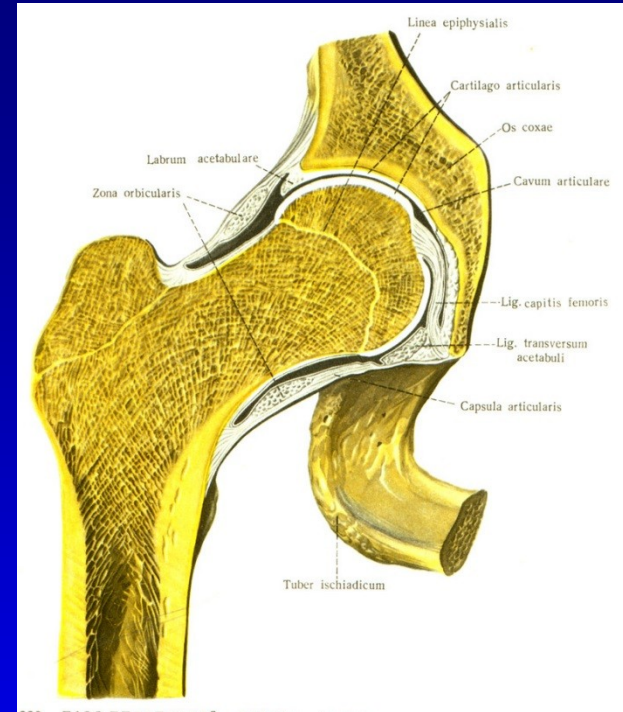


Total hip arthroplasty

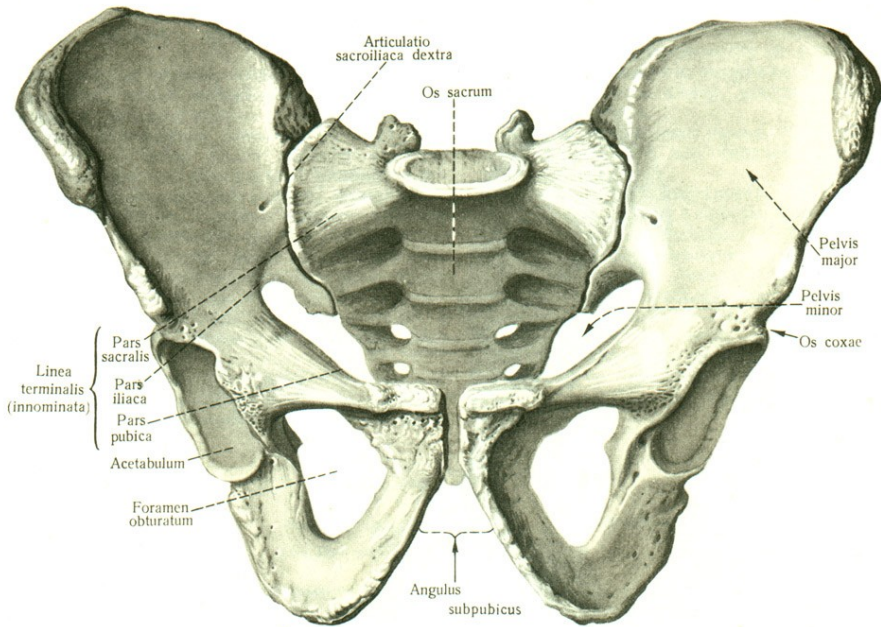
Z. Rozkydal

Hip joint

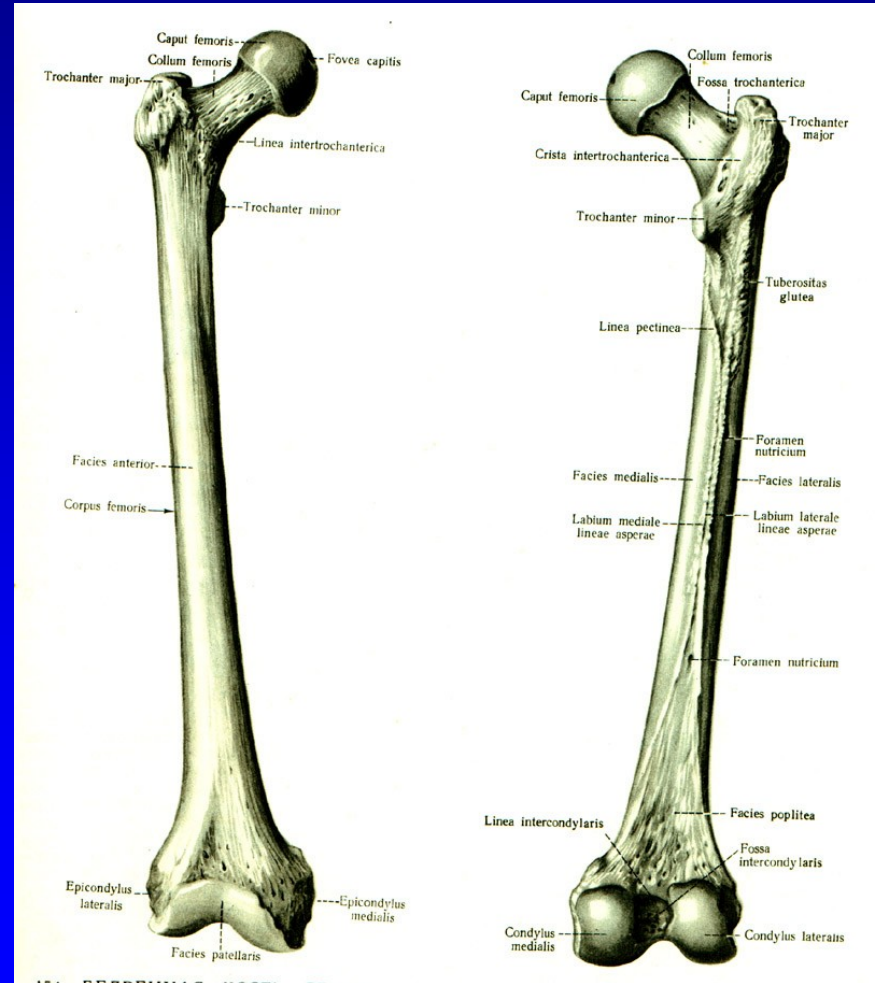
Enarthrosis



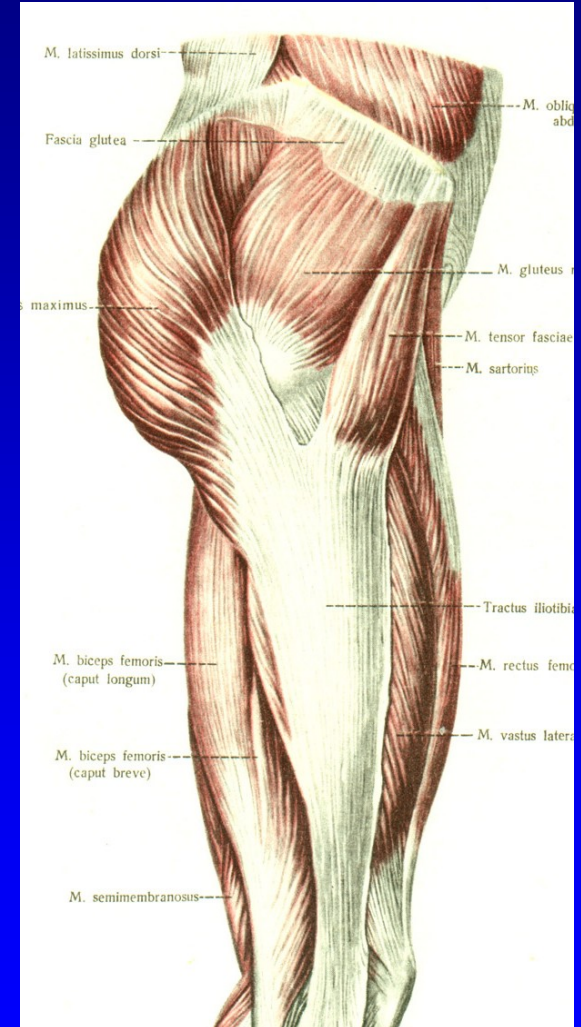
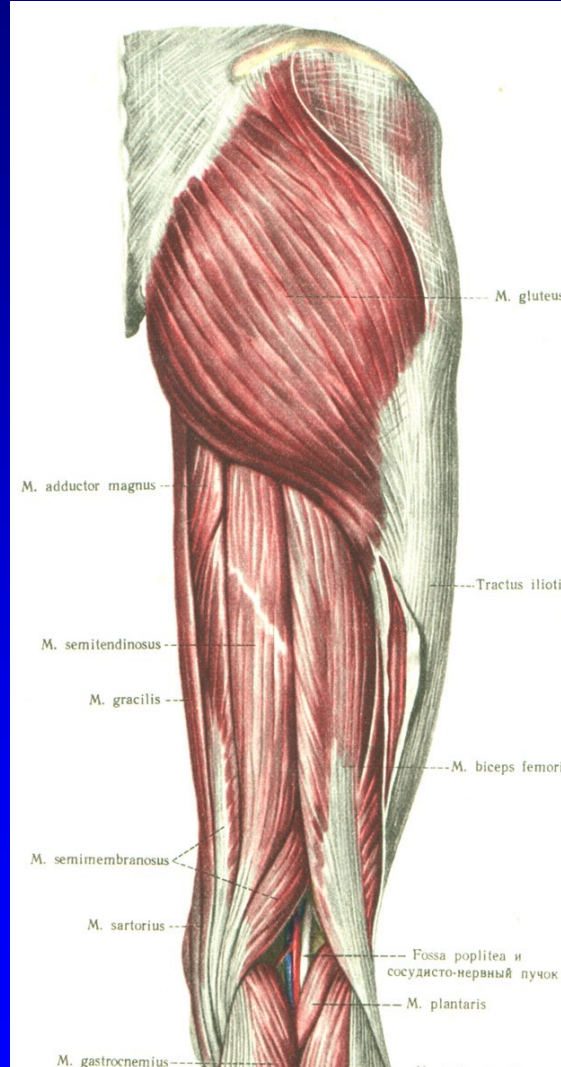
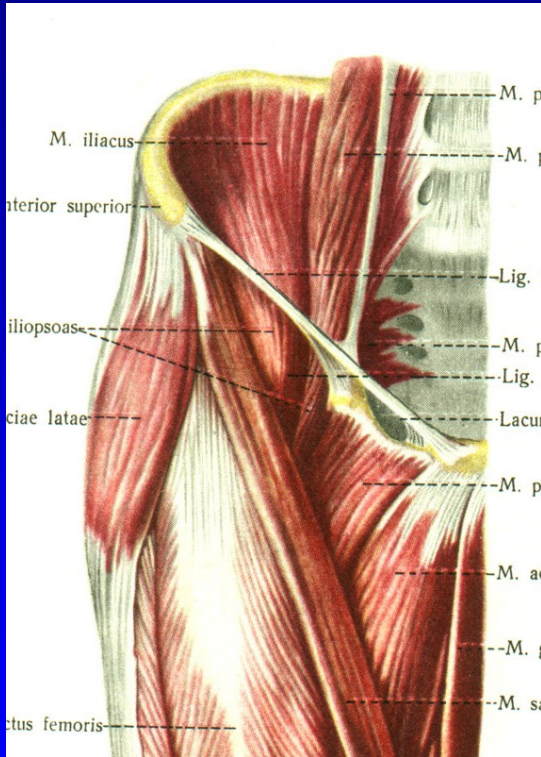
Pelvis



