MUSCULOSKELETAL IMAGING

Technical considerations of X-ray examinations of musculoskeletal system

The radiological method takes conducting place in diagnostics of damages and diseases of the skeletal system. At suspicion on damage or disease of a skeleton it is radiograhy. It is the basic method of researches of bones and joints. Radiography of bones of a skeleton and extremities make approximately 20-30 % from all diagnostic radiographic researches in the world. On some data, it is found out more than 80 % of defeats of bones, and almost in 70 % correct interpreting of the revealed changes is possible. In the beginning make survey film of a bone (joint) in two mutually perpendicular projections.

Preparation for a X-ray inspection

Special preparation usually it is not required. At an acute trauma of extremities of various sort of the splint usually are not an obstacle, therefore splints do not take out. Unguentums delete. The gypsum at research the healing of frame is taken out.

Pelvic and lumbosacral department of a backbone: cleansing enemas are carried out for 3-4 hours before dream and directly ahead of it on the eve, in day of research for 1-1,5 hours before filming. Films carry out on an empty stomach. Contraindications are not present, behind exception, a shock, a terminal state demanding an immediate medical care for maintenance of the vital functions. Regarding cases usual radiograhy cannot answer all questions of clinic that causes application of additional techniques.

Restrictions radiography:

1. The loss, a gain of an osteal tissue or their combination are displayed mainly provided that they achieve the certain quantitative degree.

2. Low specificity: it is impossible to distinguish directly non-mineralize tissues: an osteoid, bone marrow, granulation, tumoral or fibrous tissues.

3. Low sensitivity to pathological changes soft tissues elements.

Tomography conventional - the important additional technique of research of bones and joints at which the opportunity to receive the image of separate layers of a bone is frameed. The general meaning is got with a tomography at research of those departments of a skeleton which have a complex configuration.

Computerized tomography (CT) allows to reduce sphere of application of a conventional tomography considerably.

Indications to CT:

1. Revealing of soft tissuses components of osteal defeats of extremities, pelvic bones and a backbone. Revealing and exact localization of damages of muscles.

2. An estimation of changes of density of spongy frame of bones and definition of percentage of mineral salts in bones.

3. Revealing fractures of bones of extremities, a backbone, pelvic bones, is especial without shift fragments.

4. An estimation of results of a chemotherapy or radiotherapy and revealing of their complications.

Direct augmentation of image - a technique of reception of enlarged X-ray films due to change of distances: focus, object, a film. Shadow details on the given X-ray films are characterized by their augmentation in sizes that is important at an estimation of fine elements of frame of bones.

An arthrography - research of joints with application of contrast agents (oxygenium, air, water-soluble contrast agents).

The given technique specifies diagnostics of a condition of intraarticulate elements, for example, in a knee joint - meniscuses, cruciform ligaments.

Fistulography - contrast researches of fistulous courses at some diseases of a skeleton: an osteomyelitis, a tuberculosis. Fistulous courses are filled by oil-soluble contrast agents then usual pictures are made.

The angiography can benefit for an establishment of the diagnosis and definition of tactics of conducting the patient in cases:

- Occlusions or break of an arteria owing to a trauma;
- A clottage of vessels;
- Presence of formation of presumably vascular parentage in soft tissues:
- arteriovenous malformation;
- Initial tumours of bones if after a course of a chemotherapy operative treatment is planned;
- Deformations of extremities, including, fingers, for development of tactics of operation.

The digital subtraction makes an angiography more convenient and less invasive. The basic disadvantage of the given method is that at its application the fine vessels seen on usual angiograms can not be visualized.

Fluoroscopy. This method with its small resolving power and rather big dose for research of the muscodevice should be applied only in desperate situations, for example, at the some people interventional radiology operation such as erasion of foreign bodies, etc.

Bases of an applied radioanatomy of musculoskeletal system:

Technics radiography bones. At research of extremities in a picture it is necessary to grasp two nearby joints, the suspected site of a bone should be in center of the cassette, i.e. there where the central beam is referred. Fixation of taken out area is an indispensable condition at filming, small motion conducts to revealing a vagueness of a drawing.

Technically well executed picture considers such radiography on which it is well seen thin structural (trabecular) a drawing of a bone, and the bone is taped as high radiodense (radiopaque) structure on background of soft tissues which has less radiodense.

Diagnostic opportunities of a X-ray method in an osteology depend on a anatomy-morphological substratum of pathological process in osteal and environmental them of tissues.

On a radiography the precise image of especially osteal tissue, its inorganic part consisting of salts of calcium and phosphorus turns out, and the component of a bone on a roentgenogram does not frame shadow. Thus, if process is connected to destruction of mineral structure of a bone, radiological diagnostics is substantially facilitated and, on the contrary, at presence of a pathology of an ossiform tissue of an opportunity of a radiological technique rather circumscribed.

From the point of view of a radiological method of research, all skeleton will consist of three frames: a compact bone, a spongy bone, frame without osteal elements. Furthermore, bone may be of two architectural types: compact (dense) bone or cancellous (spongy) bone. The distribution of these types of bones depends on the stress to which each bone is subjected.

There are three locations within a bone: the epiphysis, or growth center; the metaphysis, an area that lies just beneath the physis, or growth plate; and the diaphysis, or shaft. As you will see later, these locations are of considerable importance in predicting the nature of some bone lesions.

The form and the sizes of a bone caused by a functional orientation of this or that part of a skeleton depend on prevalence of this or that frame. The compact bone anatomic- morphologic will consist of skintight osteal beams between which practically is not present intertrabecular the space filled soft tissues with a component. Therefore, rontgenologic the picture of a compact bone is represented as the continuous teniform or thready tissue bordering a bone outside. The compact bone in connection with such locating refers to cortical as a layer.

Spongy, or spongiform, the bone anatomic will consist from bound osteal trabeculaes, posed on the certain distances from each other. Between them there is a red bone marrow – soft tissues a part of a bone. The X-ray pattern of a spongy bone rather typical also is characterized reticular trabecular by the frame dependent on a anatomic-functional orientation of each bone. Frame without

osteal elements in a skeleton are bome marrow canals in long tubular bones, apertures or spacees through which pass vessels having a bone; cartilaginous lines in metaepiphyseal departments, air sinuses and the whole system of articulate space - all this frame as a whole rontgenological is taped by sites of an enlightenment of the various form, sizes, heights.

X-ray pattern of long tubular bones. As is known, each long tubular bone will consist of a diaphysis, two metaphyses and two epiphysises: proximal and distant metaepiphysises. Each department has a characteristic X-ray pattern. The diaphysis on a X-ray film (negative) will consist as though of two light strias of a compact bone (coritical a layer) which in the central part of a femur of the adult person can achieve 1 sm.

