

**M U N I**  
**M E D**

# **Prosthetics**

Field, its essentials and use in practice





MUNI  
MED





**Acknowledgements to assoc prof Zdenek Rozkydal & assoc prof Ivan Muller  
for database**

# Orthopaedic Prosthetics

- Medical and technical production
- Distribution of rehabilitative care

# Orthopaedic Prosthetics

- Proteometry – gets data for the design, production and application
- Prosthetics - the doctrine of replacement of lost parts of the body and function
- Orthotics - the doctrine of replacement of the lost functions of the body
- Epitetics - the doctrine of cosmetic covering of part of the body
- Kalceotika - the doctrine of orthopedic footwear
- Adjuvatics - the doctrine of operator aids



# History

21st?



# Proteometry

- History with a focus on social and work history
- Clinical examination
- Kinesiological analyses (GROSS a spol. 2005).
- Anthropometric examination
- Kartezian planes:
  - 3D, frontal, sagittal, transversal
  - orthopedic somatometry (base points, limb length, measuring sheets)

# Protetika

doctrine on the replacement of lost body parts

## □ Prothesis:

□ Replacement: body parts and functions

□ Requirements:

statics, dynamics, controllability  
durability, aesthetics

□ Construction:

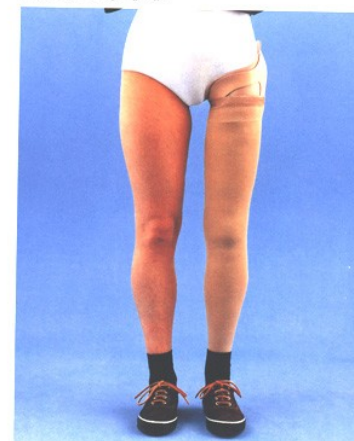
Stump bed  
Module (thigh, leg, leg, joint)  
Auxiliary parts: bandages, stools



Kurz- Oberschenkelstumpf



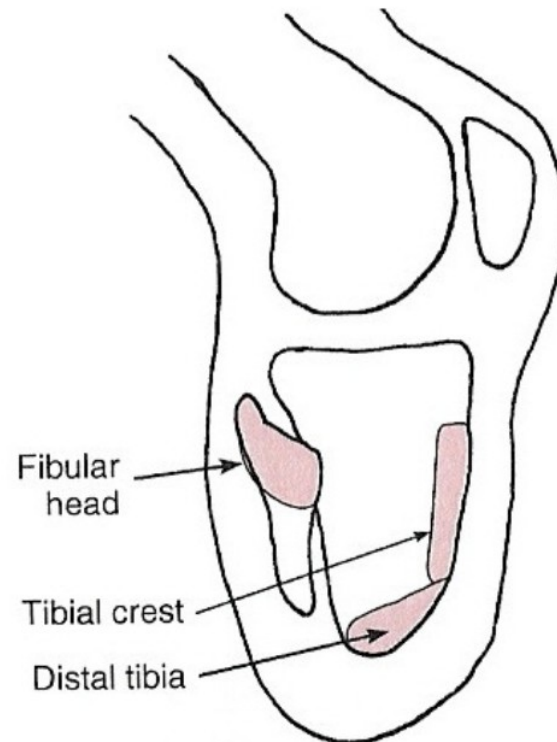
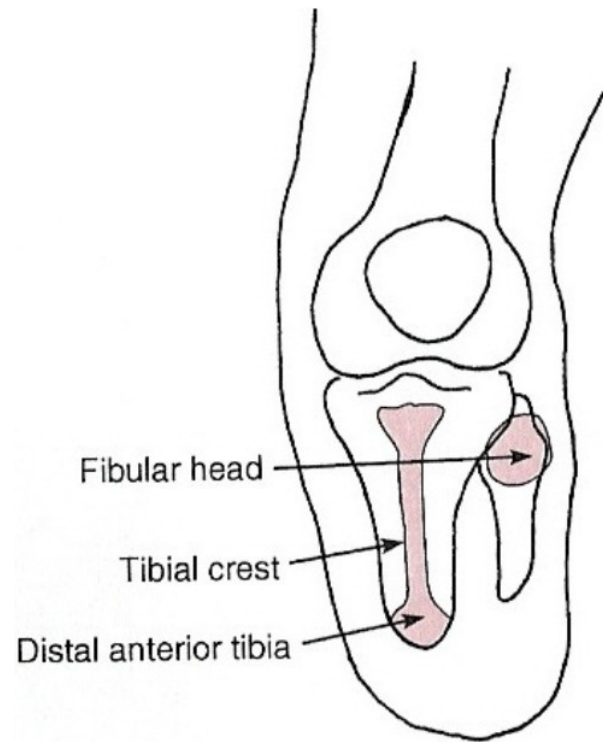
□ Zum Anziehen der Prothese wird der Stumpf mit Hilfe eines Trikotschlauch in die Stumpfhalterung eingezogen



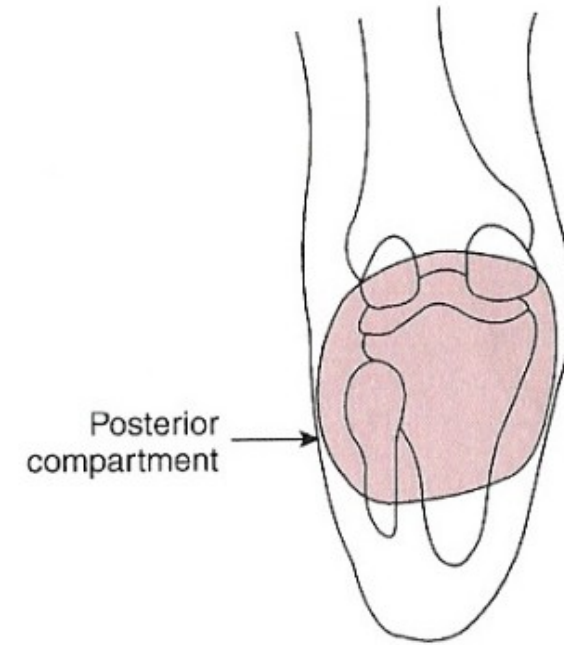
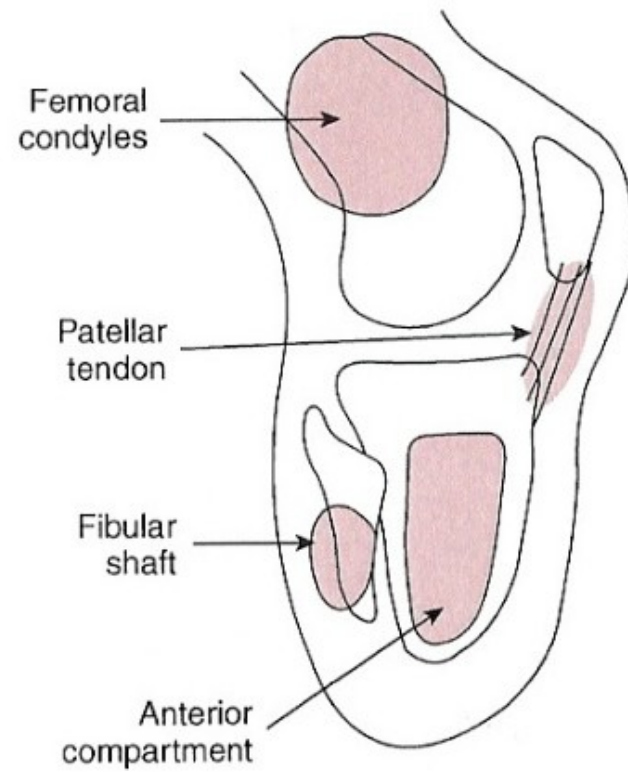
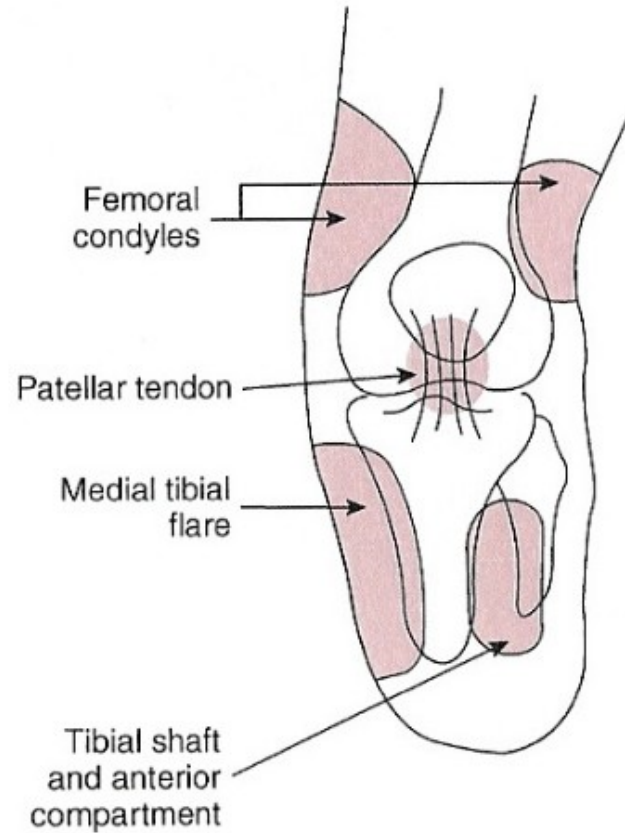
# Protetika

Construction – stump bed

## Intolerant

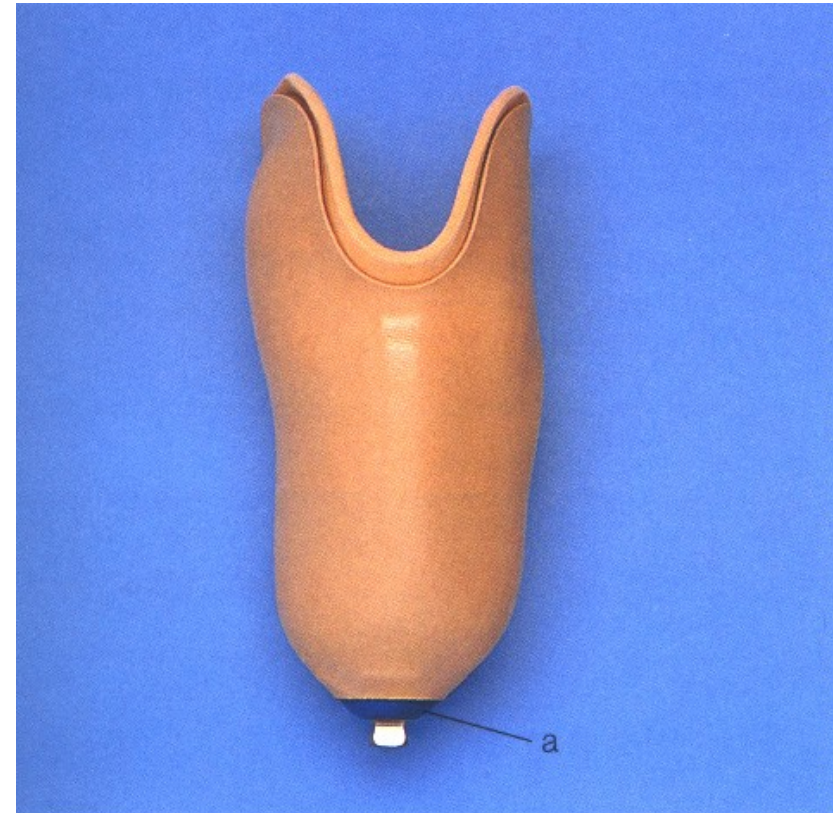
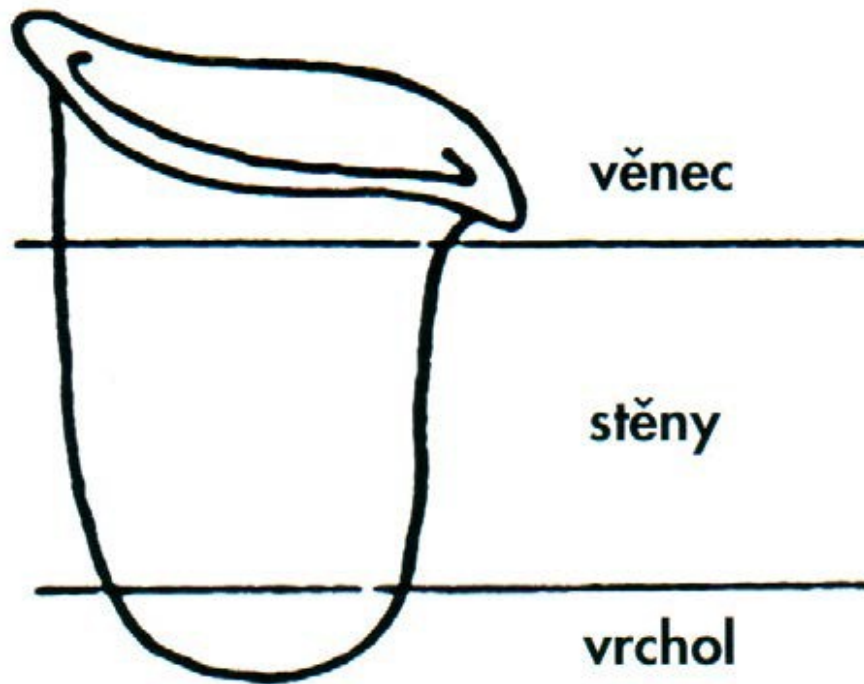


# Transtibial: PTB Weightbearing



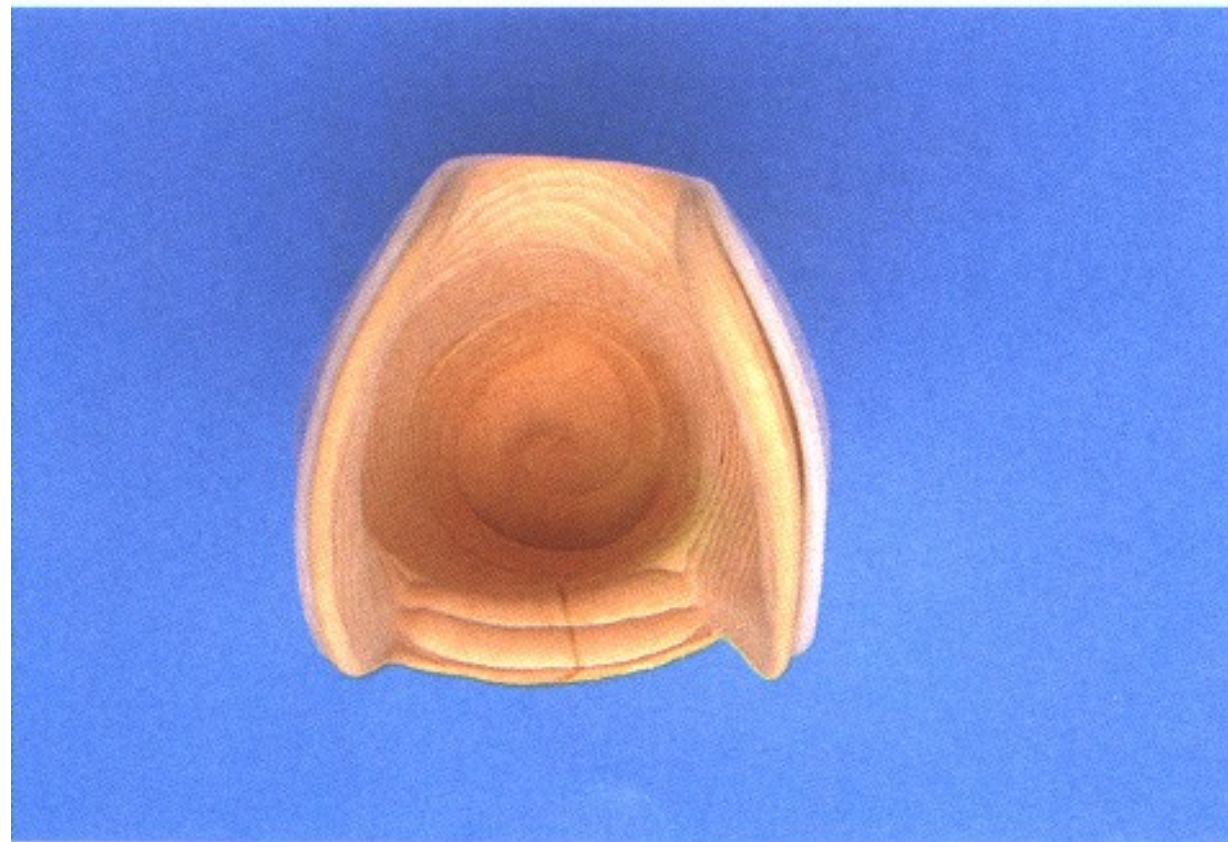
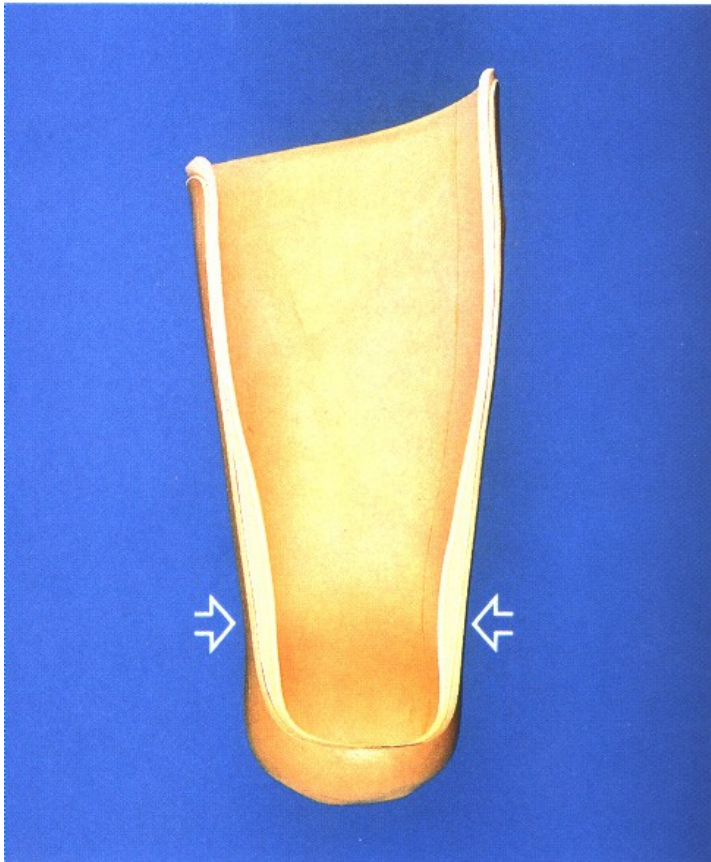
# Protetika

Construction – stump bed



# Protetika

Construction – stump bed



# Protetika

Construction – stump bed

## Interface material

- **Hard socket with ply socks or nylon**
  - **Themoplastic**
- **Gel Liner**
- **Soft inserts**
  - **Pelite (foam)**