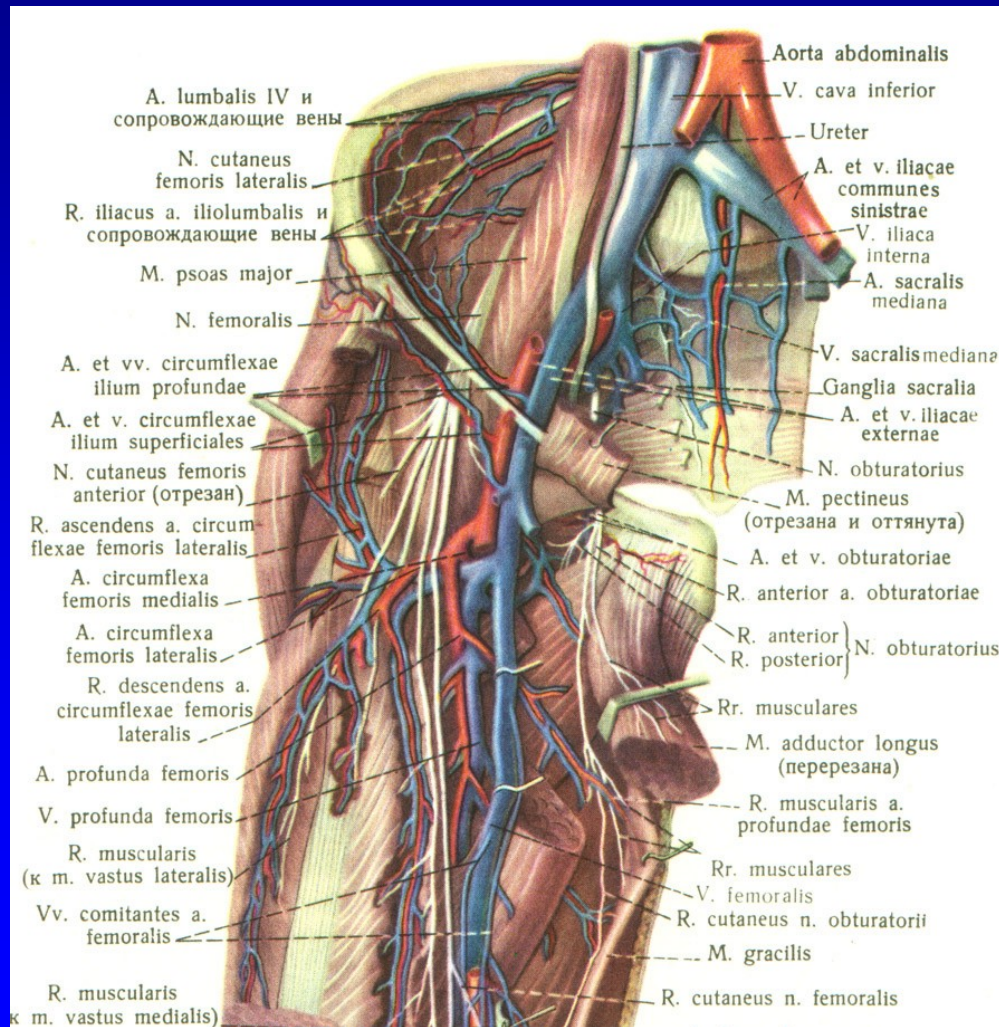
Femur



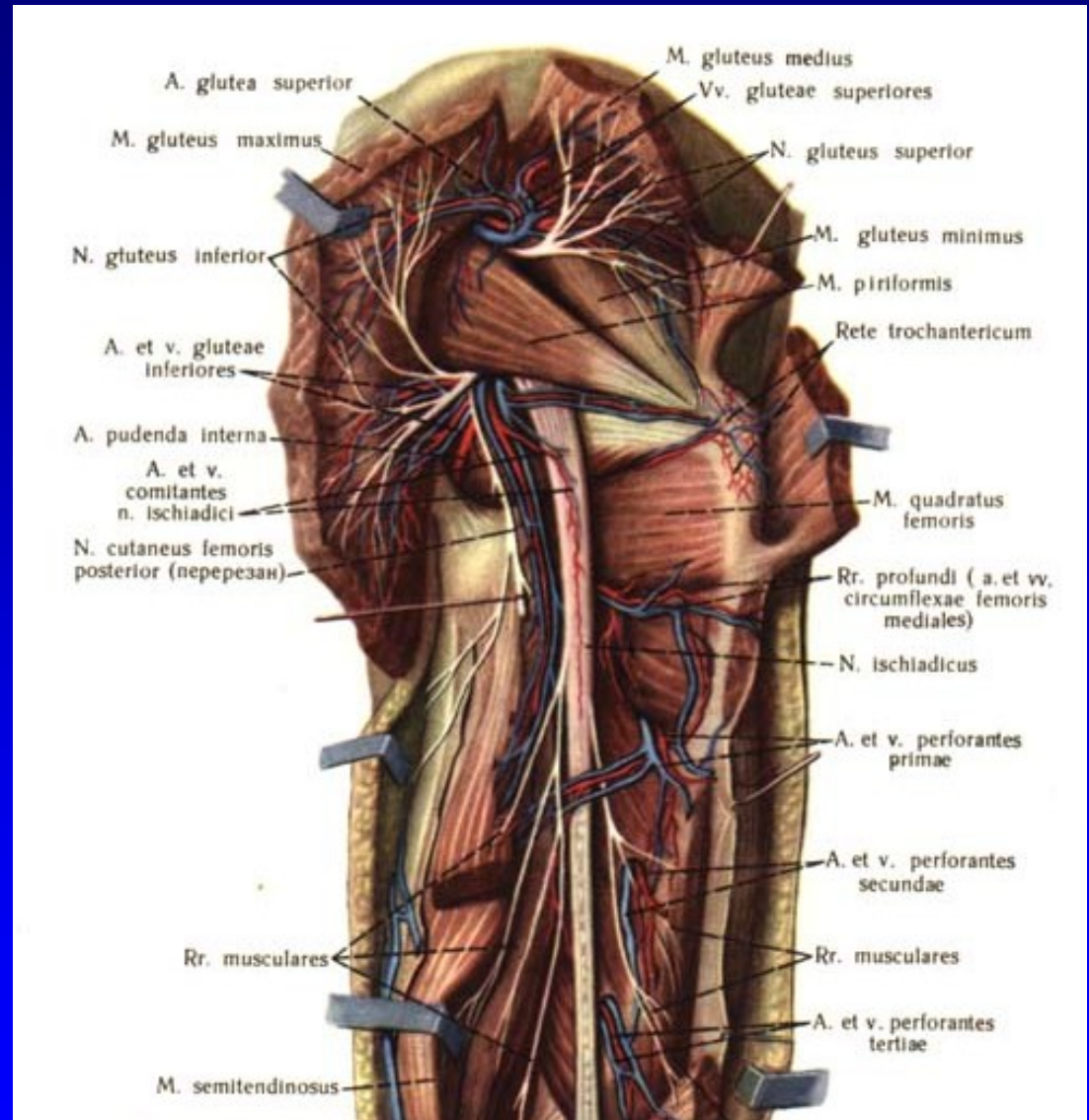
Muscles



Nerves



N. ischiadicus



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



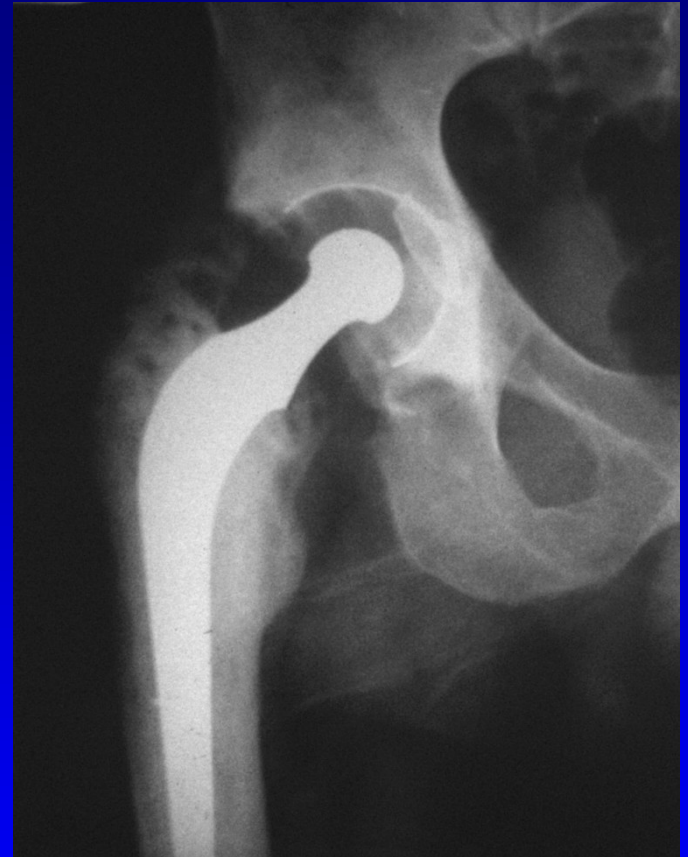
Primary osteoarthritis

Historie

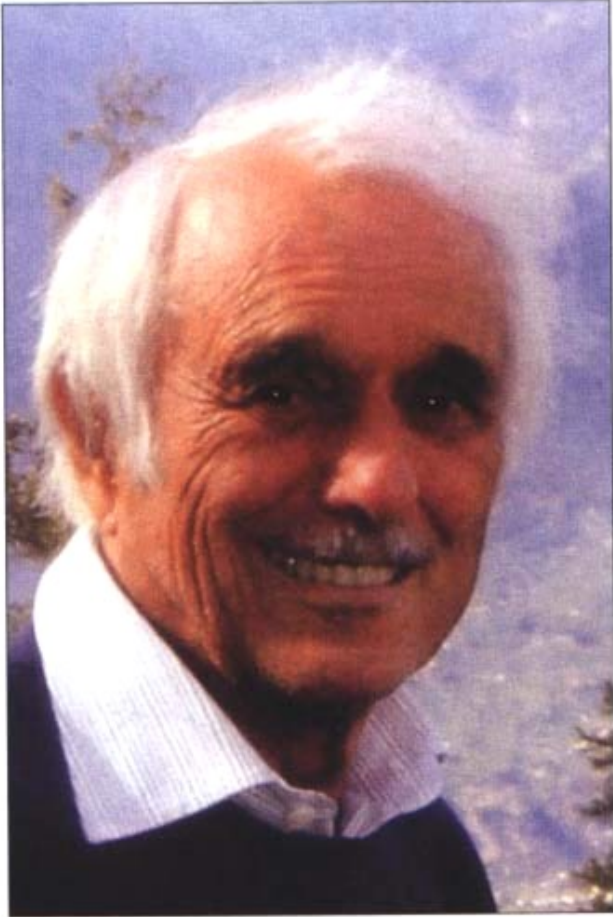
Sir John Charnley
Low friction arthroplasty
Původní teflonové jamky
nahradil polyetylénem
Acrylic dental cement
Polymethylmetakrylát PMMA
– kostní cement



1962



Low friction arthroplasty

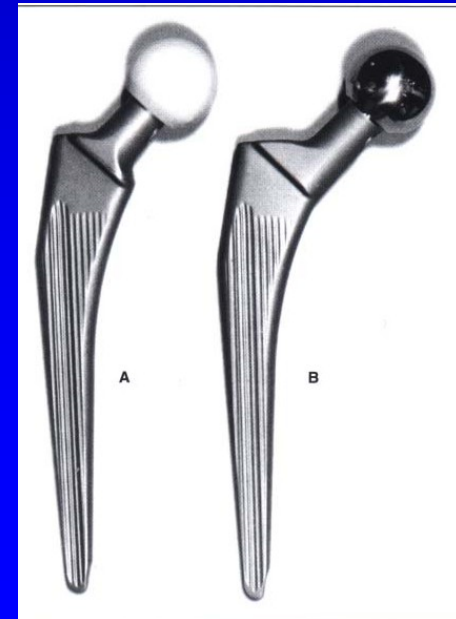


Prof. M. E. Müller



1964 -1965
Setzholzprothese

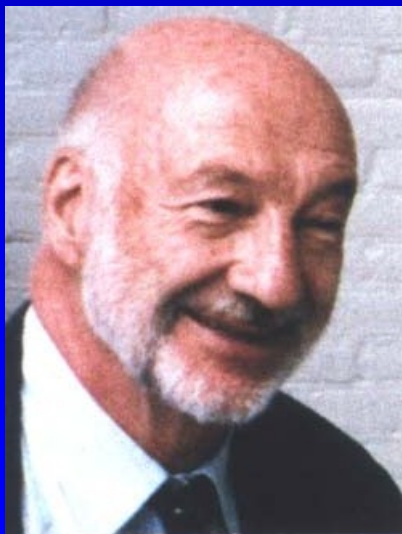
1966
Banana - shaped



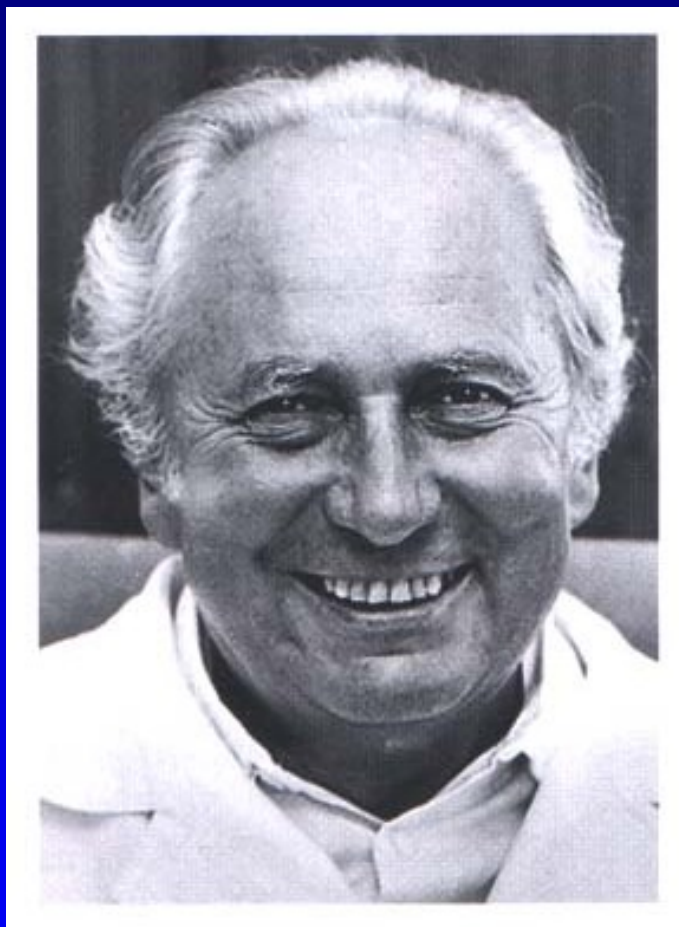
1977
Geradschaftprothese



Praha, 1988



Prof. B.G. Weber



Prof. MUDR. Oldřich Čech, DrSc.