Being referred in trailer departments, the compact bone in the field of metaphyses considerably retinens rostrali, and in epiphysises is defined as a thin thready strip which refers to as a switching plate. Along all diaphysis as a light strip passes coming to an end in a place of transition of a diaphysis in a metaphysis the bone marrow canal.

Metaphysis - the site of a long tubular bone posed between a diaphysis and a growth plate between metaphysic and epiphysises. The X-ray image of it represents typical reticular frame with larger cells, than in epiphysises.

Epiphysises - the trailer departments of a bone which are taking place behind a growth plate of a cartilage or suture (at an adult); make articulate the head with trabecular mesh frame, characteristic for a spongy bone.

Short bones of a skeleton. Their X-ray pattern in general is identical: as a whole all bone will consist of spongiform substance and is zonated from different directions by a thin plate of a compact bone.

Flat bones - bones of a breast bone, a skull, a rib, a scapula, pelvic bones. They have the common X-ray pattern, expressing that between strips of a compact bone there is a spongiform bone from it trabecular mesh frame. Bones of a skull differ some originality: the compact bone - external and internal a plate - rather thick, diploe between them has a tissue other display, than a spongy bone in other bones.

Joints. Anatomical, as is known, the joint represents intermittent, cavitary, mobile bond. The most part of articulate elements has soft tissues frame and direct display in a picture does not give. Rontgenological appears only two articulate components: the articulate ends of bones and an articulate space. Articulate the end of each bone has strictly certain form and the frame corresponding to function of a joint. In an image the articulate ends have precisely contour also are zonated by well expressed equal "smooth" compact osteal plate.Cortical layer, taking place under articulate cartilage, , it is accepted to name this part switching, or a closing plate. A closing plate of an articulate hollow in normal conditions always considerably to thickness of a subchondral plate of the articulate head.

The articulate space is shown on X- ray film as a strip of an enlightenment and the form which projectively corresponds to articulate cartilages, to disks, meniscuses and intraarticulate ligament, and also a true anatomic articulate space. For each joint the X-ray articulate space has the certain height and the form. At children an articulate space wide, and at old men narrow owing to a deterioration of a cartilage. The widest articulate space at knee and femoral joints (4-6 mm). For a healthy joint complete conformity of articulate surfaces is obligatory.

Age features of a skeleton

The bone newborn sharply differs from a bone of the adult. On a X-ray film newborn receive display only calcified diaphyses; cartilaginous epiphysises, as well as all fine stone, are not discernible, behind exception only distant an epiphysis of a hip, and also calcaneal, collision and cubiform bones which ossification begins at uterine age. Presence of the specified calcifications is an attribute of a maturity of the fetus.

In connection with body height of the child gradually there are ossification centers in epiphysises of long tubular bones and in others, including, ossicles. There will be no yet a complete ossification, between an epiphysis and a body of a bone the light strip - cartilaginous a layer termed as an epiphyseal zone or an epiphyseal line will be taped.

There are fulfilled tables on which it is possible to define rather precisely age of a growing organism on the basis of the account of occurrence of nucleus of an ossification and accretion of an epiphysis with a metadiaphysis. The epiphyseal line that will be wider, than more youngly the person, it circumscribed on the part of an epiphysis to the osteal plate environmental spongiform substance of an epiphysis - a basal zone of an ossification, and on the part of a metaphysis its spongiform substance - the dense osteal shaft termed as a zone of a preliminary calcification.

Thus, X-ray film of bones and joints of children are characterized by the following attributes: 1) presence of ossification centers of epiphysises; 2) presence of a growth plate; 3) presence of appreciable height of an articulate space.

The final synostosis of epiphysises with diaphyses comes by 24-25 years, at women for 2-4 years earlier; on a place of an epiphyseal zone on X-ray film long time is taped more radiopaque line termed as epiphyseal cicatrix.

Radiography changes of bones and joints

The plan of studying of a X-ray of a bone (joint) is rather simple. In the beginning it is necessary to estimate a position, the form and size of the bones displayed in pictures. Then it is necessary to consider contours of external and internal surfaces coritical a layer on all an extent of a bone. Further it is necessary to investigate a condition of osteal frame in all departments of a bone. If films are made to the child or the teenager specially find out a condition growth plate and nucleus of an ossification (terms of their occurrence, symmetry of an ossification, terms synostosis). It is studied a ratio of the articulate ends of bones, size, the form of a X-ray articulate space, an outline of a switching osteal plate of epiphysises. At last, it is necessary to establish volume and frame of the soft tissues environmental a bone.

The X-ray pattern of change of a bone at any pathological process develops of the following components: change of frame, the form, volume, size, contours of a bone and environmental tissues.

The sets of symptoms accompanying with decrease of substance of a bone:

The basic and most frequently a revealed radiological sign at diseases of bones is the osteoporosis. An osteoporosis, or underpressure, bones (rarefying) refers to decrease of osteal substance without change of volume, i.e. decrease of quantity of an osteal tissue in unit of volume of a bone and, hence, as augmentation in volume of medullar cells. Thus decreases both thickness, and quantity of osteal beams. The sizes of a bone at an osteoporosis remain without changes.

Thus dynamic equilibrium of metabolic processes of an osteal tissue that results in negative final balance is broken. At an osteoporosis each osteal beam contains normal quantity of mineral salts as their adjournment and connection with an organic matrix is adjusted by the physical and chemical laws retaining the force and at osteoporotic to reorganization.

The osteoporosis in the X-ray image is characterized by the following attributes: 1) occurrence reticular frame with more larger cells the drawing of a bone arising in connection with a thinning and destruction of separate osteal beams and augmentation of volume of medullar cells; 2) a thinning coritical a layer of the bone, the caused destruction of osteal beams on the part of the bone marrow canal; 3) expansion of the bone marrow canal as a result of a thinning coritical a layer on the part of the bone marrow canal; 4) spongy coritical a layer in connection with partial destruction of osteal plates; 5) sharp emphaticalness cortical a layer of all bone. The osteoporosis should be distinguished from a destruction at which osteal beams disappear absolutely. On character of shadow display the osteoporosis can be: focal, non-uniform (spotty, skewbald) and uniform (diffuse).

The non-uniform osteoporosis as the remote islands is observed more often at acute processes: neuritises, fractures, phlegmons, combustions, frost-bitten and frequently is an initial phase after which there comes a diffuse osteoporosis.

The uniform (diffuse) osteoporosis is observed at chronic, is long proceeding processes. On localization an osteoporosis distinguish: 1) local - around of the center of defeat; 2) regional, fascinating whole anatomic an area - joint; 3) wide-spread (all extremity); 4) systemic (all skeleton).