# Protetika

Stump moulding – stump bed



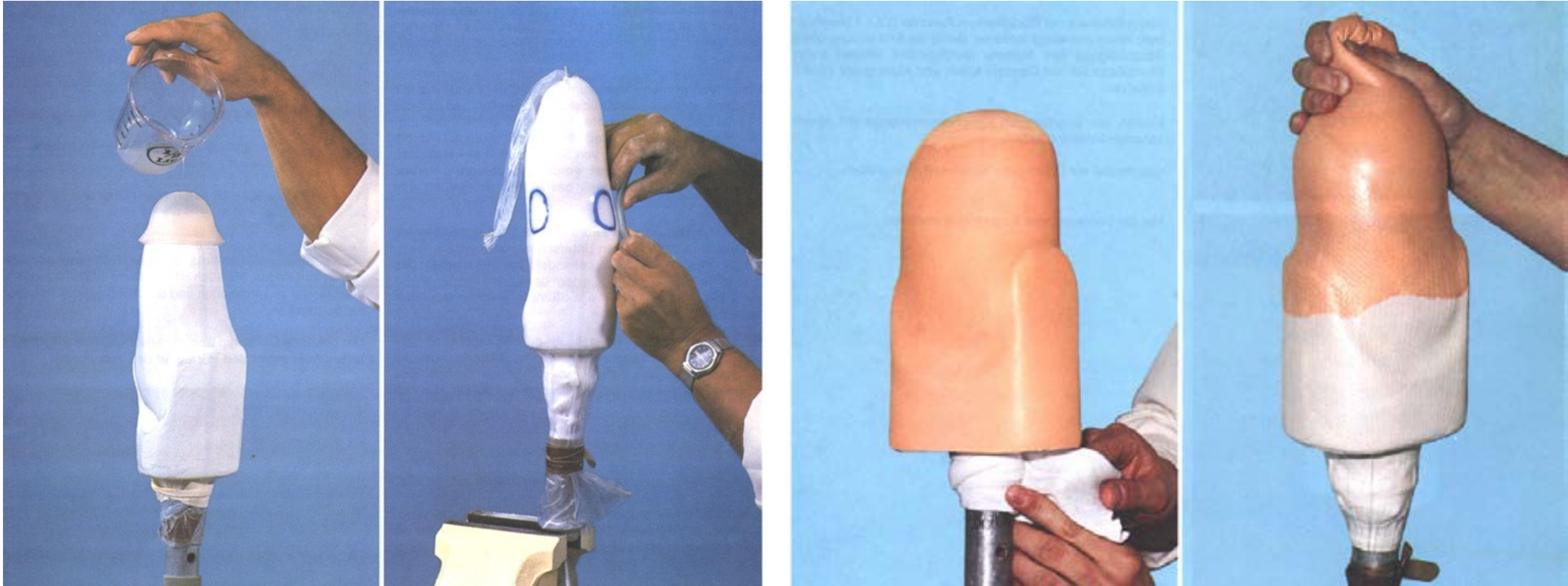
# Protetika

Production – stump bed – negative positives



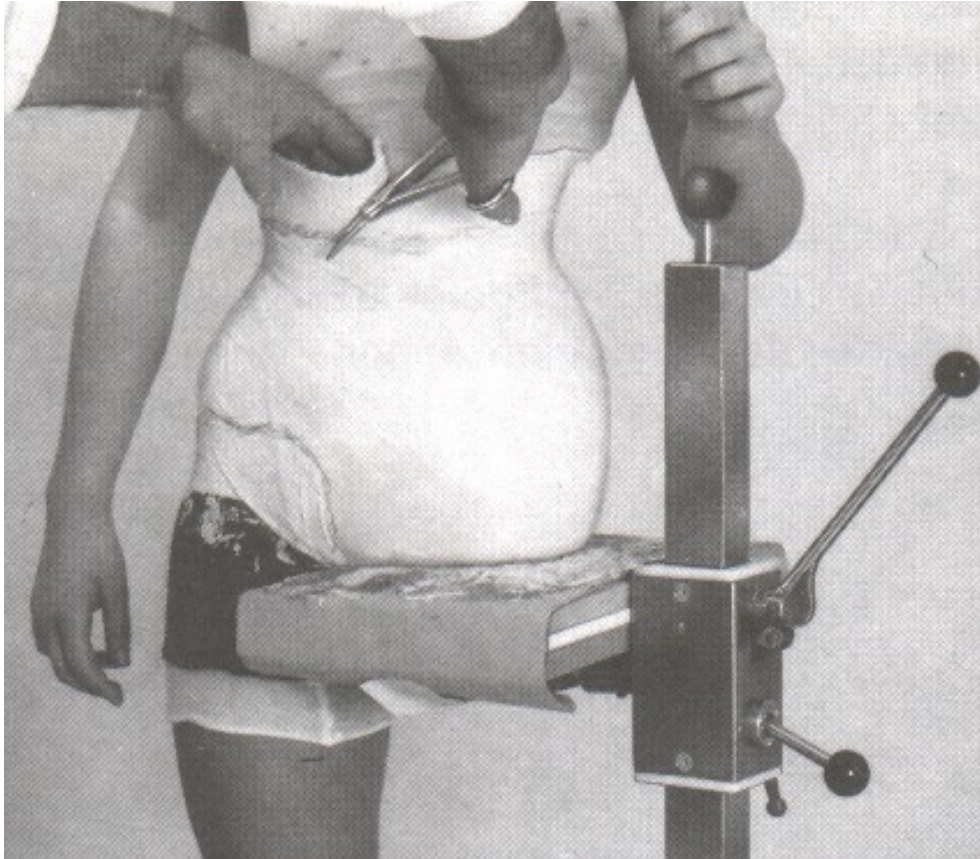
# Protetika

Production – stump bed – silicone/rubber, thermoplastic



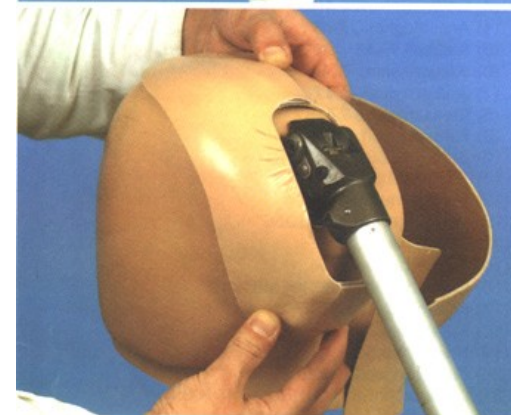
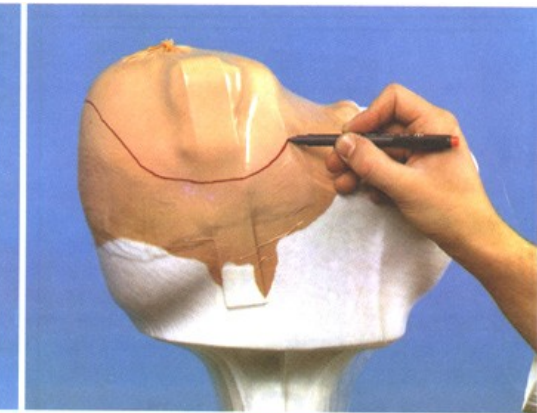
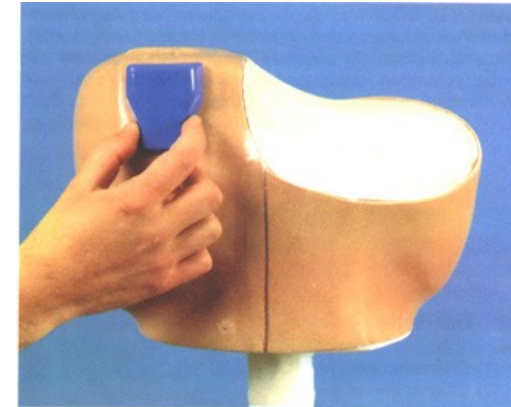
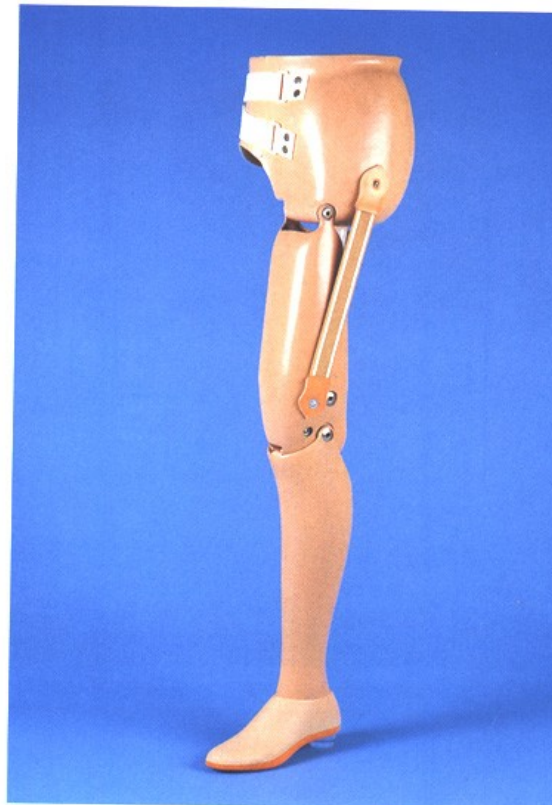
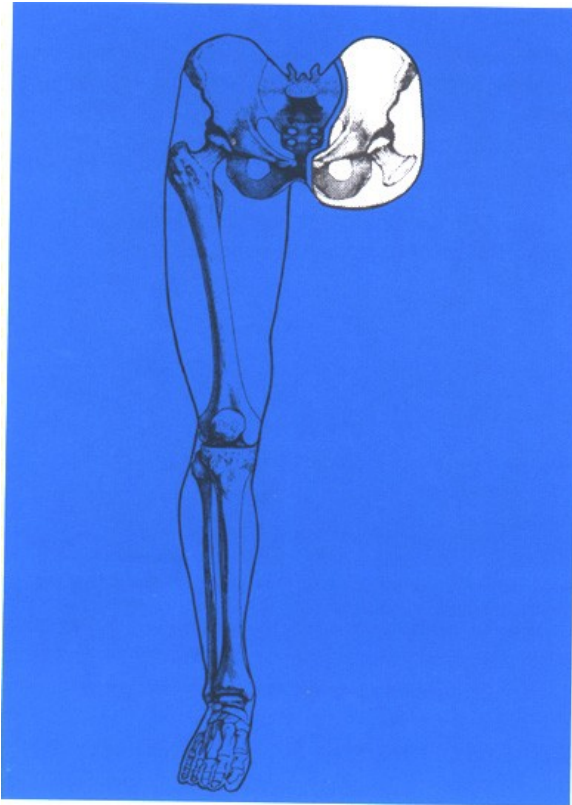
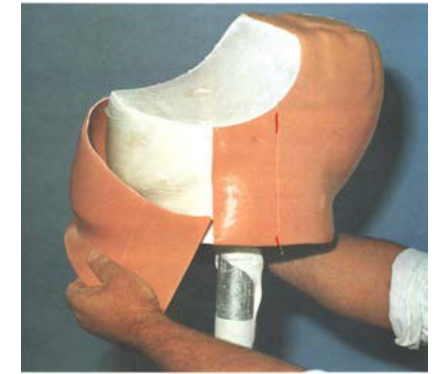
# Prosthetics

Production – stump bed – exarticulation in the hip



# Prothetics

Production – stump bed – exarticulation in the hip



# Prosthetics

Production – stump bed – exarticulation in the hip



(1) Mittellanger Oberschenkelstumpf



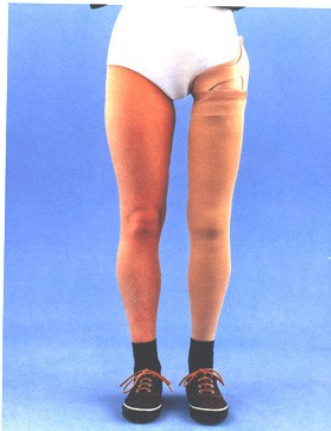
(2) Zum Ansetzen der Prothese wird der Stumpf mit Hilfe eines Trikotschlauches in die Stumpfbettung eingezogen



Kürzer- Oberschenkelstumpf

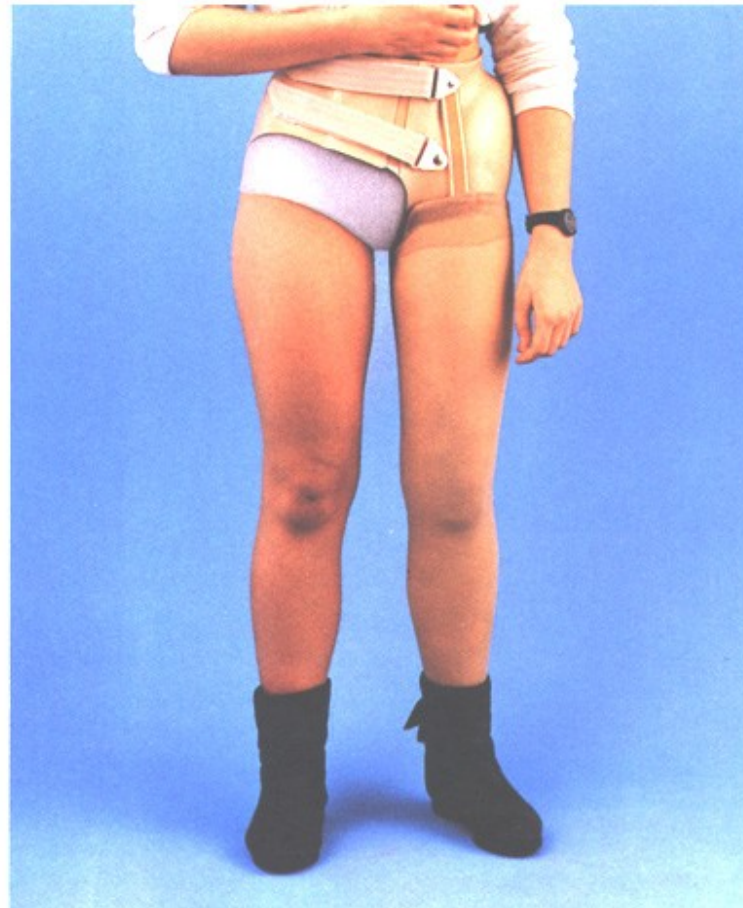


(3) Zum Ansetzen der Prothese wird der Stumpf mit Hilfe eines Trikotschlauches in die Stumpfbettung eingezogen



# Prosthetics

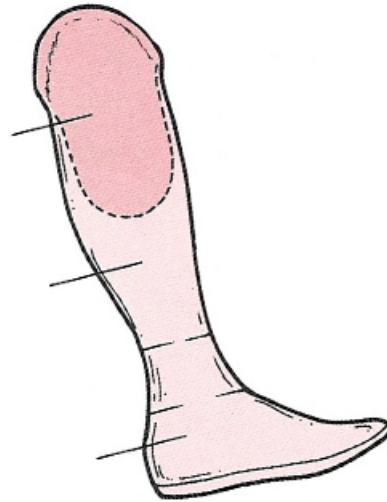
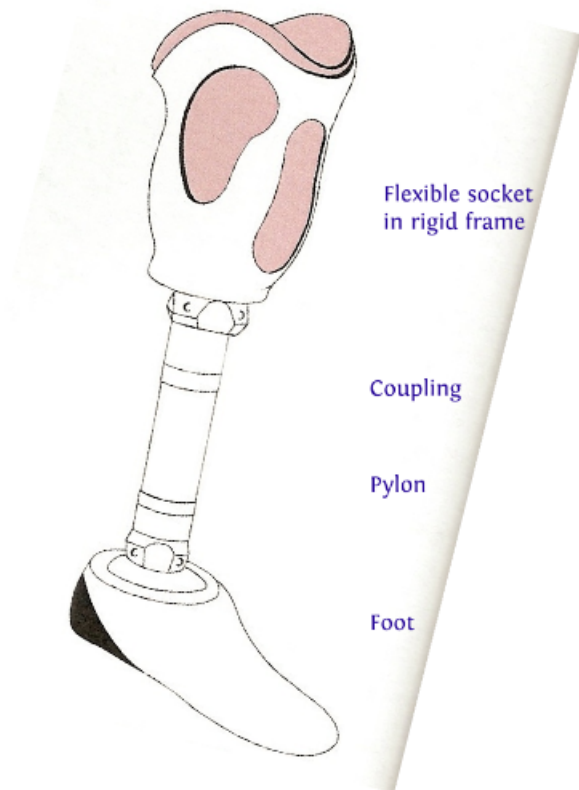
Construction – module



# Prosthetics

Construction Module

## Endoskeleton



## Exoskeleton



# Prosthetics

## Rehabilitation

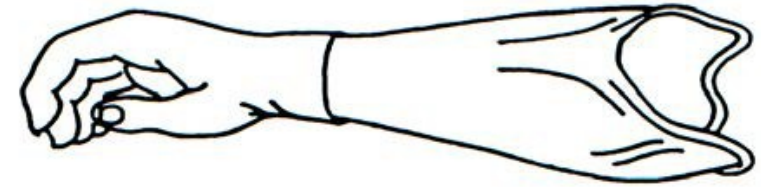
- Training the seat
- Proprioception
- Work out
- Coordination of movement
- Walk
- Stay in the inpatient department
- 



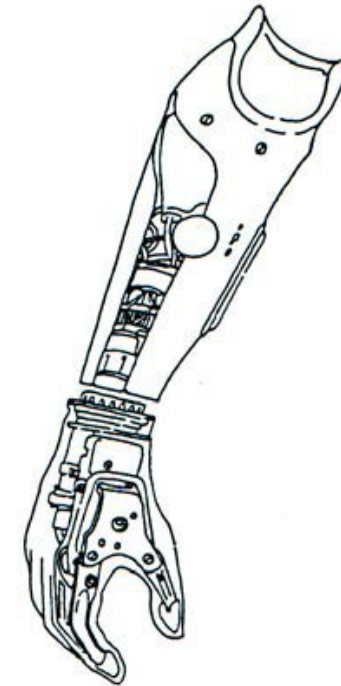
# Prosthetics

## Prosthesis of the upper limb

- Cosmetic
- Cosmetic with mechanical hand
- Bioelectric prosthesis



Obr. 24-5: Předloketní kosmetická protéza

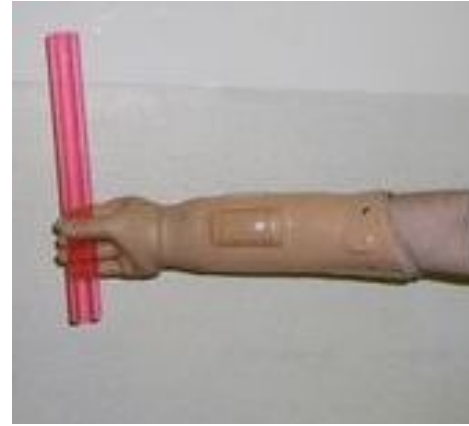


Obr. 24-6: Moderní předloketní myoelektrická protéza

# Prosthetics

Prostheses of the upper limb

- Cosmetic
- Cosmetic with mechanical hand
- Bioelectric prosthesis



# Orthosis

doctrine on the replacement of lost body functions

- Weakened or lost function

- Brace:

- serial or individual

- torso or limbs

# Orthosis

doctrine on the replacement of lost body functions

## Static:

- Solid without movement, relieve pain, stabilize the limb

## Dynamic:

- Controlled movement, replace lost or weakened functions of muscles and joints

# Orthosis

And parts of them

- Splints
- Joints
- Calipers
- Strokes
- Pelotons
- Auxiliary parts (sleeves)
-

# Orthosis

doctrine on replacing lost body functions

- Brace:**

- serial or individual
- torso or limb
- fixation (restrict movement)
- corrective (adjusting position)
- extension (straightening the limb)
- leveling (mechanical length)
- support (reliever from load)
- for work

- Dynamic**

- Static**

# Orthosis

## Upper limbs

### Finger brace

- Dynamic: Flexible strokes
- Static

### Wrist/forearm:

- Rigid
- Semirigid

### Forearm:

- epicondylitis
- elbow





# Orthosis

Upper limbs

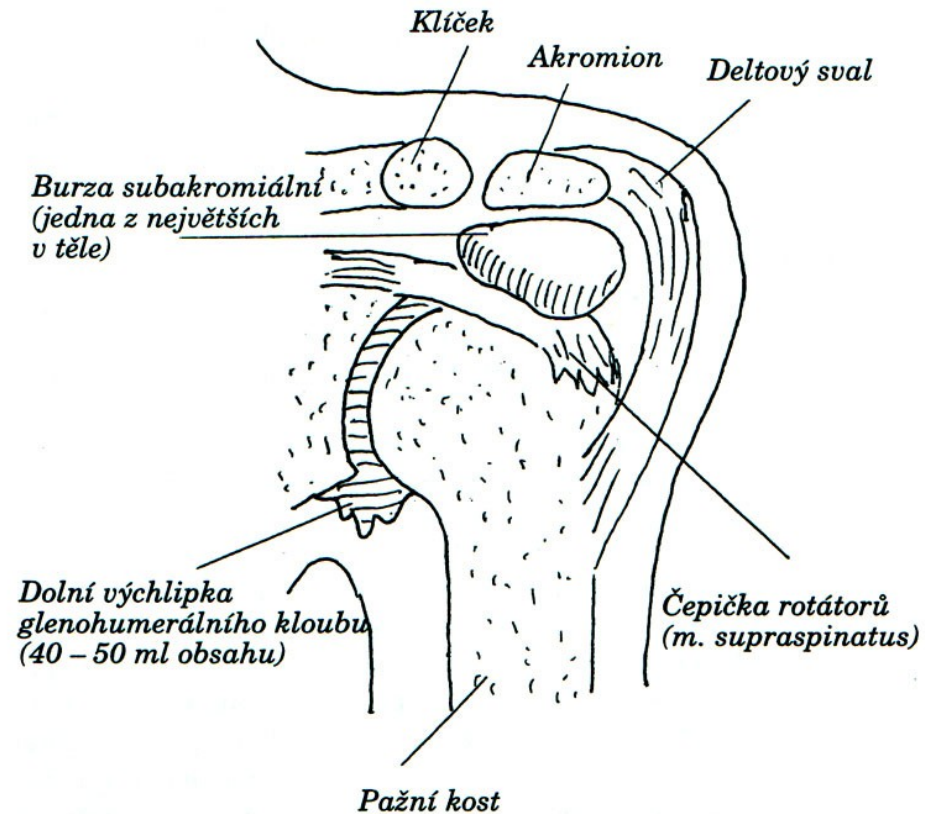


# Orthosis

## Pain shoulder syndrome

- Tendosynovitis capitis longi m. bicipitis brachii
- Rupture of the tendon long head of the biceps
- Bursitis subacromialis
- Tendinitis m. supraspinati
- Rupture of the rotator cuff
- Impingement shoulder syndrome
- Frozen shoulder syndrome
- Arthrosis art. glenohumeralis
- Affective acromioclavicular joint
- Inflammation
- Tumors
- Trauma
- Pain transferred from another place
- Postoperative treatment

Obr. 17 – Schéma měkkého ramene.