1972

1986

Dřívky Poldi- Čech

Fixation in the bone

Types of THA



Cemented



Hybrid



Uncemented

Primary THA

Polyethylene cup

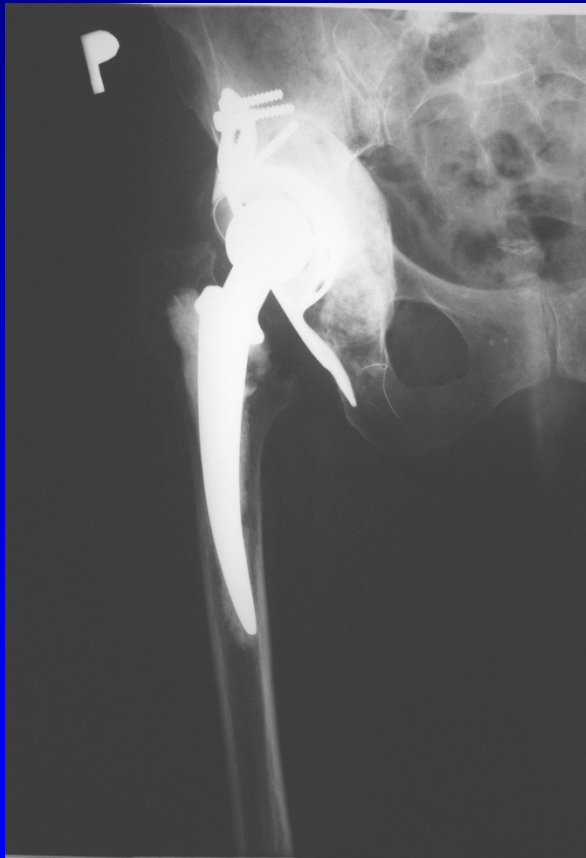


Head

Neck

Stem

Revision THA

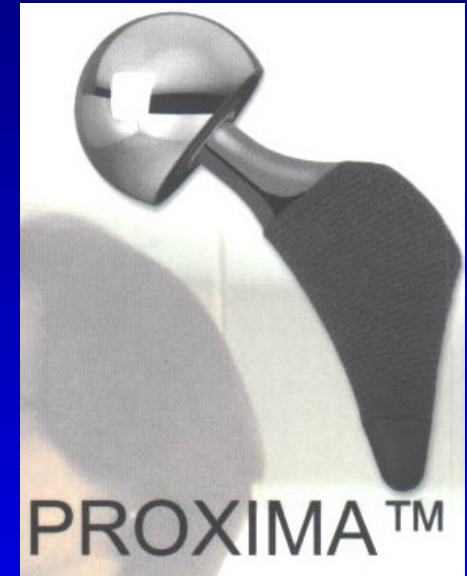


For tumors



Conservative THA

Mayo
Proxima
Mehta



Mayo stem

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
- Storage in vacuum or in argon
- Modern trends:
highly crosslinked polyethylen
- with vitamin E

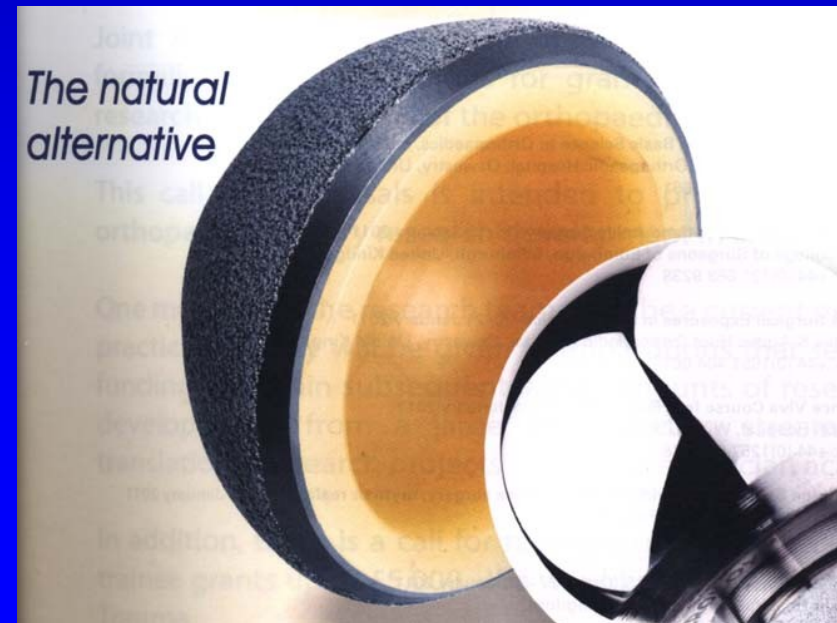


XPE- highly-cross-linked polyethylen + vitamin E

Inkorporace vitamínu E do struktury PE

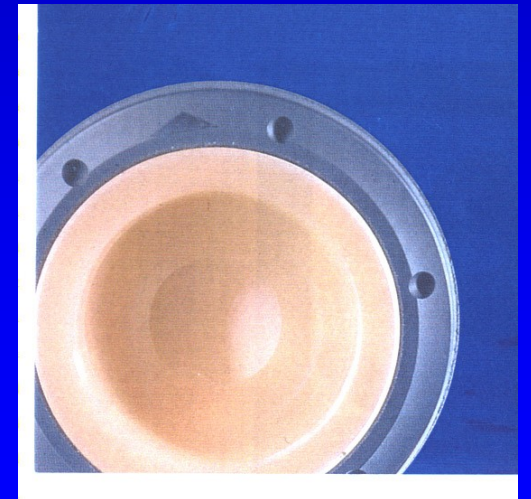
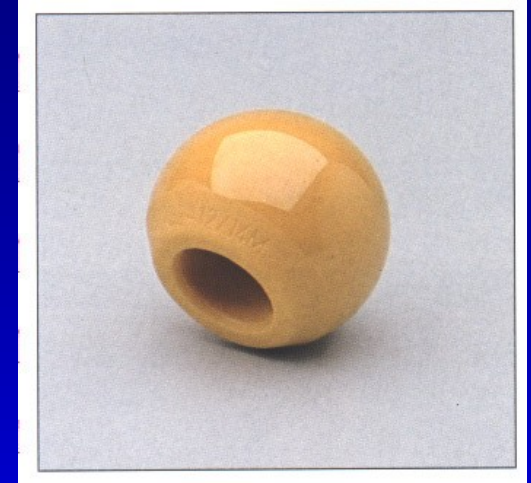
Antioxidanty tlumí in vivo oxidaci polymerů

Homogenně smíchaný vit E zvyšuje
mechanické vlastnosti více než
konvenční XPE



Ceramic

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



Keramika

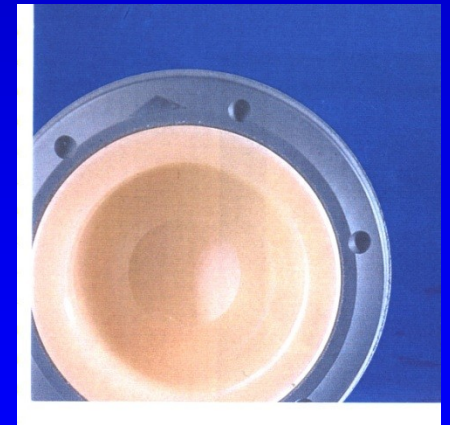
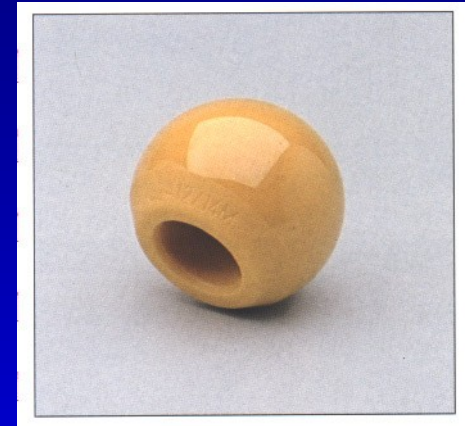
Výhoda - povrch keramiky je hladší

Zanedbatelná tvorba otěrových částic
a jejich bioinertnost

Nízký otěr

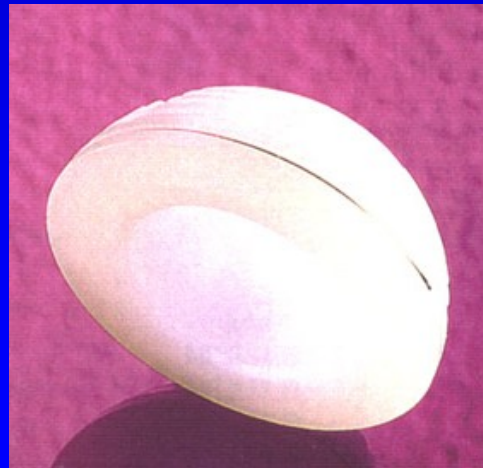
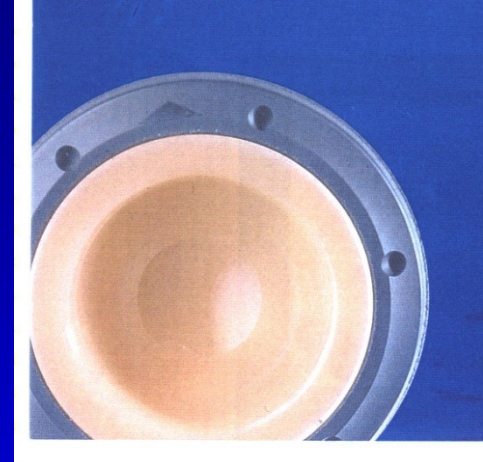
Otěr keramické hlavičky proti PE jamce:
pod 0,15 mm/ rok

Otěr keramické hlavičky proti keramické
jamce: pod 0,002 mm/ rok



Contact : head - cup

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



Průměr hlavičky a inzertu

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

Výhody 36 mm hlavičky:

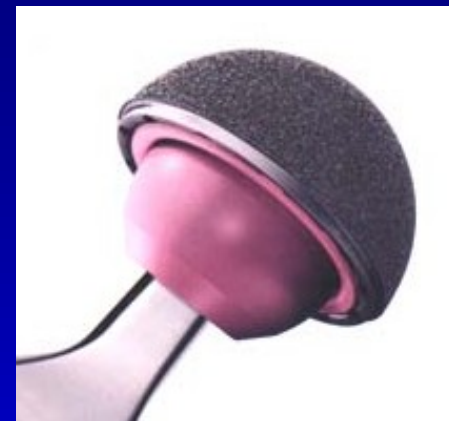
Vyšší stabilita

Nižší riziko luxace

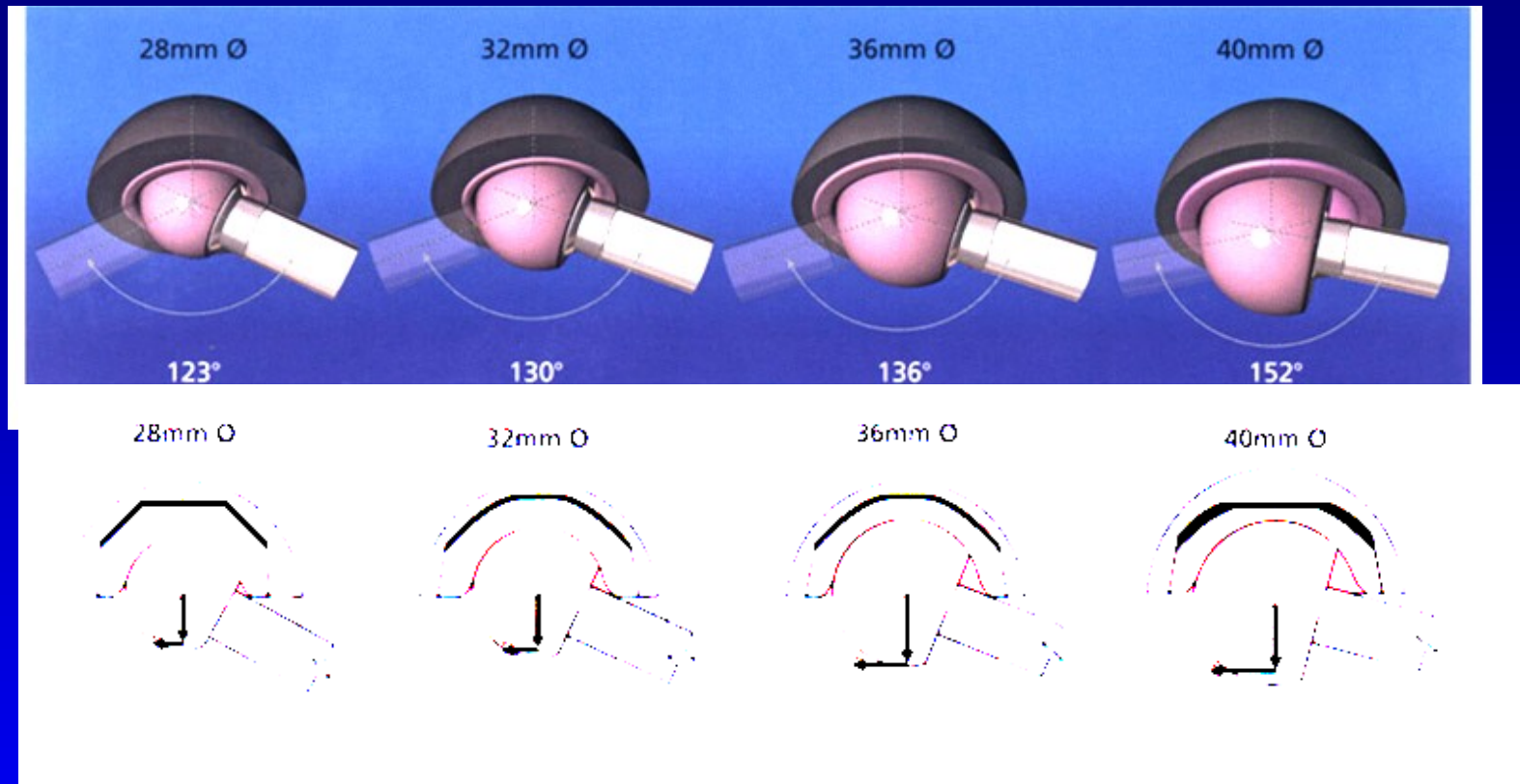
Větší rozsah pohybu

Menší riziko impingementu krčku s okrajem jamky

Zeštíhlení krčku



Velikost hlavičky



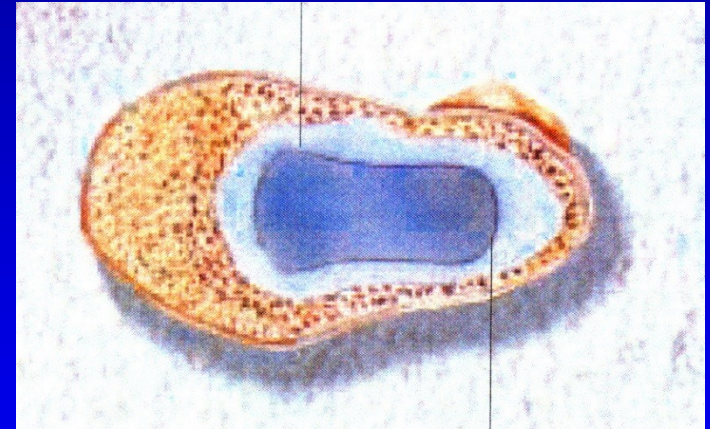
Riziko luxace: 4,63 %

0,88 %

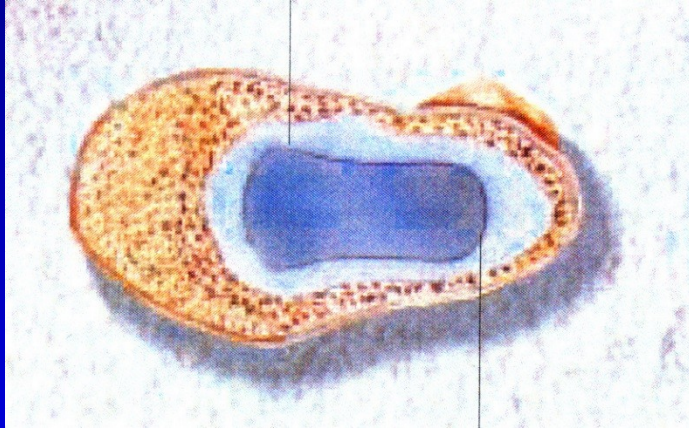
Větší průměr hlavičky: větší rozsah pohybu
snižuje se impingement
snižuje se riziko subluxace nebo luxace

Bone cement

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

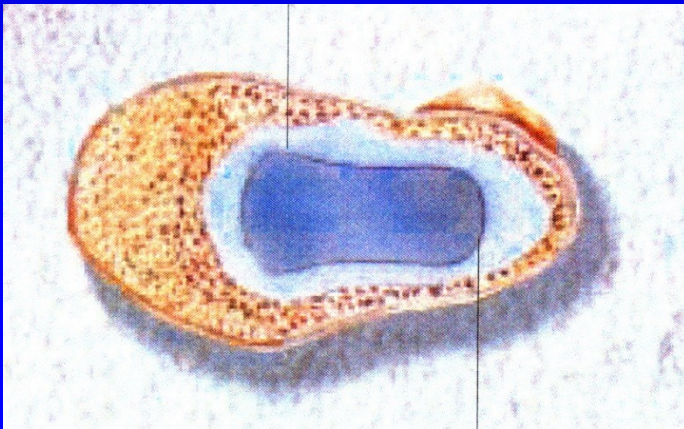


Cemented THA



Cementing technique

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



Acetabular component

- Cemented: polyethylen



- Necemented:metal- backed

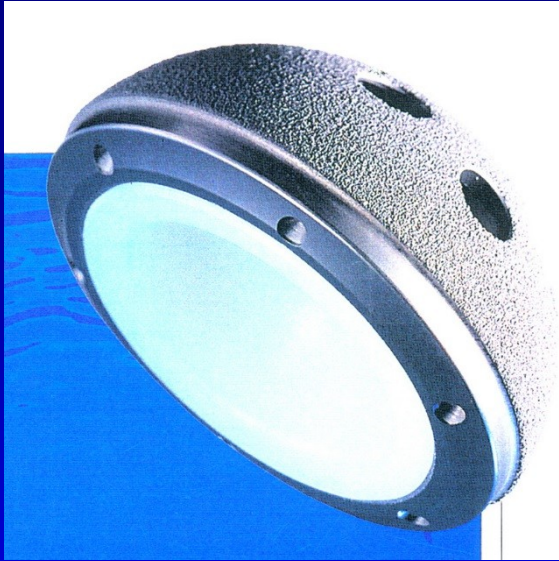
with PE insert



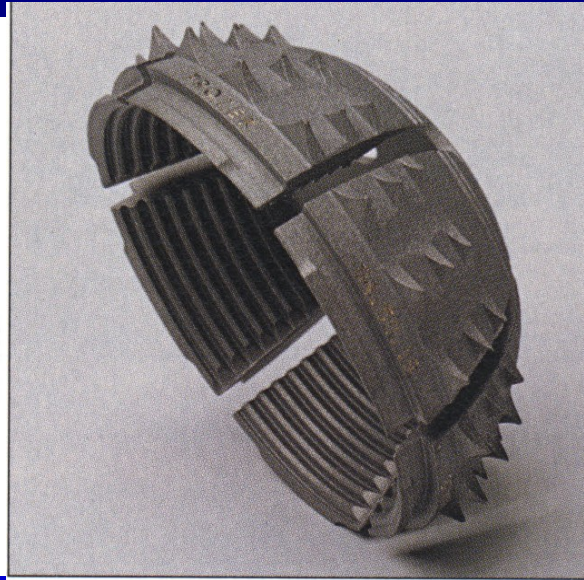
with ceramic insert



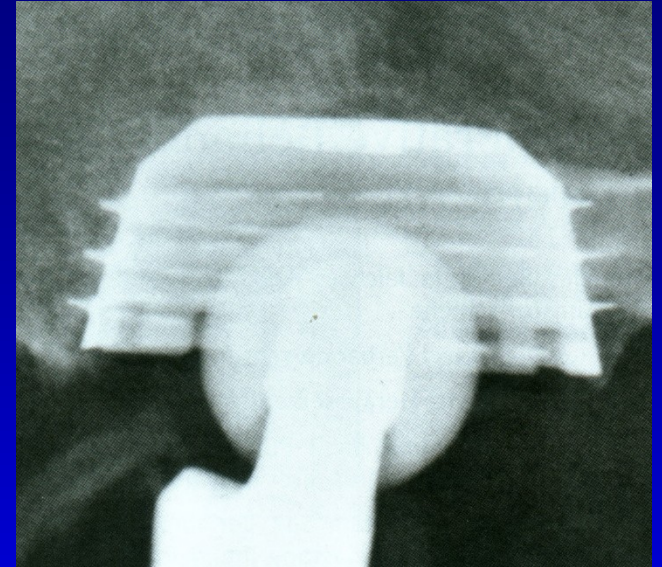
Uncemented cup



Press - fit



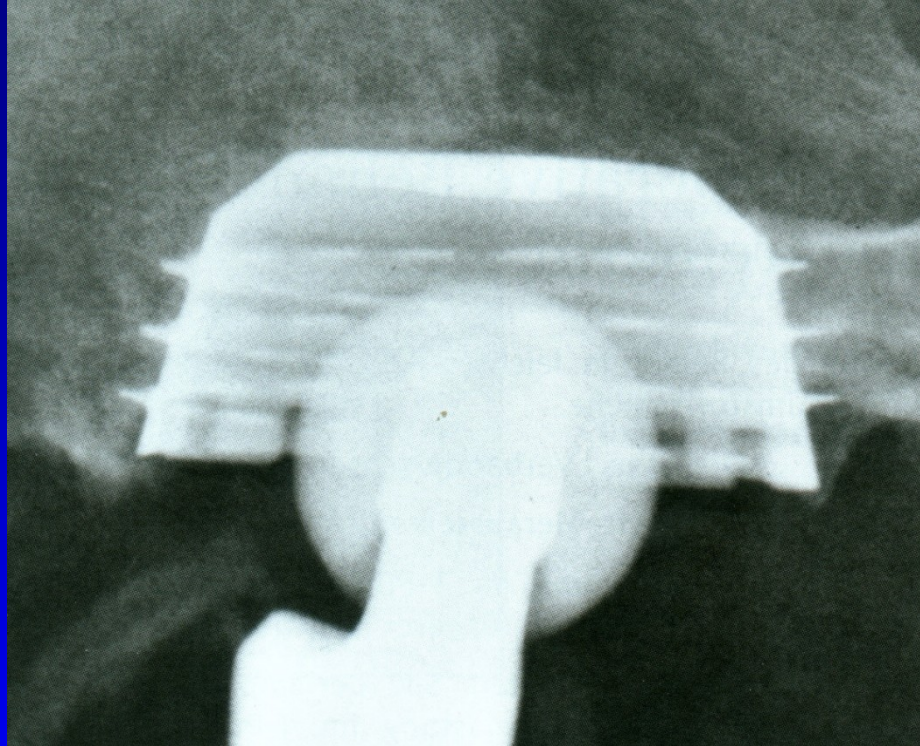
Expansion



Threaded

Primary fixation: mechanical anchorage in the bone

Uncemented cup



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

Povrchy implantátů

Makroporozita

Mikroporozita

Póry na povrchu $5\ \mu\text{m}$ - $600\ \mu\text{m}$

Póry nad $800\ \mu\text{m}$ - vrostle vazivo

Porozita- % vzduchu mezi strukturami pórů
obvykle 20-80 %



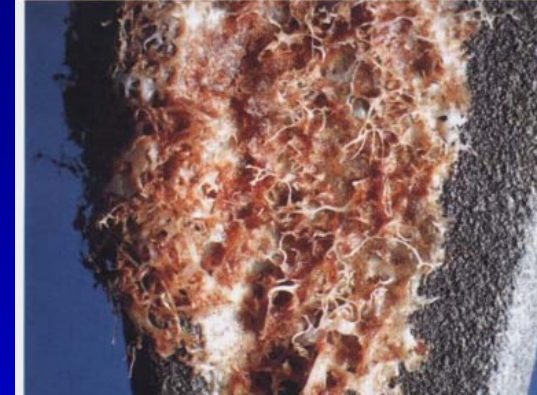
Povrchy implantátů

On-growth surface (Ti plasma spray)

Hrúbost stimuluje osteointegraci

Hrúbost povrchu- vertikální deviace od ideálního plochého povrchu R_a

R_a 5 μm – CLS dřík, Alloclasic Zweymuller dřík



In-growth surface Trabecular Metal Trabecular Titan

Velikost pórů minimálně 300 μm se doporučuje k podpoře vrůstu kosti a vaskularizaci