Atrophy. The atrophy is a decrease of volume of all bone or its part. Depending on the reason distinguish an atrophy functional (from a divergence), neurotrophic, hormonal and an atrophy arising from pressure. An atrophy, as well as an osteoporosis - process convertible. Upon termination of the reason caused it, the osteal frame can be restored completely.

Destruction. Destruction (destructive process) of osteal beams accompanies with inflammatory and tumoral processes at which the bone is replaced by a pathological tissue. According to the destructive center the osteal drawing on a film is absent.

Ossifluence. It is the pathological process accompanying with a resorption of a bone at which the osteal tissue disappears completely and completely at absence of reactive changes of environmental tissues and the rest of a bone. The ossifluence is characteristic for some diseases of the central and peripheric nervous system, as for example, myelosyringoses, tabeses, wounds of a spinal cord and large nervous trunks.

Osteomalacia. Its essence is "ramollissement" of bones owing to an insufficient mineralization of osteal beams. There is this condition because at reorganization of a bone when again formed ossiform beams are not impregnated with salts of a lime. Development of a similar condition is connected to endocrine infringements and nutritional factors, first of all, with failure of vitamin of D. X-ray inspection the increasing and sharply expressed systemic osteoporosis is found out, is especial in pelvic bones and long tubular bones of the bottom extremities. The ramollissement of bones conducts to the arcuate curvatures of long tubular bones arising as a result of a physiological load and muscular draft.

Thus, the processes accompanying with decrease of quantity of an osteal tissue, are: 1) an osteoporosis; 2) a destruction; 3) an ossifluence; 4) an atrophy; 5) an osteomalacia.

The sets of symptoms accompanying with augmentation of quantity of an osteal tissue: (1) osteosclerosis; 2) periosteal stratifications; 3) a hypertrophy; 4) heterogeneous ossifications.

Osteosclerosis. It is process, opposite to an osteoporosis and described by augmentation of quantity of an osteal tissue in unit of volume of a bone. Thus the volume of each osteal beam and their quantity is enlarged and, accordingly, decreases spaces between beams, down to their complete disappearance.

Radiological attributes of an osteosclerosis are: 1) occurrence reticular frame with more smallaer cells frames with dwarfed osteal beams down to complete disappearance of a drawing of a spongiform bone; 2) a thickening cortical a layer on the part of the bone marrow canal; 3) narrowing of the bone marrow canal down to its complete disappearance. The osteosclerosis can accompany with the most various pathological processes: tumoral, inflammatory, hormonal infringements and poisonings, formation of an osteal callositas and functional overloads. At any pathology the osteosclerosis grows out the increased osteogenic activity of osteoblasts. The osteosclerosis can be process convertible.

Periosteal reactions. Them still name periostites and periostoses. The periosteum in norm on a X-ray film is not visible. It becomes a dwarfed periosteum seen only at a calcification.

Linear periostitis (laminated solid periostal reaction). On film in parallel a shadow cortical a layer of a bone and a little from outside the thin a linear shadow, separated from a body of a bone is taped by a light interval. The linear periostitis testifies to the beginning of inflammatory process, more often a hematogenous osteomyelitis, or about an exacerbation of a chronic inflammation. The

beginning of a calcification of a periostitis at an acute hematogenous osteomyelitis at children on 7-8, at adults for 12-14 day from the beginning of disease (the first clinical displays).

Irregular interrupted periosteal reaction. On along a bone the light among themselves light and dark strips, proceeding as though from one point and posed by layers the friend under the friend will be taped some. In a basis of this phenomenon wavy jerky character of development of process lays, that is observed at Ewing′s tumour and less often at inflammatory diseases.

Assimilated periostitis - the subsequent phase of a laminated solid periostal reaction (linear periostitis) when there is a joint of calcifications with the basic file of a bone, variant - a fringed periostitis - plural infringements of integrity of a periosteum shape the burst, fringed form.

Spiculated-type periostal reaction. It is shown by formation of numerous thin processes (Spiculae), growing to a diaphysis these needles represent an ossification tissues along tumors blood vessels. Most frequently meets at an osteosarcoma.

Ossifying periostosis as «Codman treangle». The essence of it is that tumoral process of the middle of a bone, sprouting cortical the layer, removes a periosteum in which there are reactive changes as an ossifying periostitis. Most frequently meets at an osteosarcoma.

Hypertrophy. This phenomenon is opposite to an atrophy. It is characterized by augmentation of volume of all bone or its part.

Heterogeneous ossifications. This term it is accepted to designate the osteal formations locating in immediate proximity from a bone and developed not from a periosteum, and from soft tissues environmental a bone, in particular, fascias, tendons, ligament, hematomas, etc. There Can be under influence of many, most various reasons, including the traumas, increased functional loads, dystrophic processes.

Necrosis and sequestration of a bone. The osteonecrosis is a necrosis of a site of a bone owing to the broken feed of bone tissue. The pathomorphologic basic osteonecrosis is destruction of osteal cells at conservation of dense intermediate substance in this connection dense elements in a necrotic site prevail and on a unit of weight of a dead bone of the mineral rest it is necessary more, than alive. At an osteonecrosis on border between a necrotic site and an environmental alive bone the connecting layer separating osteal frame of the lifeless part.

Distinguish septic and aseptic necrosises. Aseptic necrosises are observed at deforming arthroses, at clottages and embolisms.

Septic, or infectious necrosises arise at inflammatory diseases. The X-ray pattern of osteonecroses is characterized by the following attributes: 1) the increased intensity necrotizing bones; 2) the strip of the enlightenment separating a healthy bone from become lifeless; 3) an osteoporosis of an environmental healthy tissue.

On a X-ray pattern an aseptic osteonecrosis to distinguish from septic it is rather difficult. Diagnostic criterion can be width of a boundary strip - last at infectious process wide, rasping. Sometimes difficultly it happens to distinguish also intensive osteal frame at an osteonecrosis and at an osteosclerosis though it is absolutely various inherently processes. Criterion again is the strip of an enlightenment which is characteristic for an osteonecrosis and frames contrast of shadows. If this strip narrow also is not taped, difference between an osteonecrosis and an osteosclerosis at their simultaneous existence to carry out it is impossible. The become lifeless site separated from the basic bone refers to as a sequester.

Changes of the form of a bone. They can be various: arcuate at a rachitis, angle - after a trauma, S-shaped at congenital deformations.

Curvatures are classified into degrees of an expressiveness: insignificant, appreciable, sharp with the indicating of a direction of a curvature. To deformations of a bone it is necessary to carry defects of a bone: partial or total.

