The complete orthopaedic examination of patients with injuries and diseases of the locomotor system

SOAP Notes

- **S**ubjective – Patient History
- **O**bjective – Observation and Testing
- **A**ssessment – Based on compilation of findings
- **P**lan – Further testing and / or treatment

Contents of examination of orthopaedical patients

- Contents and order of clinical-diagnostic examination of the patients with injuries and diseases of the locomotor system
- The methods of physical examination (questioning the patient, external examination, measuring, etc).
- The additional methods of examination (X-ray examination, instrumental examination, laboratory examination, etc).
- The main rules of carrying on examination of the patients.
- Formulation of the clinical diagnosis.

The methods are carried out in strict order.

1. Questioning the patient: a) the patient's complaints; b) the orthopedic history) the life history (the family history).
2. General examination.
3. Determination and measuring of the joint movements and measuring of the length of the extremities.
4. Palpation.
5. Percussion.
6. Auscultation.
7. Determination of the muscular strength.
8. Determination of functional disorders.
9. Additional methods of investigations.

Complaints of orthopaedical patients

- *The pain*
- *The limb length discrepancy (LLD):*
- *Restriction of the moverment in the joints*
- *Swelling*
- *The deffects of the soft tissue*
- *The losses of functions*

Anamnesis

1. Case history

- In case of the othopedic injury you must determine exact date and time when the accident has been happened. The determination of the circumstance and the mechanisms of the injury are very important in making a correct diagnose.In taking the history of a trauma patient who may have a fracture, the following points may prove to be helpful, especially when there has been a traumatic incident.

2. Life history (family history)

History - taking is not just a way of killing time before writing up an x-ray form. It makes the diagnosis more often than does examination or x-ray alone. A complete history would be very boring, but it is important to include developmental and family histories.

1) Pain

- Location
  - Point with a finger to where it is
- Radiation
  - Does the pain go anywhere else
- Type
- How long have you had the pain
- How did it start
  - Injury:
    - Mechanism of injury
    - How was it treated ?
  - Insidious

1) Pain

- Progression
  - Is it better, worse or the same
- When
  - Mechanical / Walking
  - Rest
  - Night
  - Constant
- Aggravating & Relieving Factors
  - Stairs
  - Start up, mechanical
  - Pain with twisting & turning
  - Up & down hills
  - Kneeling
  - Squatting

2) Swelling

- Onset
- Duration
- Painful or not
- Local vs. generalized
- Constant vs. comes and goes
- Size progression: same or ↑
- Rapidly or slowly
- Aggravated & relived factors
- Associated with injury or reacti
- From: soft tissue, joint, or bone

Observation / Inspection

- General Appearance
- Functional Status
- Body Type
- Postural deviations
  - Gait
  - Muscle guarding
  - Compensatory movements
  - Assistant devices

Inspection – three layers

- Skin
- Subcutaneous tissue
- Bony structure

Tenderness Grading Scale

- Grade I - Patient complains of pain
- Grade II - Patient complains of pain and winces
- Grade III - Patient winces and withdraws the joint
- Grade IV – Patient will not allow palpation of the joint

Palpation

- Palpate the patient in conjunction with inspection.
- Begin with a light touch.
  - Dysesthesia.
  - Hypoesthesia.
  - Hyperesthesia.
  - Anesthesia.

Pulse

- Palpate for pulse rate, rhythm, and amplitude
- Normal healthy resting pulse rate for an adult is 60 – 100 bpm

3) Instability

- Onset
- How dose it start?
- Any Hx of trauma?
- Frequency
- Trigger/aggravated factors نابض
- Giving way
- Locking
- I can not trust my leg!
- Associated symptoms
  - Swelling
  - Pain

Mechanical symptoms

Locking / clicking

- Due:
  - Loose body,
  - Meniscal tear
- Locking vs. pseudo-locking

Giving way

- Due:
  - ACL
  - Patella

4) Deformity

- When did you notice it?
- Progressive or not?
- Associated with symptoms → pain, stiffness, …
- Impaired function or not?
- Past Hx of trauma or surgery
- (neuromuscular, polio)

5) Limping

- Onset (acute or chronic)
- Traumatic or non-traumatic ?
- Painful vs. painless
- Progressive or not ?
- Use walking aid ?
- Functional disability ?
- Associated → swelling, deformity, or fever.

6) Loss of function

- How has this affected the patient's life
- Home (daily living activities DLA)
  - Prayer
  - Squat or kneel for gardening
  - Using toilet
  - Getting out of chairs / bed
  - Socks
  - Stairs
  - Walking distance
  - Go in & out of car
- Work
- Sport
  - Type & intensity
  - Run, jump

Keep In Mind

Red flags

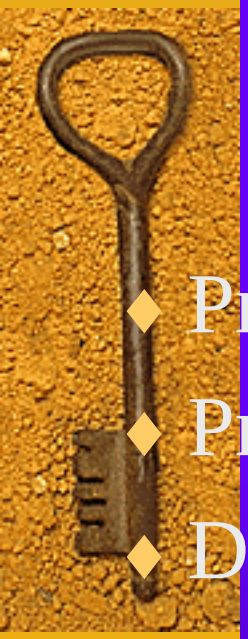
- Weight loss
- Fever
- Loss of sensation
- Loss of motor function
- Sudden difficulties with urination or defecation

Risk factors

- Age (the extremes)
- Gender
- Obesity
- Lack of physical activity
- Inadequate dietary calcium and vitamin D
- Smoking
- Occupation and Sport
- Family History
- Infections
- Medication (as: steroid)
- Alcohol
- injury/condition
- PHx Cancer

Current and Previous History of Treatment

- **Non-operative:**
  - Medications:
    - Analgesia
    - Antibiotic
    - Patient's own
  - Physiotherapy
  - Orthotics:
    - Walking aid
    - Splints
- **Operative:**
  - What, where, and when ?
  - Peri-operative complications



Pediatric

- Product of → premature
- Pregnancy → normal or not
- Delivery → (cephalic vs. breach), C/S (elective vs. E.R)
  - Family → parents relatives, patient sequence, F/H of same D.
  - Any → NICU, jaundice, blood transfusion
  - Vaccination
  - Signs → neck, casual, sit, stand, walk
  - Who noticed the compleint

Spine

- Pain radiation → as L٤, exact dermatome or myotome
- Coughing, straining
- Sphincter control (urine & stool)
- Shopping trolleys (forward flexion)
- Neuropathic:
  - Increase → back extension & walking easy
  - Improves → walking hard & sitting
- Vascular:
  - Increase → walking uphill (generates more work)
  - Improves → stop walking (stand) is better than sitting due to pressure gradient

Spine

- Cervical myelopathy:
  - Hand assessment
  - Coughing, straining

- Red Flags
  - Constitutional symptoms → fevers, sweat, weight loss
  - Pain → night or rest
  - Immunosuppression

Shoulder

- Age of the patient
  - Younger patients more:
    - shoulder instability,
    - acromioclavicular joint injuries
  - Older patients more:
    - rotator cuff injuries,
    - degenerative joint problems
- Mechanism of injury
  - Abduction & external rotation → dislocation of the shoulder
  - Chronic pain upon overhead activity or at night time → rotator cuff problem.

Shoulder

- Pain where:
  - Rotator Cuff → anterolateral & superior
  - Bicipital tendonitis → referred to elbow
- Stiffness, Instability, Clicking, Catching, Grinding:
  - Initial trauma
  - What position
  - How often
- Weakness → if large tear in the R.C, not as neuro

Shoulder

- Loss of function:
  - Home:
    - Dressing → coat, bra
    - Grooming → toilet, brushing hair
    - Lift objects
    - Arm above shoulder → top shelves, hanging
  - Work
  - Sport
- Referred pain → mediastinal disorders, cardiac ischaemia

Knee

- Injury → as: ACL
  - Mechanism → position of leg at time of injury
  - Direct / indirect
  - Did it swell up:
    - Immediately (haemathrosis)
    - Delayed (traumatic synovitis)
  - What first aid was done / treated
  - Could continue football match or had to leave

Knee

- Insidious → as O.A
  - Walking distance
  - Walking aid
  - How pray → regular or chair
  - Cross legs on ground
  - Squat (traditional toilet)
  - Swelling on & off
  - Old injury intra-articular

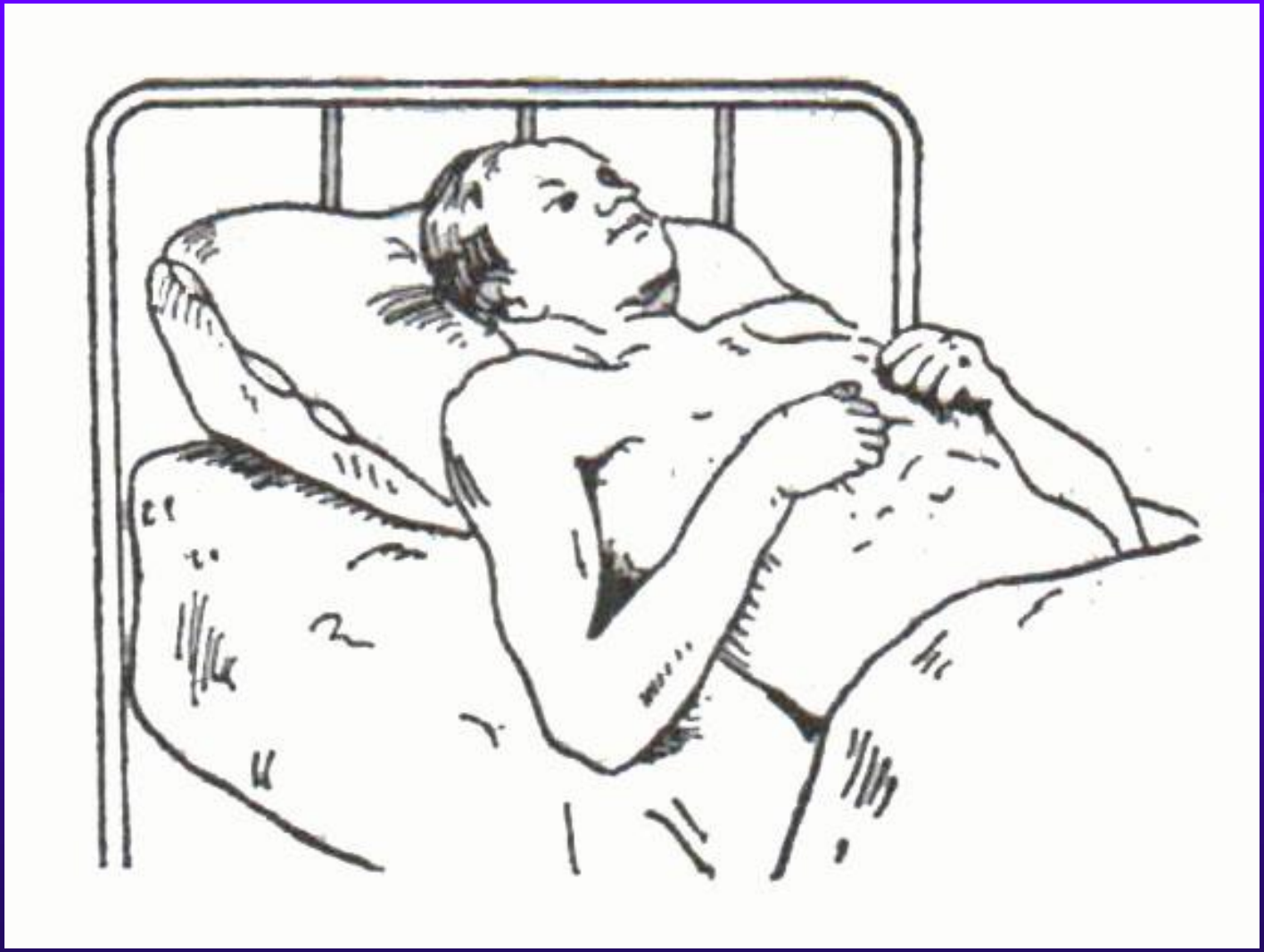
General examination

In cases of orthopedic injuries or some diseases the normal structure and function of the patient's extremities or his trunk are harmed or weakened.