Adhezivní povrchy

Trabecular tantal

Trabecular titan

Povrchy s vysokou inerciální stabilitou

- velmi dobrá adherence

- vysoký frikční koeficient



Trabecular titan

Reprodukuje morfologii spongiózní kosti

Kontinuální struktura bez vrstvy s rizikem odloučení - není to „coating“

Elasticita je blízka spongiózní kosti

Trabecular titan: porozita 80 %
velikost pórů 440 μm

Vrůstají kmenové buňky a diferencují se na osteoblasty

Není vazivová tkáň

Adhezivní rezistence



Hydroxyapatitový povrch

Bioaktivní

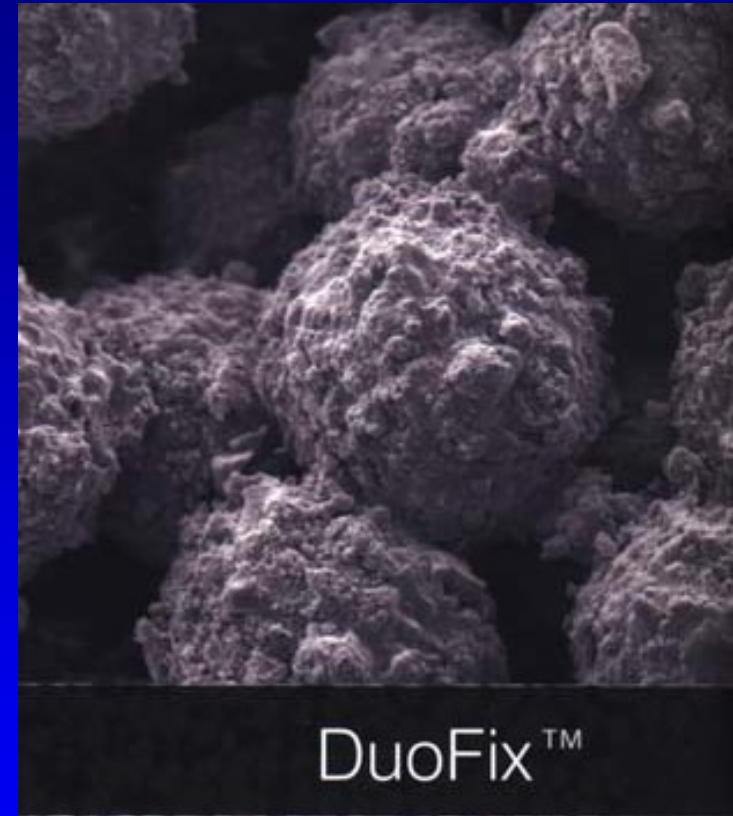
Bionertrní i osteokonduktivní

Nejvíce kompatibilní materiál

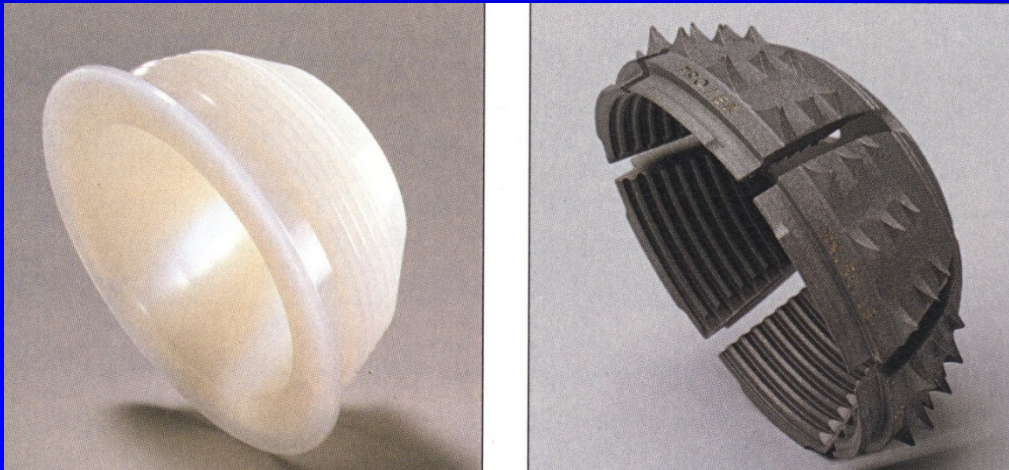
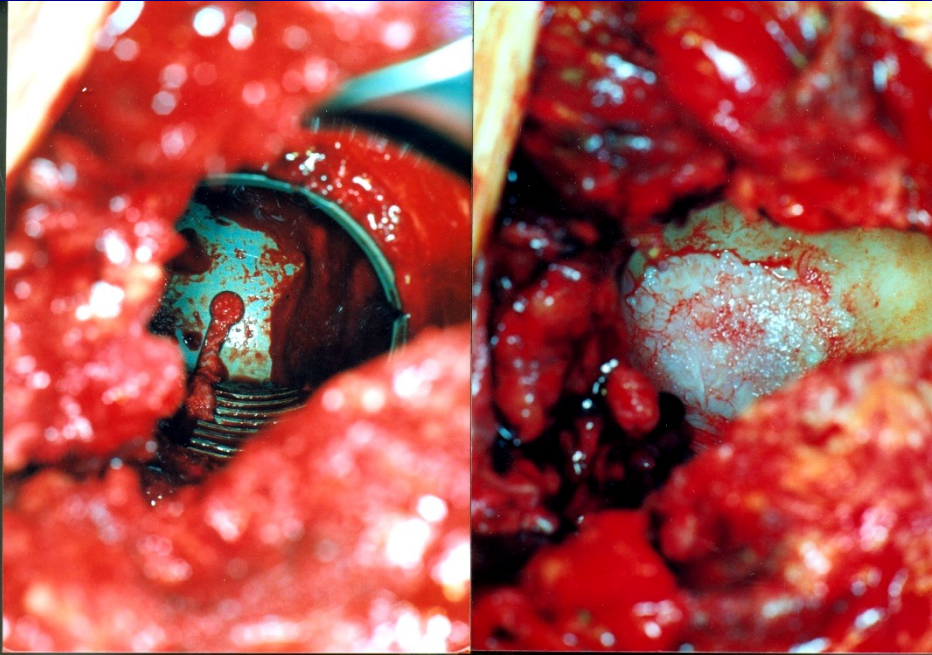
Podporuje růst kosti ze strany kosti
a dále na povrchu implantátu

