Treatment of femoral neck fractures.
Specialty of fractures in the elderly patients.
Garden classification.
Minimal invasive treatment: cannulated screw osteosynthesis.
Indications of hip replacement.
Diagnostics, classification and treatment of per-and subtrochanteric fractures.

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Lectures are facultative…
Fx. proximal femur:
Hip=femoral neck+(per/inter/sub)trochanteric

Evergreen topic
require surgery: OS or HR

Daily bread!
most frequent intervention / thrifty-financing
Hip fracture is the most frequently operated type of injury in elderly

1/3 of beds in Trauma & Orthopedic Departments is occupied by patients with hip fractures!

Treatment costs the government more than the health care of all diabetic patients!
• Speed  1935  unsolved fracture
• Pauwels  1935
• Garden  1961

— ...
— ...
— ...Manninger, Fekete, Forgon, Nyárády

2013  is this fracture solved?
EPIDEMIOLOGY

• „Hip” fractures are frequent in elderly patients

• Hip fractures are based on osteoporosis (>)

• Typically low energy-trauma!

• Every 200th hip fracture occurs under age of 40
• Every 1000th hip fracture occurs under age of 15
INCIDENCE

• 1,5 /1000 inhabitants
  15000 hip fx /year

• femoral neck / pertroch. = 4/6

• The hospital stay > Tumors + Diabetes + Hypertonia
## Chance for hip fracture after 50 yr

<table>
<thead>
<tr>
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<th>female</th>
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<tr>
<td>UK</td>
<td>11,4%</td>
<td>3,1%</td>
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<tr>
<td>Sweden</td>
<td>22,9%</td>
<td>10,7%</td>
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<tr>
<td>Australia</td>
<td>17%</td>
<td>?</td>
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<tr>
<td>USA</td>
<td>17,5%</td>
<td>6,0%</td>
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USA: 220 000 hip fx/year
100-120 000 femoral neck fx.

UK: 65 000 hip fx/year

Forecast 2030
4,500 000 hip fx.
1,200 000 in Europe & USA
Porotic bone...

The degree of bone loss on traditional xray?
OSTEOPOROSIS
femoral nerve

superficial femoral artery

deep femoral artery

popliteal artery
Blood supply of the femoral head:

1. 5. cervical and epiphyseal art.

2. Obturator artery???

   Obturator vein!!!

4. a.epiphysarea medialis?
Bloodsupply of femoral head in childhood
Teamwork for pt. with hip fx

- Financing of HI
- Family
- Family doctor (GP)
- Orthopedic/traumatologist
- Social net
- Rehabilitator

[Image of medical equipment and X-ray]
Basic diagnostics of hip fx.:

What happened? And when?

Physical exam:

Radiological exam
    AP and lateral or axial view of affected hip
Extra or intracapsular fractures
clinical symptoms

– unable to lift this extremity
Basis of dg.: 2 directional traditional good quality xray picture
A-P (Antero-Posterior) view
Axial view:

CT?, MRI?, scintigraphy?
Pauwels 1935

1D Line?
2D Surface ?
3D !
4D !!! (G+t)

Garden 1961
AXIAL X-RAY

Lateral angulation: ANTECURVATION

1. case

G.II?

G.III.

2. case

G.I?  G.III.
Femoral neck fx. AO Classification

- B1: impacted?
  - Valgus? Garden I

- B2: laterobasal
  - B2 Garden II-III

- B3: varus
  - Garden IV
Fx. proximal femur, AO classification

A1: Stable
intertrochanter

A2: Instability of med. wall
pertrochanter

A3: Multiple instability
subtrochanter
CLINICAL SYMPTOMS

non-displaced (impacted, valgus or abduction fx.)

- pain in the hip
- patient can walk!
- patient is able to lift the limb with extended knee
SECONDARY DISPLACEMENT:

When the impacted fracture is displaced. The patient has lost walking ability.

Frequency: 20-30 %.

Better to operate all of them?
Diagnosis of hip fracture

absolute / urgent indication for surgery

hemostatus, fluid status, heart function coagulopathy

6-24 hrs
Dilemma of the treatment plan:

- Time window between the injury and arrival to hospital?
- Was the position of the patient during x-ray imaging correct? Determination of fx type!
- Mineral density of the bone?
- What is the chance for survival --- patient --- femoral head degree of emergency!
- Minimal invasive surgery?
- Medication --- anticoagulation --- pain killers --- bone formation --- general medicines
Fx. of the femoral neck

subcapital

medial

lateral

Prothesis  Osteosynthesis?!
When can the femoral head can survive the fracture?
The blood supply of the femoral head
-is intact or
-can be restored by early reposition&fixation

Functional tests of femoral head:

- venography
- osteoscopy
- scintigraphy
Types of osteosynthesis

femoral neck fx.

Childhood: - parallel K wires

Adults:
• 17-55 years: - screws
  over 55 years: - screw/s/blade+dyn-plate
Closed reduction:
1. Traction – elongation
2. Internal rotation
3. Ab/adduction?

Open reduction = further risk for blood supply
Only in young patient!
Proper manoeuvre?