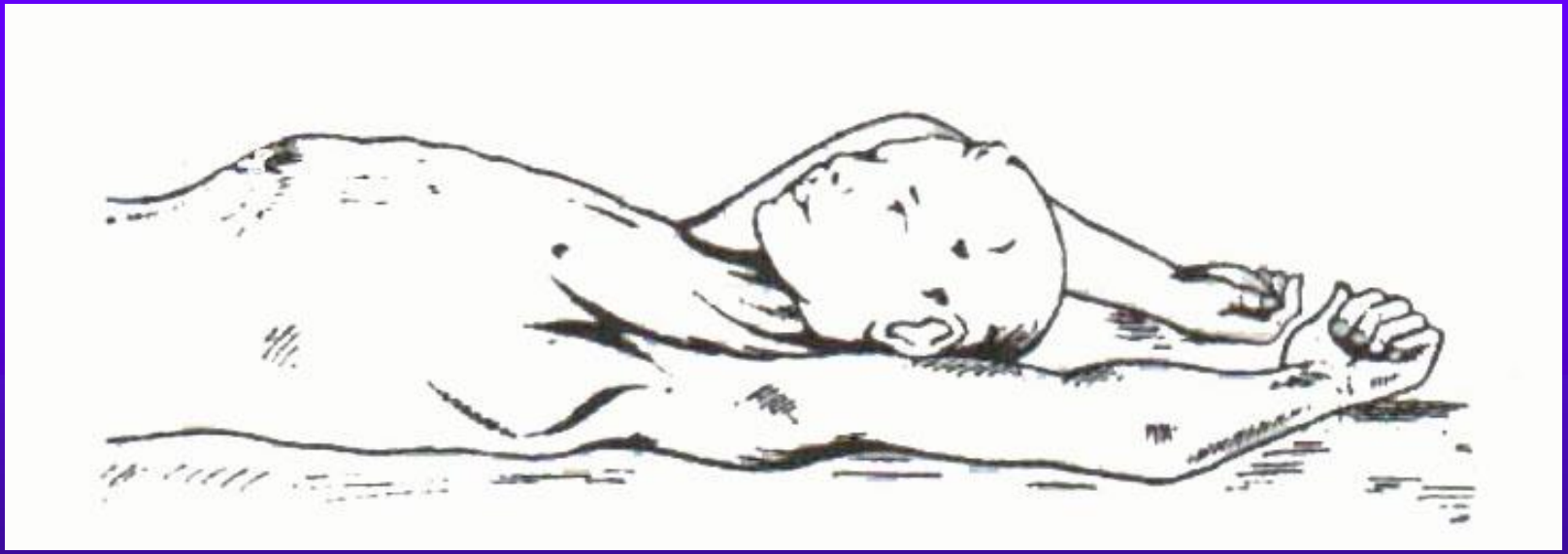
There are following main types of the postural abnormalities:

1. Flatback (the spinal kyphosis and lordosis are decreased, the neck is elongated, the spine is flexible, anterior pelvic tilt is increased).
2. Swayback (the spinal kyphosis and lordosis are increased, the head is bended toward).
3 Roundback Deformity (increased thoracic kyphosis) includes not only rounded thoracic spine but also rounded shoulders, increased lordosis (gooseneck), anterior pelvic tilt.
4. Habit Scoliosis (a lateral deformity of the spine column, spinal kyphosis and lordosis are normal).

Passive postural position



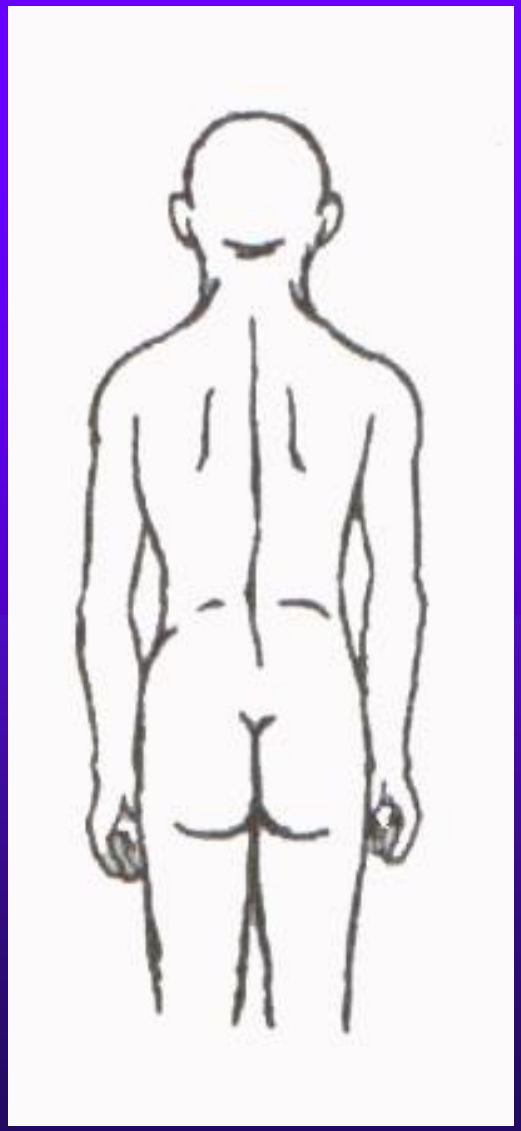
Passive postural position

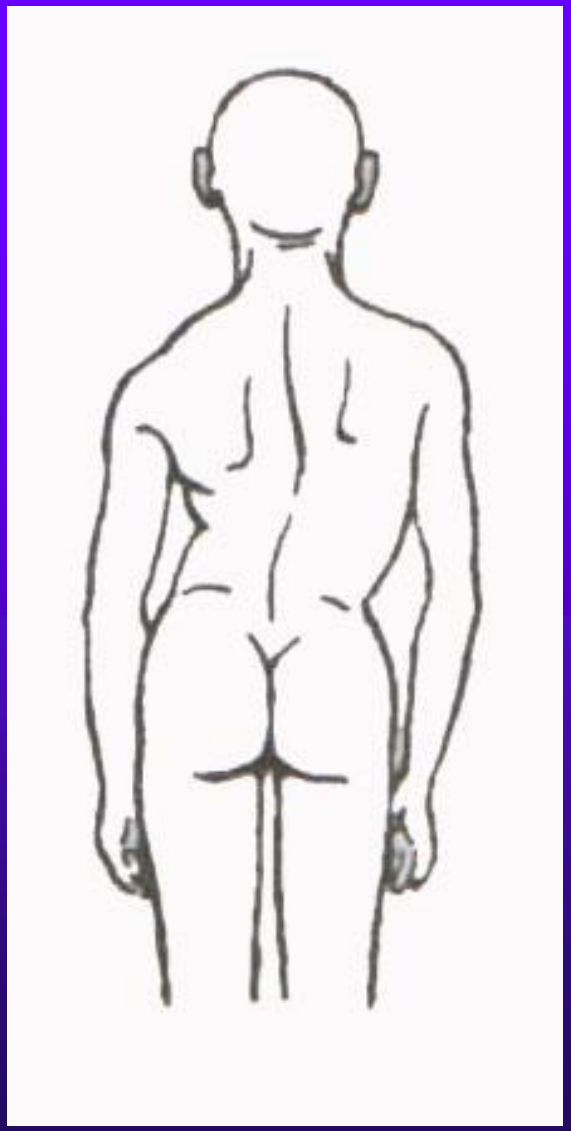


Compelled postural position

Clinical measurement of the body

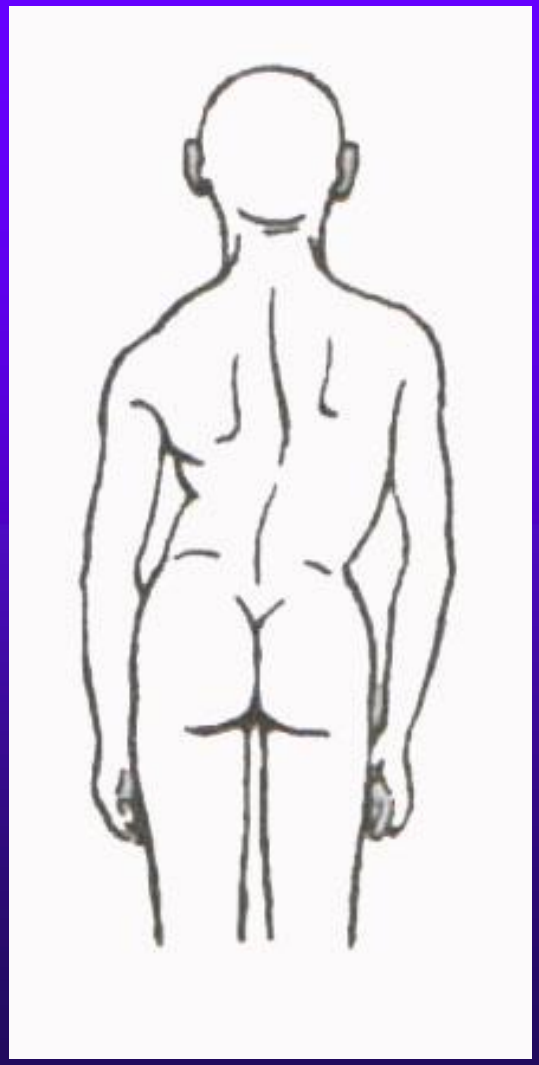
- The normal axis of the spine
- Nonsemetric triangles of the waist