Change of volume of a bone. At the characteristic of volume mean a thickening, an inflation and a thinning of a bone. A thickening (hyperostosis) - an osteosclerosis plus augmentation of

volume of a bone. When speak about a hyperostosis, mean augmentation of a diameter of a bone at an appreciable extent.

Exostosis - superfluous growth of an osteal tissue on the circumscribed site, supporting limits of a bone.

Enostosi - growth of an osteal tissue aside the cerebral canal.

Inflation of a bone - augmentation of volume of a bone but with decrease of quantity of osteal substance, due to growth pathological soft tissues a substratum. The last can be a cartilage - at enchondroma, products of degenerative disintegration at cysts, giant-cell tumours, etc.

Symptomatology at diseases of joints

The basic and most frequently a met sign in such cases is narrowing an articulate space or its complete absence that testifies to destruction of articulate cartilages. Narrowing of an articulate space can be uniform (on all an extent) and non-uniform - then speak about deformation of an articulate space in which basis there are circumscribed infringements of integrity of cartilages.

Complete absence of an articulate space with transition of osteal beams of one bone to another refers to as an ankylosis. The ankylosis can be complete and incomplete (partial) - at conservation of an articulate space on circumscribed sites. Congenital absence of a joint (an articulate space can take place - then speak about a concrescense which has typical localization - fine joints of extremities, vertebra.

Change of subchondral plates. It can be shown as intensifying intensity of its shadow that testifies to inspissation at arthroses, osteochondroses vertebra or, on the contrary, as a thinning, break or complete absence that grows out resorptions, infringement of integrity or fusion due to destructive process (a tuberculosis of joints, purulent arthritises, etc.)

Destructions of articulate departments of bones. This sign is meant as presence of destruction of the bones which are taking place within the limits of an articulate capsule and near to her{it} outside of a joint or under a switching plate.

Deformation of articulate ends of bones. A disfiguration of the articulate ends and articulate surfaces, as a rule the basic sign at arthroses.

Deformation happens following: as flattening both the head, and an articulate hollow; excavations of an articulate hollow; growths on edges of an articulate hollow; as elongations of closing plates in horizontal directions (at osteochondroses vertebra), etc. Deformations of articulate edges of bones as accentuations triangular, and also rostral forms are observed. The last is typical for a deforming spondylosis in which basis the calcification longitudinal ligament at a place of an attachment to edges vertebra lays in the field of switching plates. The maximum degree of deformation of articulate departments of bones is infringement of normal ratio in a joint that underlies whole nosological unit - dislocations.

Bone scintigraphy

Other advantage bone scintigraphy - visualization of all skeleton. Therefore, if it is necessary to investigate some departments of a skeleton, it is more favourable radiography at which the radial load grows with augmentation of quantity of visualized areas. At systemic and plural defeats of a skeleton the scintigraphy as an initial method with the subsequent radiography areas of increased accumulation radiopharmaceutical preparation (RPP) is shown. With the introduction of ^{99m}technetium-labeled phosphorus compounds, a new dimension of safety and accuracy was accomplished. The phosphorus contained within the isotope is exchanged in areas of rapid bone turnover: destructive lesions such as osteomyelitis and tumors, arthritis, and areas of growing bone. Although the scan itself is not specific for a particular disease, it indicates an area of bony abnormality to which radiography, CT, and MR may be directed.

Thus, the basic indications to initial application bone scintigraphy are: 1) clinical suspicion on plural and systemic lesions of a skeleton; 2) an osteomyelitis in the first 10-15 days; 3) searches of metastasises in a skeleton at the fixed diagnosis of a cancer; 4) studying of a degree of intensity of a

mineral exchange at general diseases of bones and joints; 5) definition of functional suitability transplant and their viability.

In all cases of use osteotropic RPP it is necessary to consider the common factors influencing quantity of a radionuclide absorbed by pathological process: a degree vascularization, quantity of a collagen, bones ossification activity, depth and an anatomic locating of the center, complications (fractures), duration of disease, and for tumours - a degree of body height and presence of a necrotic component. In norm in 3-4 hours after introduction RPP a background of rather uniform distribution of Natrii phosphases in bones very many areas of the raised accumulation are marked: the basis of a skull, a rib, angles and edges of scapulas, vertebra, pelvic bones, metaepiphyseal departments of tubular bones. Raised accumulation RPP in all terms of research also in kidneys, meanwhile the centers of defeat are visible precisely enough.

The return side of high sensitivity of a scintigraphy is its insufficient specificity. Therefore to estimate positive radionuclid finds it is necessary with care, considering mainly the centers of intensive hyperbracing RPP or wide-spread changes, and in comparison to the clinical data, roentgenograms and other diagnostic images, including in dynamics.

Because of the low spatial sanction the macromorphological analysis of the revealed changes in radionuclid images is impossible. That is why also criteria of differentiation between various pathological processes are more indistinct, than in a radiodiagnosis, that in addition limits specificity of a method. Besides at a usual scintigraphy not always probably precisely to localize pathological process (for example to distinguish the centers of hyperbracing in a scapula and back departments of ribs or in bodies and back frames vertebra) though this disadvantage it is deprived OPECT. Some defeats visualized rontgenologic, are badly taped at a scintigraphy - for example, myelomatosis units or at a usual technique of research - a hemangioma. Thus radionuclid visualization and radiography supplement each other.

Magnetic resonance imaging (MRI)

MRI has advantages before radiography and CT in display of medullar tissues, conceding to them in an estimation coritica bones. It is the most sensitive method of visualization of defeats of an osteal brain at patients with Chodgkin,s desease and limphosarcoma or with its local changes − an aseptic necrosis of a bone, an osteomyelitis, metastasises of a cancer, a bone marrow edema.

MRI allows to estimate defeat of a bone and simultaneously to reveal soft tissues a component of a tumour. Though scope MRI in many respects coincides with a scintigraphy, last is frequently less informative. By virtue of high self-descriptiveness comparisons of MR-images to X-ray films it, apparently, becomes a second-order method in many cases of illnesses of bones, supplementing if necessary X-ray films.

Mri the best noninvasiv a method of visualization of joints. It is the unique method directly displaying all structural elements of joints and their pathological changes:

- an exudate in a space of a joint;
- changes synovial environments;
- articulate cartilages;
- intraarticulate frames from a fibrous cartilage, for example meniscuses of knee joints;
- a sheaf;
- a subchondral bone marrow.

MRI it is most exact in an estimation of these frames. For example, on the published comparisons, at radiographic the exudate in a ulnar joint in quantity of 5-10 ml is found out, at ultrasonic - 1-3 and at MRI - 1 ml. MRI with special regimens is the best method of an estimation of articulate cartilages, allowing to distinguish an early stage of a chondromalacia, anabrosis of a cartilage of an inflammatory parentage, defects and a thinning at arthroses, damages cartilaginous labiums of articulate hollows.