Chemické vazby mezi kostí a HA

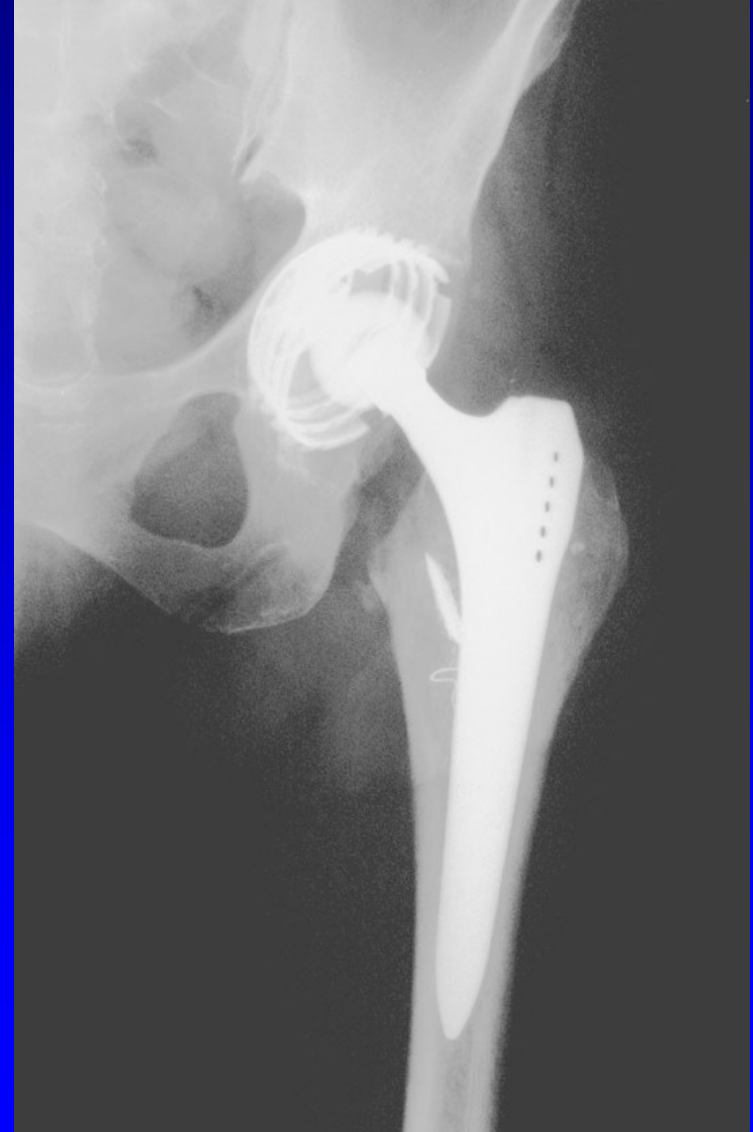
Spojení s kostí na 70 % povrchu



Expansion cup- CLS

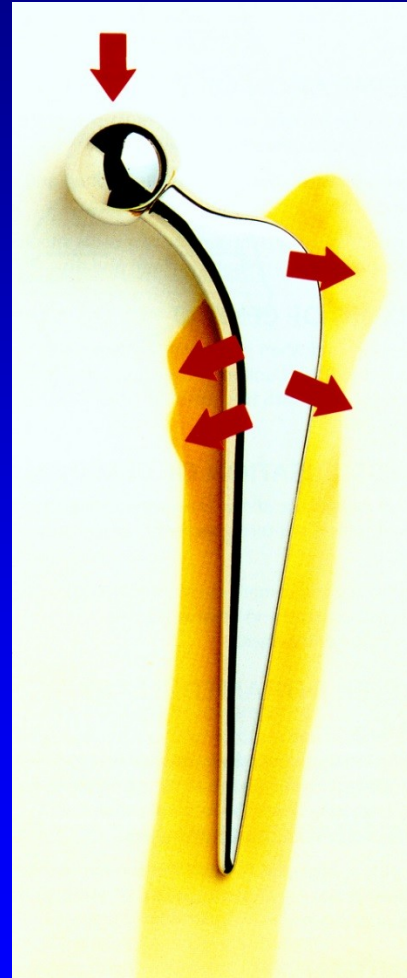


Bicon – Zweymüller cup



Femoral component

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

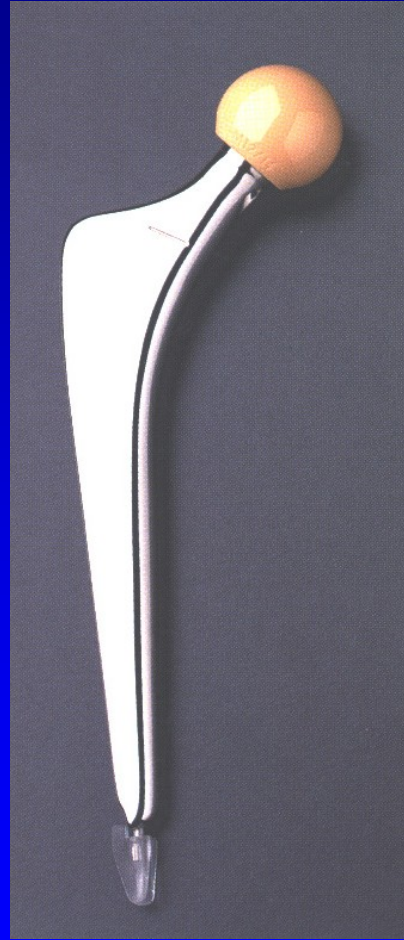


Cemented

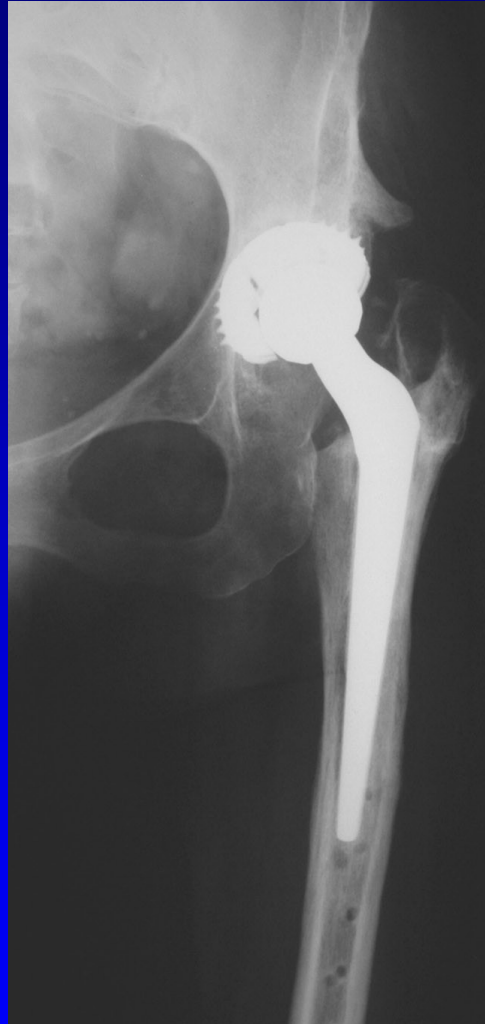


Cementless

Morscher, Spotorno MS – 30 stem cemented



Uncemented stems



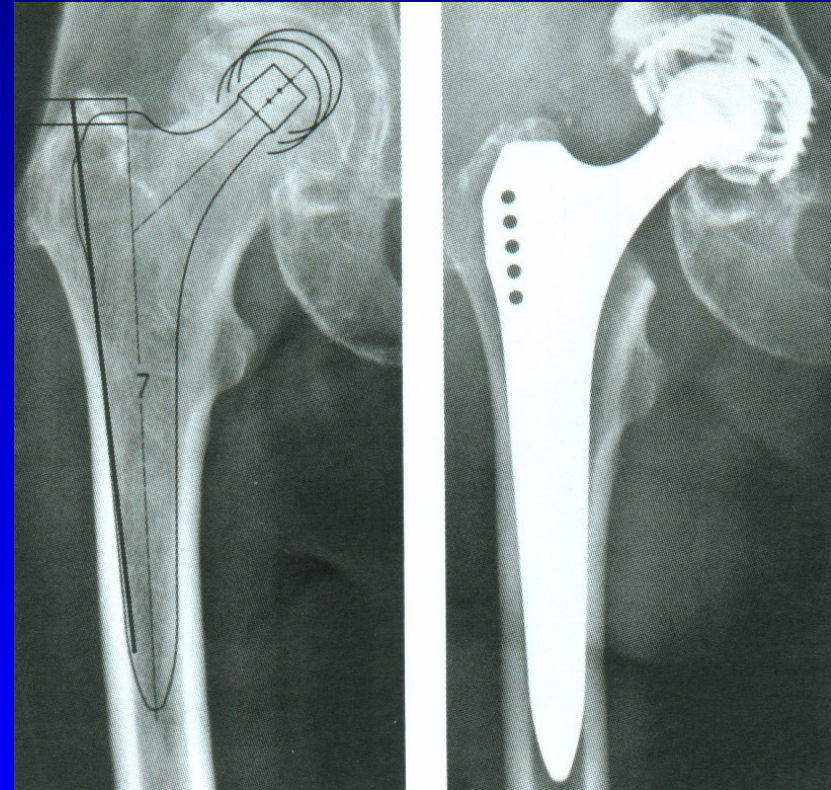
Proximal fixed



Distal fixed

Uncemented stem

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

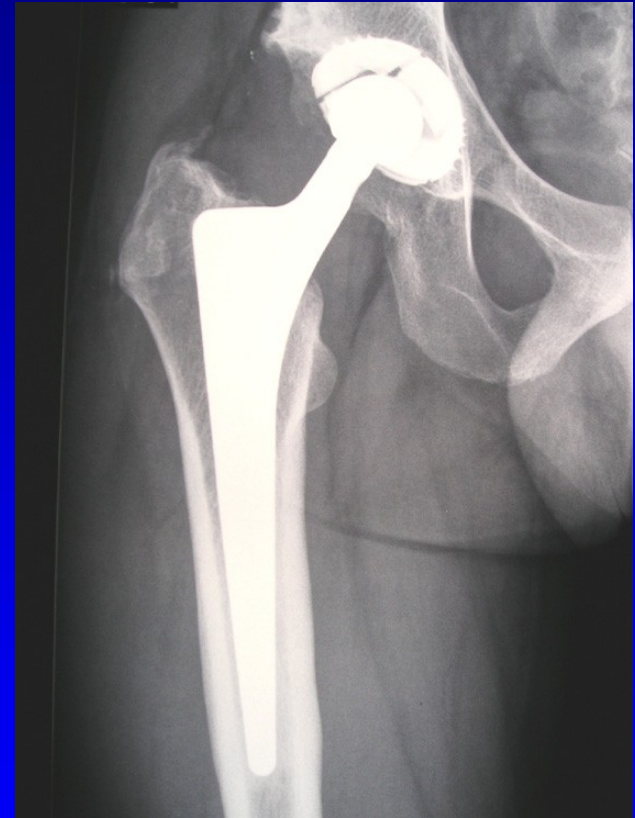


Indication scheme

- 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

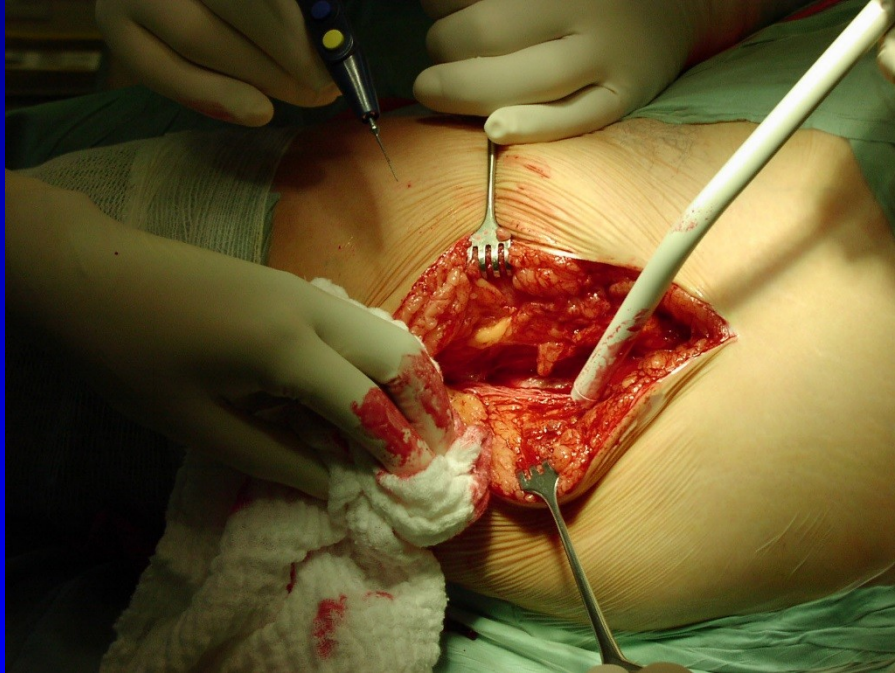


Contraindication

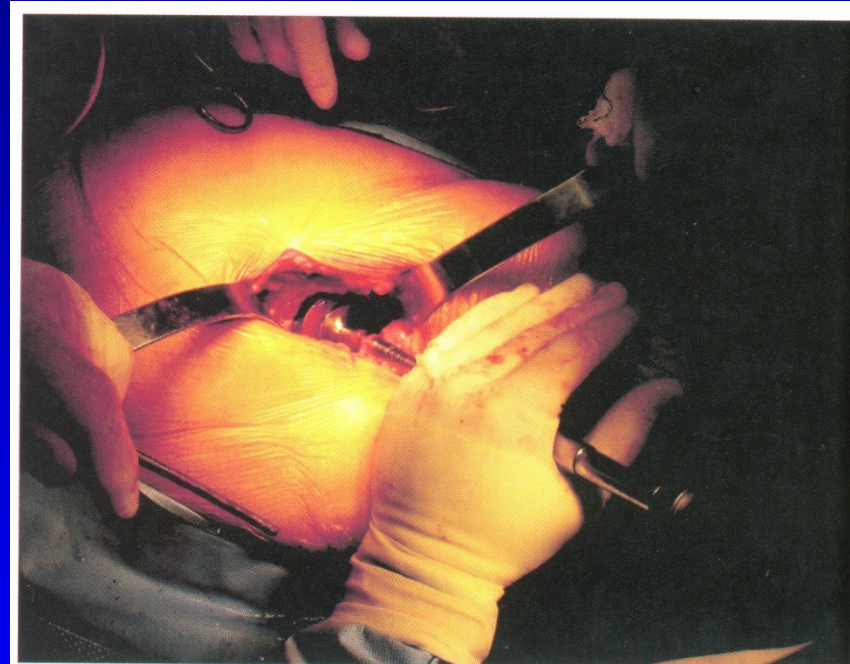
- Active infection of the hip
- Infection in the body
- General condition not good
- Neurogenic arthropathy
- Extreme low bone quality
- No cooperation of the patient
- Relative: age over 80 y.
elevated ESR



Approaches



MIS- mini invasive surgery



Operative technique

Femur – brush

pulsatile lavage

sealing of medular cavity prox.- dist.

drainage of the femur

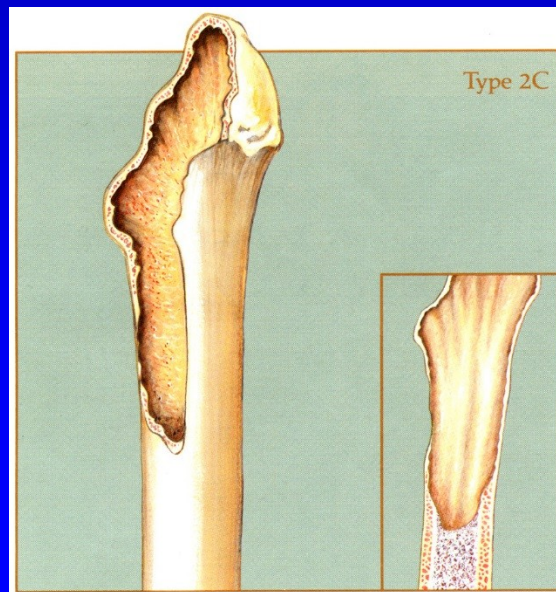
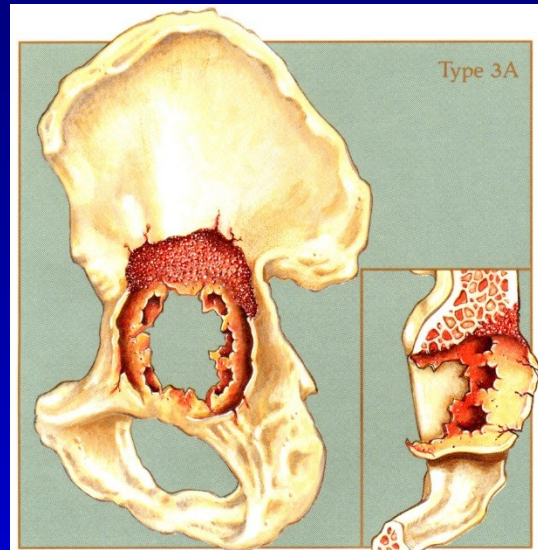
Vacuum mixing of bone cement

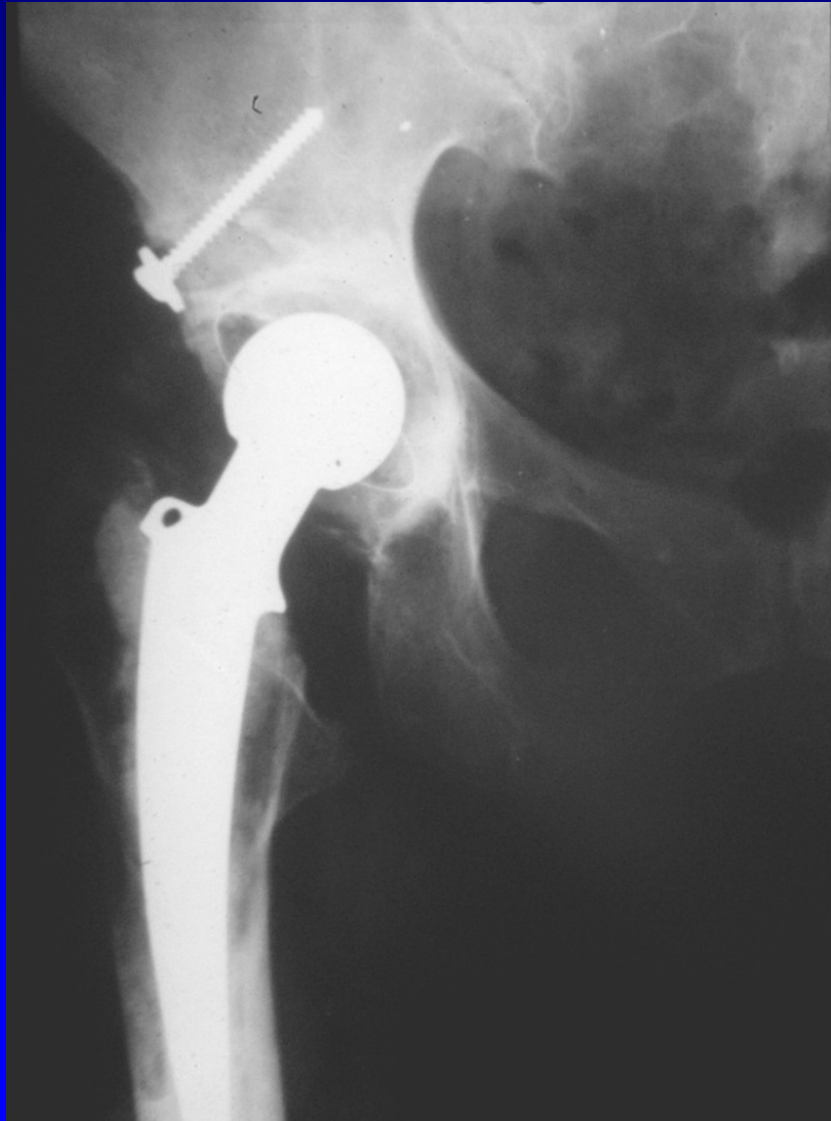
Presurisation of bone cement

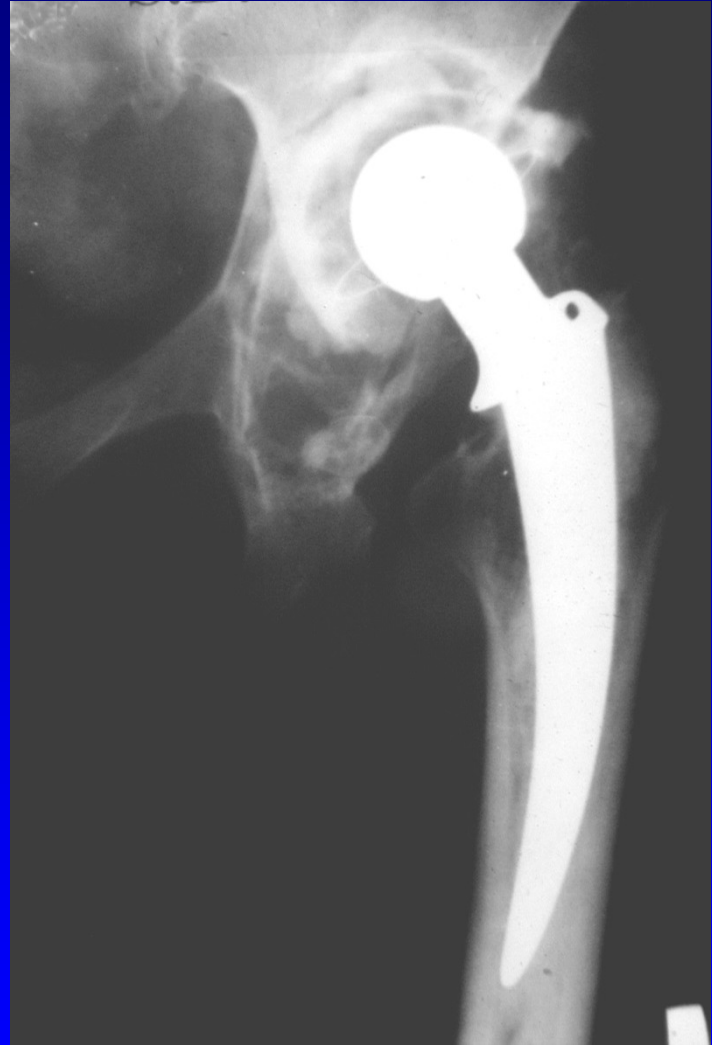
Timing of insertion of the stem

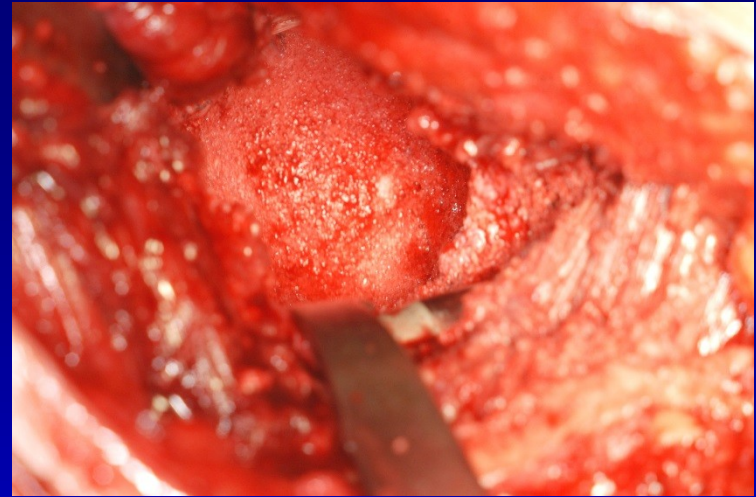
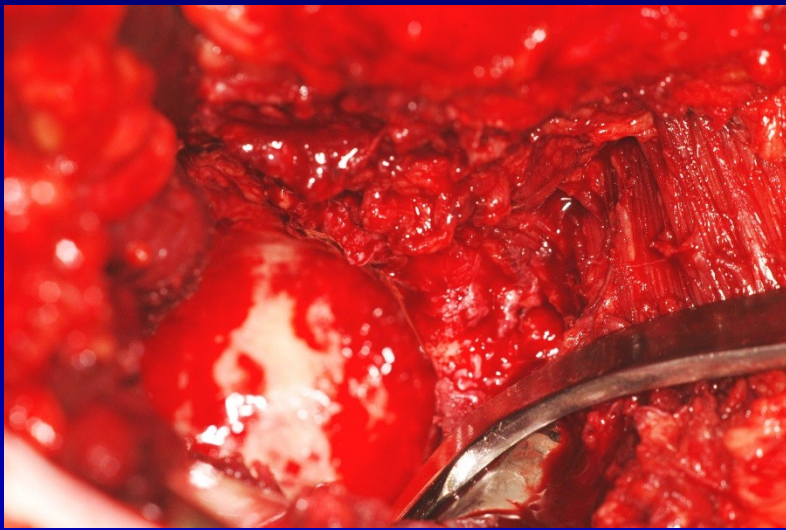
Continuous pressure