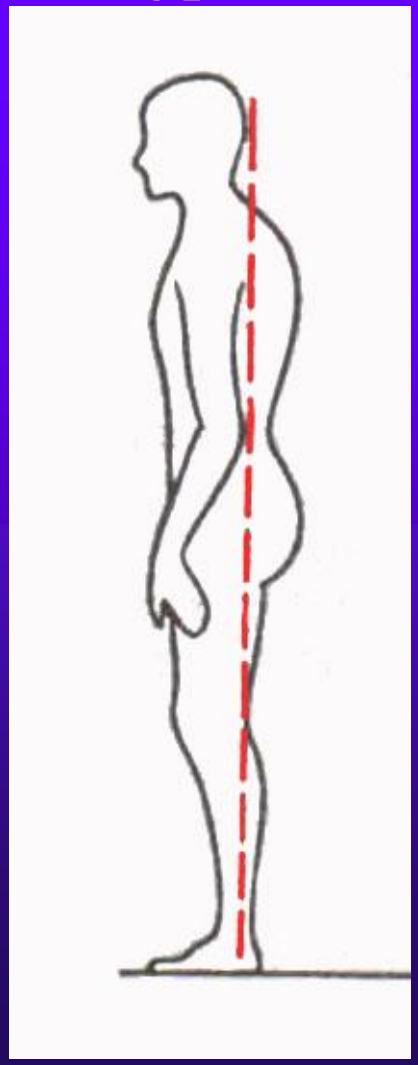


Clinical measurement of the body

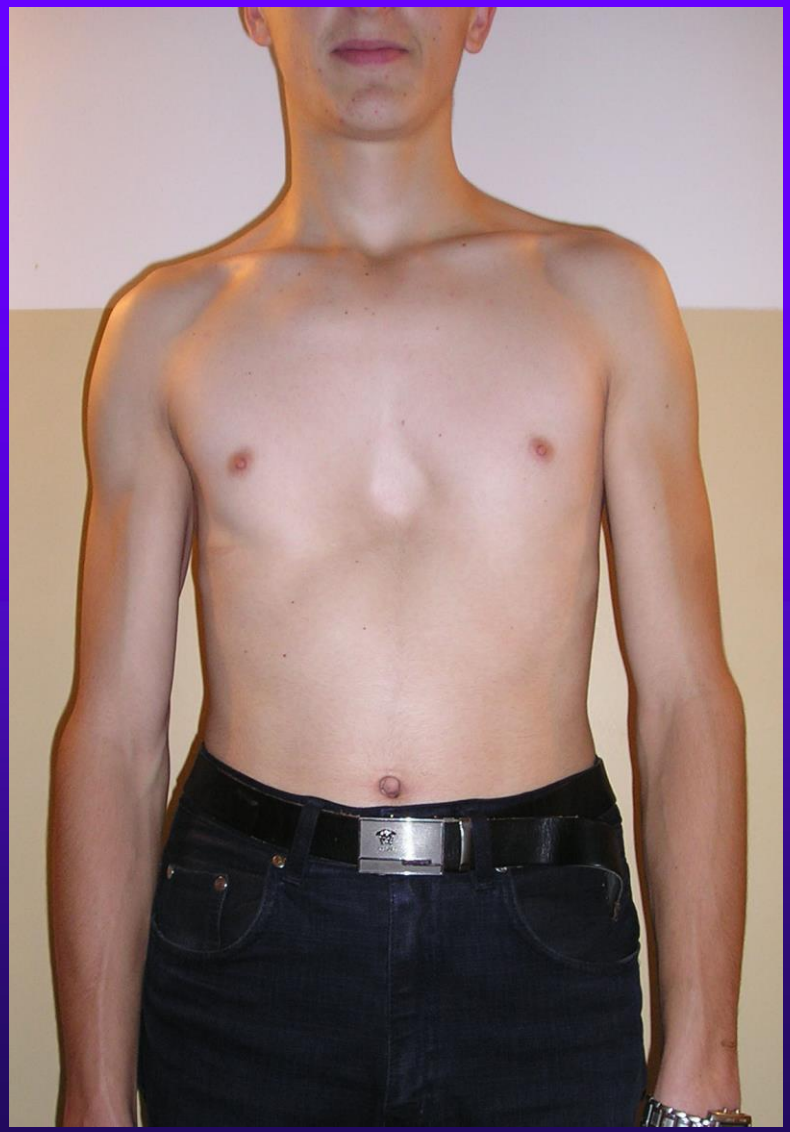
- Scoliosis



- Kyphosis



Koilosternia



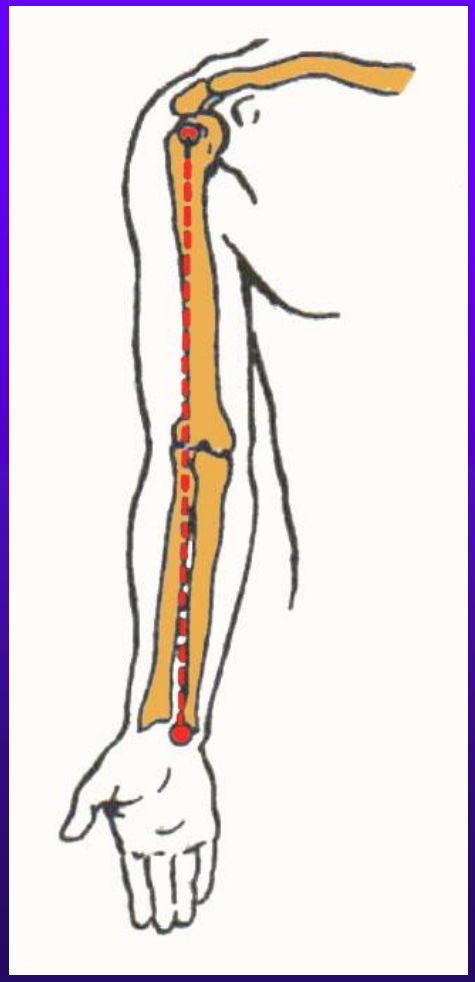
Clinical measurement of the limbs

Clinical measurement of the length of the limbs is following.

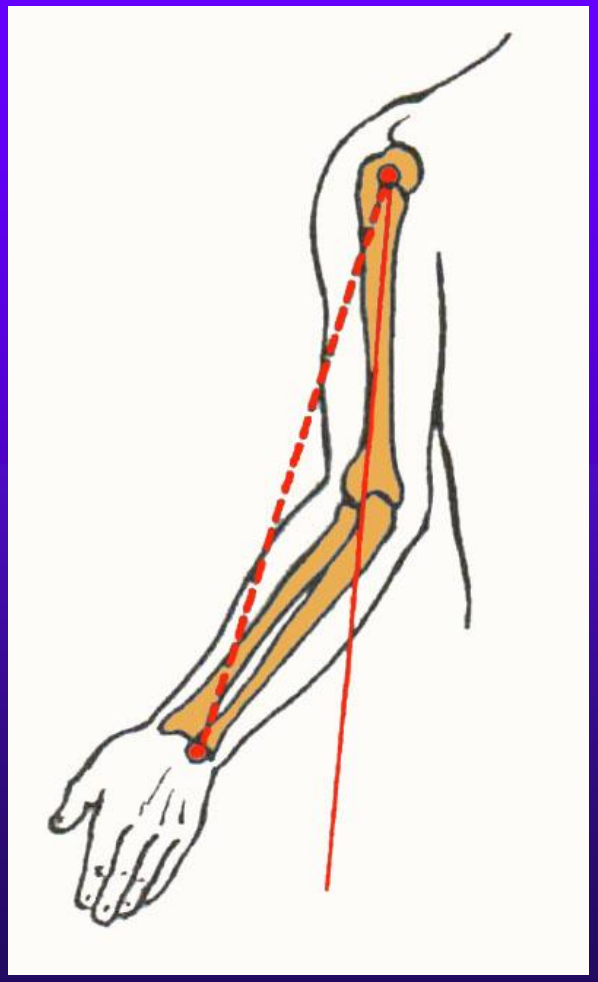
Leg or arm length discrepancy may be found among the most characteristic symptoms. Many injuries of the bones and impairments of the joints begin with this symptom. Sometimes it occurs in cases of congenital underdevelopment of the limbs. In these cases it is necessary to find out the length of the limb and clinical measurement should be done to determine the exact data.