# Orthosis

## Shoulder joint

### □ Orthopedic surgery:

- Arthroscopy:
  - SLAP lesions
  - Rotator cuff repair
  - SA decompression
- Endoprosthesis:
  - hemiarthroplasty
  - Rev TSR
  - TSR
- Traumatology:
  - ORIF
  - IM nail

### □ Brace:

- Arthroscopy
  - Desault 4 – 6 weeks
  - Abduction orthosis
  - Scarf hinge
- Endoprosthesis:
  - No fixation/DO
  - No fixation/DO
  - No fixation /DO
- Traumatology:
  - No fixation 90% ORIF performance
  - Conservative Therapy: DO/AD
  - Individual orthosis and splints
  - Scarf hinge

# Orthosis

## Shoulder joint

### **Desault Orthosis**

- fixation for 4 – 6 weeks
- a) active exercises of fingers, wrists
- b) passive and later active elbow movement
- b1) (arm in internal rotation!)
- c) isometry of arm muscles in the orthosis
- d) adjustment of the posture

### **Abduction splint/orthosis**

- fixation 4 – 6 weeks
- a) active exercise of fingers, wrists
- b) passive and later active elbow movement
- c) modification of the posture

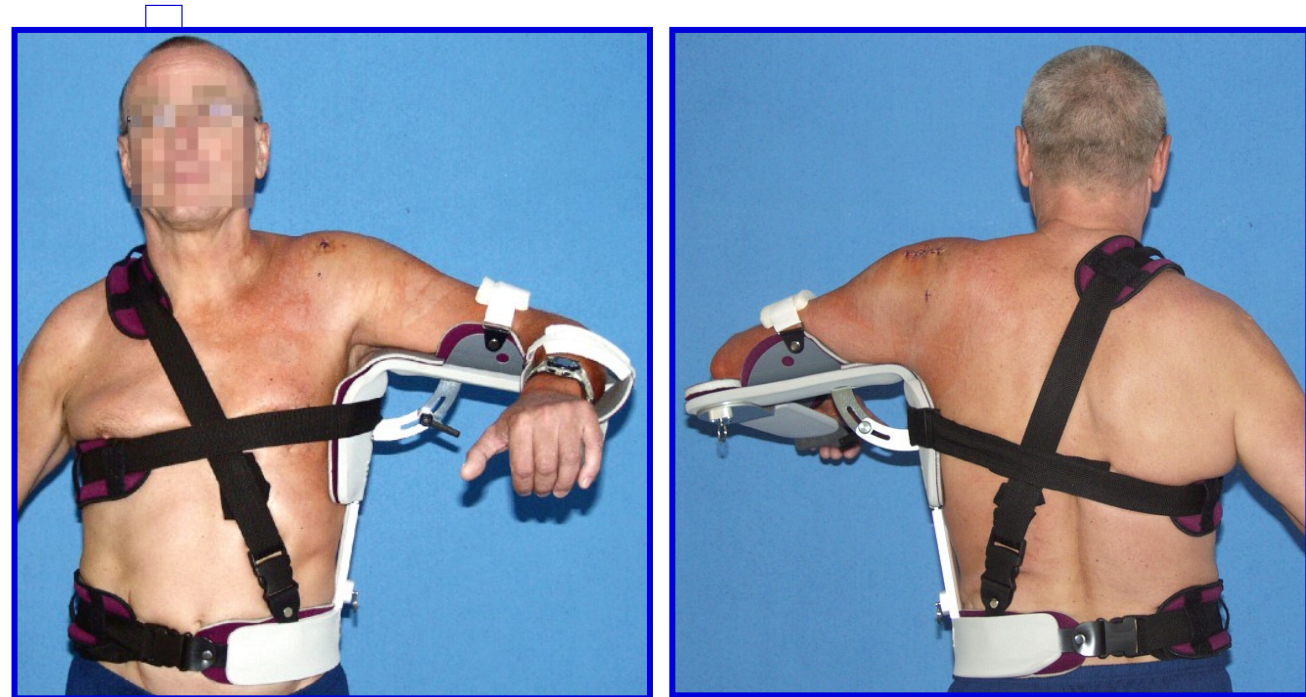
# Orthosis

Shoulder joint

Desault Orthosis



Abduction splint/orthosis



# Orthosis

Shoulder joint

Desault Orthosis



Abduction splint/orthosis



# Orthosis

Pierre-Joseph Desault

## □ Pierre-Joseph Desault

- 6 Feb 1738 – 1 June 1795
- France
- Anatomy/surgeon



FIG. 81. Desault's bandage for fractured clavicle. From: *Oeuvres chirurgicales de P. J. Desault*



P. J. DESAULT,  
1738-1795

FIG. 80

# Orthotics

Lower limb





# TLSO brace

Types and clinical use



# Prosthetics

- Prosthetics - doctrine on the replacement of lost parts of the body
- Orthotics - doctrine on the replacement of lost body functions
- Epithetics - doctrine on cosmetic cover of the body part
- Kalceotika - doctrine of orthopedic shoes
- Adjuvatics - doctrine of aids
-

# Korzetoterapie

- Stop/mitigate the progression of spinal deformity
- Maintain steady position of the fuselage
- NMS sometimes questionable and problematic

# Differential diagnosis of pathologies

etiology: physical, chemical, biological and in particular genetic and multifactorial

Trauma  
Radiotherapy  
Postural  
Laminectomy

Osteoporosis  
Osteomalacia

Achondroplasia,  
Mucopolysaccharides  
Oncology  
Infectious causes  
M Bechterev  
M Scheuermann

## PHYSICAL INFLUENCES

Injuries  
Iatrogenic causes  
Faulty posture  
Muscle dysbalance

## CHEMICAL INFLUENCES

Hormone/Corticoid Therapy  
Menopausa

## BIOLOGICAL INFLUENCES

Genetics  
Combination of influences  
Congenital kyphosis – disorders of  
segmentation and formation  
Neuromuscular kyphosis  
Degenerative changes

# Conservative treatment of trauma

A) Rest

B) Collars:

- soft/molitan
- Philadelphia



# Conservative treatment of trauma

- rest
- C: Halo traction



# Conservative treatment of trauma

- Rest
- Th fracture: Jewet's brace/TLSO
- Th-L fracture: Jewet's brace, lumbar belt





# Conservative treatment of trauma

Plaster TLSO: not adequate in traumatology these days



# Conservative treatment of trauma



# Corsetotherapy

## Indications:

- Scoliosis: Congenital, Idiopathic, Neuromuscular, Degenerative
- Traumas: primarily, event. postoperative treatment
- Oncology: primarily, event. postoperative treatment

## Degeneration: postoperative treatment

## Objective: stabilization, correction

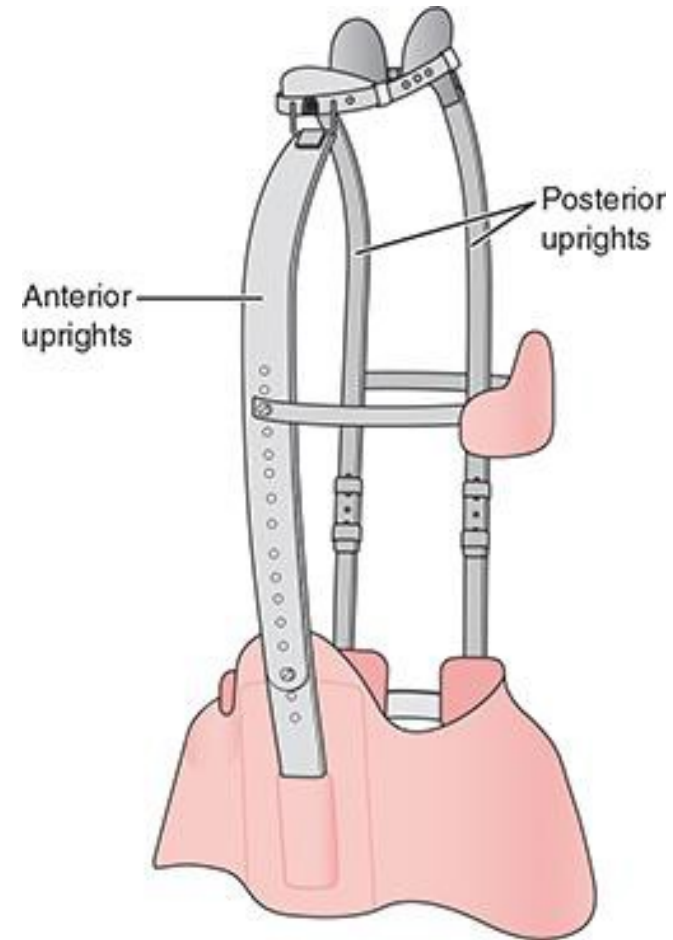
# Principle of three-point fixation

Pelvic belt – neck circle – side pressure pellets

- Primary forces:
  - acts indirectly on the spine through surrounding structures
  - axis: tensile – for deformity in the sense of stretching: pelvis – cervical pelotes
  - sides: pressure – through the rib cage by pressure on the vertebra
  
- Milwaukee Brace
- Thorakolumbosacral orthosis (TLSO)
- Two-part cervikothoracolumbusal orthosis (CTLISO).
- Carlson and Payette (2017) braces supporting sed
-

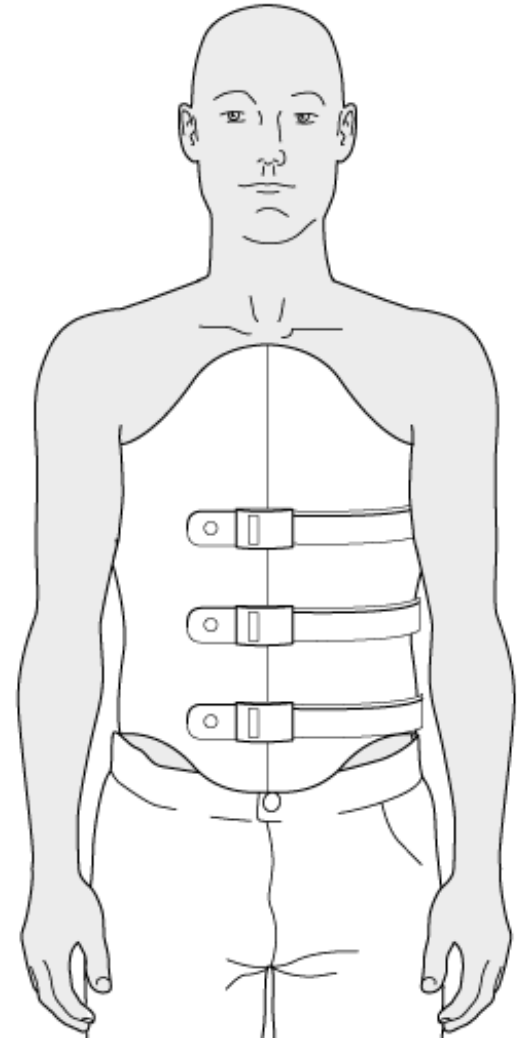
# Principle of three-point fixation

Milwaukee Brace (May & Lockard, 2011)



# Principle of three-point fixation

Thorakolumbossacral orthosis (author unknown, 2018)



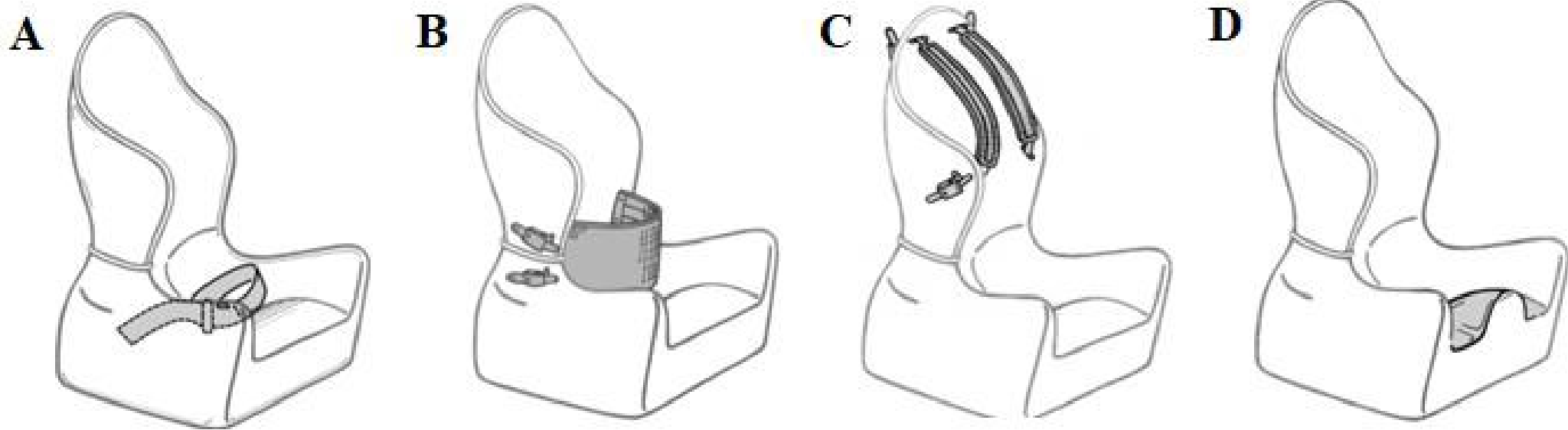
# Principle of three-point fixation

Thoracosocal corset of synthetic material



# Principle of three-point fixation

Sample sit-supporting orthosis supplemented with additional compensatory aids (Carlson & Payette)





# Morbus Scheuermann

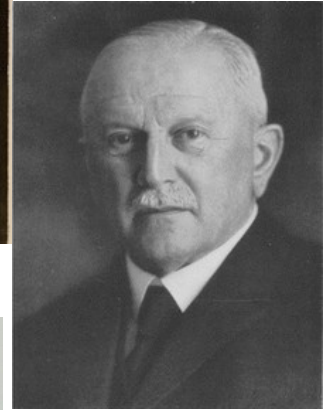
Holger Werfel Scheuermann (1877-1960) - Dánsko - 1920 osteochondritis deformans juvenilis dorsi

- Abnormal increase in lower thoracic kyphosis in puberty with rigidity and typical X-ray changes (ASCANI and co. 1985)
- Disparity between growth hormone production and sex hormones with vertebral fragility (Bradford 1985)
- The cause is not yet fully known
- Genetics/Multifactorial

# Epidemiology and Etiology

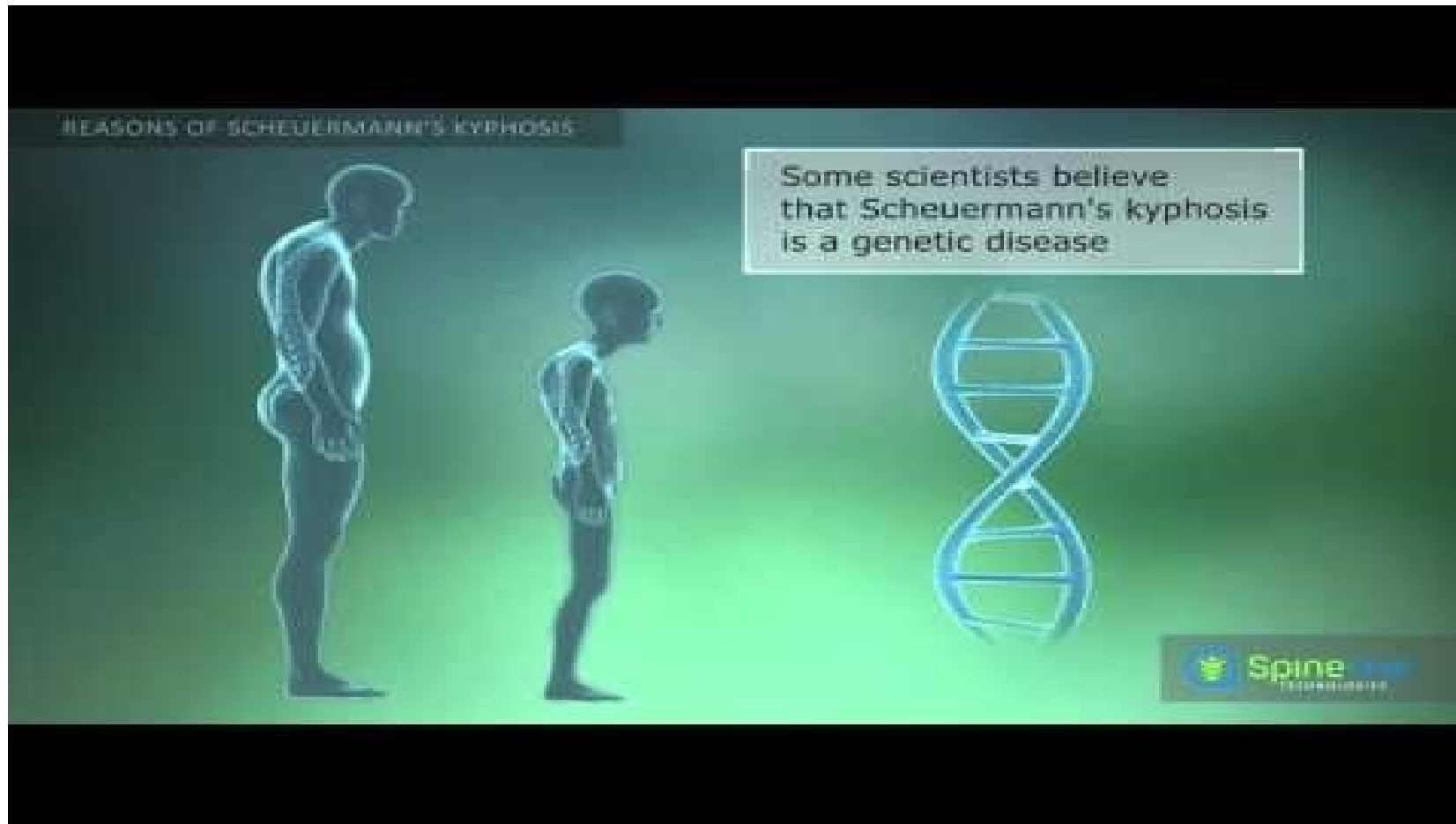
## Morbus Scheuermann

- Aseptic necrosis of the vertebrae (Scheuermann 1920)
- Herniation of discs into vertebrae (C.G. Schmorl 2 May 1861 – 14 August 1932)
- Mechanical overload ("apprentice's back," Mau 1927, Keim 1975)
- Hereditary talents (Sörensen 1964, prof. Vlach a spol. 1990 – 36%)
- Hormonal influences (Ipolito 1981)
- 0.5 - 8 % of the population
- More often boys (but 612, Ž:M 1,2:1; ORTK FN, odb.as.Filipovič 2001)
- Age 12-18 years
- Enchondral ossification disorder
- More often lower thoracic spine
- 



# Epidemiologie a etiologie

Morbus Scheuermann youtube



# Epidemiologie a etiologie

Morbus Scheuermann youtube



# Epidemiology and Etiology

## Morbus Scheuermann in literature

„...autosomal genetic component of high penetrance and variable expressivity, with 74% heredity...“

*Damborg F, Engell V, Andersen M, Kyvik KO, Thomsen K. Prevalence, concordance, and heritability of Scheuermann kyphosis based on a study of twins. J Bone Joint Surg Am. 2006;88(10):2133–2136*

„...Its origin has been associated with avascular necrosis of the epiphyseal rings...“

*Scheuermann HW. Kyphosis dorsalis juvenilis. Orthop Chir. 1921;41:305–317*

„...juvenile osteoporosis...“

*Gilsanz V, Gibbens DT, Carlson M, King J. Vertebral bone density in Scheuermann disease. J Bone Joint Surg Am. 1989;71(6):894–897*

*Lopez RA, Burke SW, Levine DB, Schneider R. Osteoporosis in Scheuermann's disease. Spine. 1988;13(10):1099–1103*

„...shortening of the ischiotibial musculature...“

*Lopez RA, Burke SW, Levine DB, Schneider R. Osteoporosis in Scheuermann's disease. Spine. 1988;13(10):1099–1103*

„...mechanical factors that would trigger secondary remodelling responses, such as reduction of sternal size...“

*Sorensen KH. Scheuermann's Juvenile Kyphosis: clinical appearances, radiography, aetiology and prognosis. Munksgaard; Copenhagen: 1964.*

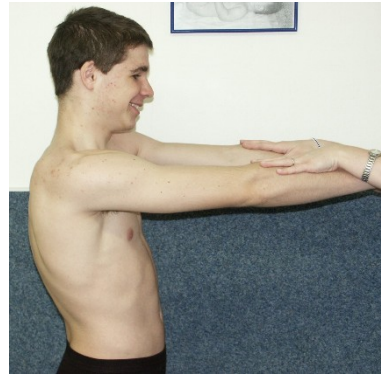
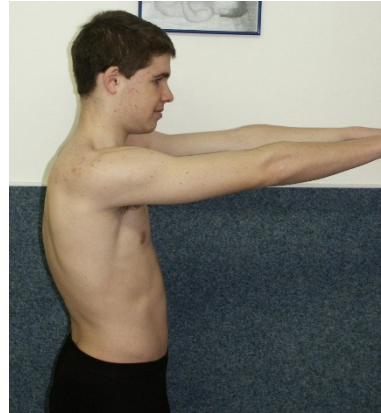
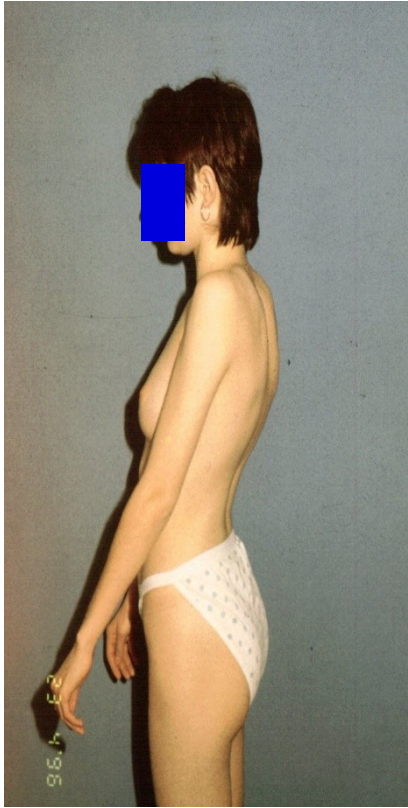
*Ferguson AB., Jr The etiology of preadolescent kyphosis. J Bone Joint Surg Am. 1956;38(1):149–157*

# Clinical examination

- Round back at the bottom t8-9 (48%)
- Thoracic or lumbar spine pain (28%)
- Rigidity of deformity
- Scoliosis in 49%
- Muscle dysbalance "texas attitude"
- Reflective changes in soft tissues
- Positive tests (Matthias, Frank, hyperextion)



