Two stage surgery

Resection arthroplasty

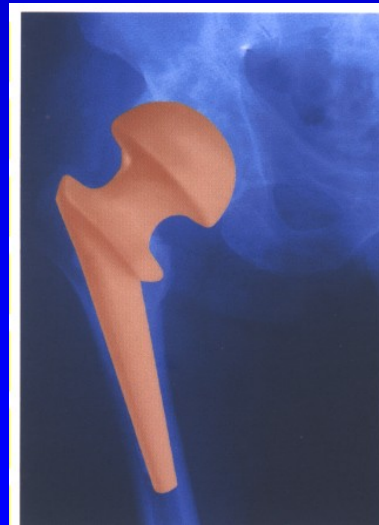
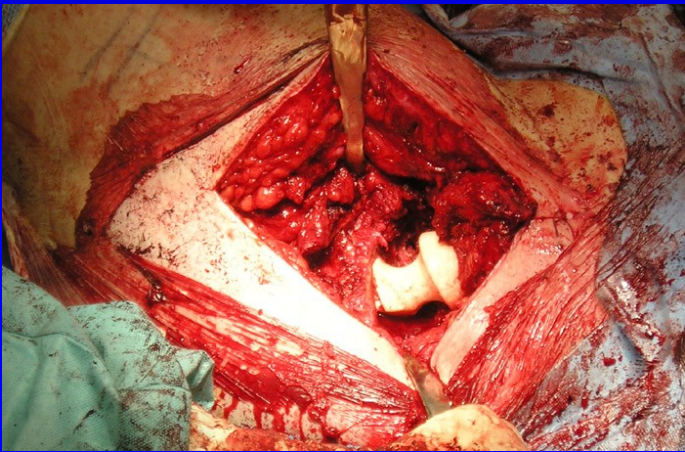
Antibiotic suppression





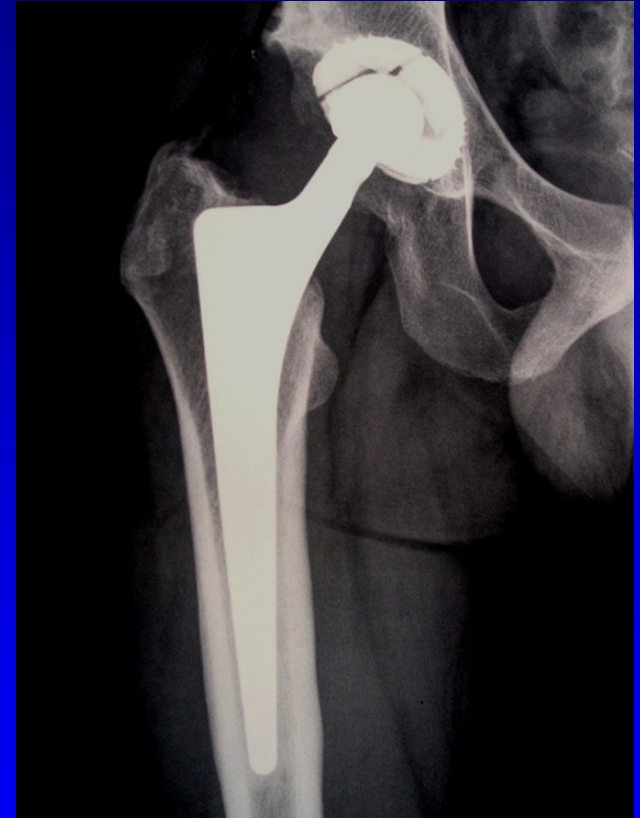
# Hip spacers

- Two stage surgery
- Better ROM
- Better walking
- Revision is easier
- Local concentration of antibiotics
  - Gentamycin a Vancomycin
  - Cover 90 % of all pathogens



# Principles

Experience of the hospital  
Long term results  
National registries  
Operative technique  
Reliable implants  
Activity of the patient  
Regular follow up



# Daily activity after THA

No lifting and wearing of heavy objects  
No strenuous manual labor  
Limited running and jumping  
No contact sports

Recommended sports:  
swimming, bicycle, tennis  
tourism, skiing?