Clinical measurement of the upper limbs

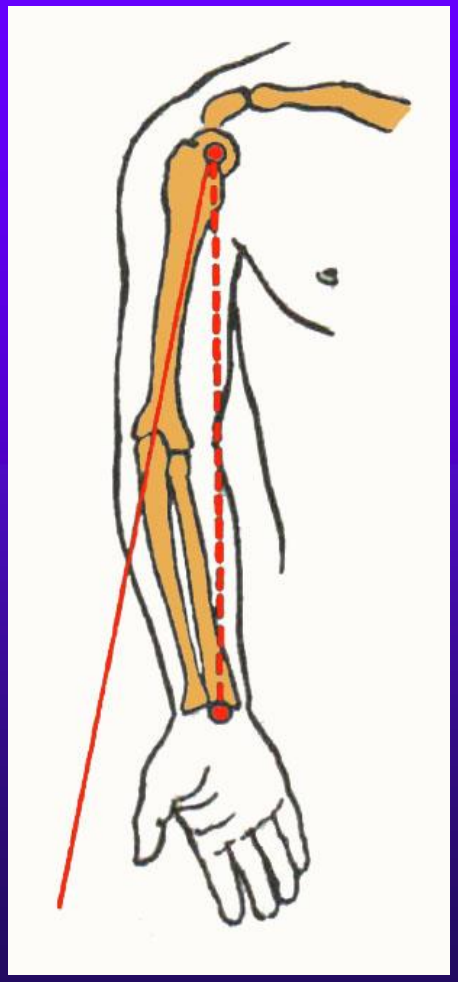
- Axis of upper limbs



- Valgus

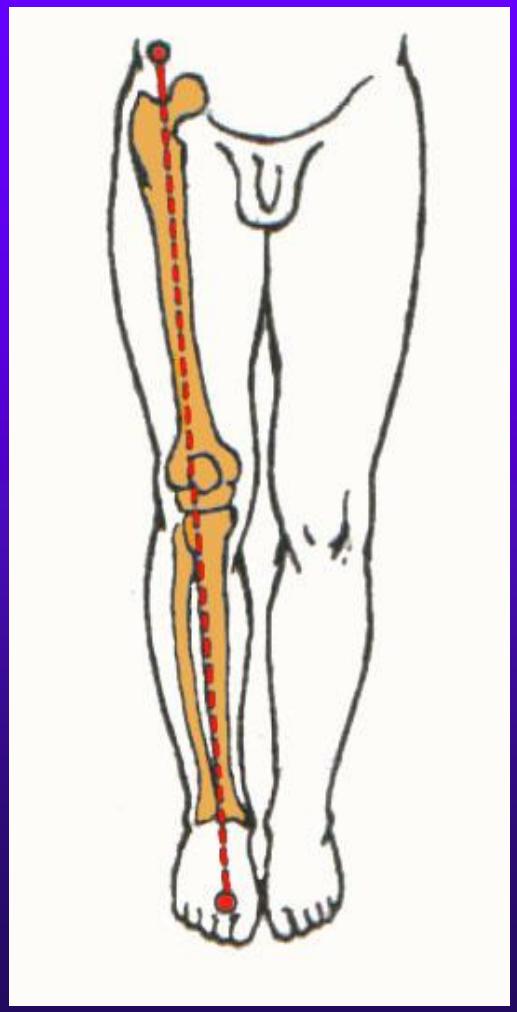


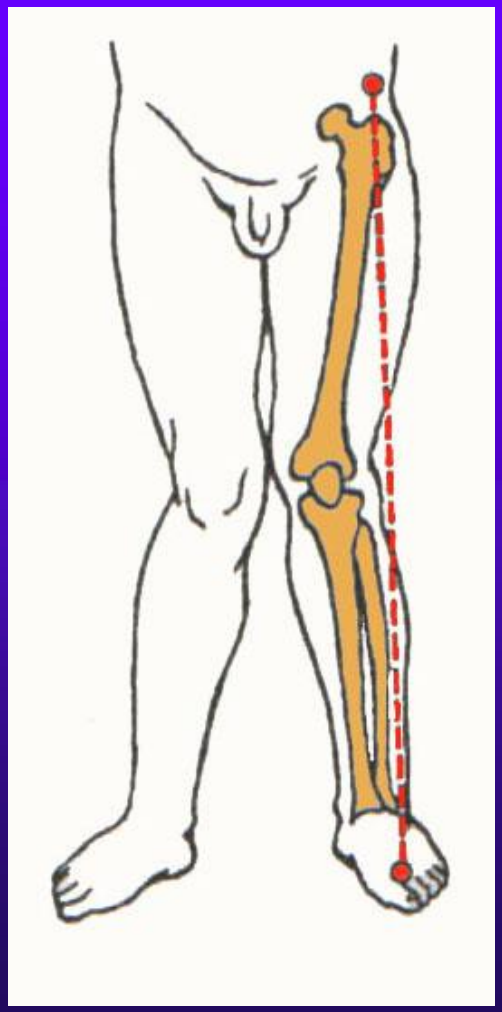
- Varus

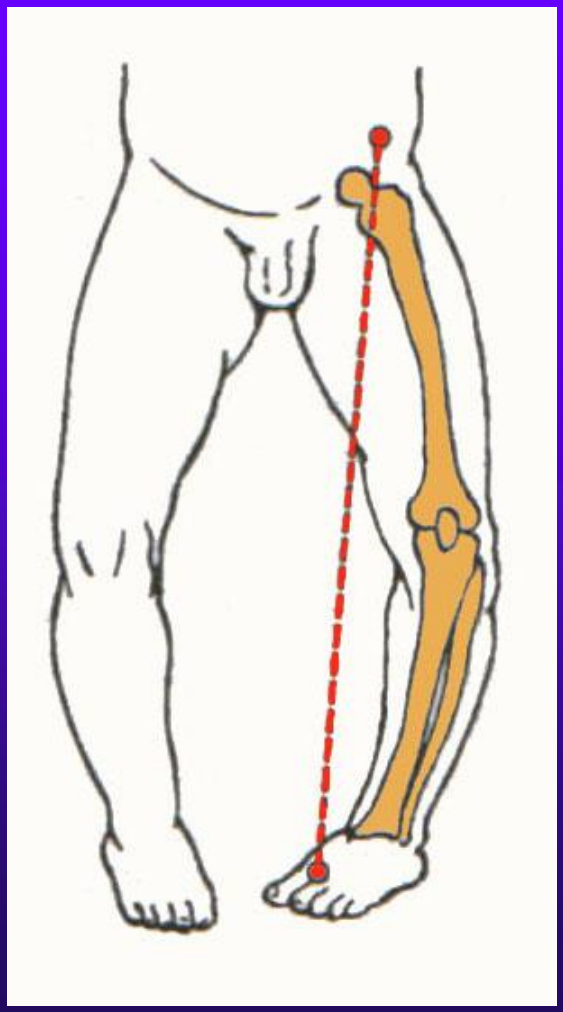


Clinical measurement of the lower limbs

- Axis of the lower limb
- Valgus
- Varus







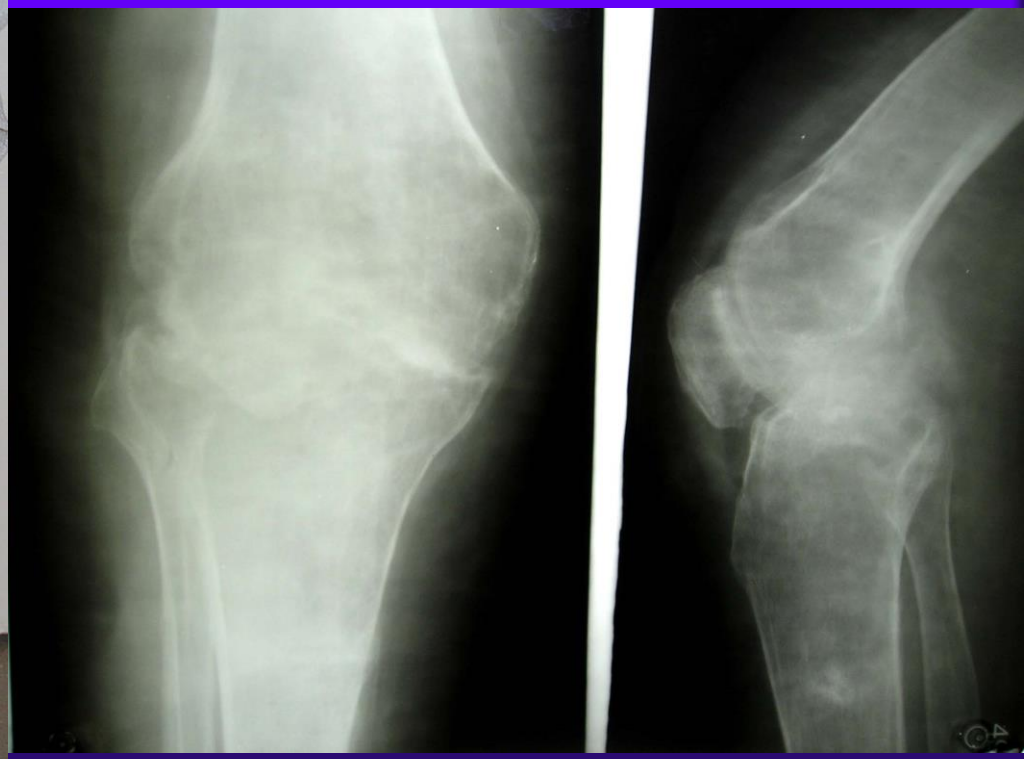
№	Name of the limb or its segment and length of the limb	Anatomic points		Comment
		Proximal	Distal	
1	2	3	4	5
1	Upper limb (total length)	The edge of the acromial process	The apex of the styloid process of the ulna	The arm is completely extended in the elbow
2.	Brachium (anatomic length)	Greater tubercle of the humerus	Lateral epicondyle of the humerus	–
3.	Forearm (anatomic length)	The apex of the tip of the elbow	The apex of the styloid process of the ulna	The forearm is flexed at right angel in the elbow
4.	Lower limb (total length)	Spina iliaca anterior superior	The apex of the medial malleolus	The lower limb is completely extended
5.	Femur and hip joint (total length)	Spina iliaca anterior superior	Joint line on the medial side of the knee	–
6.	Femur (anatomic length)	The apex of the greater trochanther	Joint line on the lateral side of the knee	–
7	Tibia (anatomic length)	Joint line on the medial side of the knee	The apex of the medial malleolus	–

Clinical measurement of the lower limbs

- Valgus of the tibia

Clinical measurement of the lower limbs

- Valgus of the knee joint



Clinical examination of the range of movements in joints

The movement produced by the action of skeletal muscles of the body of the patient is called an "active movement". In this case the movements should be examined passively and assisted "passive movements" will be required. The examiner's goal is to gently adduct, abduct, flex, and extend the patient's limb in its joints is an attempt to demonstrate mobility. The special instruments (the goniometer and rotatometer) are used to determine a range of the movements in the joints. The value of the angel is determined when the limb is completely flexed and extended in the joints. For example, the maximal flexion in the joint is 135° and the maximal extension is 20°. In this case the range of the movements in the joint is 135° – 20° = 115°.

Goniometer

There are three degrees of joint stiffness

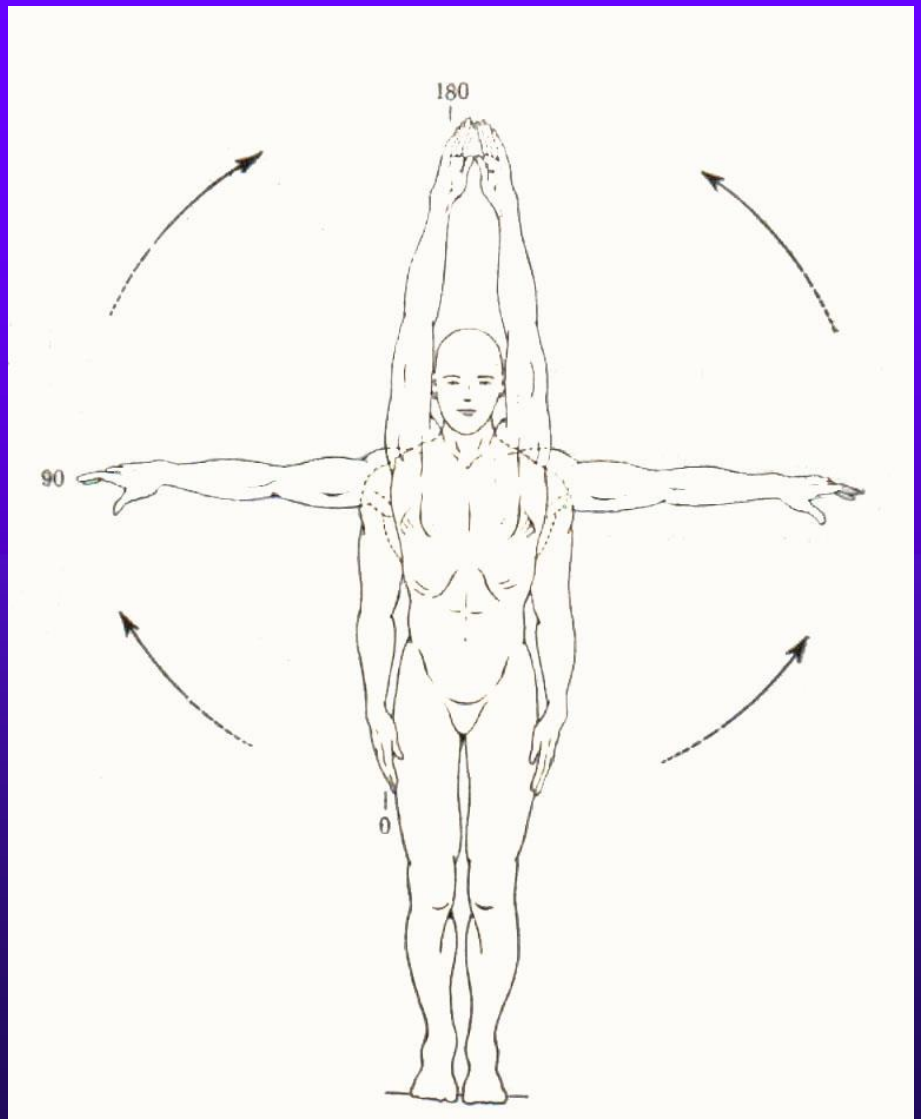
Ankylosis (all types of the movements are absent);

Contracture (there is visible limitation of the movements);