# Clinical examination



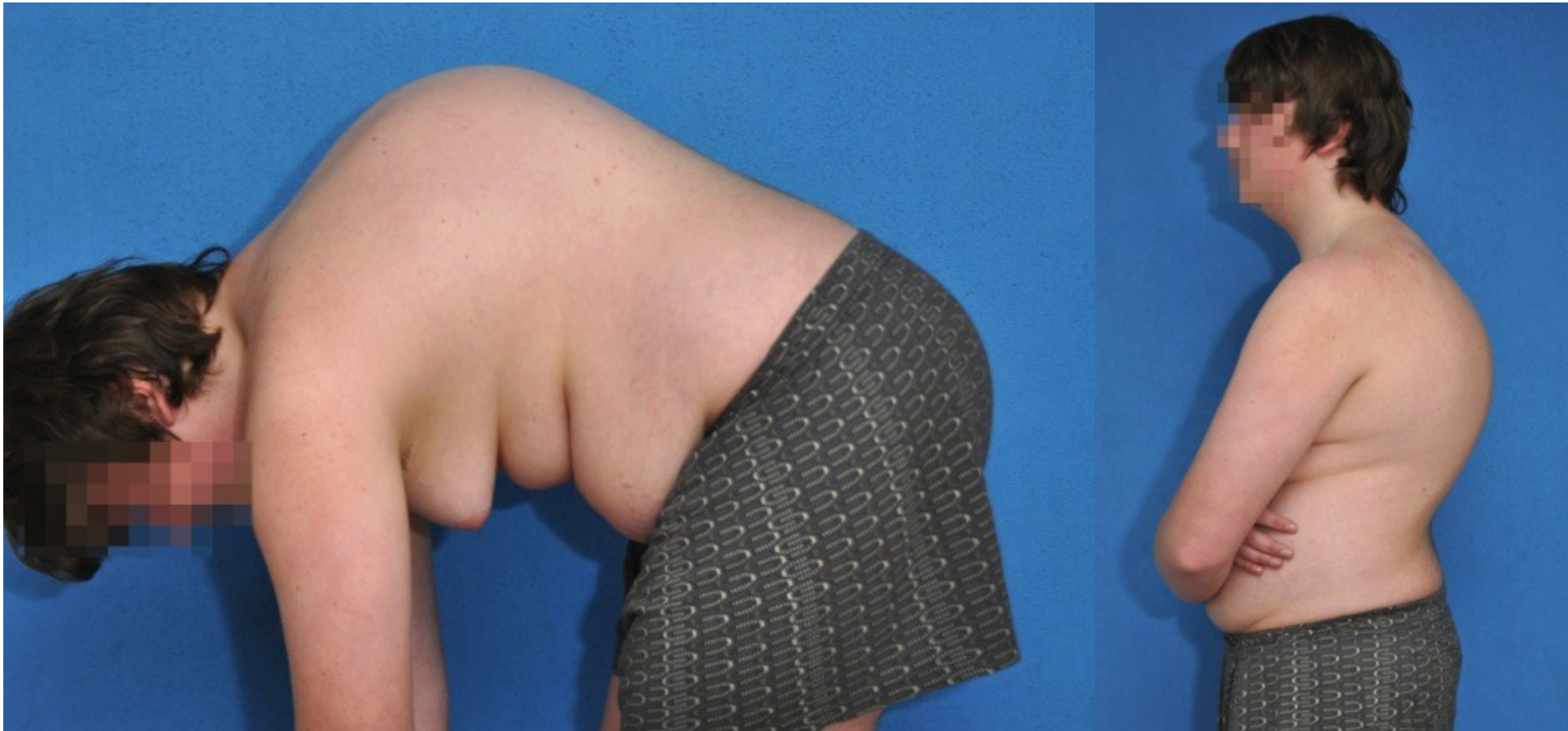
Matthias



hyperextension

Franke

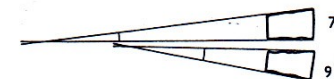
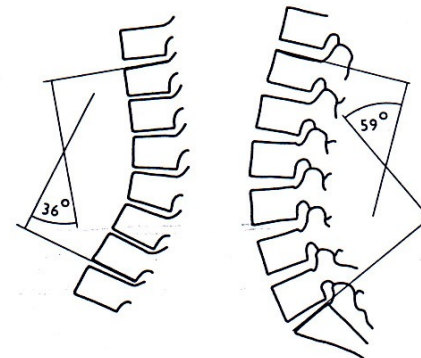
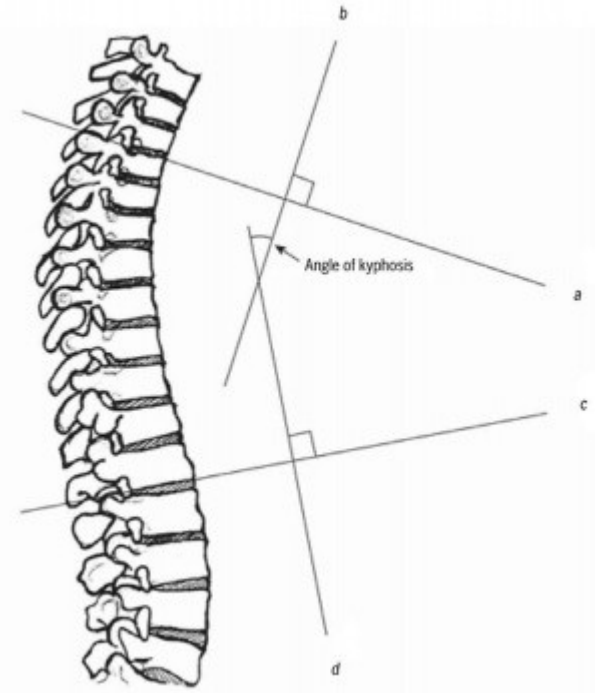
# Clinical examination



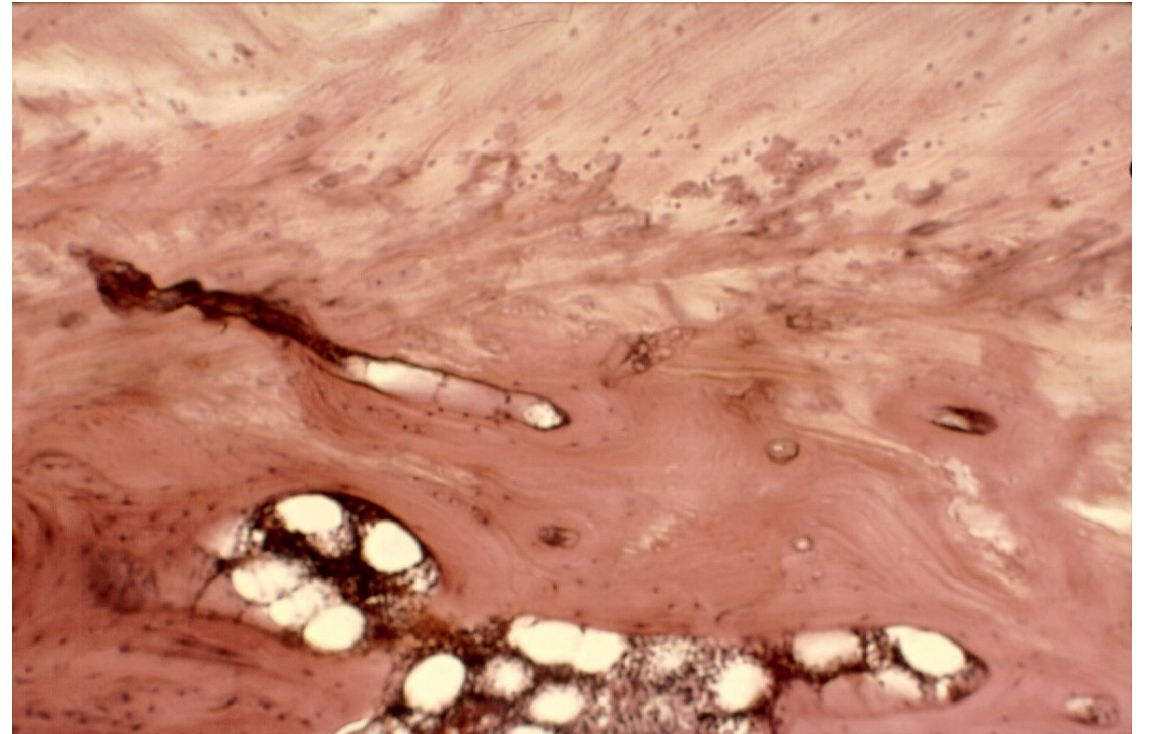
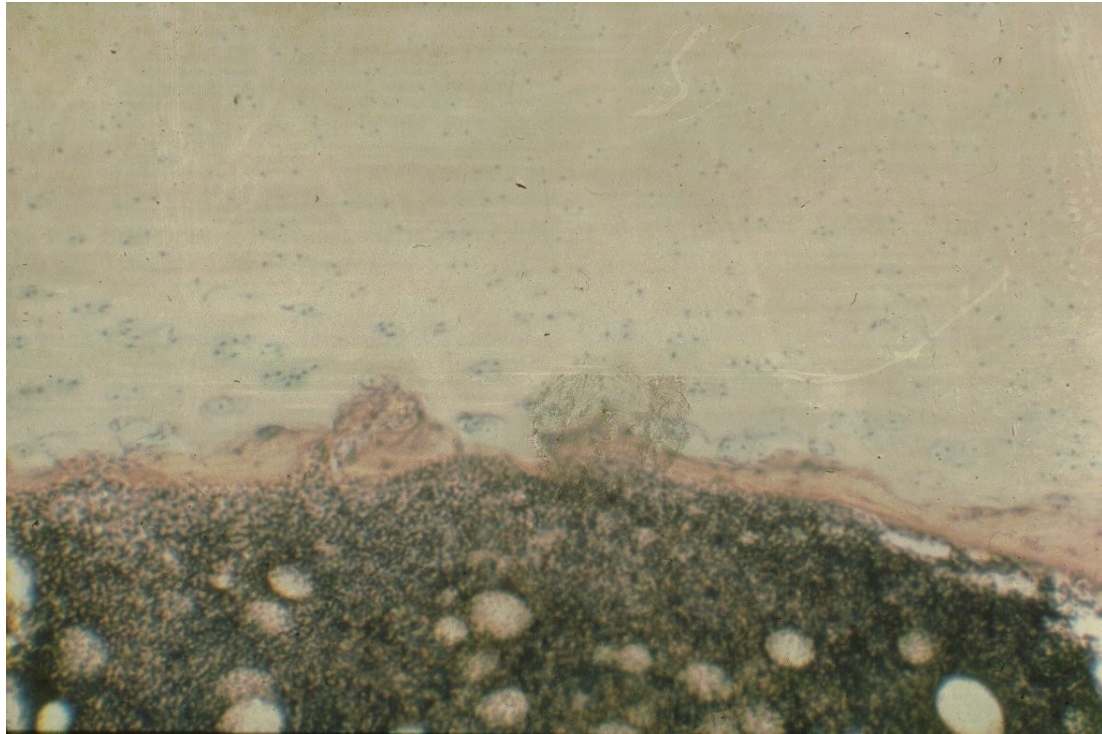


# Morphology

- Histology, X-ray, CT, MRI
- C lordosis, Th kyphosis, L lordosis
- Th kyphosis:  $20^{\circ}$  -  $40^{\circ}$  ( $< 20^{\circ}$  hypo;  $> 45^{\circ}$  hyper)
- Radiological criteria according to Bradford 1985:
- Chest kyphosis above  $40^{\circ}$  according to Cobb
- Vertebral wedges above  $5^{\circ}$  (43% in 3 vertebrae)
- Unevenness of covering surfaces and disc narrowing
- Stretching of vertebral bodies
- Schmorl nodes (up to 42%)

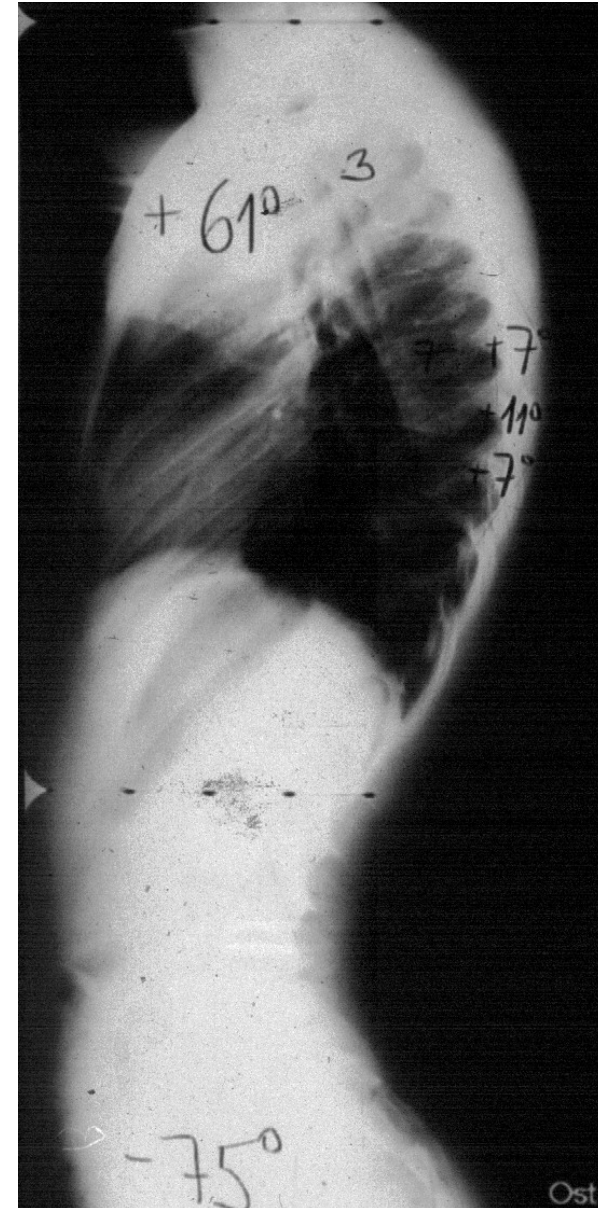


# Histology



# Xrays

- AP + side long formats
- re-evaluation
- We measure:
  - Cobb angle T3/4 – T12
  - reclinacion
  - SVA
  - PT, PI, SS



# CT

- CT - bone window
- fresh Schmorl knot:
  - character of osteolysis
  - around the edge break
  - In addition, STIR MRI
- Differential diagnosis!



# MRI

- old Schmorl's knot:

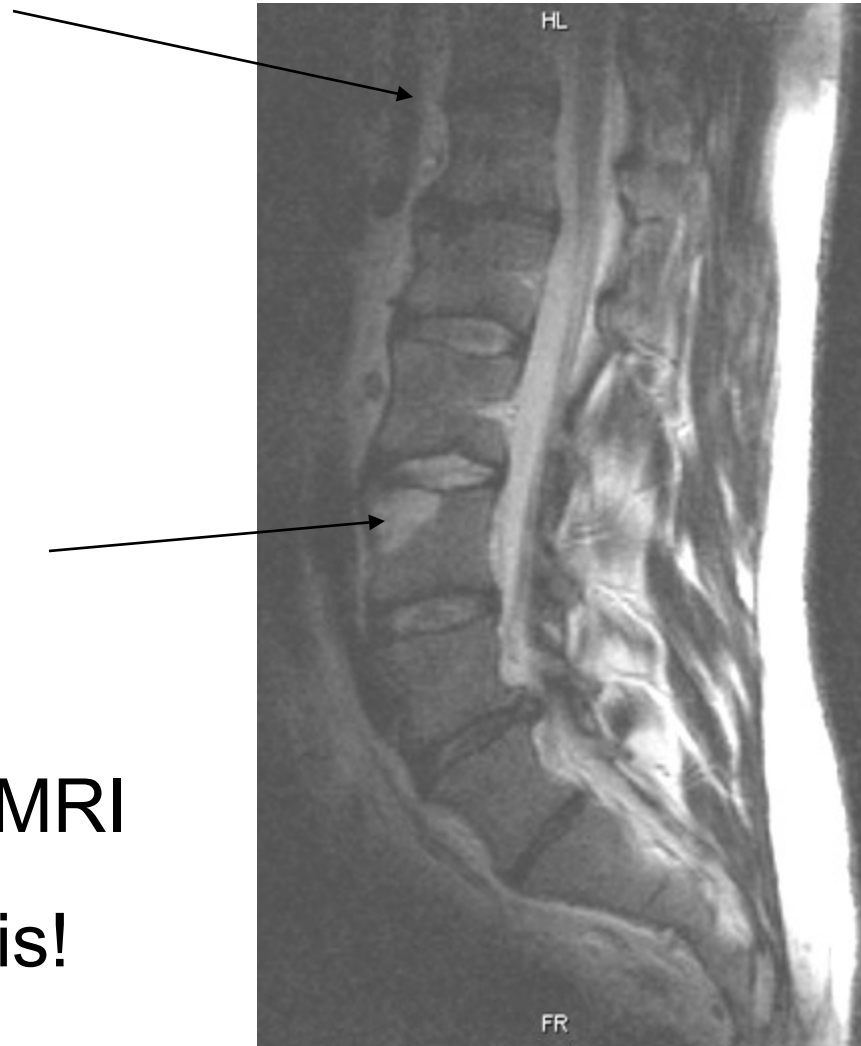
- Consolidated
- Inactive

- fresh Schmorl knot:

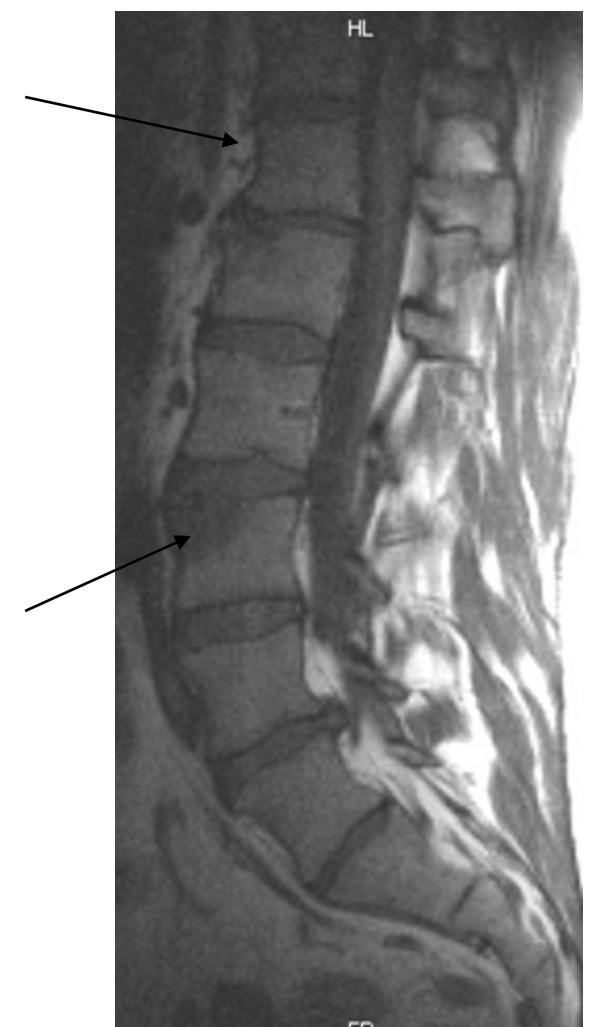
- Character of osteolysis
- around the edge break

- on T2, better STIR MRI

- Differential diagnosis!