At MRI with intravenous staining short (up to 15 mines) the stage of intensifying it is rich vascularized in joints space frames is replaced by transition contrast agents (CA) in synovial a liquid owing to what the joint space and its borders is better displayed. Such arthrography the effect can promote diagnostics of some pathological changes of joints. MRI with intraarticulate staining (MR-arthrography) is considered in many cases the best method of visualization of articulate frames, is especial at presence of an exudate in a joint. Intraarticulate introduction MR CA is cheaper intravenous as for it} it is used less CA.

Functional MRI (during movements in a joint) or cinema – MRI allow to analyze impellent function, promoting revealing of instability of joints or a set of symptoms of " a mechanical obstacle " and it is especial infringements of the mechanism of an extension in a knee joint. Damages of a capsule and ligament, not found out are distinguished by other methods. However speed MRI still is not enough for display of movements in real time. On the majority of MP-tomographs at the best it is possible to receive only a series of images during the different moments of this or that movement.

Ultrasonic investigation

For reception of images of extremities it is recommended to use the gauge on 5 or 7,5 MHz..

This method gives the helpful information for diagnostics:

- Neoplasms in soft tissues;
- Clumps of a liquid in soft tissues;
- Traumatic damages of tendons and muscles;
- Intraarticulate exudates;
- A congenital dislocation of a hip;
- The congenital or got anomalies of vessels (in such cases especially valuable information is given with research in Doppler regimen).

Ultrasonic research is useful and for specification of a position of a needle at a biopsy, an aspiration or a drainage of a liquid.

Thermography

Thermography. It is applied at diagnostics of inflammatory diseases of soft tissues. Changes on thermograms arise before clinical attributes (a gradient of temperatures 1-4,6 ^{0}C).

Osteomyelitis. It is observed increasing of temperature a segment or all extremity. This research can represent diagnostic value when a clinical picture erased, and radiological attributes still are absent.

Arthritises. Thermographic the researches made at once at revealing of initial clinical attributes allow, as against radiography, to find out the inflammatory center during the acute period.

Radiology at traumatic damages of a musculoskeletal system

Fractures and dislocations of bones.

Complete disharmony of articulate surfaces (desolation of an articulate hollow) refers to as a dislocation. This sign revealed at X-ray inspection, is accompanied also by appreciable shift of the central axis of one of bones in relation to another. Dislocated it is considered to be a bone posed distant.

In a backbone dislocated it is accepted to name overlying vertebra. Describing X-ray film with the given pathology of a skeleton, it is necessary to specify in details: 1) a direction of shift of the dislocated bone and 2) a degree of its expressiveness in centimeters or in relation to the sizes longitudinal and a diameter fixed articula bones.

Incomplete infringement of ratio of bones in a joint and partial disharmony of articulate or jointed departments of bones refers to as a subluxation.

Much more often traumatic damages of bones are accompanied by fractures.

Anatomic basis of fracture is the plane of fracture, radiography displayed: 1) a line of a lucid interval. Estimating a condition of contours and osteal frame in the field of a prospective plane of fracture, sometimes it is possible to reveal as well 2) a line of radiopaque. In this case bones are a

little bit short, contours of them are insignificantly deformed. Such kind of fracture refers to impacted, or fracture with impaction fragment. Distant fragment it is usually displaced on longitudinal bones in a proximal direction. Thus, besides a sign of a line of fracture, there is still a sign of shift fragment. Rontgenologic shift fragment is characterized by revealing of their sizes, forms and quantities. Shift fragment can be 1) lateral along a diameter of a bone (displacement), longitudinal in relation to longitudinal bones, and also as 2) divergences fragment, overriding them and impaction. Any shift fragment is analyzed on a direction and a degree of an expressiveness: 1) At lateral - in relation to diameter proximal fragment, 2) at longitudinal - in centimeters, and at 3) angle in degrees. Quite often typical traumas give so-called 4) peripheric or rotatory shifts fragment. On a direction of a line of fracture to an axis of a bone distinguish 1) transversal (displacement), 2) longitudinal (divergences fragment, overriding them and impaction), 3) spiral fractures and their various combinations. Fracture in many planes is designated as comminuted. If there are fractures of one bone, but in different places speak about a multiple fracture. In relation to a joint distinguish: 1) intraarticulate and 2) extraarticulate fractures. The locating of fracture is typical for the first behind a place of an attachment of a capsule of a joint, i.e. about an articulate surface of a bone, or penetration into this zone of a line of fracture from the outside (thus, into joint space). All other fractures will be extraarticular. If the part of a bone and a line of fracture is damaged does not achieve an opposite contour then it is a crack.

The adhesion of fractures goes through formation of an osteal callositas which develops from an endosteum, from a great bulk of osteal substance and a periosteum. The most intensive reparative processes has a periosteum. First attributes of formation of an osteal callositas are calcifications. At children of adjournment of a lime are defined on roentgenogram on the average in 1,5-2 weeks after fracture, at adults of 3-4 weeks. Complete osteal consolidation comes not earlier than 3-7 months. Approximately during same time visibility of a line of fracture disappears also. The frame is restored completely, however on its external surface, in a place of former fracture, constantly kept cuff a thickening as result of the generated osteal callositas. Dynamics of adhesions of fractures and their complications is estimated with the help by radiography.

The radiological attributes of fractures described earlier more all are characteristic for fractures of long tubular bones. Short spongiform bones have also attributes, but except for it also a sign breaking configuration bones without seen shift fragment. For example, at compression fractures of bodies vertebra their clinoid deformation is taped. Thus the line of fracture in a spongiform bone is not established almost, and only careful studying of a condition trabecula and crossbeams will help to find out it.

Flat bones can have a specific kind of a line of fracture.

Usually in a compact part of a bone the line of fracture has precise, fine serrate contours. In thickness of spongiform osteal substance contours of a line of fracture less precise and serrate. Dependences on age of the patient fractures have different display. Senile fractures are characterized by set of lines of fractures, comminuted. Children's fractures are submitted: a) - a break when there is a local deformation of an external contour, but lines of fracture are not taped by an excess of a bone; б) subperiostal fracture when the line of fracture and circumscribed infringement of flatness of a contour of a bone, but shift fragment is defined is not present. The special kind of children's fractures is allocated into group traumatic epiphyseal. Usually as this term understand infringement of an integrity of a bone in area growth plate. Radiological recognition is based on revealing of shift of a nucleus of an ossification in relation to a metaphysis of a bone (epiphyseolysis). Fracture of the shaft of bones may be either complete or of the green-stick variety. Three types of green-stick fractures are recognized: classic green-stick (fracture on one side of the bone, bent on the other), "torus," resembling the base of a Greek column (buckling of cortex on both sides of the bone), and "lead pipe" (one side buckled, one side cracked). Of these, the torus variety is the most common.