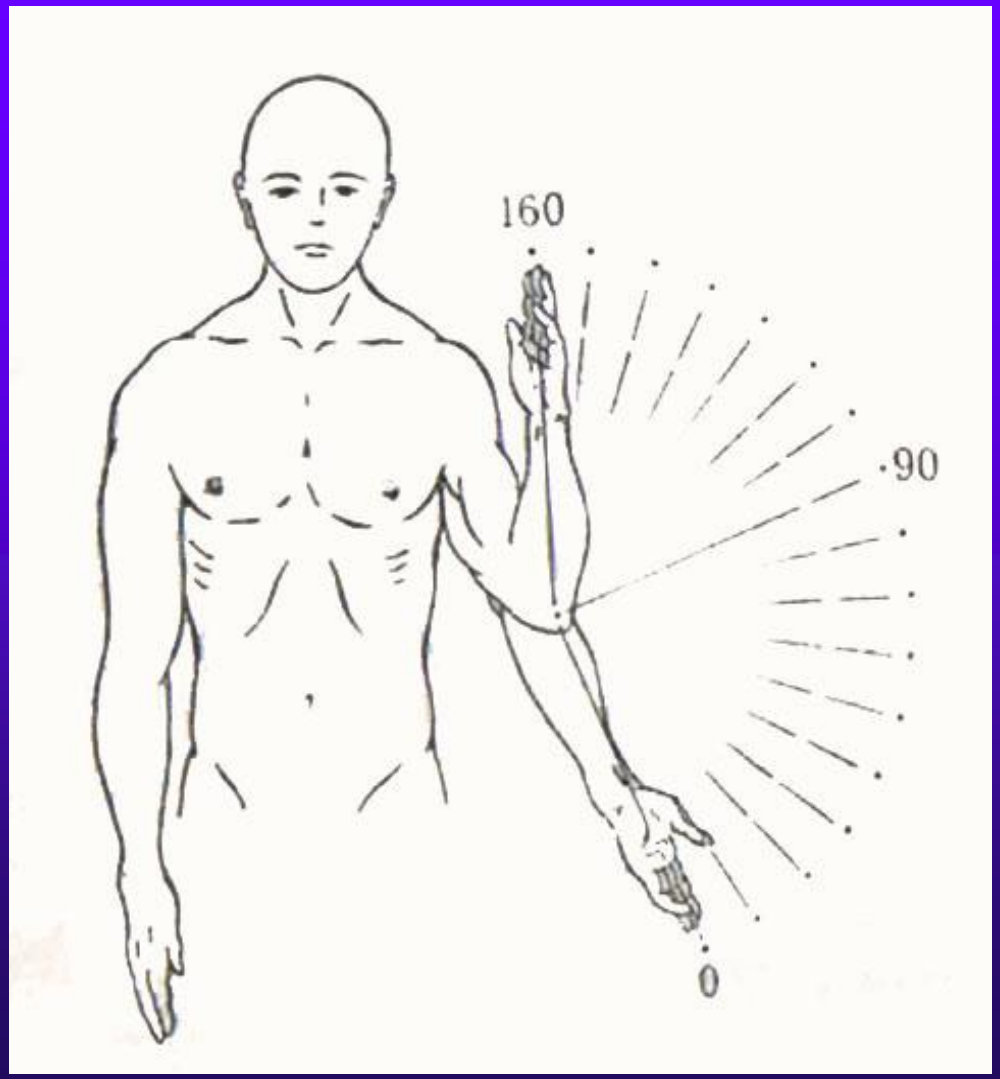
Regidity (the range of the movements in the joint is less than 5°).

The flexion contracture of the knee joints

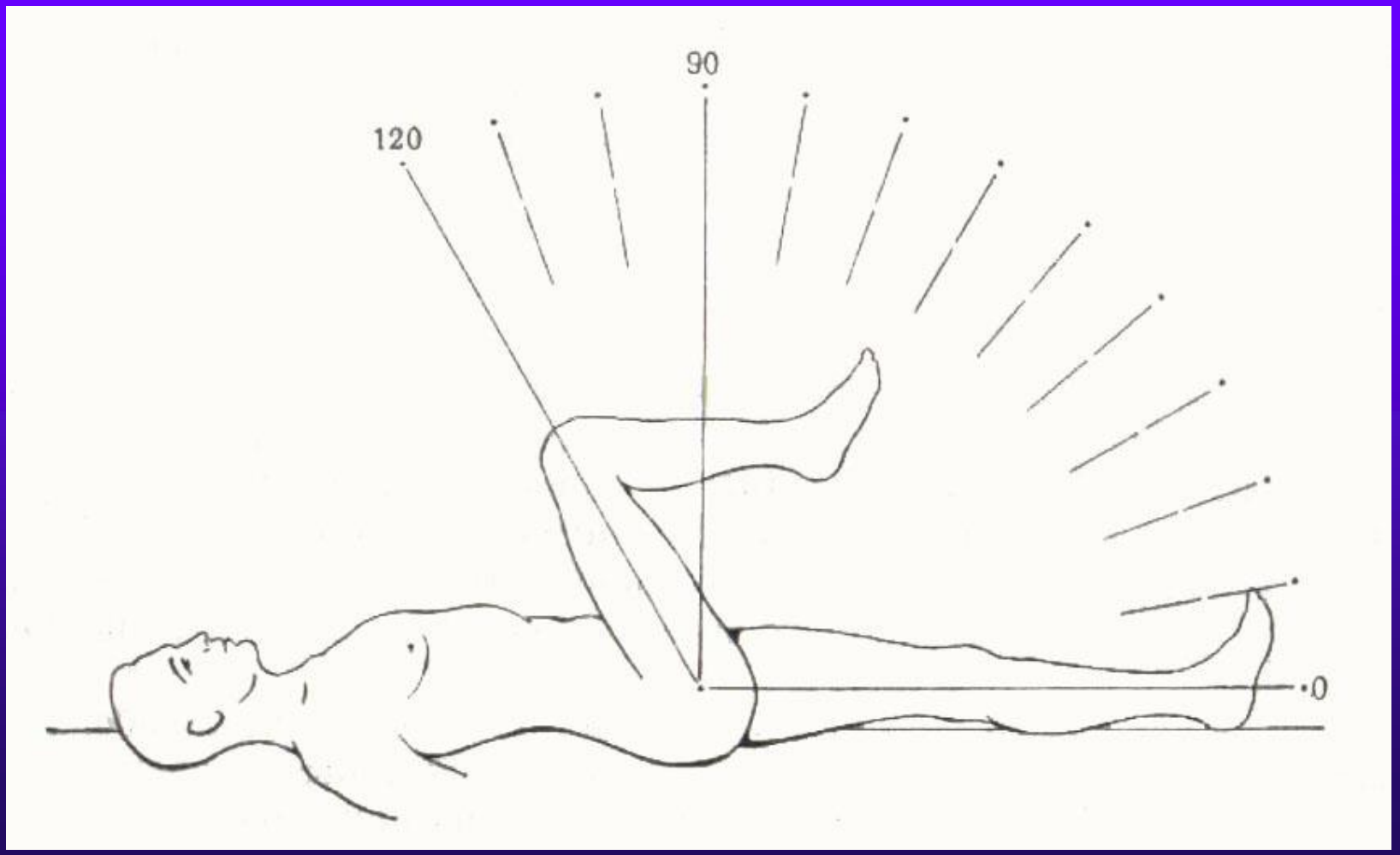
Clinical examination of the range of movements in humerals joints



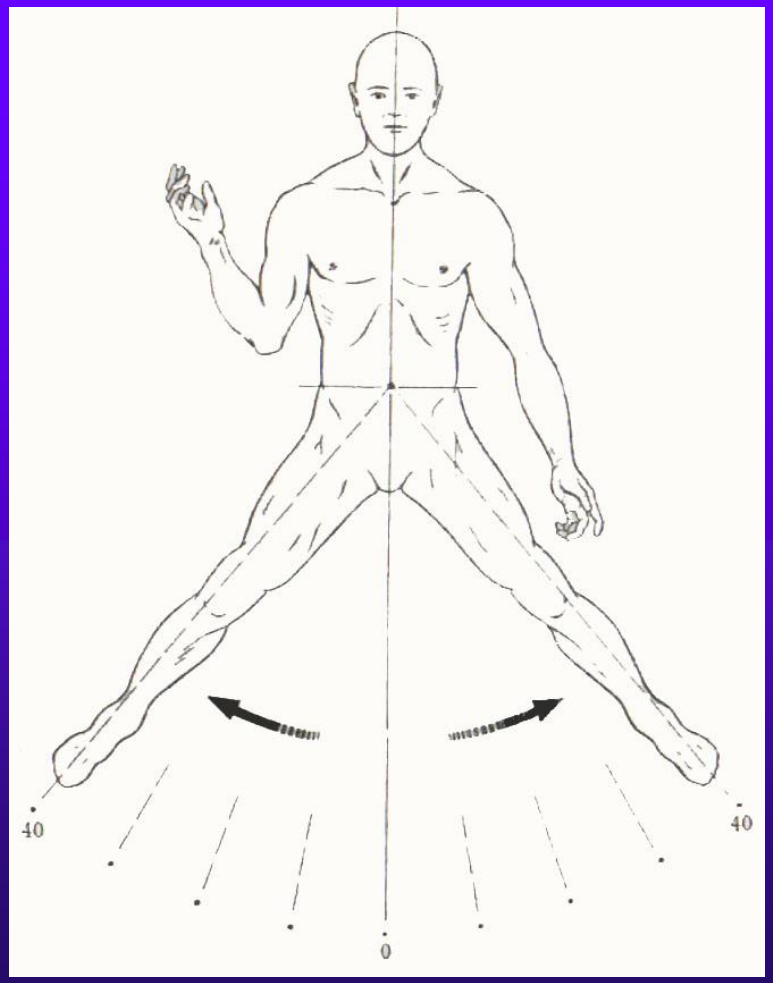
Clinical examination of the range of movements in elbow joints

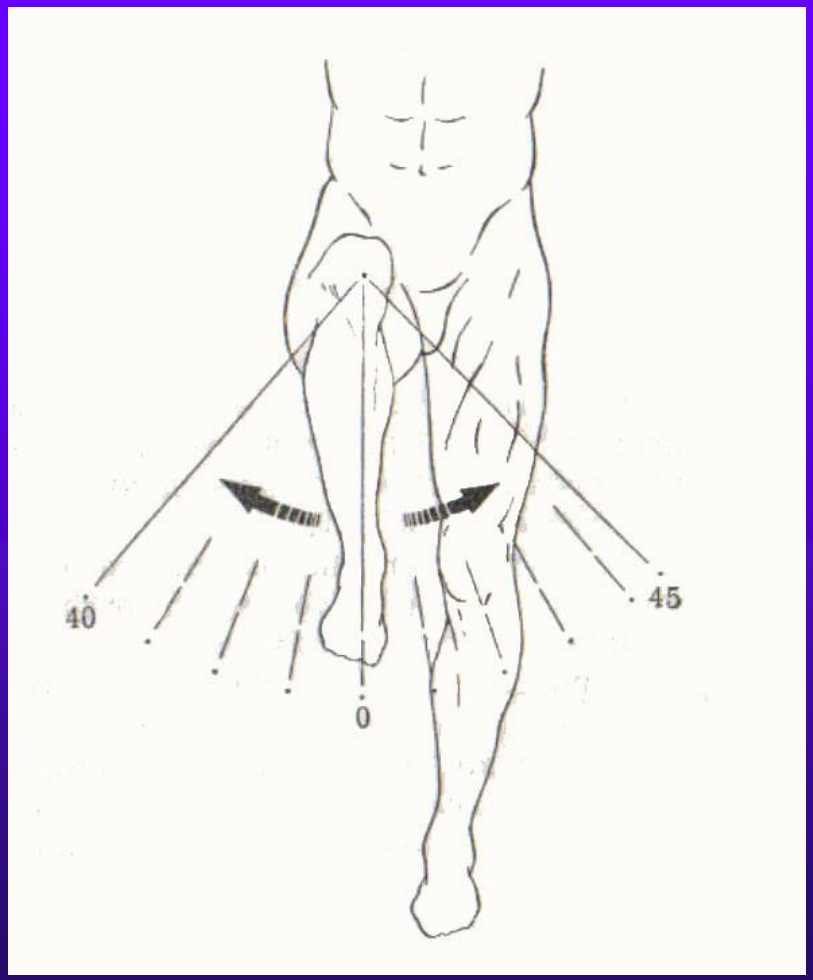


Clinical examination of the range of movements in coxofemoral joints



Clinical examination of the range of movements in coxofemoral joints





Clinical examination of the range of movements in coxofemoral joints

For example:

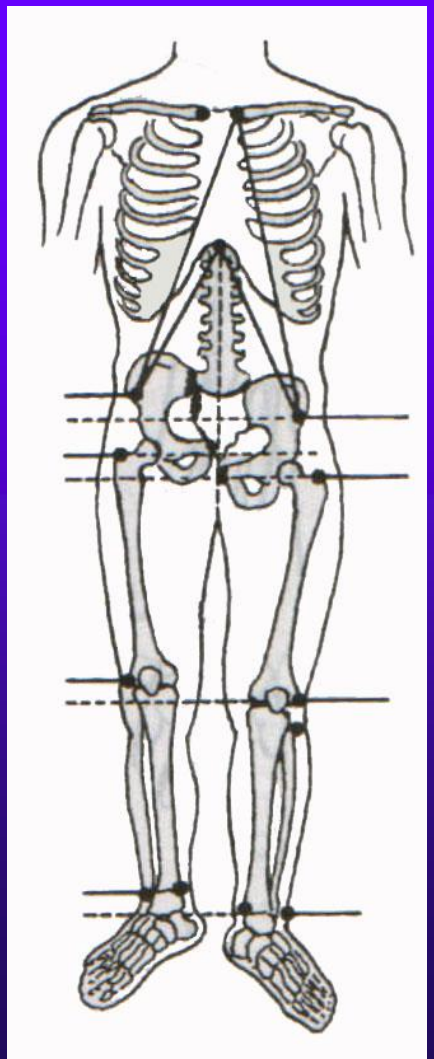
coxofemoral joints	R.	L.
ext. / flex.	10/0/20	5/0/90
abd. / add.	20/0/20	10/0/15
rot. auts. / ins.	20/0/15	10/0/5

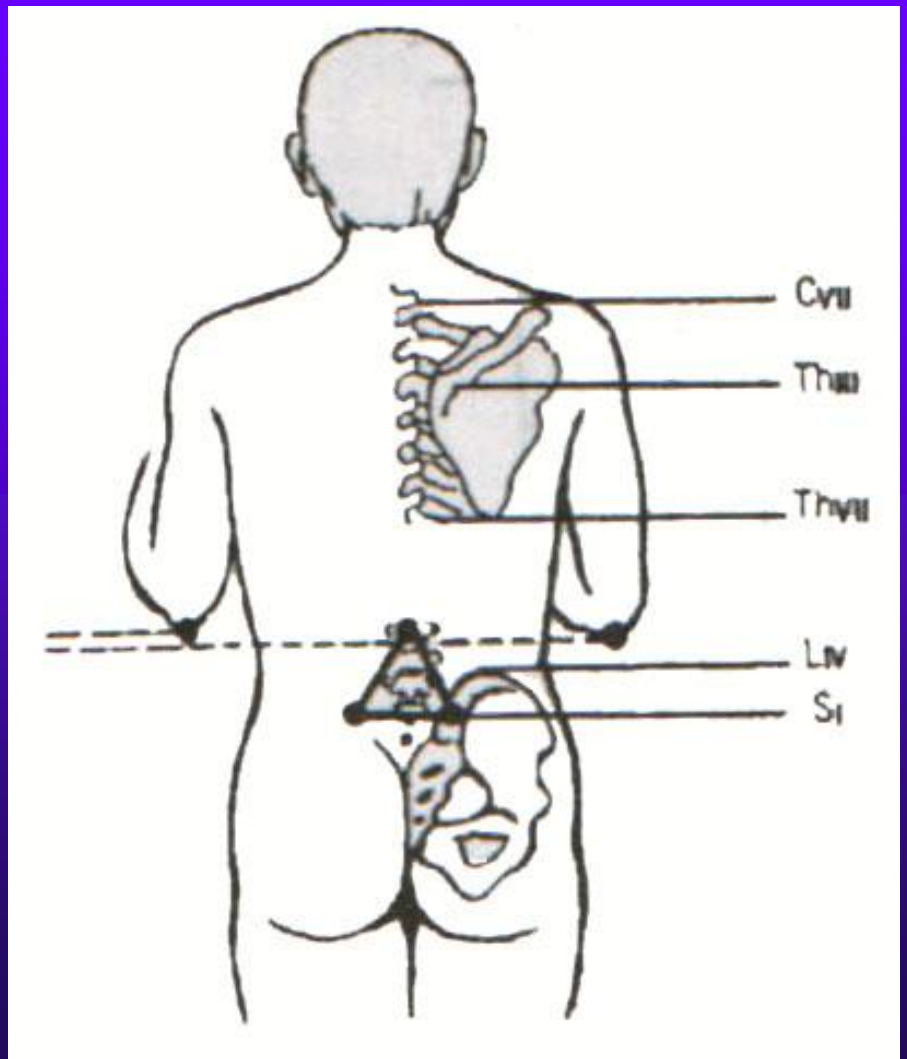
Sprain Vs. Strain

- Sprain - A sprain is an injury involving the stretching or tearing of a ligament (tissue that connects bone to bone) or a joint capsule, which help provide joint stability.
- Strain - Strains are injuries that involve the stretching or tearing of a musculo-tendinous (muscle and tendon) structure.

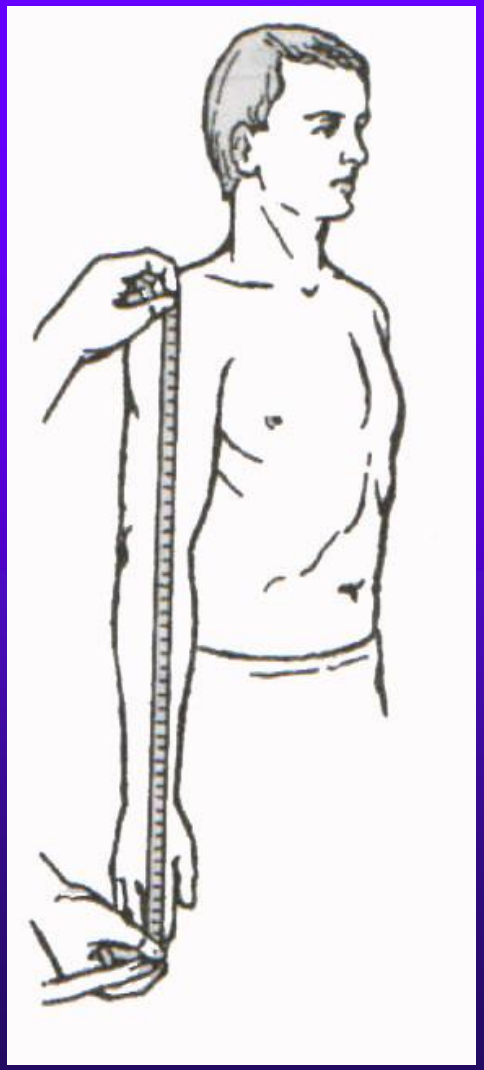
Clinical measurement of the body

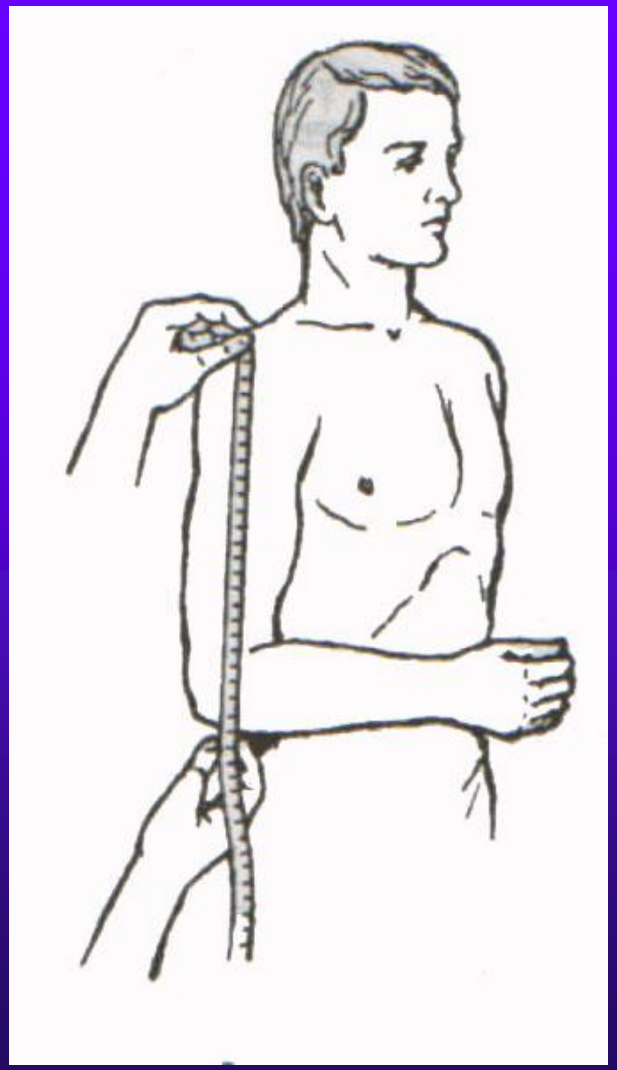
- **The comparative measurement from the bones puncts:**

