Malignant skeletal tumors

Skeletal malignant tumors are tumors of the bone and cartilage with a local tendency to destruct the bone and a distant metastatic potential

Osteosarcoma

__ Osteosarkom

Osteosarcoma is a **primary** malignant tumor of the bone (2nd most common bone tumor after multiple myeloma). Osteosarcoma mostly affect young patients aged between 10 and 25. Osteosarcoma typically grows in the metaphysis of long bones, most commonly in the vicinity of the knee.

Osteosarcoma can arise without any predisposition in the young patients but in the older population it usually arises due some predisposing factors as Paget's diseases, fibrosis, and dysplasia.

Locally, osteosarcoma destroys the bone and enters into the surrounding soft tissues around the bone. Distantly, it metastasizes hematogenously into the lungs, bones (skip metastasis) and the brain.

Classification

- **Central** (medullary, conventional) **osteosarcoma**: is when the tumor grows in the marrow of the metaphysis and then infiltrates into the cortex bellow the periosteum or even into the surrounding soft tissues. Microscopically, osteoid formation is a hallmark of the disease. Osteoid is produced by neoplastic osteoblasts. Different proportions of osteoid, cartilaginous, fibrous and vascular tissues can develop and according we can classify it into
  1. **Fibroblastic**: spindle shaped tumor cells are present. Osteoid is minimally present. High vascularization is also evident.
  2. **Chondroblastic**: Neoplastic cartilaginous tissue is present with some atypical spindle cell elements
  3. **Osteoblastic**: mineralized or non-mineralized osteoid islets or beams are present. Tumor osteoblasts are severely anaplastic (pathologically deformed cells)
- **Peripheral** (superficial) **osteosarcoma**: Forms a painful protuberance on the bone surface. On x-ray secondary periosteal ossification is visible. One example is the parosteal (juxtacortical) osteosarcoma with very good prognosis.

Clinical picture

- pain in the affected bone, typically resting and nocturnal (ie not associated with stress),
- with tumor growth, solid swelling occurs, which may not be painful to the touch (typically around the knee joint),
- in an advanced stage, pathological fractures of the relevant bone could occur,
- non-specific general symptoms - night sweats, fever, weight loss,
- cough and difficulty breathing - lung metastases

Diagnostics

- Elevated phosphates levels are a biochemical marker for bone tumors
- Simple x-ray
  - osteolysis and newly formed bone
  - cortical bone disruption
  - periosteal reaction in the form of Codman's triangle
- bone MRI
- Bone scan (scintigraphic bone examination)
- Bone biopsy for histopathological examination and definite diagnosis not only of the tumor but also of the type.
- Lung X-ray or CT , brain MRI to check for distant metastasis

Therapy

- chemotherapy (Adriamycin, high dose Methotrexate, leucovorin, Cis-platin, Isophosphamide)
- Radical surgical removal of the tumor (amputation or limb saving procedures)
- Osteosarcoma are generally not radiosensitive so radiotherapy is rarely used

Prognosis

Patients with a radically cured tumor and a good response to chemotherapy has an 80% chance of cure. (tumor type, patient age, time of diagnosis, treatment effect all play a role in prognosis)

Ewing Sarcoma

__ Ewingův sarkom

Ewing's sarcoma (EWS) belongs to the *sarcomas of the Ewing group:* EWS, PNET (primitive neuroectodermal tumor), Askin's tumor (Ewing on the chest wall).

It is the 2nd most common malignant bone tumor in children and adolescents, the highest incidence in the period of 5–30 years.

It most often develops in the bone marrow of the diaphysis of long bones (main femur, tibia). Early metastasizes to the lungs is typical.

Clinical picture: It often mimics acute osteomyelitis: subfebrile, leukocytosis, increased sedimentation. Pain, swelling and pathological fractures are also common

Diagnosis:

- **X-ray image:** osteolytic changes with permeative bone destruction + periosteal reaction.
- Scintigraphy examination is positive

Therapy: 1. neoadjuvant CHT , 2. radical surgical resection, 3. intraoperative / subsequent RT , 4. adjuvant CHT.

Prognosis: 5-year survival 60-76% (in case of no metastases).

Chondrosarcoma

__ Chondrosarkom

Chondrosarcoma is a chondrogenic tumor usually happening in the metaphysis of the proximal part of the humerus , femur , tibia , and pelvis

It arises primarily or secondary to Ollier's disease (multiple enchondromas)

typically affects older patients between the age of 30 and 70 years.

Clinically manifests as gradually increasing pain specially nocturnal, swelling, and a palpable mass

X-ray: intraosseous osteolytic lesion.

Histological picture: lobularly arranged masses of cartilaginous tissue with cellular atypia.

Therapy: the only treatment is surgical removal of the tumor: broad / radical resection of the tumor.

Multiple Myeloma

__ Mnohočetný myelom

Multiple myeloma (MM) is a malignant tumor of the plasma cells. It is usually arising from the bone marrow, where it destroys the bones and the bone marrow. In MM several neoplastic foci develop. Neoplastic cells produce protein chains (immunoglobulin or parts of immunoglobulins) known as paraprotein.