Revision THA

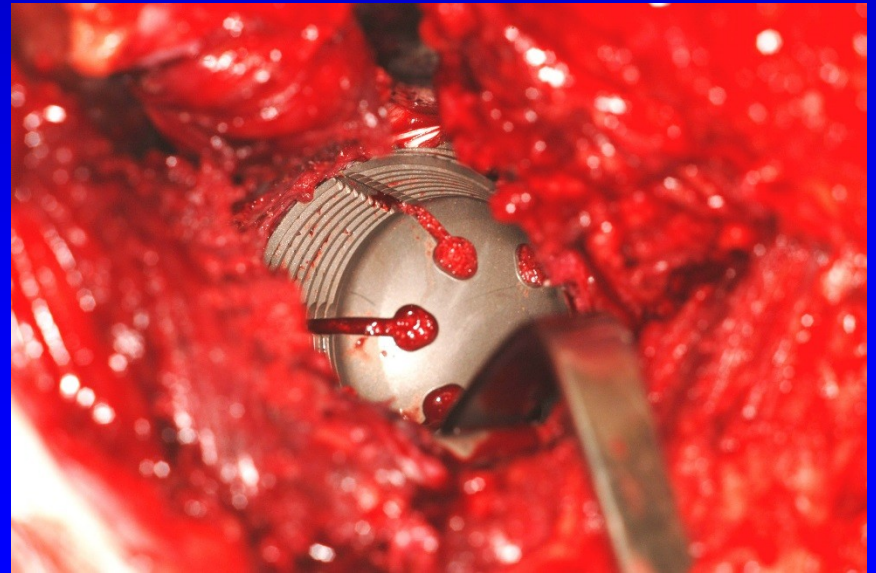




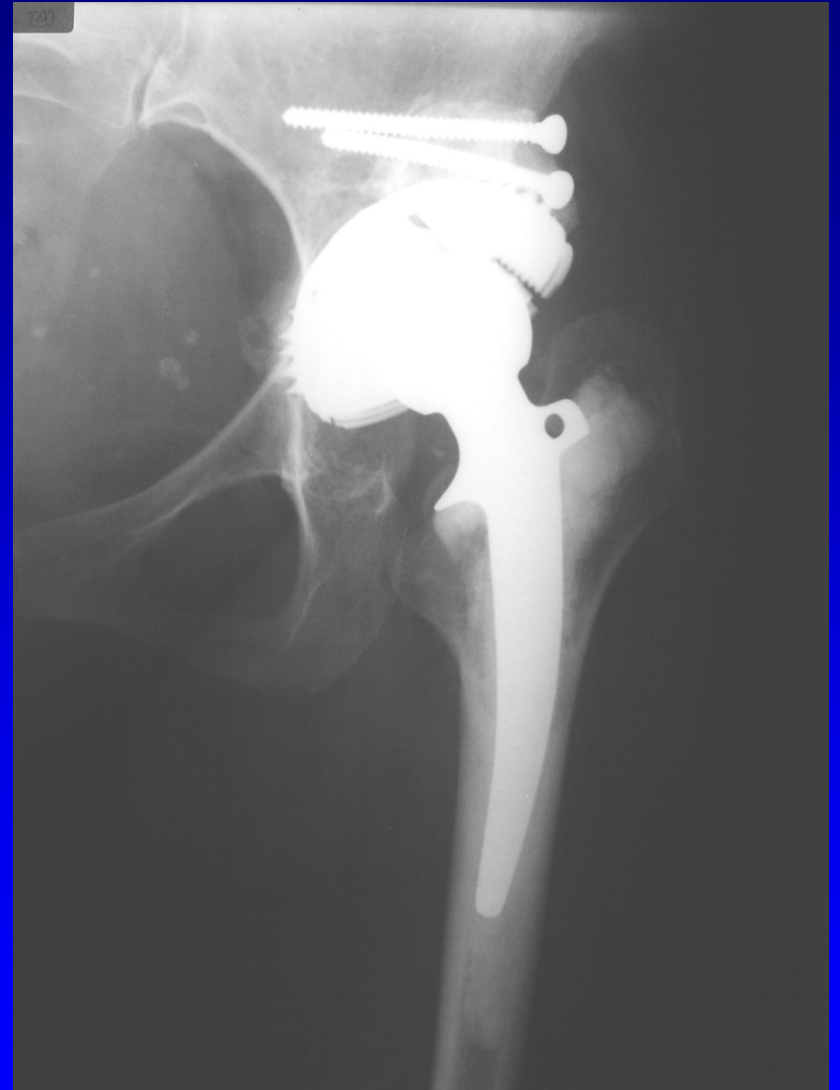
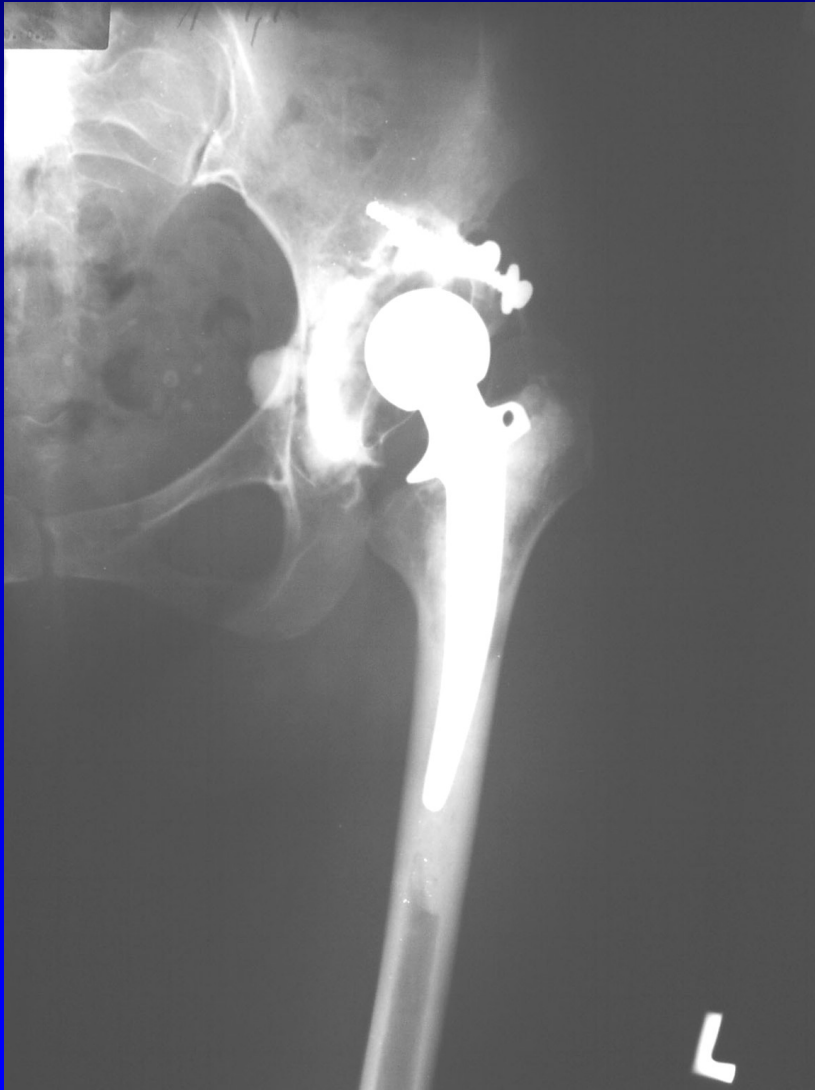


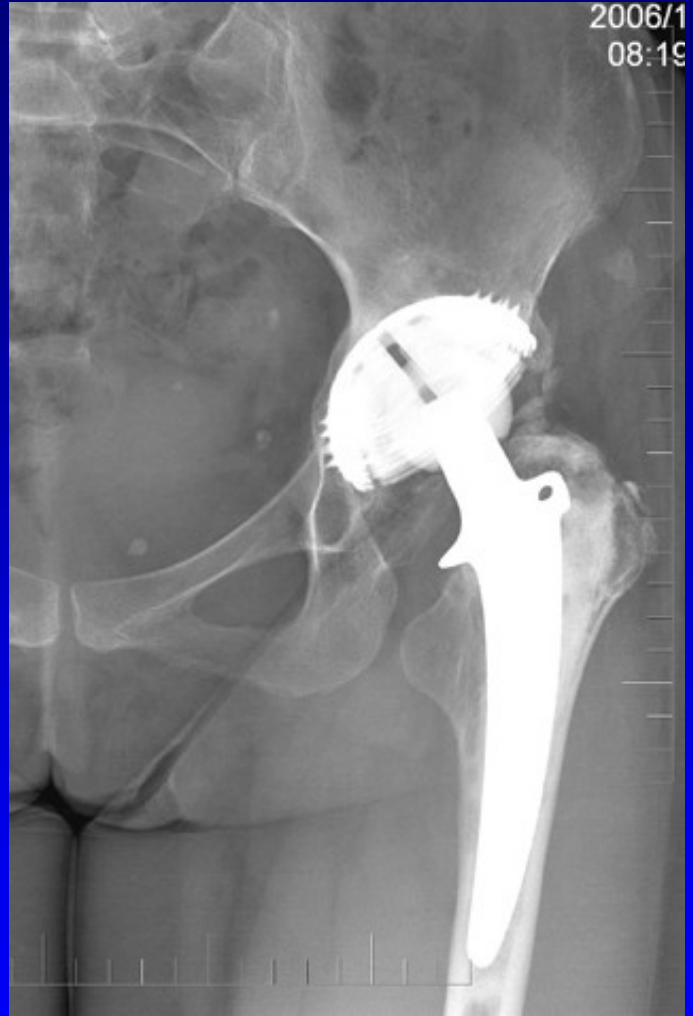
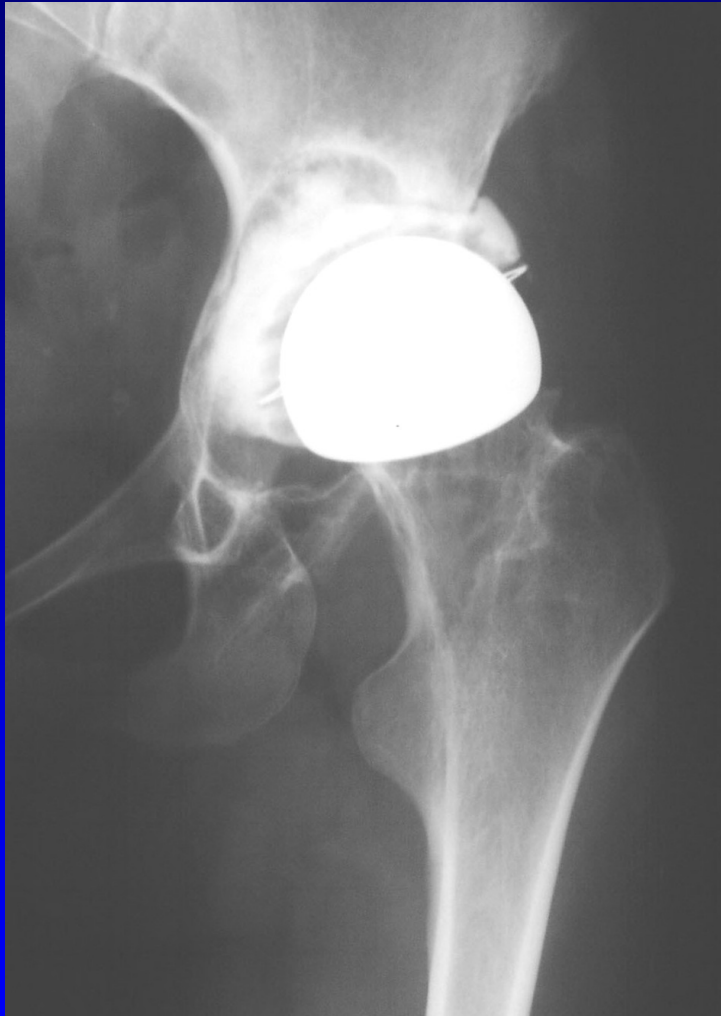