Damage of soft tissues at fractures of bones, dislocations and subluxations always accompany the basic pathological process, being shown on roentgenograms as various deformations because of hemorrhages and exudation to an interfabric liquid besides presence fine osteal fragment is possible, calcifications of intermuscular hematomas, muscles and ligaments.

Pathological adhesions of fractures are displayed by formation incorrectly accrete fractures, a superfluous osteal callositas, a nearthrosis, a synostosis of bones or an ossifluence of an injured department of an osteal skeleton.

At fractures and dislocations of bones a conducting method of radial diagnostics is radiography.

Traumatic damages of soft tissues

The greatest opportunities at damage of muscles among methods of radiology diagnostics at ultrasonic.

Opportunities of ultrasonic at damages of muscles:

• visualization of stretchings and breaks, intramuscular hematomas on ground of a bruise, an atrophy of muscles from inactivity and due to a denervation;

• the control over current of partial breaks of muscles;

• an estimation of outcomes of damages: cicatrixes after extensive nontreated breaks of muscles, cysts as consequences of not allowed hematomas, a focal ossifying myositis, muscular hernias.

The certain role is played with an opportunity to observe in a regimen of real time of change of the form of muscles at reduction.

Breaks of tendons are distinguished rontgenological only in places of an attachment to a bone due to a separation of an osteal fragment. Ultrasonic allows to distinguish reliably damages of tendons on all an extent, to differentiate partial breaks from complete and to localize the ends retract muscles. For example, all breaks achilles tendons are taped practically.

Damages ligament. Series of methods are used. Functional radiography allows to distinguish them, for example, in radiocarpal and talocrural joints to indirect attributes − redundancy of physiological movements in a joint or to occurrence of physiologically impossible movements. Functional ultrasonic: sensitivity, for example, at recognition of instability hand joint is higher than radiography.

Relations MRI and ultrasonic in this diagnostics are ambiguous. At damages lateral ligament an ankle joint they are practically interconvertible, though opportunities of both methods circumscribed owing to anatomic variants. In the field of a radiocarpal joint of ultrasonic considerably concedes MRI and especially the MRI-arthrographies, allowing to visualize the majority ligament and to distinguish their damages.

MRI − a unique method of radiology of bruises of bones and a local traumatic edema of bone marrow.

Breaks of many ligament are defined at an arthrography.

Radiology signs of inflammatory defeat of a bone

1) Methods of a choice in an acute stage and at exacerbations - MRI and bone scintigraphy; changes are visualized from first days. Sensitivity MRI (up to 98 %) is higher, than CT and scintigraphies. Its insufficient specificity (it is little more than 80 %) limits diagnostics at the account of a clinical picture a little.

2) X-rays patterns are negative not less than 10-14 days from the beginning of disease while the bone marrow and a periosteum are mentioned only soft tissues components of a bone − bone marrow and periostium. Before all X-rays patterns are possible to define changes in soft tissues around bone, however in practice they are usually missed.

Early recognition of purulent processes, for example, in the field of a hip joint, promotes prevention of a fast osteal destruction, improving an outcome.

Radiography - the basic method of visualization at a subacute and chronic osteomyelitis. However in a subacute stage the X-ray pattern lags behind from pathomorphologic and clinics. The osteonecrosis is distinguished usually not earlier, than in a month from the beginning of disease, and a sequestration - even later. Should not mislead increase of changes on roentgenograms on a background of clinical improvement; it is usual only display of earlier not seen pathomorphologic changes.

3) Changes of soft tissues are displayed at ultrasonic; subperiostal abscesses are distinguished. Ultrasonic promotes earlier diagnostics at inaccessibility MRI and a scintigraphy.

4) At CT a little bit earlier, than at radiography, inflammatory changes in the bone are taped; it does not concede ultrasonic in revealing soft tissues changes. At chronic osteomyelitis CT it is better than other methods visualizes sequesters and abscesses.

5) Activity of an osteomyelitis in a chronic stage can be estimated by means of a scintigraphy and CT earlier, than at radiography which shows a newly arisen osteal destruction and periosteal reaction. MRI surpasses in it all methods, simultaneously displaying intramedullar diffusion of process and change to soft tissues, including fistulas.

6) Fistulas can be visualized at ultrasonic. CT and MRI use with this purpose at presence of other indications to them. The best method − a fistulography.

At X-ray patterns the radiological set of symptoms of inflammatory defeat of a bone includes the following attributes: 1) the centers of a destruction; 2) osteal sequesters; 3) a periostitis; 4) underpressure bones (osteoporosis); 5) an osteosclerosis.

At a hematogenous osteomyelitis most a precursory symptom on 2-3 day of disease is a tumescence and deformation of the soft tissues environmental a bone. The first direct attributes of an osteomyelitis are periosteal stratifications (periosteal reation) and an osteoporosis. The initial phenomena of a periosteal osteogenesis can be seen by the end of 1-st week, during the same period the osteoporosis is formed. On 2-3 to week of illness on the common background of an osteoporosis there are centers of a destruction. If treatment is well-timed to begin, in the end 3-rd beginning of 4-th week around of the destructive centers on a background of an osteoporosis process an osteosclerosis, characteristic for an osteomyelitis begins. This process is characterized by diffusion and prevalence, than and differs from a narrow zone of an osteosclerosis at a tubercular ostitis. Sequesters are formed. The wide-spread osteosclerosis at an osteomyelitis testifies to transition of process in chronic, for it the assimilated periostitis is characteristic.

At a tubercular inflammation (a tubercular ostitis) the acute phase is stretched for many months. As a rule, process begins in the articulate end of a bone, where in a bone marrow and arise initial (in relation to a joint) tuberculous focuses. Diffusion of an inflammation on a joint has received the name arthritic, on intervertebral disks and soft tissues of a backbone - a spondylitic phase.

The ambassador decrease inflammations there comes the third phase - postarthritic, for which typically gradual replacement of an inflammatory granuloma by a cicatrical tissue. Localization of the centers is typical for a tuberculosis: 1) bodies vertebra, 2) flat bones, 3) epiphysises of tubular bones. The centers in epiphysises frequently have the big sizes, contain sequesters from spongiform osteal substance, are accompanied by roughness of contours of the articulate ends of a bone and narrowing of an articulate space.

The lues amazes mainly diaphyses of superficially posed bones (tibial, ulnar, clavicles). At a nem the centers fine, are under cortex, are surrounded with a zone of inspissation of an osteal tissue. Here periosteal stratifications are localized merging with coritical a layer.