T2



T1

# Forms Morbus Scheuermann

Typical and atypical

## Typical:

- Type I: Th spine only: upper type
- Type II: Th – L Gradient: Lower Type
- Affects the transition of Th and L of the spine
- "Lumbar type" Morbus Scheuermann
- fresh Schmorl's knot

## Atypical:

- I. form (vertebrae changes without hyperkyphosis)
- II. form (typical clinic, no significant serious X-ray changes)
- III. form (lumbar localization)

# Stages Morbus Scheuermann

early – deformities - consequences

## Stage I early on set

- 9-12 years, round loose back with pain, muscle changes

## Stage II deformities

- 13-16 years, stiffness, x-ray changes

## Stage III of the consequences

- chronic back pain

# Degrees Morbus Scheuermann

Montgomery 1981

- Grade I – up to 45° kyphosis
- Grade II - up to 55° kyphosis
- Grade III - up to 65° kyphosis
- Grade IV - 75° and up
-



# Therapy

## Conservative

- Exercising
- orthosis and exercises
- antigravity plaster corset  
followed by orthosis and LTV
- "Lyon method" De Mauroy and Stagnar's 1978

## Surgical

- Indications:
  - Absolute:  
neurological deficiency (extremely rare)
  - Relative:  
Rigid deformity above 70°  
Pain  
Cosmetics  
Posterior spondylodesis  
SPO/PSO

# Conservative practices

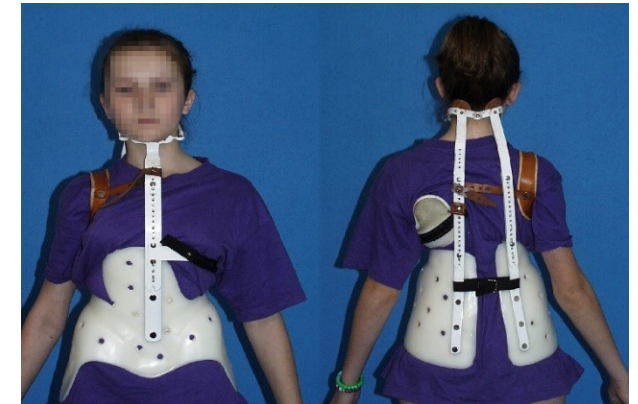


# Conservative practices

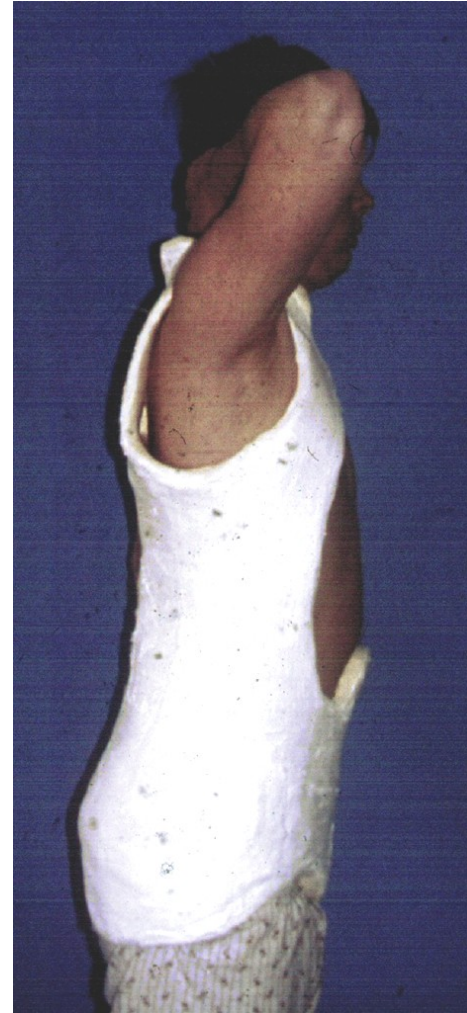
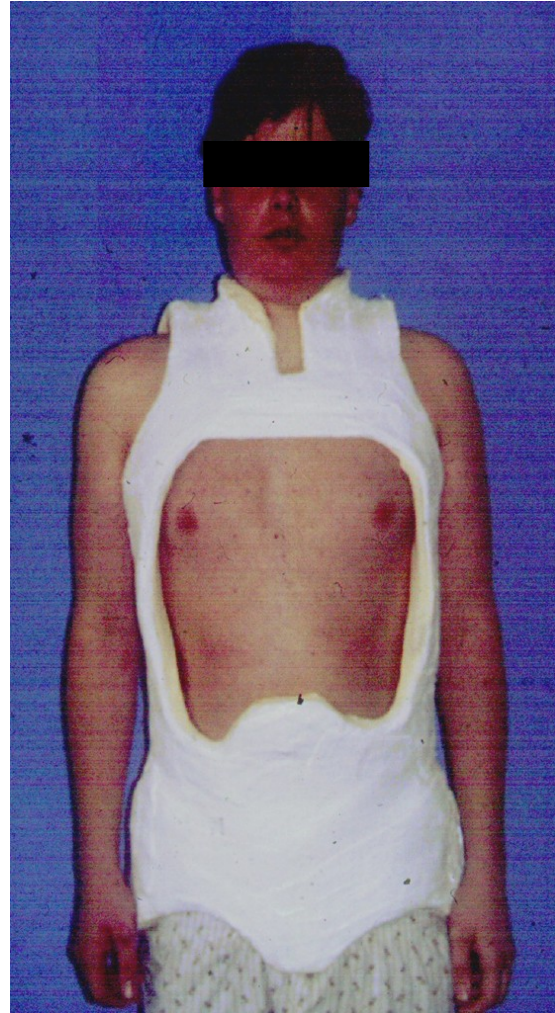
- Exercise + corztotherapy
- Physical treatment
- Stop: competitive sport
- Stop: heavy loads
- NSAIDs, analgesics?
- Myorelaxantia?
- 



Modified Milwaukee Orthosis (Hudeček- Wernio – Nobility 2004)



# Antigravity – plaster - corset



# Rehabilitation and prosthetics

23h/16h night mode, „NO“ night mode, intense, daily exercise

- Exercising
- Physical treatment
- Prohibition of competitive sport
- Prohibition of heavy loads
- NSAIDs, analgesics
- Muscle relaxants
- Anti-gravity brace
-

# Rehabilitation and prosthetics

23h/16h night mode, „NO“ night mode, intense, daily exercise

- Individual LTV + instruction
- Individual + special techniques (Brunkow, Brügger, Klapp and others)
- Group and Motivational (swimming, hippotherapy, dancing)
-

# Rehabilitation and prosthetics

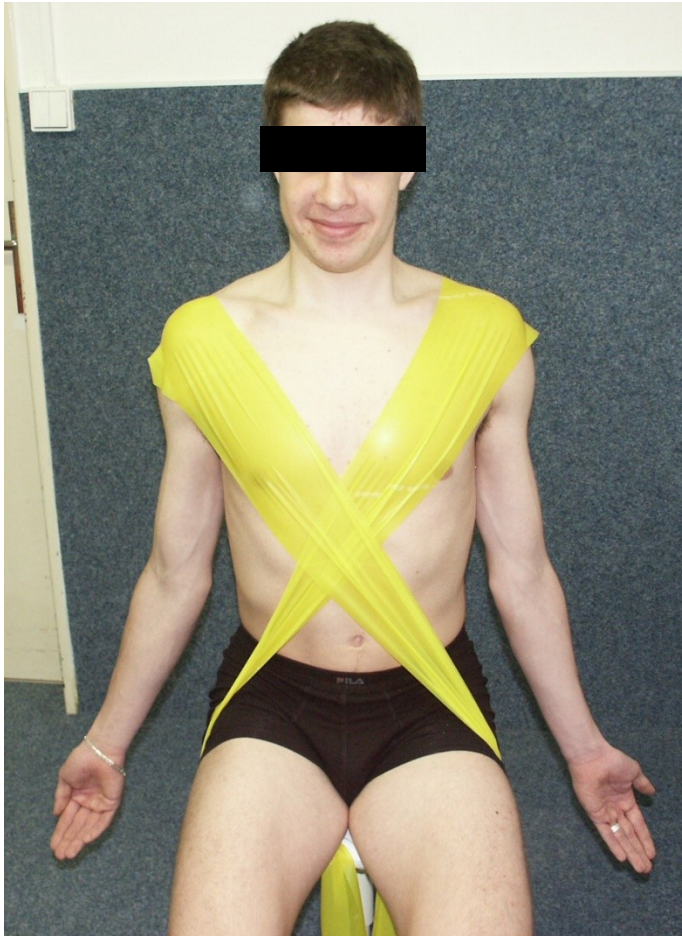
Brunkow



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# Rehabilitation and prosthetics

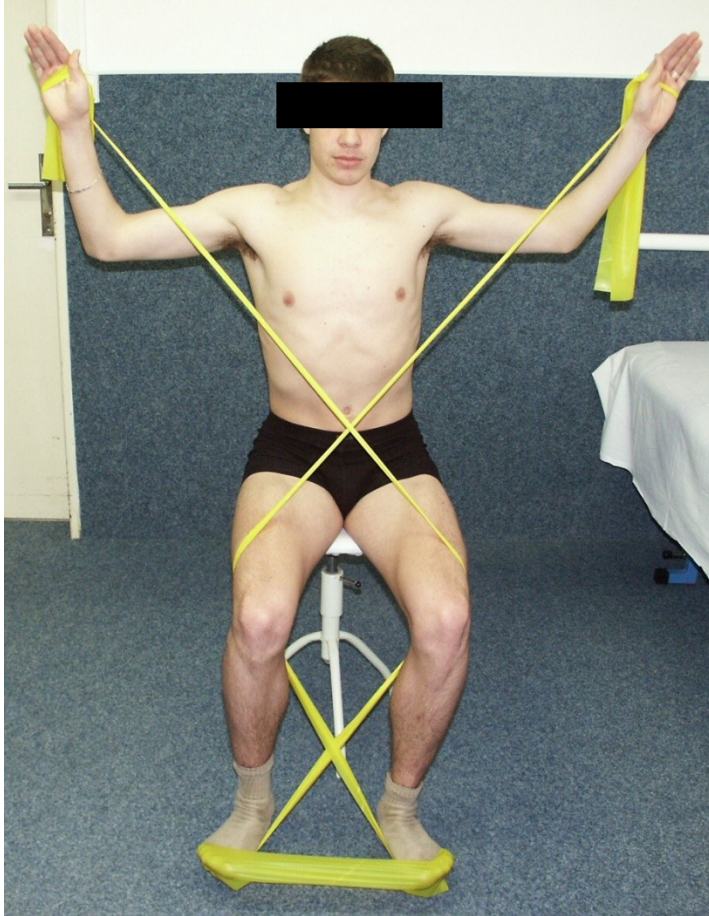
Brügger





# Rehabilitation and prosthetics

Brügger



# Rehabilitation and prosthetics

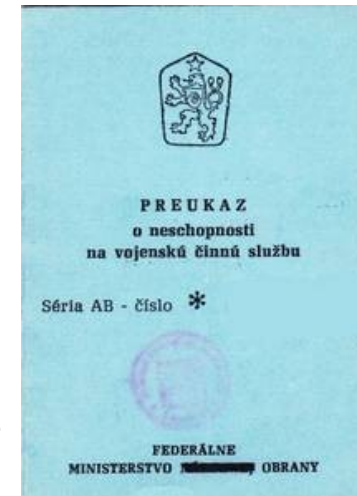
Klapp



# Complications of conservative therapy

Patient and parents

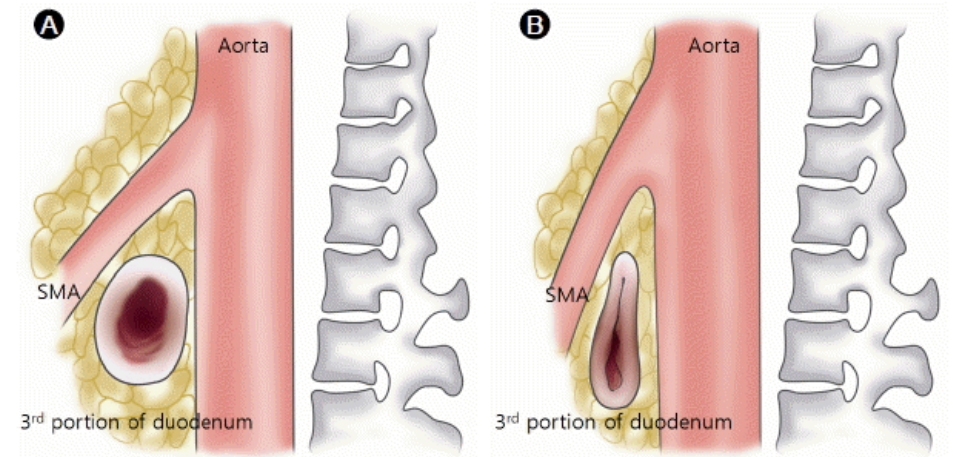
- CAST SYNDROME!!!**
- Care for antigravity corset (exanthema, decubitus)
- Long-term treatment
- Small cooperation in puberty
- Little motivation
- Lifestyle
- Assessment problems:
  - improved with the abolition of compulsory military service
  - the most common cause of the "blue book"



# Complications

CAST SYNDROME = ACUTE CONDITION = THERAPY IMMEDIATELY

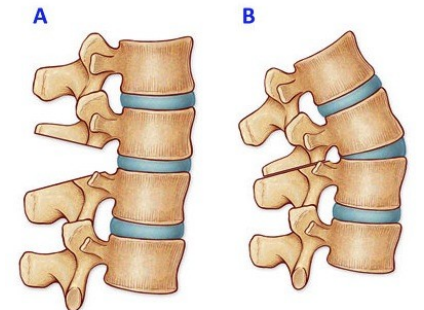
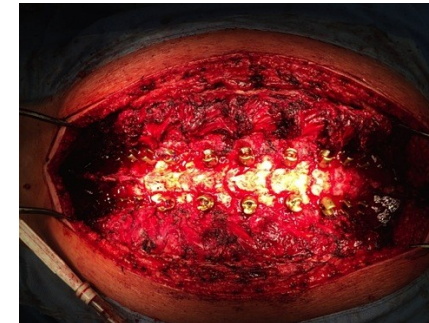
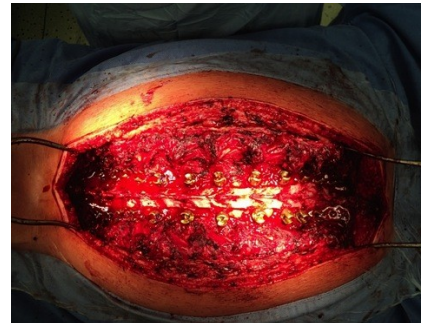
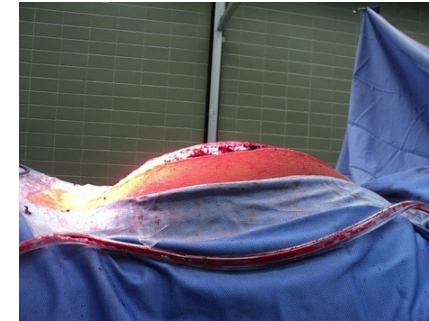
- SMAS= superior mesenteric artery syndrome (mesenteric artery syndrome)
- dilation of the stomach with partial or complete obstruction of the duodenum
- Conservative therapy: castings, plaster corsets, corsets:
- in all patients with mesenteric artery syndrome
- NSG (nasogastric decompression), pharmacological treatment: Metoclopramid i.v.
- Positioning: left, knee-to-chest position or Goldthwaite maneuver
- Enteral nutrition using a double lumen tube, soyurally guided distal to obstruction under fluoroscopic assistance
- Surgical therapy:
- Failure of conservative treatment = surgical intervention:
- duodenojejunostomy or gastrojejunostomy to bypass obstruction or duodenal derotation altimeter
- mobilization of duodenum by laparotomy or laparoscopy
- duodenojejunostomiestomy rarely
- Pathophysiology:
- compression of the duodenum between the upper mesenteric artery forward and the aortic and spine at the back.
- obstruction may occur within a few hours to days after surgery or casting or plaster corset or may not develop for several weeks.



# Surgical treatment

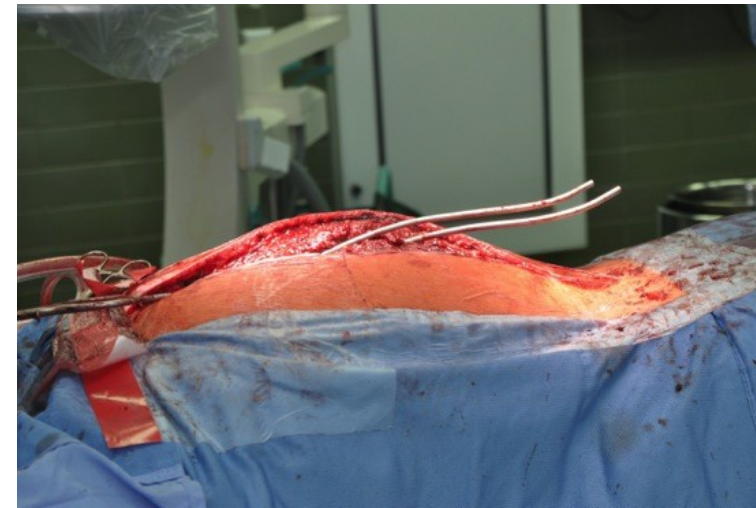
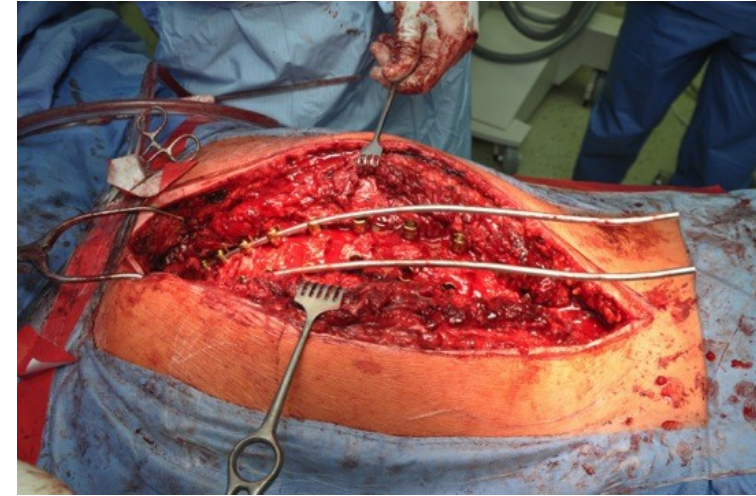
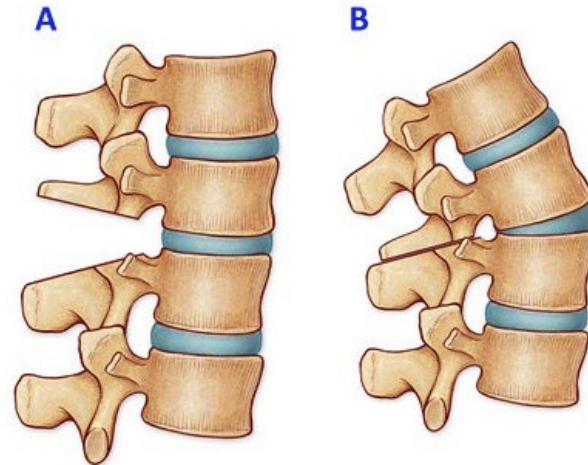
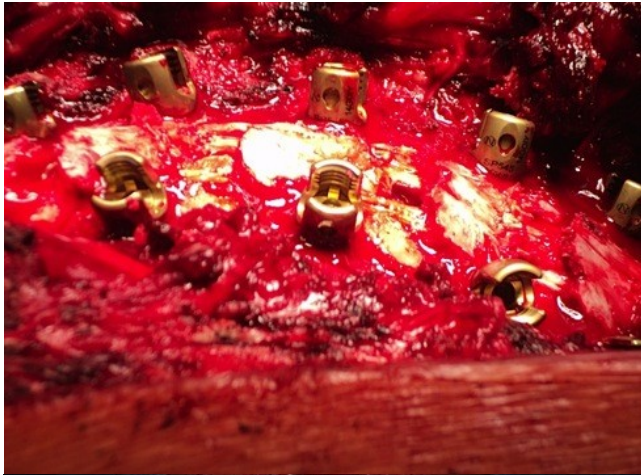
Late, severe diagnosis

- Posterior spondylodesis
- Osteotomy: SPO/PSO
- + treatment in TLSO
- 



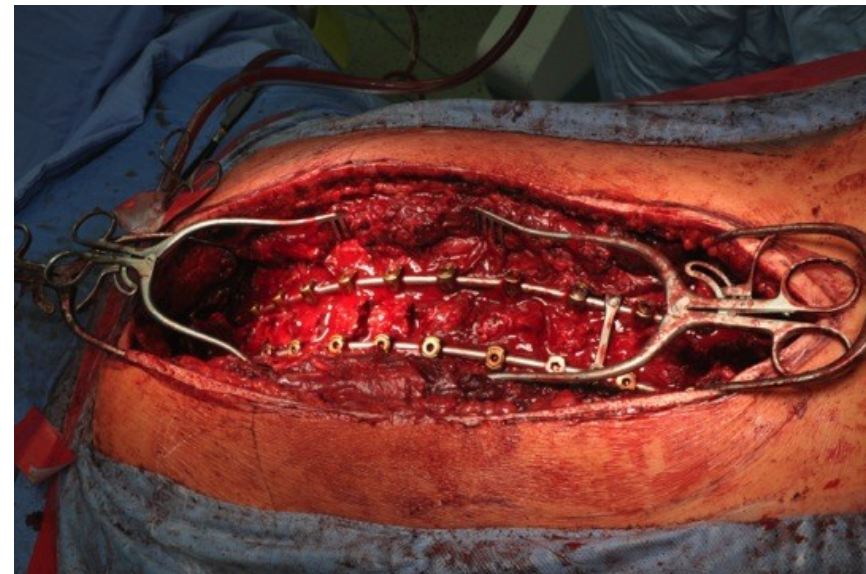
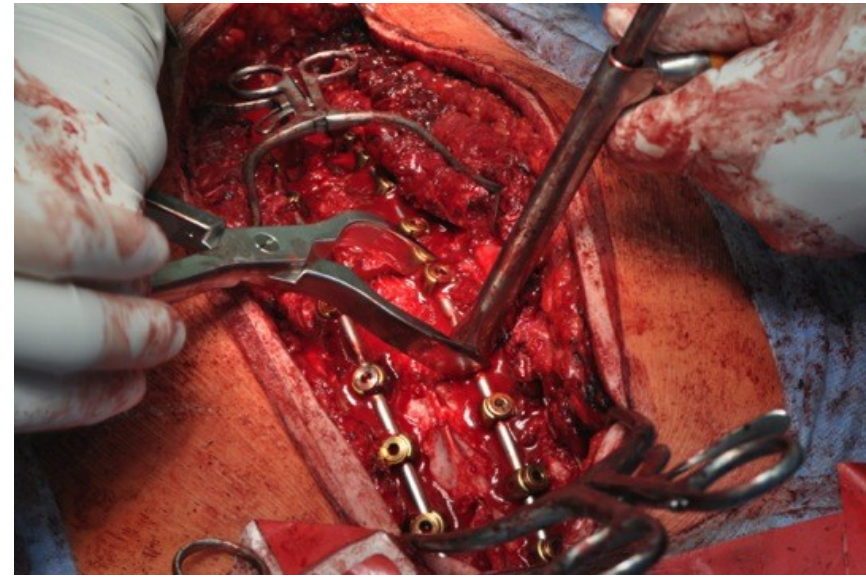
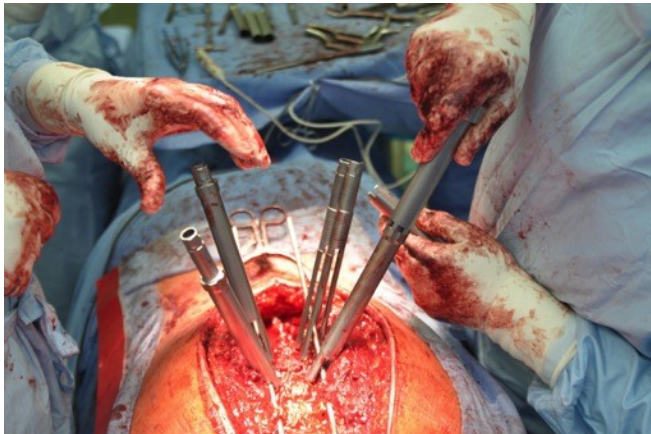
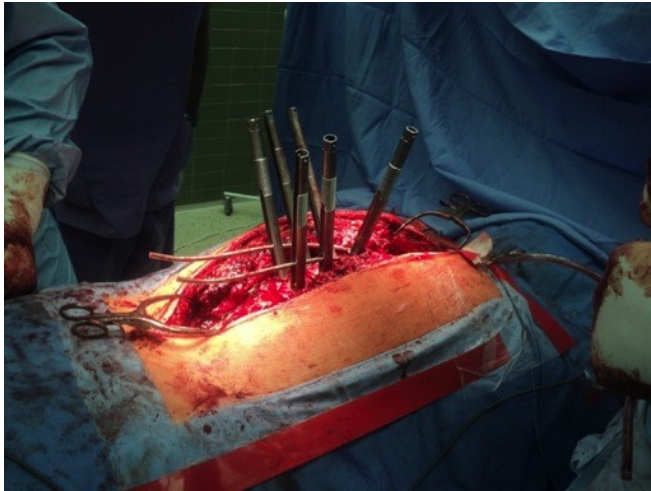
# Surgical therapy