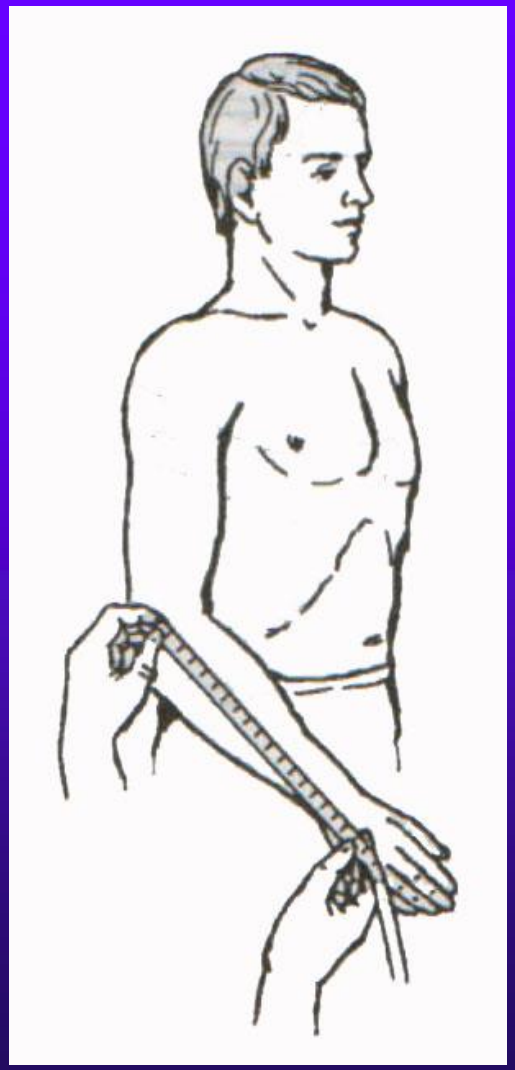




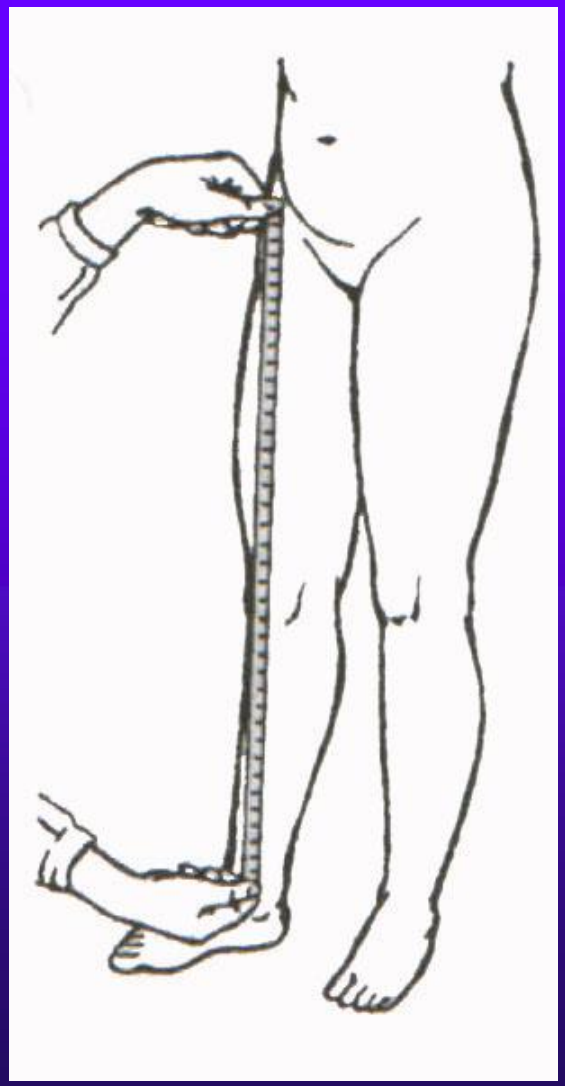
Clinical measurement of the upper limbs according the bones puncts

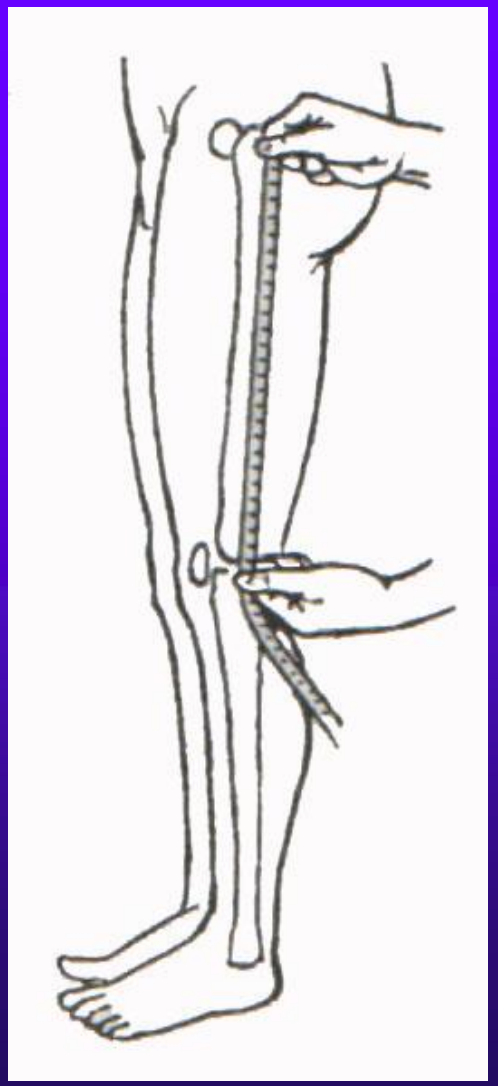


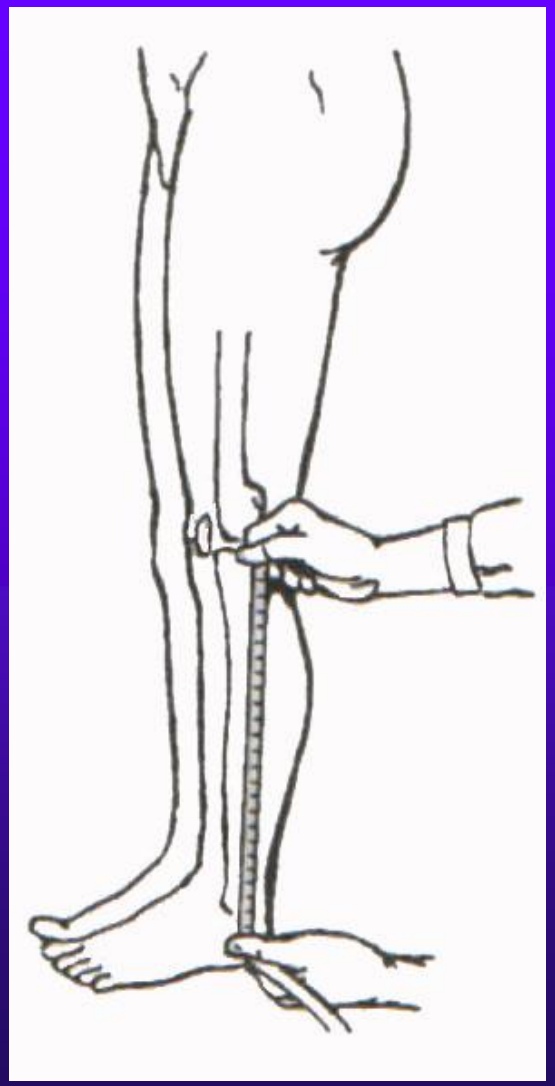




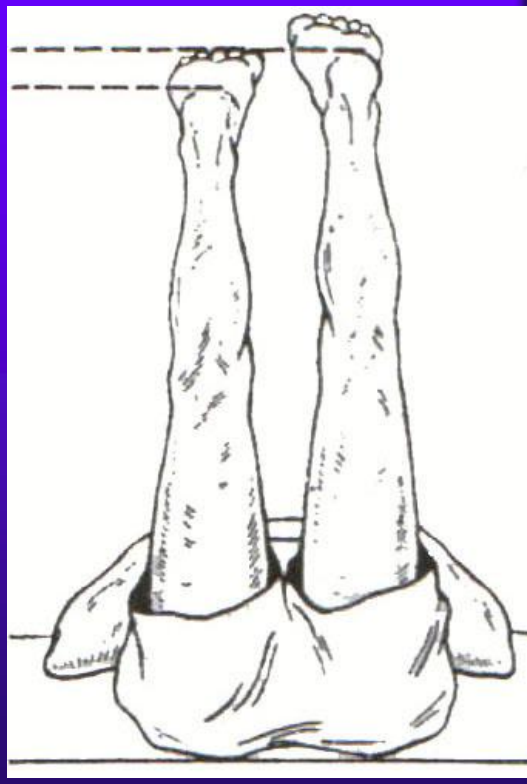
Clinical measurement of the lower limbs according the bones puncts



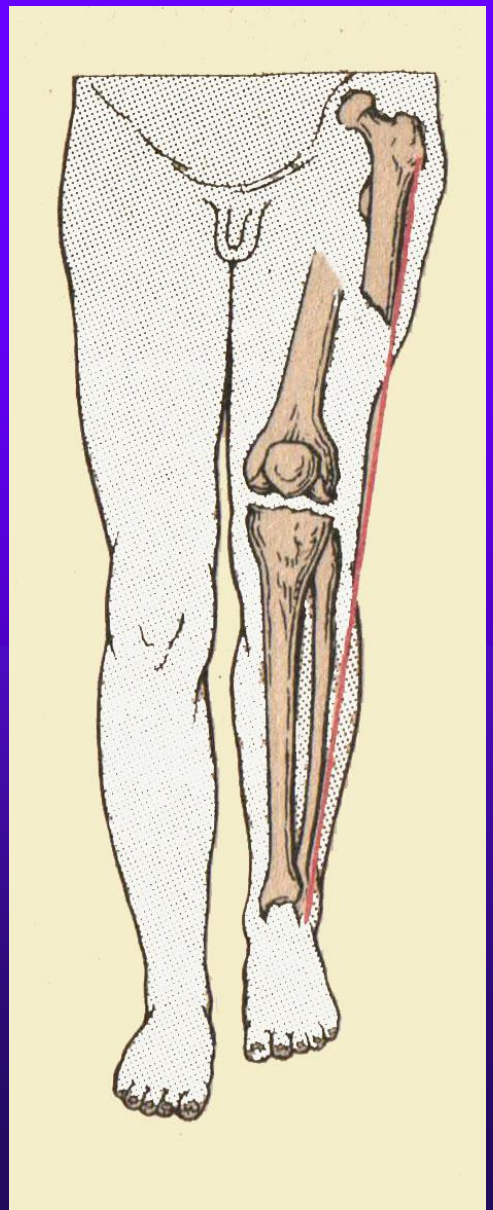




- The comparative measurement from the bones puncts:



Types of limb length discrepancy (LLD):



1. **Real** (anatomic) LLD may occur due to fracture or congenital anomalies (for example, bone dysplasia, hemihypertrophy, etc). In these cases one leg or arm grows faster than the other.