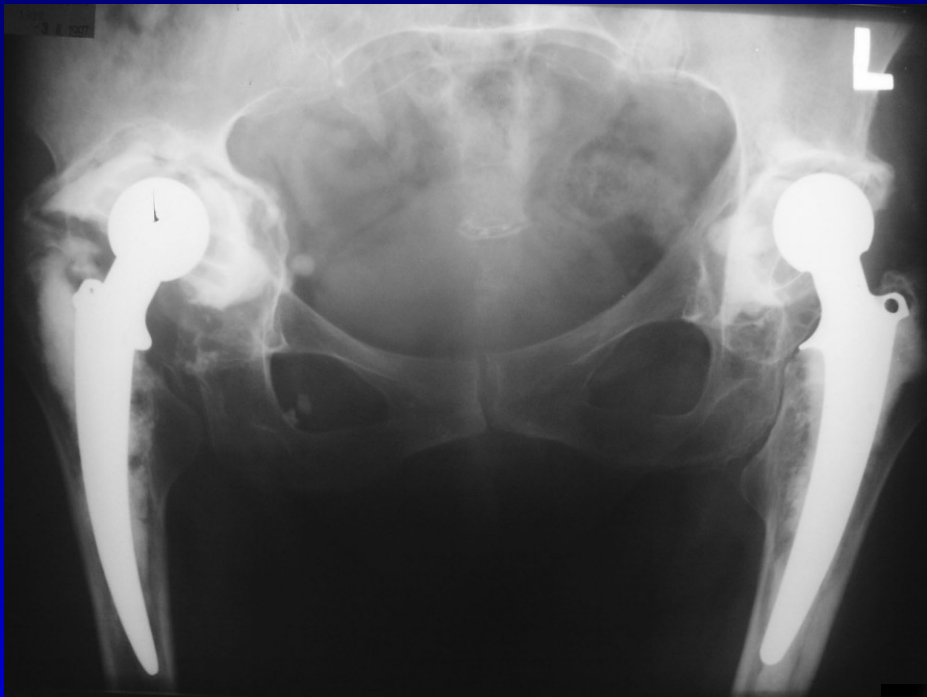
Revision of the acetabulum



Revision THA







Periprosthetic infection

St. aureus

St. koaguláza negativní

Streptokoky

Enterokoky

a jiné

·
MRSA

Rezistence dalších mikrobů

Problematika biofilmu

Periprotetická infekce - diagnostika

Klinicky

Labor: CRP, leu, FW

Kultivace punktátu kyčle

RTG- osteolýza, usurace

SONO

Kostní scan Tc-99

Peroperační průkaz

Sonikace implantátu a následné
bakteriologické vyšetření

Prodloužená kultivace



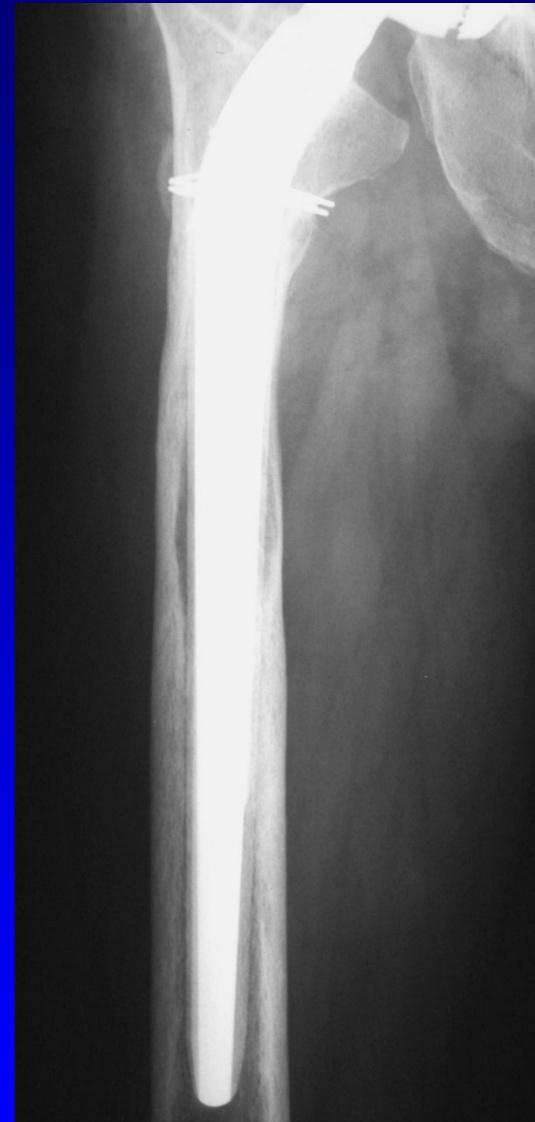
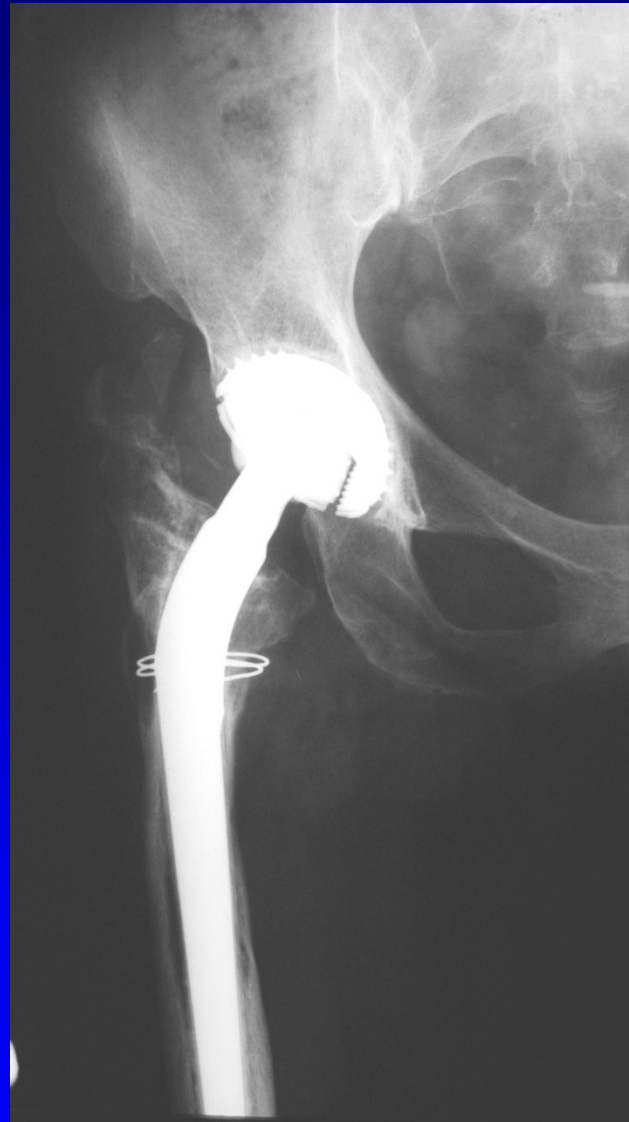
Periprotetická infekce - PPI

Časná PPI

Chronická PPI

Pozdní haematogenní PPI





Kyčelní spacers

Zajišťují pohyb a distanci femuru
proti acetabula

Lepší pohyb a chůze

Jednodušší reimplantace

Prolongované a konstantní uvolňování
Gentamycinu a Vancomycinu
ve srovnání s míchanými cementy

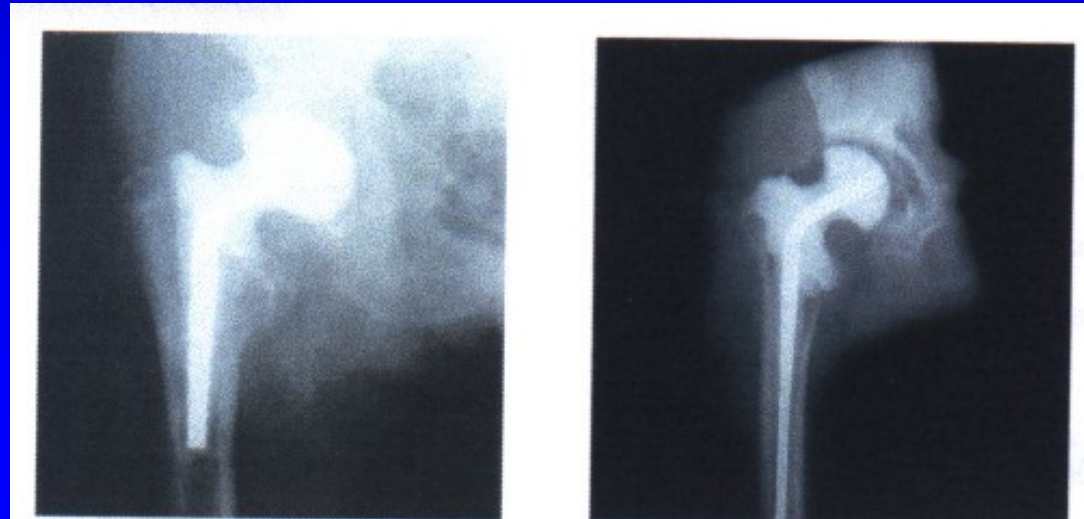


Kyčelní spacery

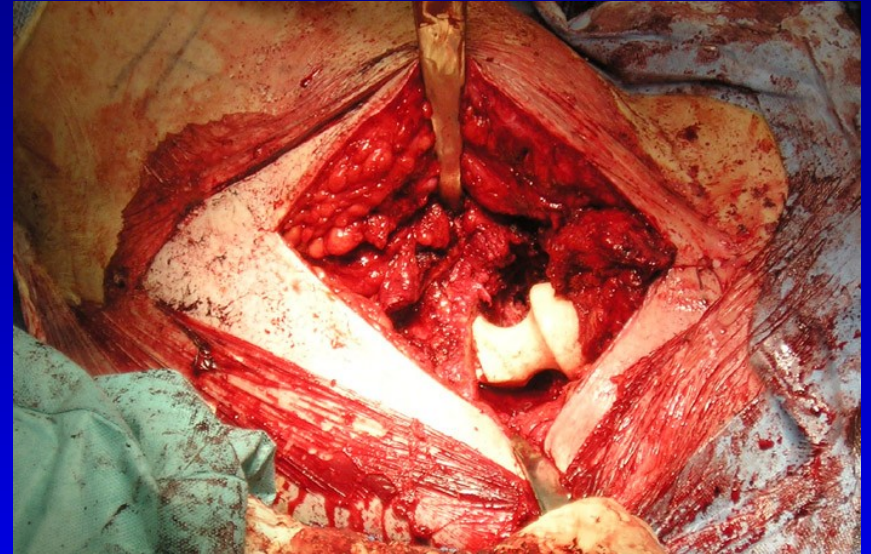
Lokální hladiny jsou vysoko nad MIC

Kryjí 90 % všech patogenů
Včetně MRSA a MRSA, Enterokoky

Zabraňují kolonizaci povrchu



Kyčelní spacery



Vhodné též u coxitid

Zásady

Zkušenosti pracoviště

Dlouhodobé výsledky kvalitních studií

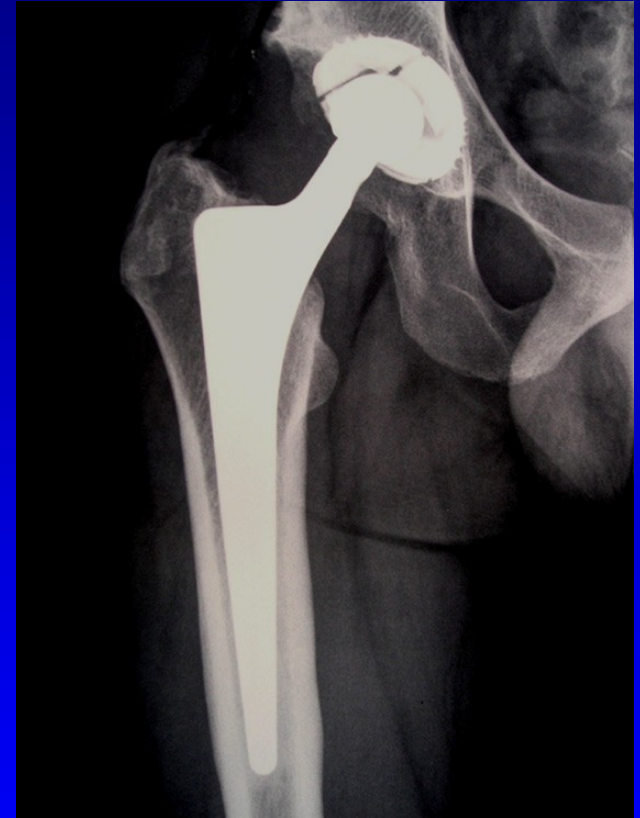
Registry kloubních náhrad

Operační technika

Vhodný implantát

Aktivita nemocného

Pravidelné kontroly



Daily activity after THA

No lifting and wearing of heavy objects

No strenuous manual labor

No long standing and walking

Limited running

No jumping

No contact sports

Recommended sports:

swimming, bicycle, tennis

tourism, skiing?