Smith-Petersen osteotomies



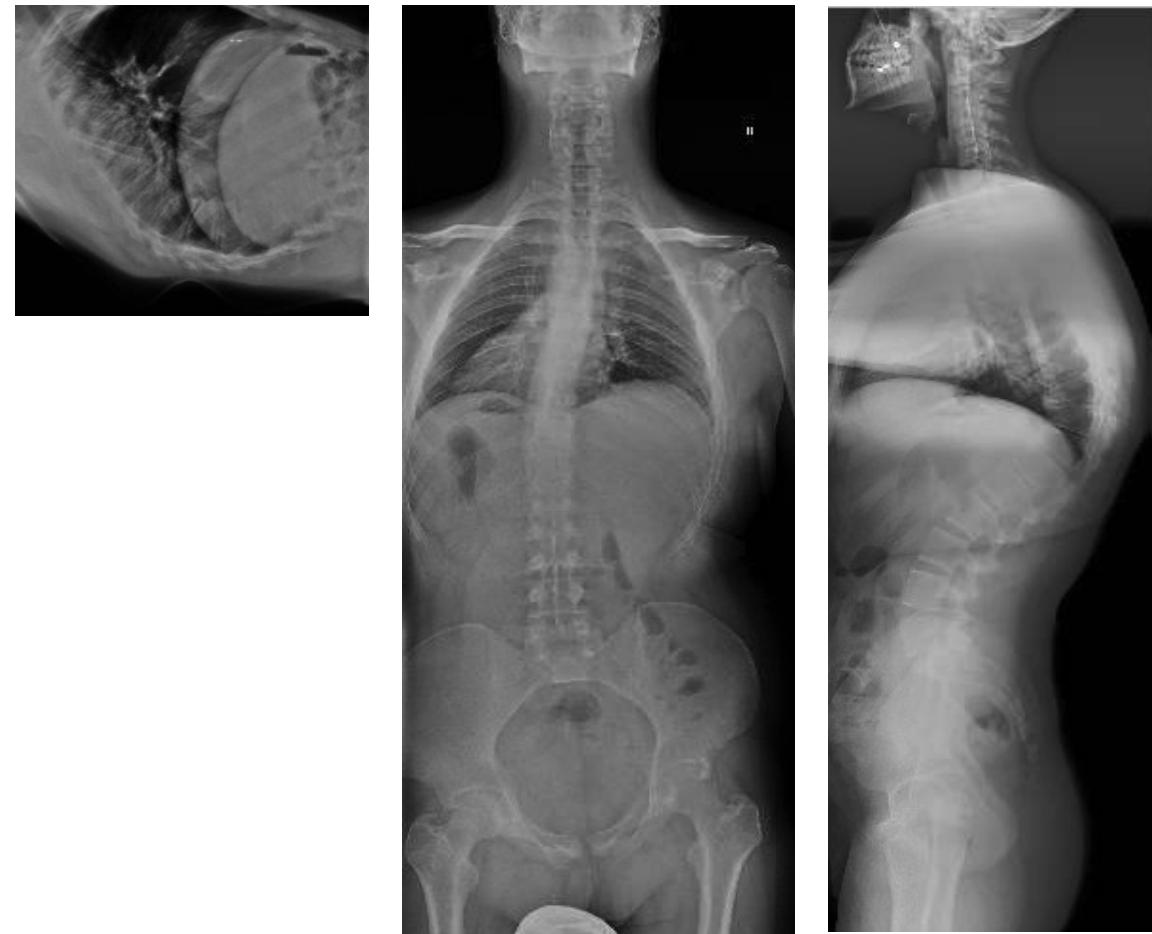
# Surgical therapy

Cantilever maneuver



# Surgical therapy

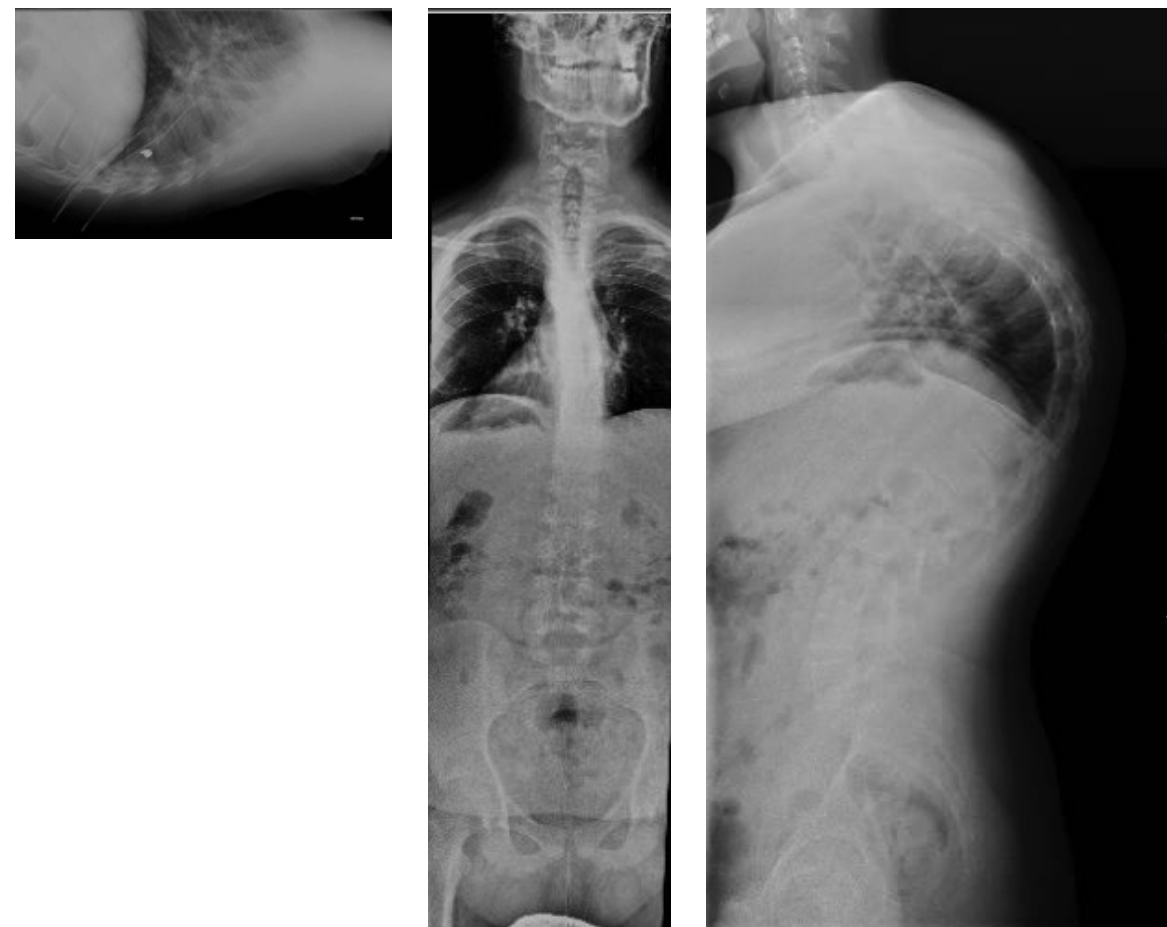
Xrays Follow ups (16y + 2m)





# Surgical therapy

XR FU (17y + 3m)



# Faulty posture

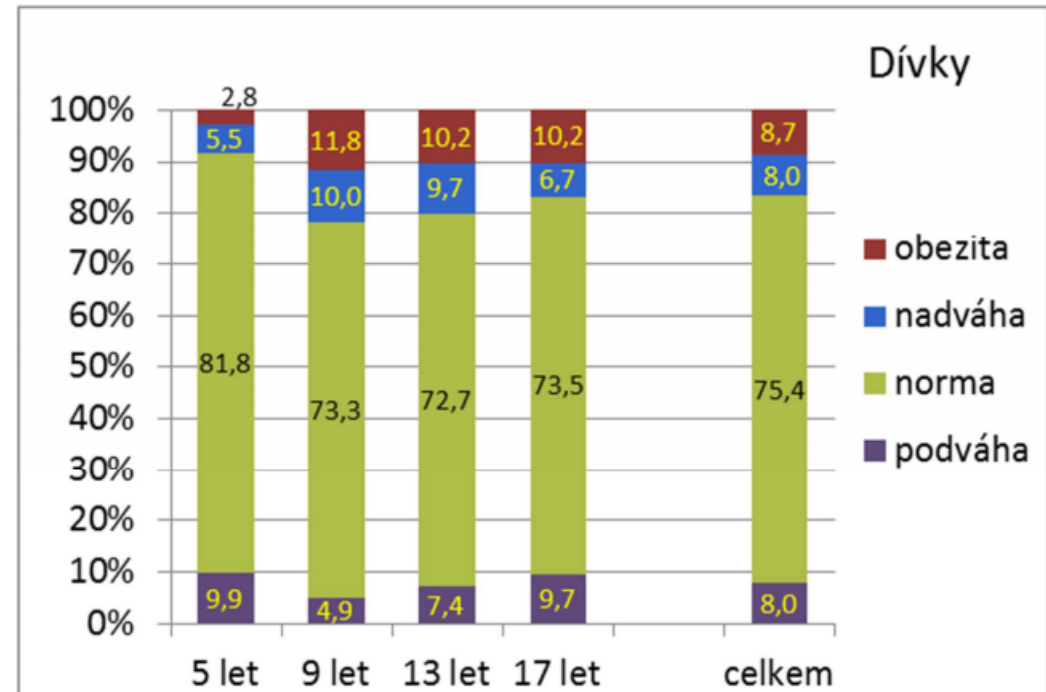
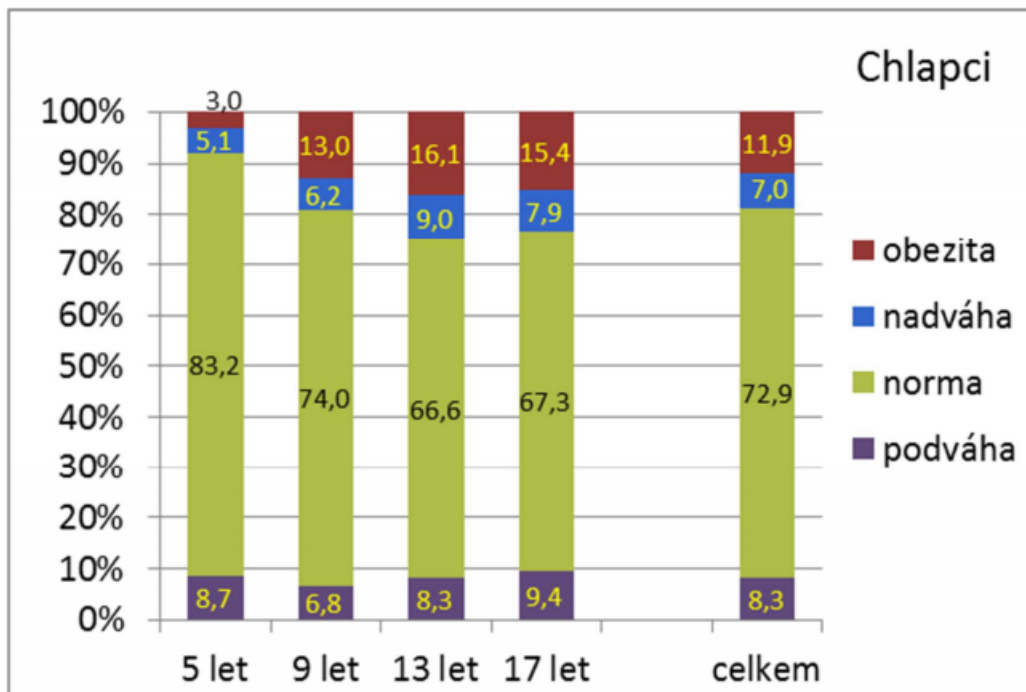
## Most common

- It arises with muscle imbalance, lack of exercise and „sitting“ lifestyle.
- Poor musculature of the back and abdominal.
- Increased lumbar lordosis and thoracic kyphosis
- Treatment:
  - "Good lifestyle"
  - Regular exercises of back and abdominal muscles
  - Endurance
  - Physiotherapist

# Faulty posture

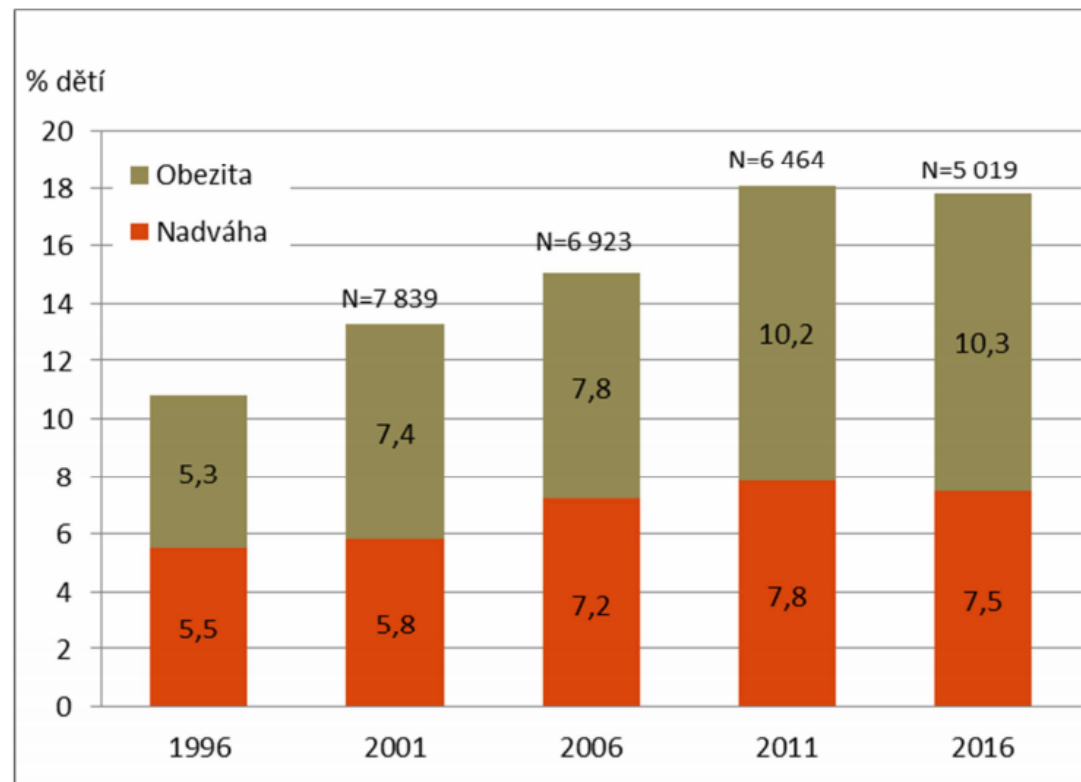
BMI a „bad posture“?

*Graf č. 14 a 15. Hodnoty BMI u chlapců a dívek podle věku*



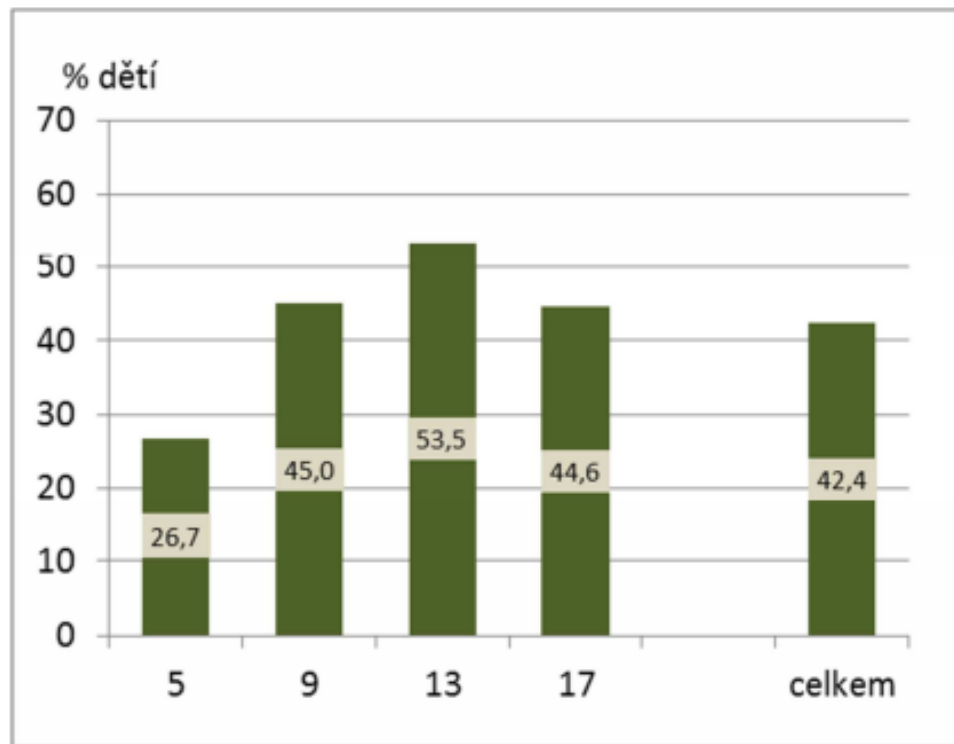
# Faulty posture

*Graf č. 16. Vývoj prevalence nadváhy a obezity u dětí (věkové skupiny 5, 9, 13 a 17 let) mezi lety 1996 až 2016*

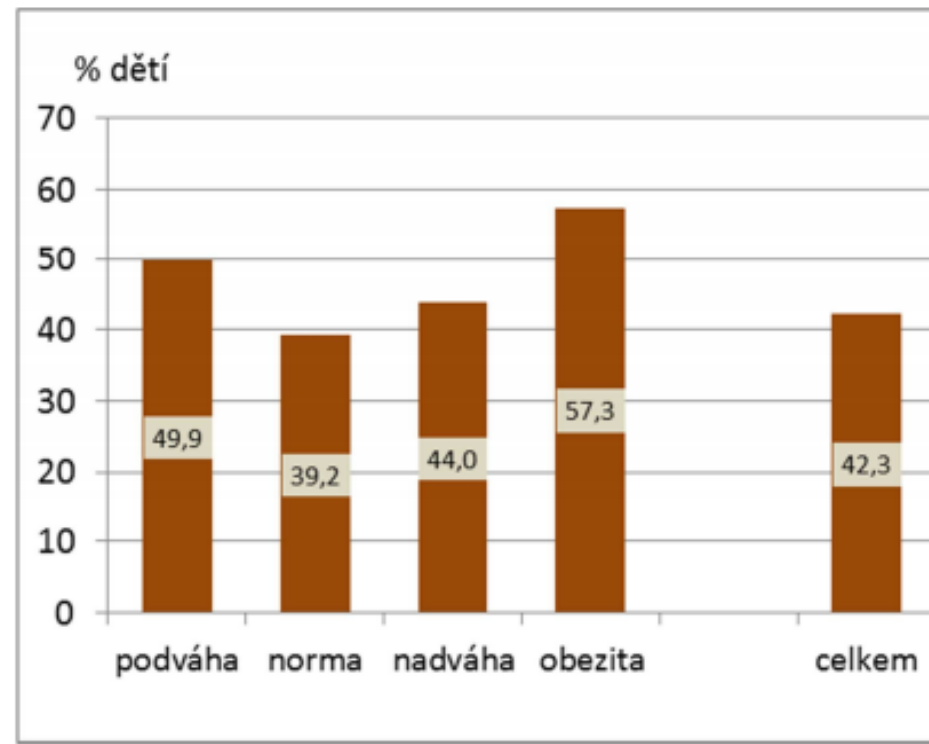


# Faulty posture

**Graf č 17. Prevalence VDT dle věku**



**Graf č. 18. Prevalence VDT dle BMI**



Nejčastější zjištěnou vadou v držení těla byl předsun hlavy (25,5% dětí), kulatá záda / zvýšená hrudní kyfóza (14 %) a skoliotické držení (13 %). Předsun hlavy a kulatá záda byly častější u chlapců, ve výskytu skoliotického držení se chlapci a dívky nelišili. Všechny tyto tři vady byly nejčastější u třináctiletých dětí.

Nejzávažnější z posuzovaných vad je skolióza. Jedná se o již fixovanou poruchu zakřivení páteře, kterou není možné zvýšeným svalovým napětím vyrovnat a která ovlivňuje celou funkci páteře a ve svých důsledcích může vést k snížení funkce plic. Skoliózu mělo celkem 79 dětí (1,5 % souboru), nejčastěji byla diagnostikována u 17letých (45 dětí, 4 % všech 17letých).

Součástí rodičovského dotazníku byly otázky zjišťující, jestli děti trpí bolestmi hlavy a páteře.