Closed reduction!
Double SP nail + buttress – plate with a socket
AO screws
Cannulated „femoral neck” screws with additional stabilizer plate
THREE POINT FIXATION:

1. Subchondral bone
2. Adam-Shenton line
3. Lateral cortical bone
Osteosynthesis módszerek:
Allows shortening
Prevent rotational dislocation

DHS
BJ 79 yr
Bone-loss (DH) screw versus PFNA blade

Segment 2

A = 81.3 mm²

Segment 2

A = 26.7 mm²
01. 07. 2009. – 30. 06. 2012. 648 pts

<table>
<thead>
<tr>
<th>Garden</th>
<th>Count</th>
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<td>Garden I</td>
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<tr>
<td>Garden II</td>
<td>80</td>
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<td>Garden III</td>
<td>193</td>
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<tr>
<td>Garden IV</td>
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### Surgical treatment

**01. 07. 2009. – 30. 06. 2012.**

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<tr>
<td>Screws</td>
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<td>Screws + suppl.</td>
<td>416</td>
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<tr>
<td>DHS</td>
<td>81</td>
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<tr>
<td>Screws + blade</td>
<td>9</td>
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</tbody>
</table>
Redislocation rate after femoral neck fx.: 30-40%

Redislocation rate after trochanteric fx.: 10-15%
Death within 3 months
Femoral neck fx.

2009  4
2010  18
2011  16
2012  9
After 6 months

- 239 patient (648)
- correct 90
- neck is shortened 66
- redislocation 79

Patient 90 (239) corrected patients are 90% of the overall group. Neck is shortened 66% and redislocation 79% of the overall group.
General complications

• Thromboembolism
• Pneumonia, heart failure
• Urogenital infection
• Decubitus (bed sores)

Long-term survival?
„Local” complications

• Redislocation

• **Non-union** (absence of callus formation)

• Migrating pseudoarthrosis

![Diagram of bone with labels](image)

- damaged bloodsupply
- Partial or total head necrosis
Special complications

- Local displacement of the implant
  slipping out / perforation / migration
Local complications

• Pseudarthrosis / non-union
Necrosis of the femoral head

Partial or total
Necrosis of the femoral head
resorption of the neck.
Osteosynthesis or prosthesis?

- Prosthesis implantation is indicated if: the fracture is not fresh (24 hours or even longer)
- reduction has failed
- Occurrence of early or late complications:
  - redisplacement,
  - head necrosis,
  - slipping out of the metal

- Here, in Debrecen, preference is given to osteosynthesis.
- In young patients, up to about 50 years, OS is the method of first choice
Primary hip replacement?

- **Advantage**
  - early weight bearing ability for self support
  - return to normal life
  - one, „definite” solution

- **Disadvantage**
  - higher operation (risk) ~ 15%
  - infection > 5%
  - more expensive
  - transfusion demand
The viable femoral head should remain in the hip, the best place for a hip-prosthesis is on a shelf in the storage.
Typical indication for THR after femoral neck fx.

Subcapital neck fx.

Dislocated medial neck fx if it is more than 24 hrs old

Failed OS after hip fx.

Femoral head necrosis - sec. arthrosis
HIP PROSTHESES

Hemiarthroplasty: limited only to the replacement of the fractured femoral head

Total hip arthroplasty: replacement of the head and acetabulum
OSTEOSYNTHESIS OR PROSTHESIS?
History of fracture of the femoral neck

• 1935 Speed: unsolved fracture
• 1935 Pauwels
• 1961 Garden
• 1964 urgent (<24 hr) operation
• 1981 acute (<6 hr) operation
• 2013 solved fracture?
OS or HIP replacement?

- Age of the patient?
- Blood circulation of femoral head?
- Quality of bone?
- General status of patient?
- Mental status of patient?

No evidence based prospective studies!!!
20-25 % of patients die in the first year (over 80 y > 90 %)

Mortality rate of primarily prosthesis > OS

Early ability for self support is higher after prosthesis implantation.

Best chance for good results of OS:
- Minimal invasive technique
- More stable OS /blade?/
- Urgent surgery (within 6/24 hours)

No of patients shows a tendency to further increase!
TROCHANTERIC FRACTURE:

- necrosis of the femoral head occurs only in 5 %
- blood loss is more expressed.
  Blood transfusion is more frequently required
- full recovery occurs in 3 months
- complications are observed „only” in 15 %
Fx. proximal femur, AO classification

A1: Stable
   Intertrochanter

A2: Instability of med. wall
   Pertrochanter

A3: Multiple instability
   Subtrochanter
Clinical symptoms

• Painful hip region
• Shortening (of the affected extremity)
• External rotation
• Inability to walk or weight bear

• Symptoms and diagnostic steps are similar to those of femoral neck fractures
Diagnosis of hip fracture

= absolut / urgent indication for surgery

hemostatus, fluid status, heart function coagulopathy

24 hs
Per- subtrochanteric fx

- Fix angled plates (95 - 130 - 140°)
- DHS (130 – 150°) DCS (95°)
- AS plates (± hook)
- Singles screw
- Double screws
- Blade (125 - 135°)
Loading arm (a)
Plate and nail
DCS – DHS Plate
Fix angled plates

- Young patient
- 130-135° or 95° cd angles
- Maximally invasive
Trochanteric nails

- Biomechanically better
- Minimally invasive
- Rotational stability
- Dynamic sliding effect
Hasonló elv – különböző megvalósulás

Gamma

Fi

Targon

PFNA
Intramedullary nails

PFNA blade

Single screw
Approaches

4+4+2 = 10 cm

IM nail

DHS
Prognosis of trochanteric fx:

• Blood supply of bone is excellent/good
  • Transfusion required

• Soft tissue coverage of the region is good

• 10-15% or more overall complication rate
  • Nonunion, cut out, septic complications, head necrosis
General complications & problems of rehabilitation are similar to the problems of femoral neck fx.
Girdlestone hip:

5-10 cm shortening
Limited active flexion

but

Stable
Painfree
Safe
3 months later
Take home message

Hip fx are the most frequently operated fx everywhere

Osteoporosis is the silent murderer.

Problems of femoral neck fractures originate in the unusual blood supply of the femoral head. There is an overall 50% chance for head necrosis.

Trochanteric fx. have ~ 15% complication rate.

Old /unstable patients need urgent & minimally invasive surgery.

Hip fx. require team work of all health care and social systems.