Pathology

Macroscopy

Myeloma takes the form of dark red osteolytic deposits in the bone marrow (calf, vertebrae, pelvis, humeral shaft, femur).

Complication

- Pathological fractures (spinal cord lesions in the case of vertebrae).
- AL amyloidosis .
  - Myocardium - arrhythmias, heart failure.
  - Large intestine - malabsorption.
  - Kidneys - renal failure (proteinuria , periorbital edema, uremia).
  - Liver, blood vessels, nodes...
  - Tongue - macroglossia.
- Myeloma kidney - clogging of tubules by protein chains - Bence Jones protein .

It threatens the patient's life

- Failure of an organ affected by amyloidosis,
- bronchopneumonia - develops after vertebral fracture and spinal cord injury,
- opportunistic infections after total bone marrow destruction

Clinically

Epidemiology and Etiology

The diseases affects more males than females in a ratio 5:1. Incidences increase after the age of 50, where the median age of diagnosis is 70. It is almost non-existent in children and extremely rare in adults. The disease has no known etiological factor.

Clinical picture

The initial period may be completely asymptomatic (in indolent lymphomas), but back or ribs **pain** predominate in more than 70% of patients . Pain is tied to physical activity.

The clinical picture consists of a set of symptoms hidden under the abbreviation **CRAB** :

C alcium - hypercalcaemia , which is associated with bone breakdown. Hypercalcemia causes bone pain, depression , lethargy and weakness.

R enal failure - renal failure due to tubulopathy, due to accumulation of Bence Jones proteins,

Anemia- normocytic normochromic anemia is the most common symptom, it is associated with weight loss, fatigue, shortness of breath and paleness

B one - bone disease - very common, tumor cells in the bone marrow produce osteoclast activating factors, which leads to osteolysis of the bones and the formation of pathological fractures, which occur in up to 70% of patients.

Susceptibility to infections, manifestations of hyperviscousity syndrome (headache, vision disorders) and palpable infiltrates over osteolytic deposits (especially on the skull) also contribute to the clinical picture.

Investigation methods

- **X - ray** - reveals pathological foci (often in the skull and spine, but myeloma can be in virtually anywhere), as well as **CT , MRI , PET** ,
- **determination of paraprotein in blood** - electrophoresis of plasma proteins, serum paraprotein (immunoglobulins) concentration is usually> 30 g / l,
- **free chain determination (FLC)** - the most sensitive method. The method tries to determine the ratio of Kappa light chain of immunoglobulin to Lambda light chain of immunoglobulin in the plasma. Normally the ratio is 1:1 or 2:1. In case of myeloma one specific light chain is highly produced and the ratio is severely changed, eg: 350:1.
- determination of **Bence Jones protein** in urine,
- **bone marrow examination** -in MM the number of plasma cells will be almost 10% of all nuclear cells in the marrow,
  - Further immunohistochemically and cytogenetic examination can be done to detect genetic aberrations (deletions, duplication, trisomy) that can be the basis of the disease
- **laboratory examination,**
  - normocytic normochromic anemia , mild leukopenia and thrombocytopenia
  - often increased sedimentation,
  - hypercalcemia,
  - renal dysfunction - increased urea and creatinine,
  - examination of LD, thymidine kinase and beta $_2$ -microglobulin, hyperuricemia - their increased values have a negative prognostic significance.

Clinical stages

Classification according to Durie and Solomon:

clinical stage I - paraprotein concentration IgG <50 g / l, or IgA <30 g / l, proteinuria <4 g / 24 hours, no osteolytic changes without hypercalcemia,

clinical stage II - values are between stages I and III,

clinical stage III - IgG paraprotein concentration> 70 g / l, or IgA> 50 g / l, proteinuria> 12 g / 24 hours, multiple bone deposits, hypercalcemia> 2.75 mmol / l, hemoglobin concentration <85 g / l ,

Subclassification A, B according to the value of serum creatinine (renal impairment),

subclassification A - serum creatinine ≤ 177 µmol / l,

subclassification B - serum creatinine> 177 µmol / l.

Therapy

If myeloma is asymptomatic, it is not treated, it is only monitored,

If symptomatic, the following is treated:

- younger patients are indicated for autologous hematopoietic stem cell transplantation,
- elderly patients are indicated for chemotherapy,
  - chemotherapy - cyclophosphamide and dexamethasone (or thalidomide) are used as standard
- Biological therapy with bortezomib has been registered in the Czech Republic since 2009 for primary treatment
- radiotherapy - for painful bone deposits,
- palliative treatment - in patients with severe comorbidities, melphalan and prednisone, or radiotherapy.

Ostatní vzácnější malignity skeletu

- adamantinom dlouhých kostí
- chordom
- maligní fibrózní histiocytom
- fibrosarkom
- liposarkom

Odkazy

Související články

- Benigní nádory skeletu

Reference

Použitá literatura

-
-
-

Kategorie:Patologie Kategorie:Ortopedie Kategorie:Radiodiagnostika Kategorie:Hematologie Kategorie:Vnitřní lékařství Kategorie:Onkologie