Bolestmi hlavy trpělo 21,2 % dětí, významně častěji dívky (23,1 % dívek, 19,4 % chlapců;  $p=0,001$ ). Podíl dětí s bolestí hlavy narůstal s věkem (graf č. 19), nejčastěji ji trpěli sedmnáctiletí (34,8 %; více jak pětina z nich pociťovala bolest hlavy nejméně jedenkrát za týden). Častěji bolestmi hlavy trpěli děti s vadným držením těla (24,7 %) v porovnání s držením fyziologickým (18,0 %). Bolesti krční i bederní páteře uváděli rodiče shodně u 7 %

# Evaluation morbus scheuermann

- adolescent damage to the spine with lifelong consequences
- requires 100% cooperation between patients and families
- Conservative therapy: in combination treatment with orthosis and rehabilitation
- Surgical therapy: Dpt of Orthopaedic Surgery UniHospital Brno

# Evaluation morbus scheuermann

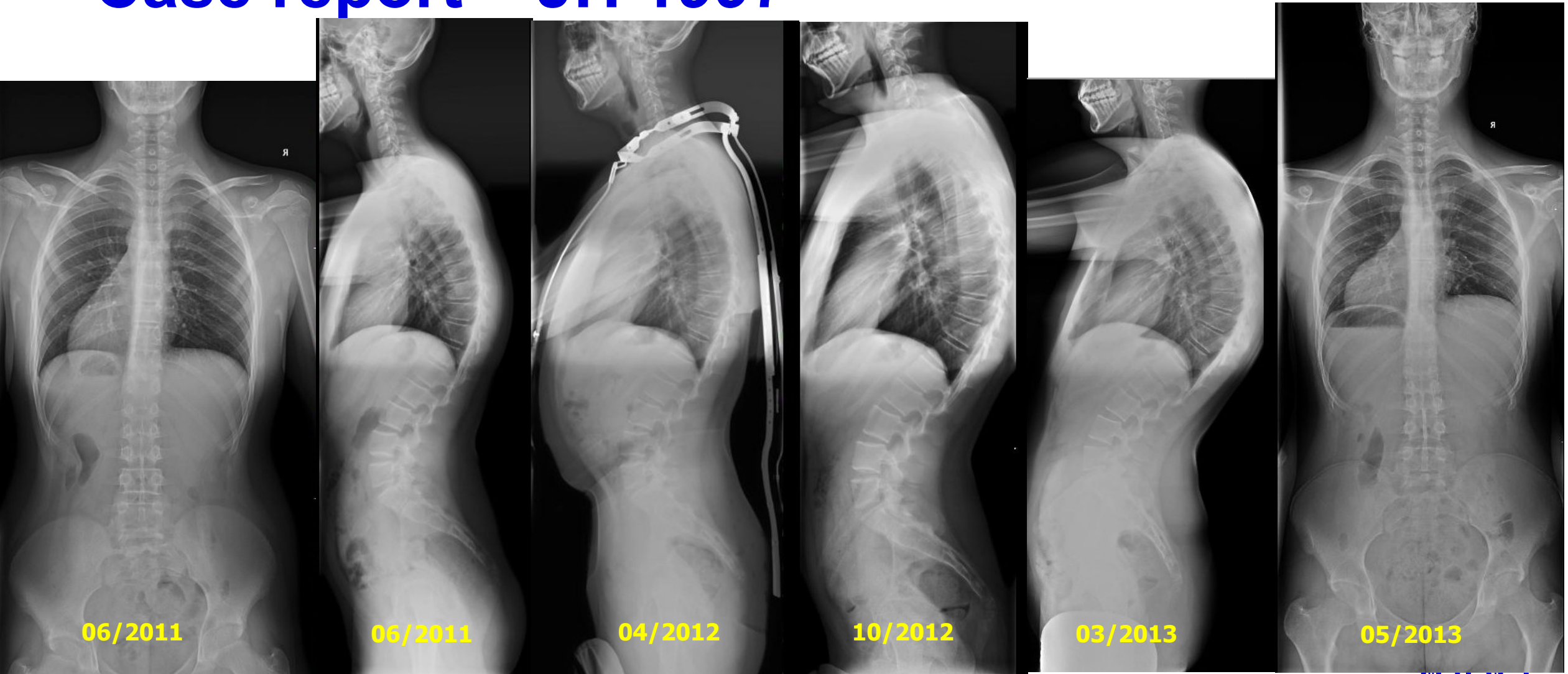
- Exercise: affecting up to 5%
- TLSO braces: up to 30% influence
- Operation: today over 70%
-

# Case report – JH 1997





# Case report – JH 1997



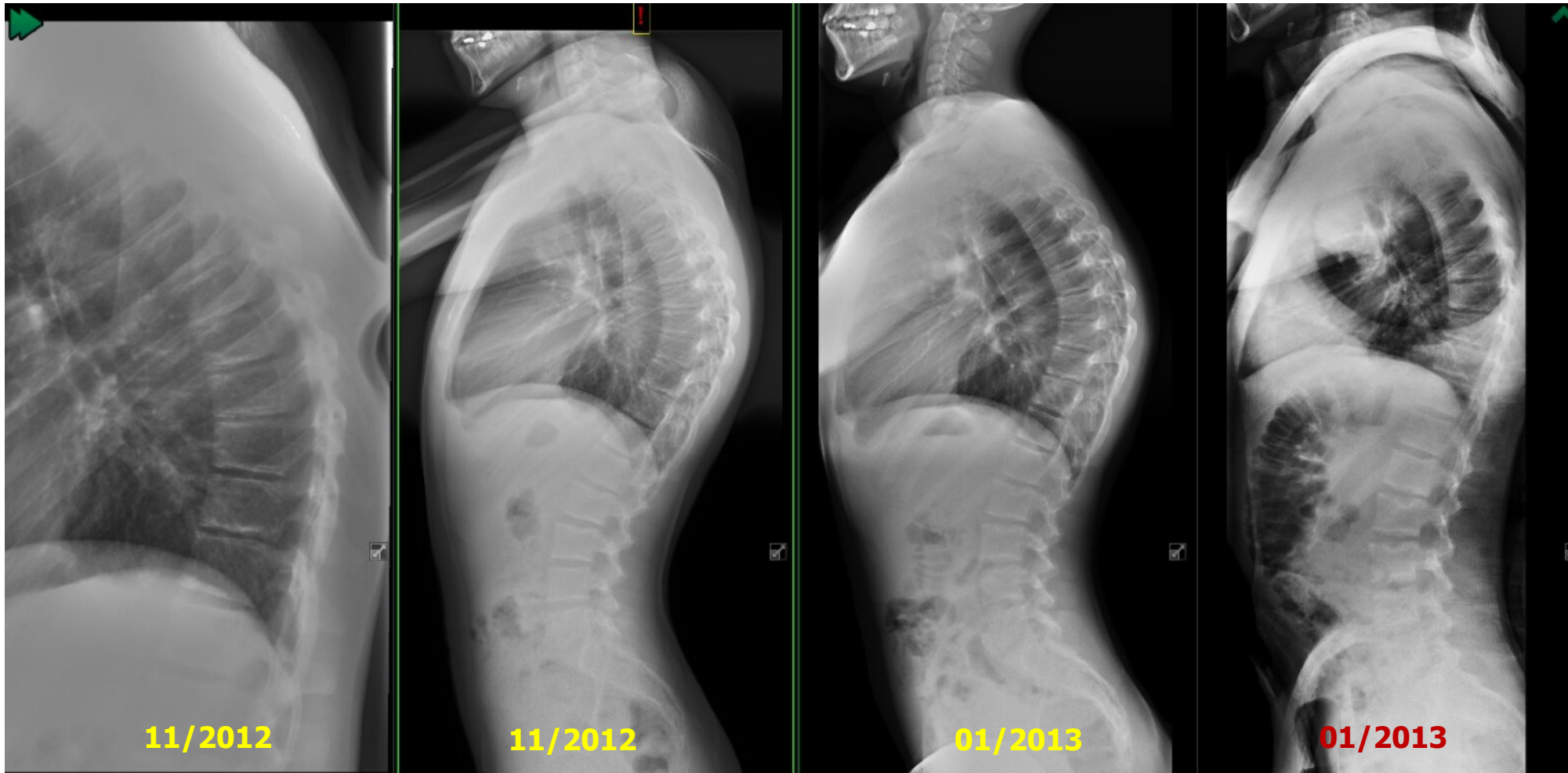
# Case report – JH 1997



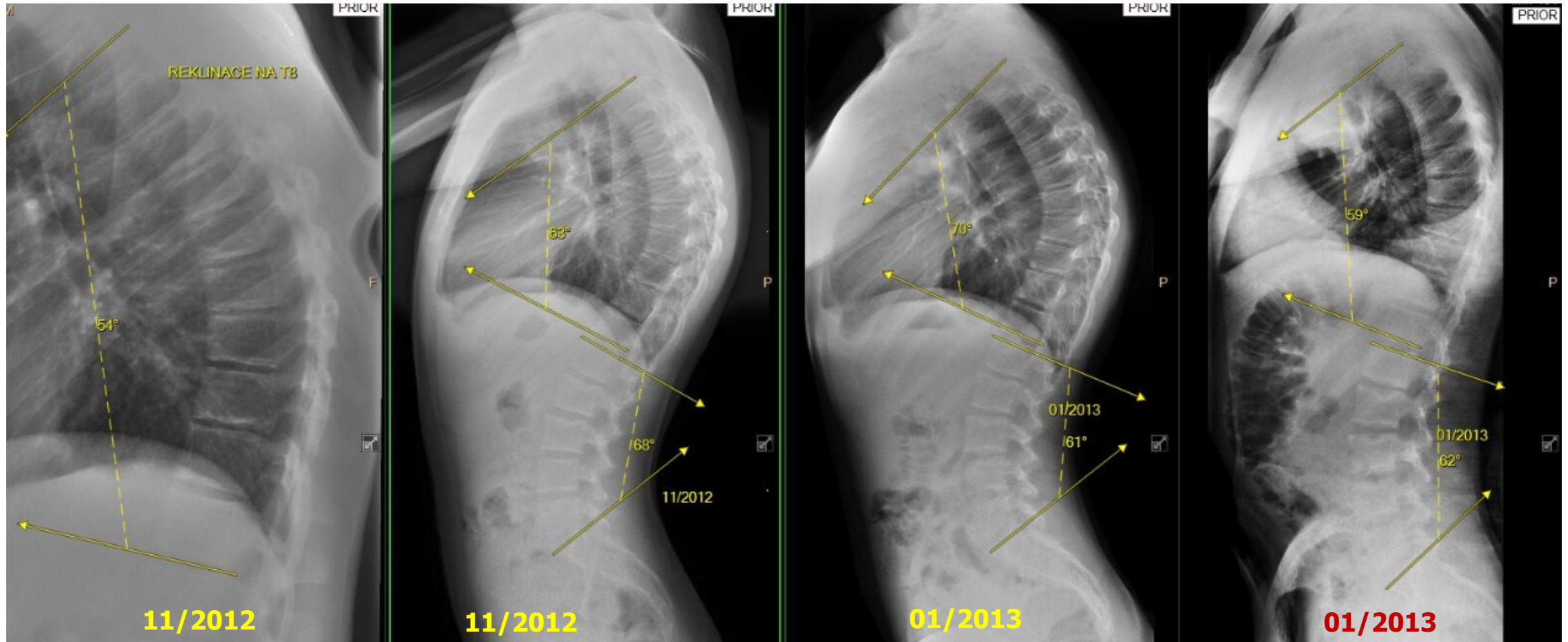
# Case report – AF 1999



# Case report– AF 1999



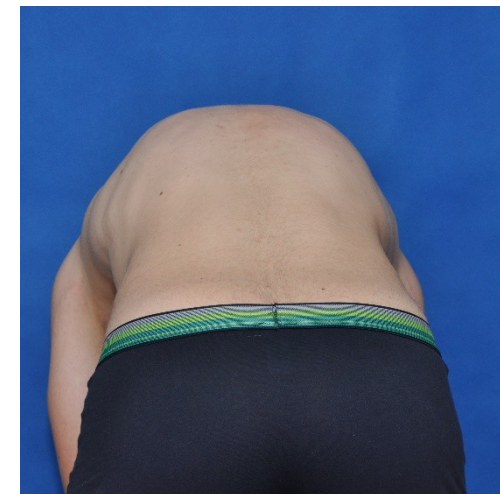
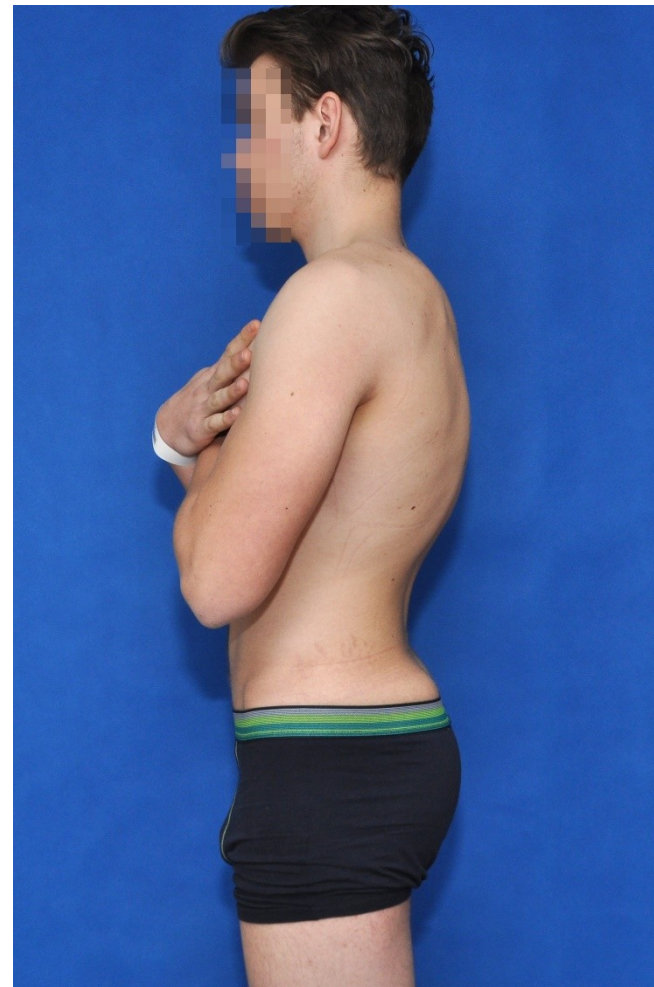
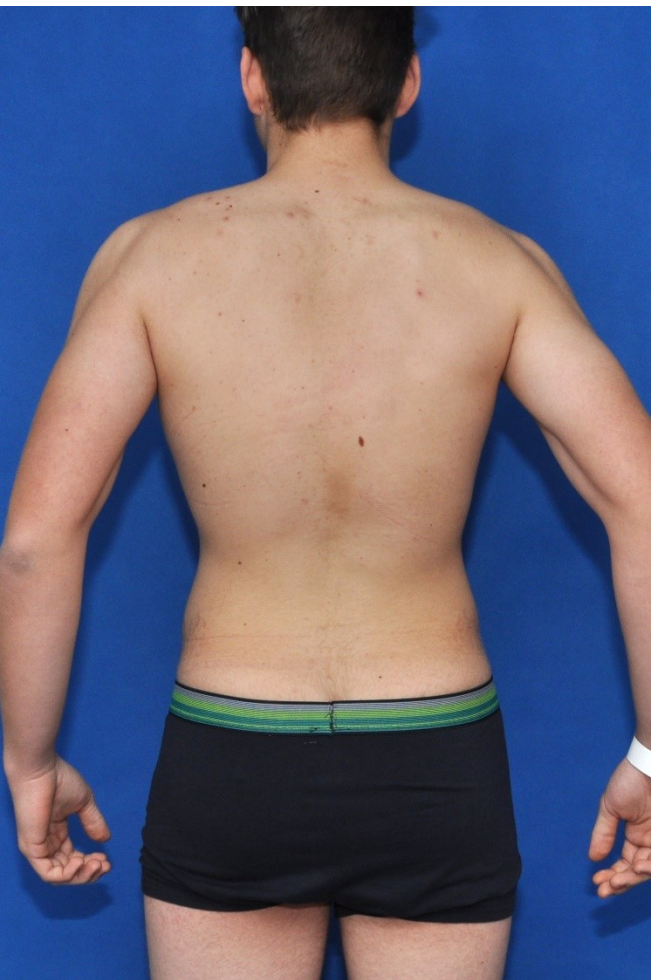
# Case report – AF 1999



# CR – AF 1999



# CR – RS 1999

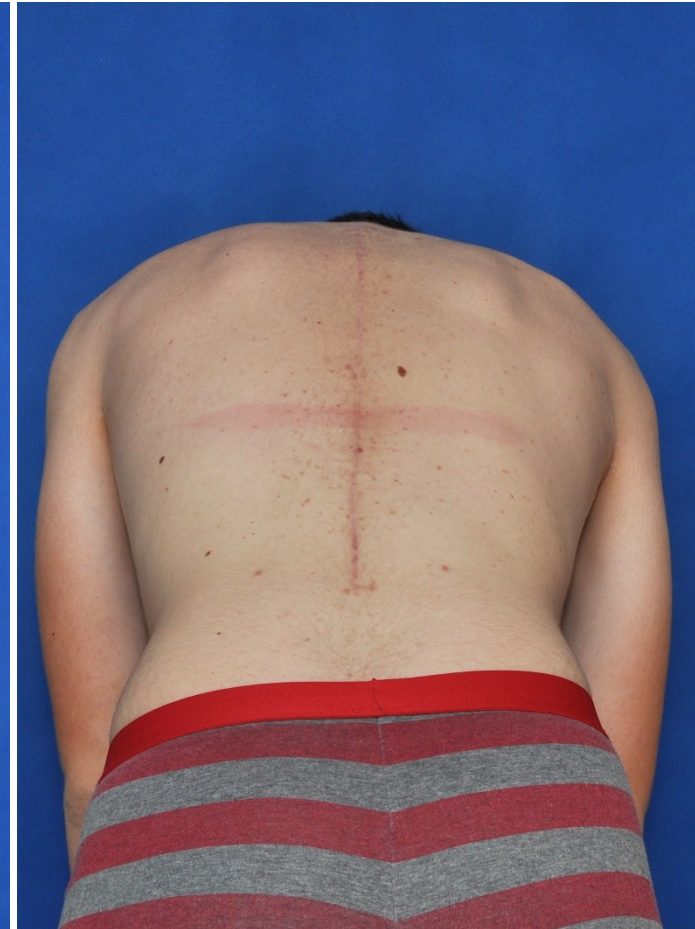
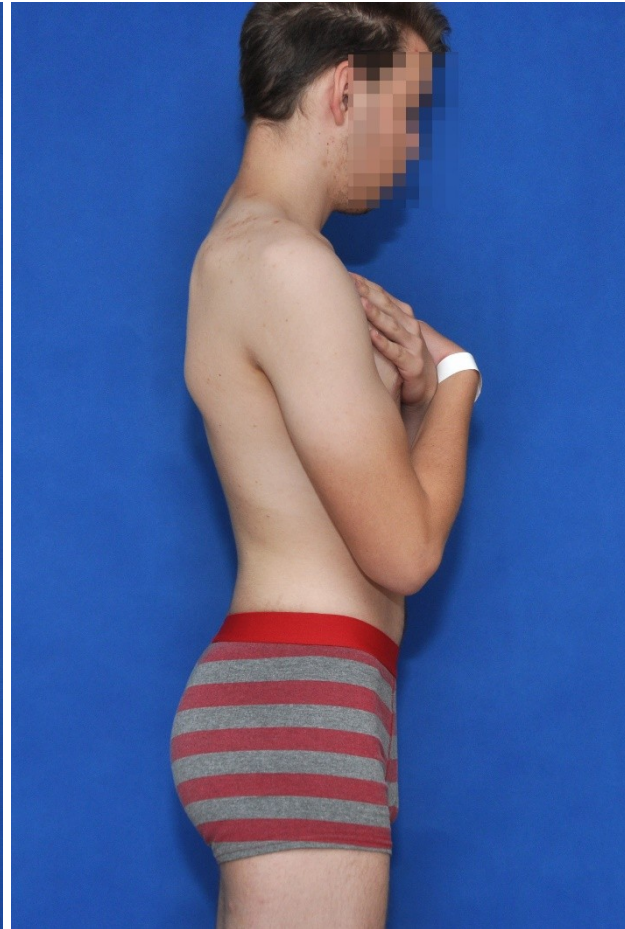


# CR – RS 1999





# CR – RS 1999



# CR – RS 1999



# Epithetics

doctrine on cosmetic cover of the body part

Replacement of lost, undeveloped or atrophied body parts



# Epithetics

3D

- In the abode of paired organs, parts (ears, fingers, amputation of the foot)
- Skenner: sensing – CAD - positives
- Maxillacafacial epithesis (Bibb et al.)
- Design Covers - SLS (Selective Laser Sintering)
- 



# Calceotics

orthopedic shoe doctrine

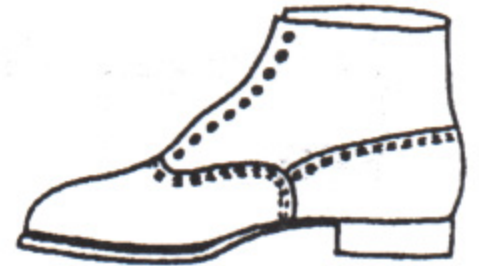
## Specially adapted shoes



# Calceotics

orthopedic shoe doctrine

- Features of orthopedic shoes:
- 1. Relief
- 2. Correction of defective position
- 3. Immobilization
- 