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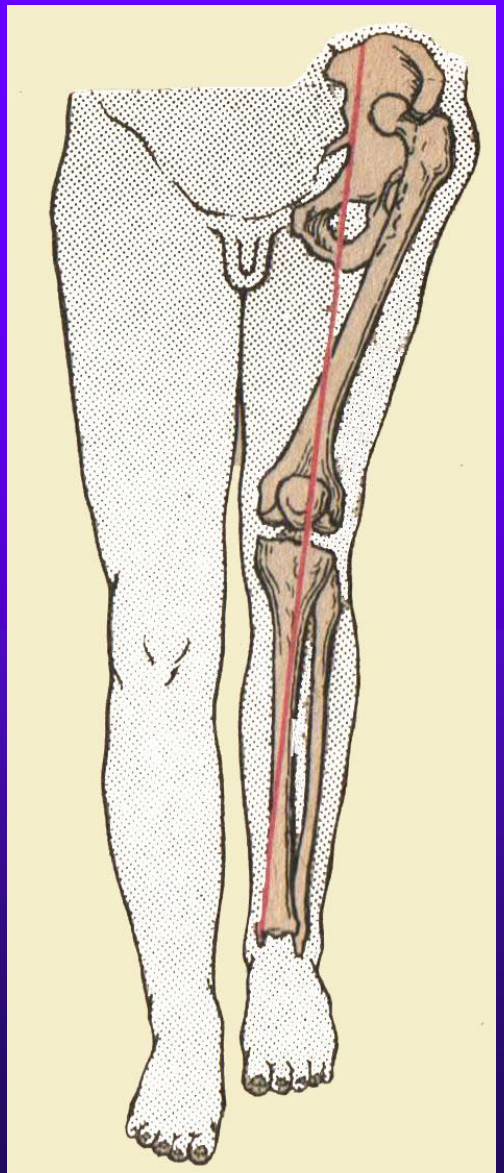

2. **Apparent** LLD is due to telescoping of the hip or humerus resulting from dislocation.

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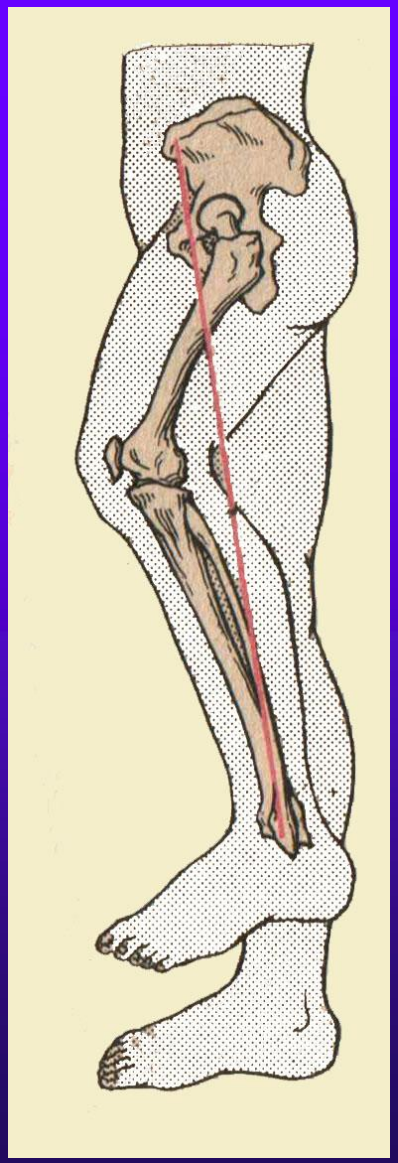
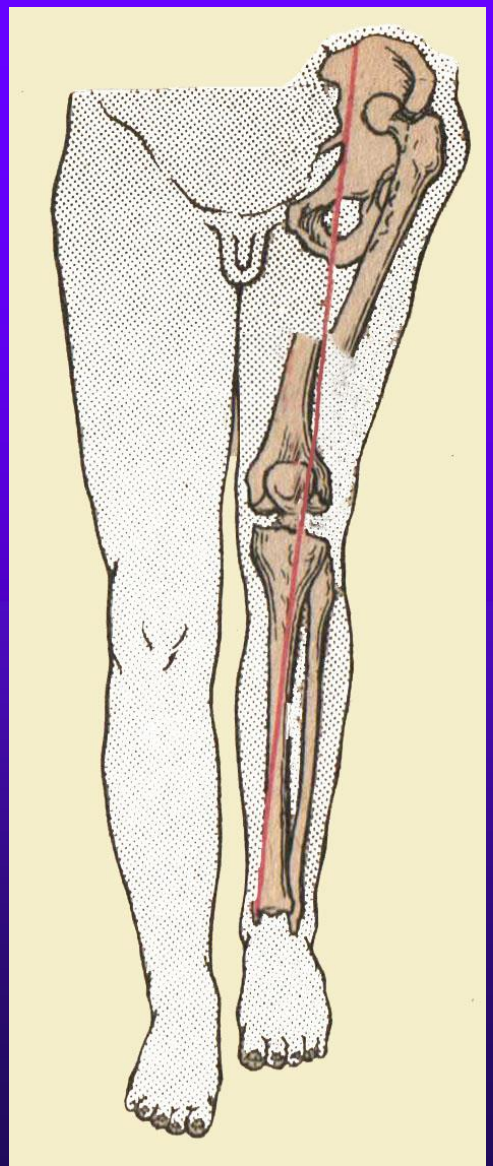


3. **Positional** LLD is due to an adduction contracture or fixed flexion at the knee or hip. In these cases the limb is shortened. The abduction contracture can make the limb surprising longer

Types of limb length discrepancy (LLD):



4. **Mixed** LLD is the total sum of all before mentioned types of LLD.

Impairment of the muscular strength

There are following levels of muscular strength may be determined:

5 points (excellent);

4 points (good);

3 points (satisfactory);

2 points (unsatisfactory);

1 point (the separate muscular contractions are hardly determined);

0 (any muscular contractions are absent).

Determination of the function

A thorough clinical examination of the function of the locomotor apparatus is always of great importance in making a correct diagnosis. To examine the patient the students are to pay attention to the gait of the patient and his movements and adaptions.

The typical disorders of the human gait

The types of the gait	The typical impairments
Halting gait متردد	Shortening of the lower extremity, the pain in the lower extremity
Salutatory gait تحية	Stretching of the lower extremity, ankylosis, pes equinoexcavatus
Shuffling gait متثاقل	Developmental dislocation of both hips
Swaying gait يترنح	O-like or X-like deformations of the lower extremities
Spastic gait	Spastic paraparesis
Paralytic gait	Paralytic paraparesis

Additional methods of examination:

- X-ray examination (roentgenography, roentgenoscopy);
- Computer tomography;
- Magnetic resonance;
- Surgical examination (arthroscopy, biopsy, puncture of the cavity of the joints, lumbar punction, etc);
- Laboratory examination (total blood count, blood sedimentation test, urinalysis, microscopic analysis, etc);
- Electrodiagnosis (electrocardiography, electromyography, etc).

Roentgenography is more available method of diagnosis. During this examination the students are to pay attention to:

- **shape of the bones a joints;**
- **contour of the cortical bone;**
- **site of the articular ends of the bones;**
- **structure of the spongy bone;**
- **shape of the joints line;**
- **state of the bone's cartilage and its ossification;**
- **structure of the soft tissues.**

Arthrography

- Radiographic procedure to check for the integrity of a joint.
- Air (pneumoarthrograhy) or contrast dye is injected.
- Xrays taken under stress to check for excess seepage into places where dye shouldn’t be.
- Done under local ansethesia by a radiologist or orthopedic surgeon.
- Podiatrists do arthrography to the foot and ankle.

Bone Scan (scintography)

- Radioactive isotope
- Bone absorbs the isotope at places where there is increased “blastic” activity. Osteoblasts are cells that lay down new bone.
- Normal scans show no uptake.
- Positive scans do not explain the reason for the result. Very sensitive but specific.

Computer Axial Tomography (CAT)

- Radiographic sectioning of the body.
- X-rays are taken at a specified thickness. When completed the individual slices are put together by a computer (computer generation).
- The scanner and detector and parts of the tube that encircle the body and record..
- Can be used to examine the abdomen, brain, chest, and extremities.
- Done by specially trained technicians and interpreted by radiologists.

Magnetic Resonance Imaging (MRI)

- No radiation
- Uses magnetic fields to produce an image.
- Useful for soft tissue structures (muscle, tendon, ligament) whereas CAT scans are useful for bones.

Doppler Ultrasound

- A test used to measure blood flow into a body part.
- Uses sound waves that are forced through the skin and bounce back to a recording probe. The result makes a sound that is used to diagnose circulation problems.
- Usually done on the large vessels of the extremities. A specialized version is used for the small vessels of the toes and penis.

Arthroscopy

Direct Joint Visualization

Instrument is Arthroscope

Done by an orthopedic surgeon

Knee, shoulder, and ankle are most common. Toe joints are also scoped with increasing frequency.

Can be a diagnostic tool or a treatment tool by removing tissue that is “dead”

Aspiration

- Withdrawal of fluid from a joint
- Can be done by any doctor in an office setting.
- A large bore needle is inserted into the joint to remove the synovial fluid.
- Fluid can be examined under a microscope for crystals (gout) or cultured for bacteria (infection).

Biopsy

- Remove of skin or other tissue for examination.
- Microscopic examination can reveal “changed” cells. Ie: cancer
- Breast, bone, muscle, and skin
- Usually done to make a diagnosis.
- When skin cancer is suspected, a biopsy is also used to remove tissue.

Complete Blood Count (CBC)

- Used to measure the components of blood.
- RBC, WBC, Platelets, Hemoglobin, and Hematocrit
- Differential separates the different types of WBC's

Bleeding Time

- Used to assess how long it takes to form a clot of a small cut or wound.
- Used to determine platelet function.
- Increased bleeding times is found in patients with low platelet counts and deficiencies of fibrinogen.

Orthopaedic Core Competencies

- EMERGENCIES / RED FLAGS
- FRACTURES / TRAUMA
- PEDIATRIC ORTHOPAEDIC CONDITIONS
- NON-TRAUMATIC ORTHOPAEDIC CONDITIONS
- CLINICAL ASSESSMENT & DIAGNOSIS SKILLS

EMERGENCIES / RED FLAGS

- Open Fractures
- Fractures with nerve or vascular compromise
- Compartment Syndrome
- Cauda Equina Compression
- Bone, Joint and Soft Tissue Infection
- Multiple Trauma (Pelvic Fracture)
- Acute Joint Dislocations

Fractures & trauma

- **Common Adult % pediatric Fractures**
  - **Upper Limbs**
  - **Lower Limbs**
  - **Pelvic**
- **PERIPHERAL NERVE INJURIES**
- **Acute Spine Injuries**
- **Soft tissue injuries**
- **Joint dislocation**

Pediatric orthopaedic

- **Common Hip Conditions**
- **Common Lower Extremities Condition**
  - Alignment / Rotational conditions
  - Gait Problems
  - Lower extremities deformities

NON-TRAUMATIC ORTHOPAEDIC CONDITIONS

- Spine
- Tumors
- Metabolic
- Joints condition

Spine

- **Degenerative/Mechanical neck/back pain**
- **Spinal cord or root entrapment (for example, herniated lumbar disc)**
- **Vertebral fracture of osteoporotic origin**
- **Spinal deformity (scoliosis)**
- **Destructive (infectious and tumor related) back pain (for example, tuberculosis, metastasis, certain cancers)**

Bone tumors

- **Metastatic bone disease**
- **Primary bone lesions**
  - Benign bone tumors
  - Malignant bone tumors

Metabolic bone disorders

- **Osteoporosis**
- **Osteomalacia and Rickets**

Joint conditions

- **Degenerative OA**
- **Shoulder Chronic Condition**

Clinical Assessment & diagnosis skills

- History taking
- Physical Examination
- Investigation interpretation
- Communication and attitude skills
- Procedural Skill
  - Knee joint aspirations.
  - Apply and remove a cast
  - Joint/fracture reduction techniques