The congenital lues is shown in the first months after a birth. Changes are found out, mainly, in bones, which ossify dyschondrosteosis by way. There are two forms of a congenital lues: specific an osteochondritis and an ossifying periostitis. There is a syphilitic osteochondritis of the big tubular bones of the bottom extremities more often. Distinguish three stages of such osteochondritis: 1-n the

stage - extends up to 2-3 sm and there is more intensive a zone of a preliminary calcification of an epiphyseal cartilage; 2-n a stage - the border of this zone on the part of a metaphysis gets rough, serrate contours, under it there is a transversal light strip; 3-n a stage - the zone of a preliminary calcification is non-uniformly blasted, therefore are possible pathological fractures. At patients processes of an ossification are accelerated. At children the syphilitic phalangitis at which inside phalanxes the centers of an enlightenment are formed also is marked, periosteal stratifications, phalanxes cylindrical or clavate thicken are shaped. Owing to infringement of an ossification of the basis of a skull the saddle-like nose is formed.

At patients with the got lues on 2 - 3-rd year after infection (in the secondary period) attributes of periostites are quite often defined. Sharp changes of bones (gumma) are found out, mainly, in the tertiary period, mainly under periostomas and it is, less, inside a bone. In bones there are small centers or diffuse growths. Around of the centers there are fields of a sclerosis and periosteal stratifications. Bones thicken also are bent, especially tibial which get acinaciform the form. Process is localized mainly in a diaphysis of a bone. Plural symmetric defeats of a skeleton are characteristic. Processes of a destruction and an osteosclerosis go in parallel, but last more often prevails. Sequesters, as a rule, it does not happen. Joints are amazed seldom. At patients with a tertiary lues frequently there comes a destruction of an osteal septum of a nose (the nose becomes saddle-like).

Radiology sings of tumours of bones

The basic method of radiology of tumours of bones - radiography.

Opportunities radiography at diagnostics of tumours of bones:

• the overwhelming majority of initial and metastatic tumours of bones is taped, and localization is precisely defined;

• it is better, than other methods, estimate type of a tumour (osteoclast, osteoblastic, mixed), character of body height (expansive, infiltrativ);

• pathological fracture is found out;

In diagnostics of malignant tumours of bones it is necessary to consider two situations.

1) Searches of metastasises in a skeleton at patients with obviously malignant tumour, it is especial with a high index of an innidiation in a bone (a cancer of prostatic, thyroid, mammary gland, lung, a nephrocellular cancer), that it is important for a choice of a method of treatment.

Initial method – scintigraphy of bones; more sensitively radiography also allows to visualize all skeleton.

As the given scintigraphies nonspecific, the following stage should be rontgenograph those departments of a skeleton in which hyperbracing RPP is found out. Positive scintigraphy finds at patients with a malignant tumour are not necessarily caused by metastasises. Roentgenograms allow to distinguish better them from changes in a skeleton of other nature. In case of retained clinical suspicion at acritical given radiography or negative results of a scintigraphy it is carried out CT or MRI.

On the published data, at MRI about 80 % of metastasises of a cancer of mammary gland in a skeleton are visualized. Apparently, this advantage MRI can be used on occassion, however apply it, as well as CT, as a search method unprofitably.

2) Clinical suspicion on a neoplasm of this or that department of a skeleton (a pain, infringements of the function, palpated pathological formation at patients with absence of indicatings on an initial malignant tumour of other localization. If on the clinical data plural defeat of a skeleton it is more favourable to begin with a scintigraphy also is suspected. Otherwise pspacerily use radiography. In infrequent cases when at qualified X-ray examination by radiologist the tumour remains latent, visualization is shown first of all scintigraphy. CT or MRI should be used as second-order methods for specification of the nature and the detailed morphological characteristic of defeat.

Differentiation between initial and metastatic malignant tumours of bones is based on not enough specific radiological signs. Other methods of visualization help at the decision of this question a little.

If the initial tumour is not found out, it yet does not exclude the metastatic nature of defeat of a bone, but raises probability of an initial tumour. For the final decision the biopsy of the struck bone is shown, is especial in cases, perspective for therapy.

The basic indications to CT at malignant tumours of bones:

• at difficulties of differential diagnostics with inflammatory diseases of bones (it is especial between Ewing sarcoma or malignant lymphoma and an osteomyelitis) and with benign tumours CT quite often gives proofs malignancy (minimal coritical to anabrosis and extraosseous a component of a tumour) or allows to reject it, visualizing, for example, coritical a sequester or beside of bone a clump inflammatory exudation;

• when it is important to visualize mineralized osteal or cartilaginous a matrix of a tumour, it is especial if a mineralization scanty, CT it is more preferable MRI, allowing delimit than a tumour osteogenous and cartilaginous lines from other.

MRI - the most sensitive and exact method of diagnostics of tumours of musculoskeletal system. Advantages:

• definition of initial localization of a tumour (soft tissues, bone marrow) and its relations to a fatty tissue, muscles, bones;

• the most exact estimation of diffusion of tumours on a bone marrow (including the "jumping" centers in the same bone), through a growth plate and on soft tissues and mutual relations with a neurovascular fascicle (sensitivity up to 95 %); differentiation of a tumour from a perifocal edema demands intravenous injection of contrast agents;

• recognition of involving in process of a joint.

MRI - the best method of definition of a stage of tumours of bones, it is irreplaceable at planning surgical interventions and radiotherapy. At the same time MRI concedes radiography in differential diagnostics between malignant and benign tumours.

The periodic MRI-control - a deciding condition of well-timed revealing of residual and recurrent tumours after surgical erasion or at radiotherapy and chemotherapies. As against radiography and CT they are distinguished already at the small sizes.

Indications to dynamic MRI with contrast agent:

• recognition of malignant tumours on the basis of early contrast intensifying in contrast slowly increasing at good-quality (accuracy of 72-80 %); this difference reflects a degree vascularization and perfusion, than immediately kindly or malignancy more likely: richly vascularization an osteoblastoclastoma and an osteoblastoma not distinguishable to this attribute from malignant tumours;

• differentiation of an active tumoral tissue from devitalizing, a necrosis and reactive changes that is important for forecasting effect of a chemotherapy and a choice of a place of a biopsy;

• in some cases as addition native MRI at distinctive recognition of a tumoral tissue and postoperative changes, not earlier than 1,5-2 мес after operation.

MRI - the most sensitive method of visualization infiltrative changes of a bone marrow at bone marrow and lymh- proliferative diseases (a myeloma, lymphoma, leukoses). Diffuse and focal bone marrow changes are frequently found out at a negative X-ray pattern in patients with a generalized myeloma.