# Calceotics

orthopedic shoe doctrine

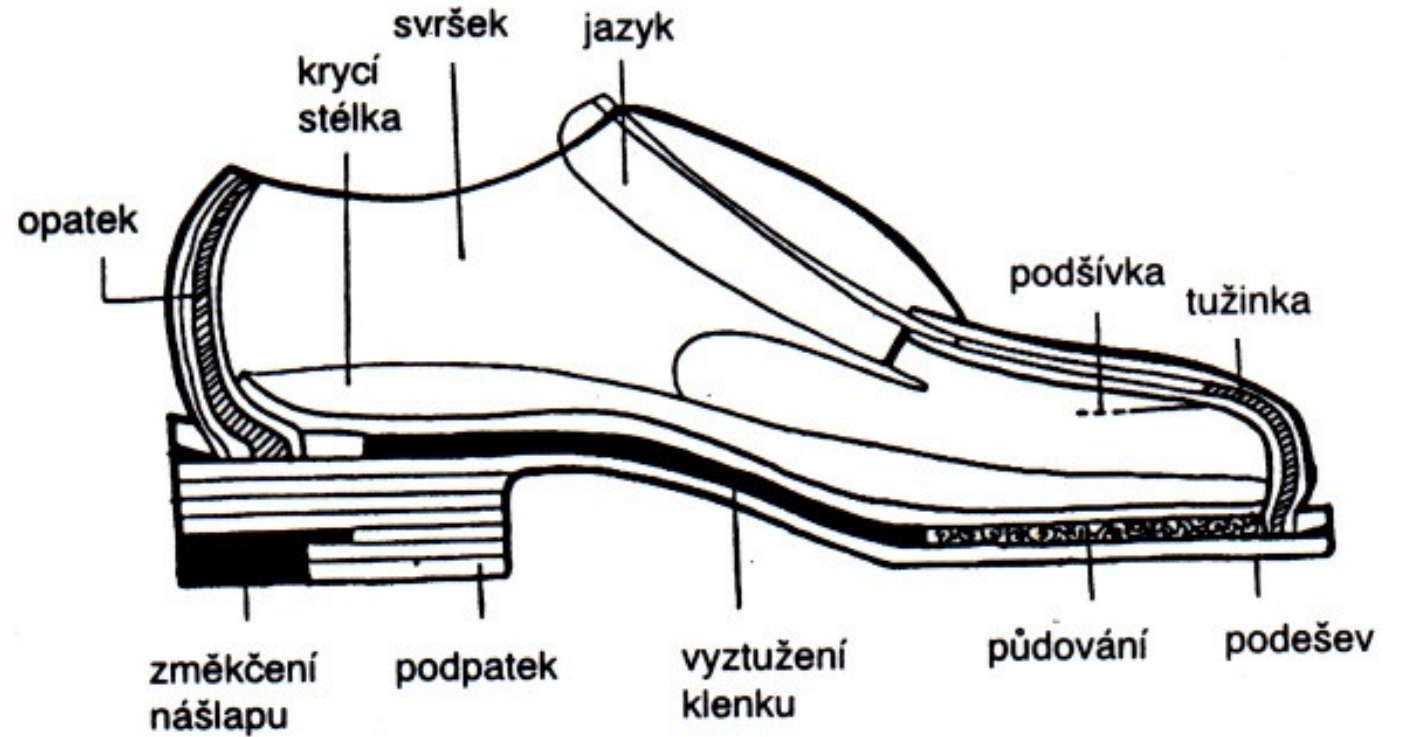
- Types of orthopedic footwear:
- Medical shoes
- Customized ready-made shoes
- Orthopedic shoes
- Diabetic shoes
- 



# Calceotics

orthopedic shoe doctrine

Part:



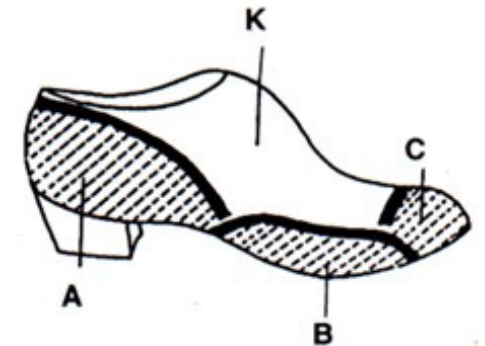
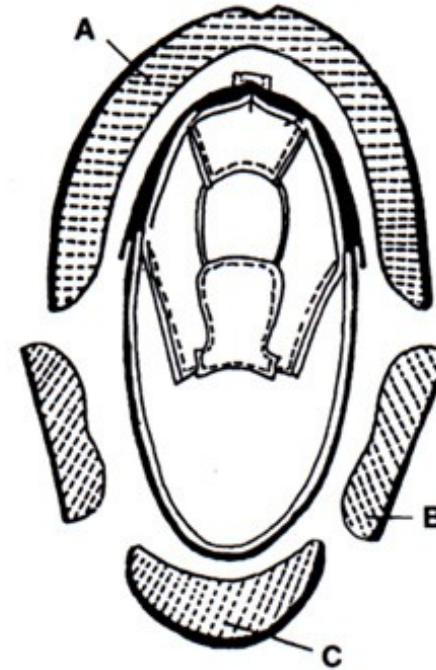
Obr. 10. Průřez botou.



# Calceotics

doctrine on orthopedic shoes

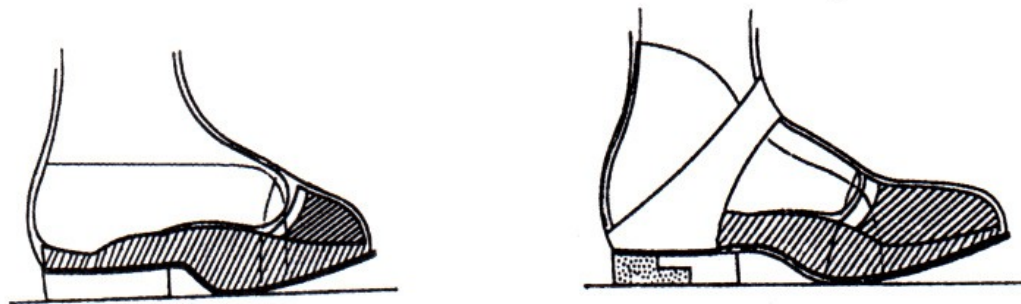
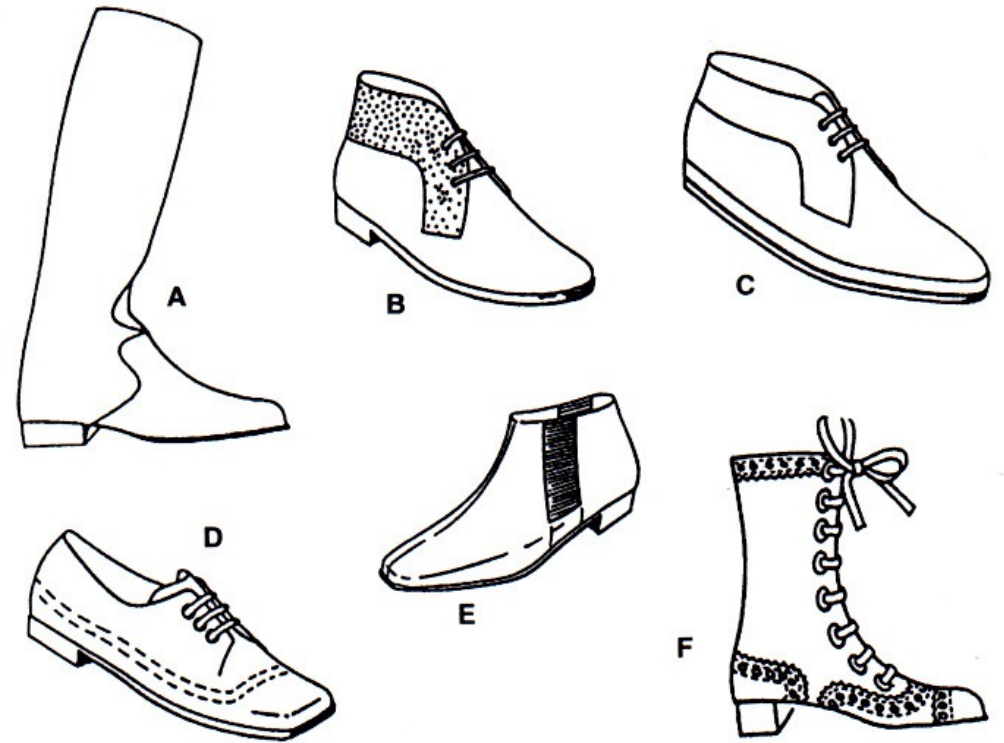
- To make a copy:
- 1. Sew the upper according to the hoof
- 2. Drawing of the tensioning insole
- 3. Tensioning the upper through the insole
- 4. Sticking the upper to the insole
- 5. Making a frame circling the entire insole
- 6. Knob workmanship – reinforcement
- 7. Soiling
- 8. Sticking soles and heel: A-measures, B-sides, C-tuna, K-hoof



# Calceotics

## Shoe shapes

- A- high boots
- B-shoe
- C- ankle shoe
- D-half-shoe
- E- „perka“
- F- boots
- 



Obz. 59. Obrazky ambutace v oblasti metatarsů (podle Regenspurgera).

# Calceotics

## Principles of children's shoes

- 1. The correct size. Front of the tip of at least 1 cm of free space
- 2. Shoes with wider forefoot
- 3. Flexible in the centre of the foot
- 4. A solid abbot that holds the heel well
- 5, Barefoot....
- 



# Calceotics

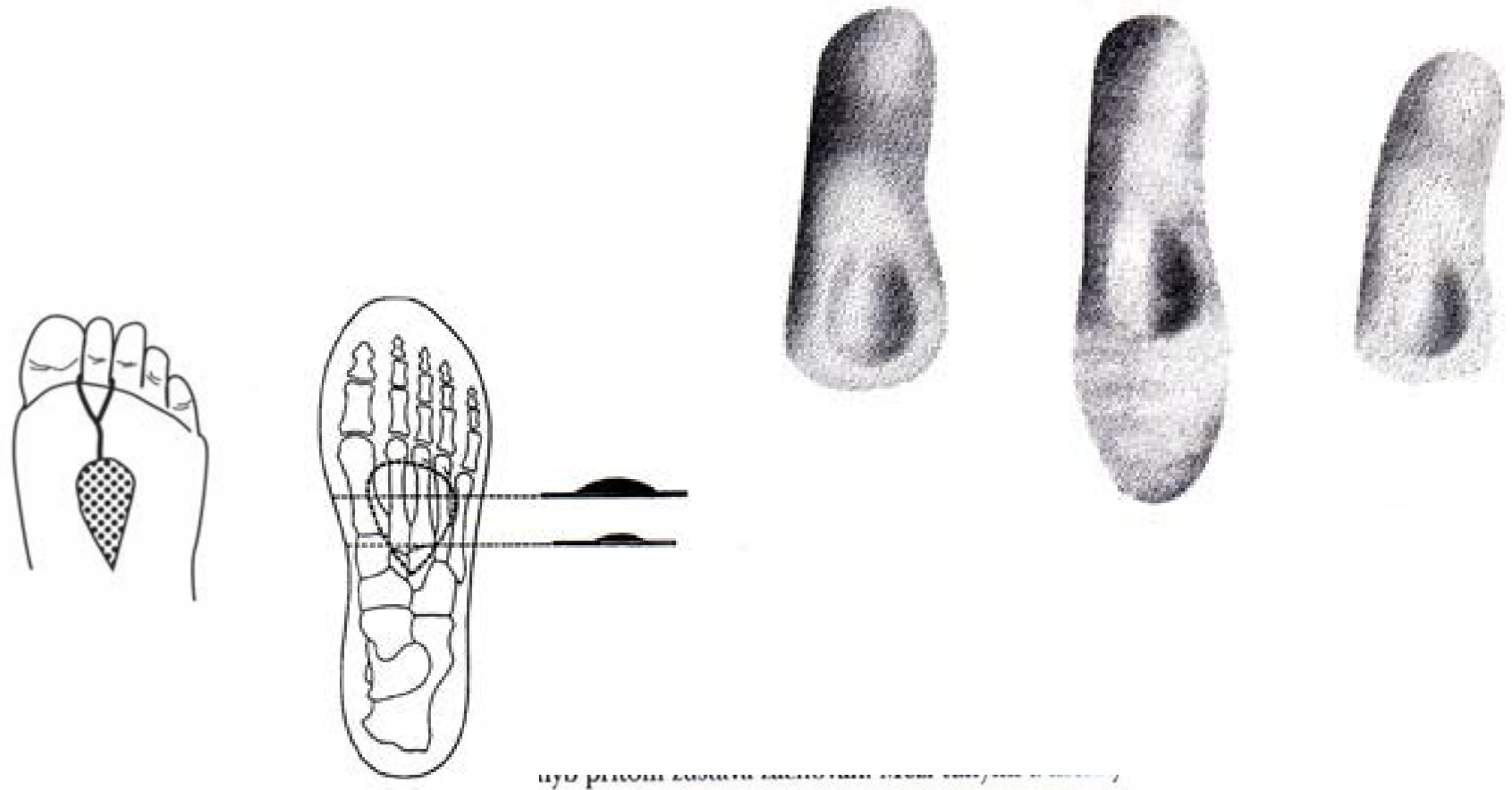
vložky

- 1. Insoles
- 2. Three-quarter
- 3. Heel heels
- 4. Hearts

- 1. Stiff
- 2. Soft

- 1. Active
- 2. Passive

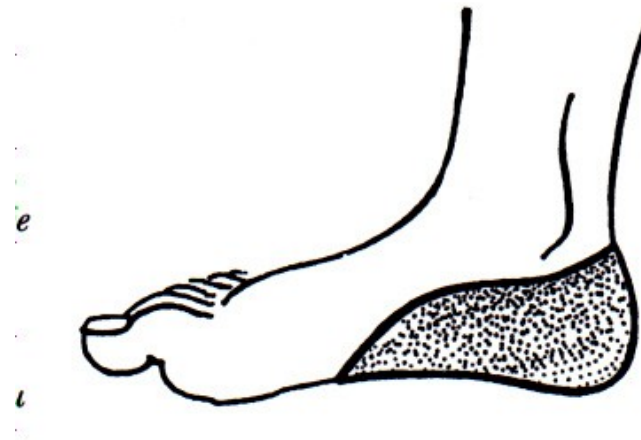
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# Calceotics

## Inserts

- Shell inserts
- Helfet heel insert
- 



# Calceotics

3D



# Calceotics

Concealers, heel-heels

- heels
- concealers
- 



# Adjuvatics - aids

teaching on operator aids

- Disabled persons and daily tasks
- locomotive, hygiene and self-sufficiency, safety
- practical and graphomotor activities
- Sports
-



# Adjuvatics

teaching of operator aids

- Immobile patients, wheelchair users, seniors
- Long-term bed treatment
- After demanding orthopedic – surgical procedures
-

# Adjuvatics

teaching of operator aids

- positioning and fixing
- for locomotion, its training and compensation
- Hygiene
- facilitating the performance of practical activities
- for the implementation of leisure, work activities
-

# Adjuvatics

positioning and fixing

- position optimisation, verticalization of persons with impaired momentum
- equipped with a controller to adjust the necessary height and slopes



# Adjuvatics

positioning and fixing

## Positioning wedges, tubes:

- Fixation lying on the back, side, abdomen
- Rotation of positions and 30min, prevention of dekubitus

## Brace:

- Stabilization of posture, spine, chest and joints

## Seats:

- Specially adapted, adjustable
- Safe seat, headrest



# Adjuvatics

positioning and fixing

- Positioning, verticalizing stands:
- Fixation in the areas of the feet, calves, knees and thighs, pelvis, hips and hare
- + working stations
- Sliding plate:
- Makes it easy to move from trolley to bed or car
- 



# Adjuvatics

For focusing, practicing and compensating

- Medical strollers:
  - For children of early age
  - Combination with duct wedges, backrests, tables and trays
- Rehabilitation carts:
  - according to the drive - mechanical x electric
  - according to the environment - interior x exterior
  - by age - for children, young people and adults
  - according to construction - fixed x folding
  - according to the purpose - standard x special (sports, hygienic, transport).



# Adjuvatics

Rehabilitation trucks – mechanical: activating, mechanical, multi-blow, for hemiparetics, amelia, dysmels



# Adjuvatics

Special sports carts: basketball, rugby, tennis, bencykl





# Adjuvatics

For sports: handbike, monocross, monoski



# Adjuvatics

Limb movement trainers, e.g. after operations

- Motopeds:
- Motoding:
- Upper limbs
- Lower limbs:
- Knee and hip joint
- Ankle joint



# Adjuvatics

Limb movement trainers, e.g. after operations

- Climbers: nana for children with cerebral palsy - diparetic form
- Walkers: walking practice:
  - Four-point immobile/mobile
  - Two-wheeled: mobile
  - Three-wheeled....
  -



# Adjuvatics

Crutches: support function

- four-point, French, children's elbow crutches,
- armpit, walking sticks
- height adjustable, folding outing sticks
- 



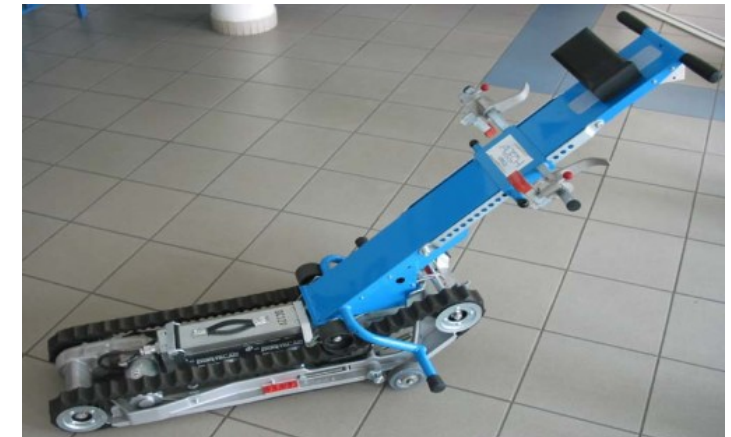
# Adjuvatics

Overcoming barriers

Stair platforms: oblique, vertical

„stairclimbers“

ramps



# Adjuvatics

For hygiene

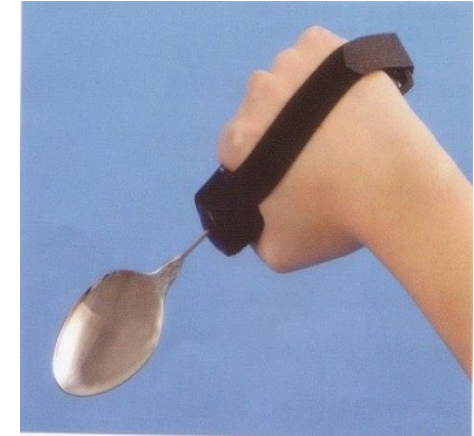
- increase the user's potential in self-service and independence from the assistance of the other person
- Jacks, bath/shower seats, toilet trolleys
- Attachments, backrests, toilet handles
- 



# Adjuvatics

Usnadňující výkon praktických činností

- fixing boards, plates
- Cutlery, handles
- Special knives
- Feeders
- 



# Adjuvatics

IT

Trackball, mouse

Keyboard





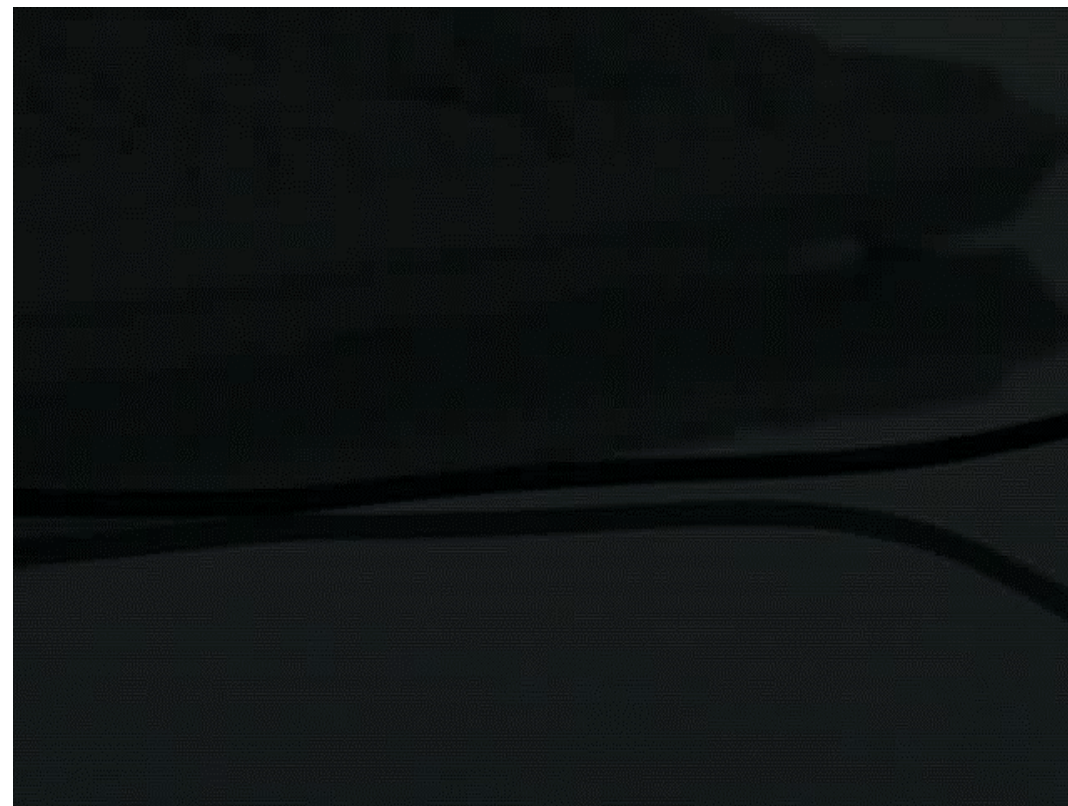
# Adjuvatics

IT



# Adjuvatics

Smart NAV a 14 Control



# Adjuvatics

## Strollers, trolleys

- Medical strollers:
  - For children of early age
  - Combination with abduction wedges, armrests, tables ap
- Rehabilitation carts:
  - according to drive - mechanical x electric
  - according to the environment - interior x exterior
  - by age - for children, young people and adults
  - according to the design - fixed x folding
  - according to purpose - standard x special (sports, hygienic, transport).

# Conclusion



# Conclusion





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# Conclusion

21st century



# Source

publikace LF MU, doc. Ivan Müller, CSc., doc. Z. Rozkydal, Internet

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- Fotografie z LAOS (soukromá databáze Jan Kocanda)



# Source

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**Thank you for your attention.**

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