Initial tumours of bones. Characteristic attributes: destructive process with destruction of all layers of a bone with break coritical a layer and a germination in soft tissues with a calcification of the last. The osteal frame of a tumour is chaotic, not similar to a picture of an initial bone. Shadows of pathological calcifications are visible: signs "Codman triangle " and “ spiculated periosteal

reaction". If in a sarcoma processes of a destruction e name osteolyti prevail. If sites of a destruction are blocked by again educated osteal masses a sarcoma call osteoblastic.

However there are secondary malignant defeats of bones, i.e. metastasises of a cancer of other bodies (MTS) more often. For these tumoral defeats typically presence of malignant process metastasizing in a bone. The important attribute is plurality of MTS. In bones the form of MTS - the plural centers of a destruction with rough contours is found out osteolytic. But under certain conditions there can be osteoblastic MTS. They cause on roentgenograms the plural condensed sites in a bone with non-legible and rough outlines. As well as at MTS, the centers of a destruction can be observed at a multiple myeloma. Here in a differentiation clinical methods - a sternal puncture, etc. help.

X-ray attributes of benign tumours: 1) deformation of a bone; 2) a single shadow of a tumour with precise contours, 3) absence of periosteal reactions, 4) coritical the layer does not interrupt, 5) the osteal frame of a tumour though is changed, but keeps the common features of a maternal, initial bone, 6) there are no calcifications environmental soft tissues a component. Can contain correctly distributed centers calcifications (chondroma). Can give absolutely unstructured defect. Slow growth of tumor is characteristic in view of the general good condition of patient.

At differentiation of inflammatory process and a tumour it is necessary to mean, as there and there there can be a destruction, but are absent at a tumour: 1) sequesters, 2) laminated but solid periosteal reaction, 3) transition to a joint. If a lesion has crossed the joint space, it is most likely an inflammatory process. Besides for an osteomyelitis typically longitudinal diffusion, and for a tumour body height in a transversal direction.

Radiology sings of degenerate - dystrophic diseases of joints

The most often diseases of joints - degenerate - dystrophic, occuring from different and not always the clear reasons (a trauma, an overload, infringement of an albuminous exchange, etc.). The main radiological attributes: 1) narrowing of a X-ray articulate space; 2) osteal growths on edges of articulate surfaces (spur formation); 3) deformation of articulate surfaces; 4) inspissation (sclerosis) under cartilage layers of an osteal tissue in both articulate ends, is especial in their most loaded sites; 5) cystoid the formations giving enlightenments in the articulate ends of bones. As against the destructive centers, they have the correct form, precise smooth contours and do not contain sequesters.

In some cases sharp narrowing an articulate space and deformation of articulate surfaces prevail, and cystoid formations are not numerous or are absent. Such form of degenerate - dystrophic defeat name a deforming arthrosis.

Thus, there are three salient features of degenerative arthritis: narrowed joint spaces, subarticular reactive sclerosis, and spur formation. Mineralization generally remains normal. In severe forms subarticular cysts (geodes) occur.

At ultrasonic regional osteophytes and ossificates and even degenerative subchondral cysts, as well as more rasping changes of an articulate cartilage down to its defects also are displayed, is especial in large superficial joints (knee).

Need in MRI arises seldom. In an estimation of degenerative changes of articulate cartilages in an early stage of defeat are frequent false-positive results though mistakes are usually supposed within the limits of one degree of an expressiveness of an arthrosis.

However it is necessary to notice, that behind the diagnosis of an arthrosis, it is especial its "exacerbations", complications or other diseases which are not visualized rontgenologic frequently disappear. With the purpose of their recognition are shown ultrasonic or MRI.

Degenerate - dystrophic diseases of a backbone.

Opportunities of a radiodiagnosis of these diseases as the reasons of lumbar pains and a radicular symptomatology circumscribed, therefore it is impossible to rely on its results entirely. Between the changes revealed rontgenologic, and a clinical picture there is no parallelism. The

expressed intervertebral osteochondrosis can be clinically non-manifestative, at the same time even rasping morphological changes (for example, the hernias of disks proved on operation with a serious radicular symptomatology) are compatible with a normal X-ray pattern. If there is a hernia of a disk it is not necessarily localized at a level diagnostic rontgenologic an osteochondrosis.

Value radiography consists not so much in revealing degenerate - dystrophic defeat of a backbone, how many in exception of other diseases and first of all destructive processes in a backbone as the reasons of clinical signs. Already one it allows to regard with the greatest probability the nature of a pain and a radicular symptomatology as discogenic.

At the same time the radiological data in some cases are important at a choice of tactics of conservative treatment:

• confirm clinically suspected prevalence of degenerative defeats of intervertebral disks (osteochondrosis) or intervertebral joints (spondylarthrosis);

• the revealed spondylosis and a spondylolisthesis limits a choice of conservative methods of treatment;

• relative value have detection of anomalies of development of a backbone (can contribute to degenerate - dystrophic changes) and indirect radiological attributes vertebral sufferings (straightening of a lordosis, a scoliosis).

The information received at radiography suffices for treatment of the majority of patients. Though at CT and MRI degenerate - dystrophic changes are found out earlier and more often, however they, apparently, reflect no more than an involution of disks, therefore their clinical value must investigate.

If the surgical intervention is necessary to apply CT, MRI, and at their inaccessibility of myelography for exact definition of a level, such as a hernia and planning of operation. Thus it is not enough to reveal a hernia, it is necessary to find out still its clinical value, i.e. the relation to it of clinical signs.

Advantages CT:

• surpass a myelography in visualization lateralis foramens hernias;

• allow to distinguish a diffuse degenerative diverticulum of a disk from local (hernias) and frequently to distinguish a sequestration;

• is more exact, than at MRI and on roentgenograms, osteophytes in vertebral the canal and intervertebral foramens are taped and their differentiation from hernias that is more important in a cervical department of a backbone is provided.

MRI it is high-strung to hernias irrespective of localization and has the same advantages, as CT, except for visualization of osteophytes. Correlations CT and MRI with results of operations concerning hernias of lumbar disks about identical (more than 80 %).

In case of a divergence of the data of body-section visualization with a clinical picture use a myelography or it is better computer - tomographic a myelography.

Advantages of a myelography :

• help to establish dependence of a clinical symptomatology on the revealed hernia of a disk, showing its influence on roots (increase the flat of disk, a thickening of a root, absence contrast its dural funnel) and a dural bag;

• facilitate differentiation of hernias from some variants of an anatomic structure and anomalies of development;

• is useful for visualization of hernias of cervical and thoracal disks at inaccessibility MPT;

• at cervical radiculopathies CT- myelography, displaying both osteophytes, and hernias of disks, is a method of a choice and it is useful not only at inaccessibility MPT, but also in addition to it.