Osteoarticular tuberculosis

- An infectious bacterial disease characterized by the growth of nodules (tubercles) in the tissues, especially the lungs.

●The disease is caused by the bacterium Mycobacterium tuberculosis or (especially in animals) a related species; Gram-positive acid-fast rods.

- The disease can affect other parts of the body, notably the bones and joints and the central nervous system.

- Its spread is countered by vaccination and by the pasteurization of milk to prevent transmission from cattle.

- It was once considered incurable, but early X-ray diagnosis permits its arrest by drugs and surgery.

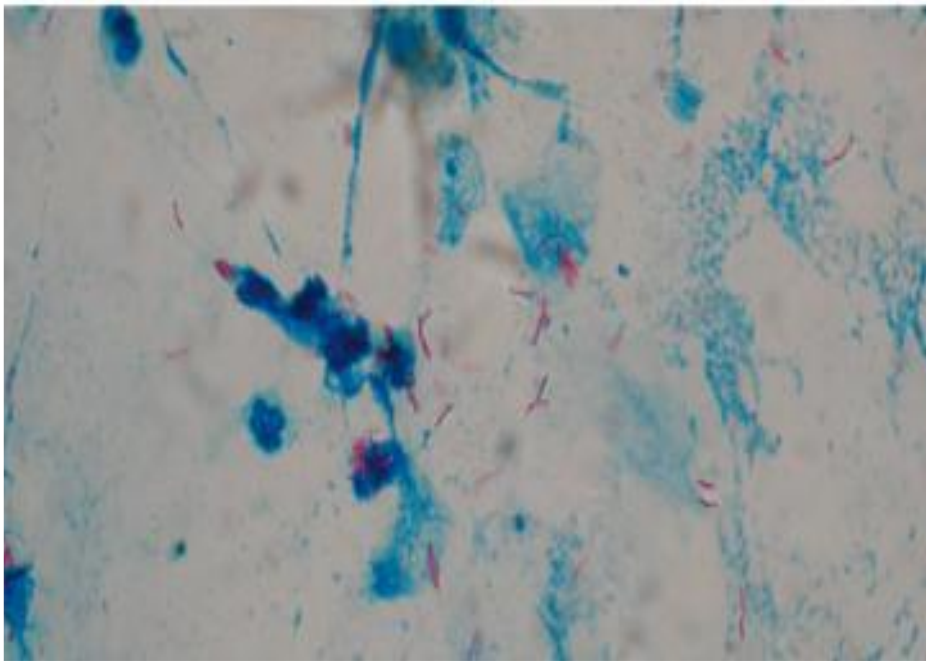
- The most common form, pulmonary tuberculosis (formerly known as ‘consumption’), is caused by inhalation of the bacteria.

- It was widespread in 19th-century Europe, and still causes millions of deaths each year in developing countries.

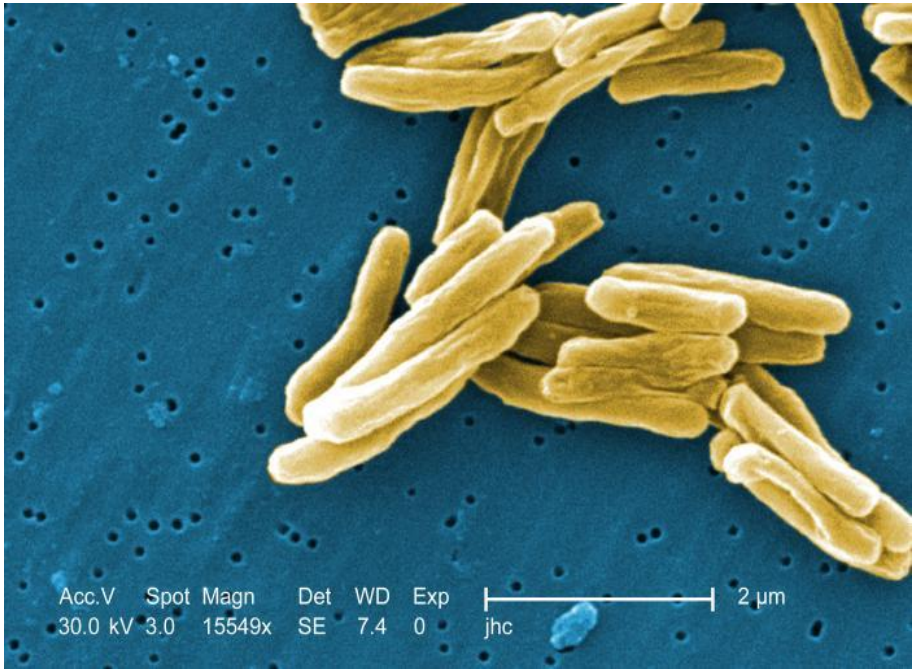
- Tuberculosis is a very old disease, which has affected humanity since ancient times. This has been demonstrated by identifying vertebral tuberculosis in Egyptian mummies dating from 3000-2400 BC

- **A total of 1.5 million people died from TB in 2018 (including 251 000 people with HIV). Worldwide, TB is one of the top 10 causes of death and the leading cause from a single infectious agent (above HIV/AIDS).**

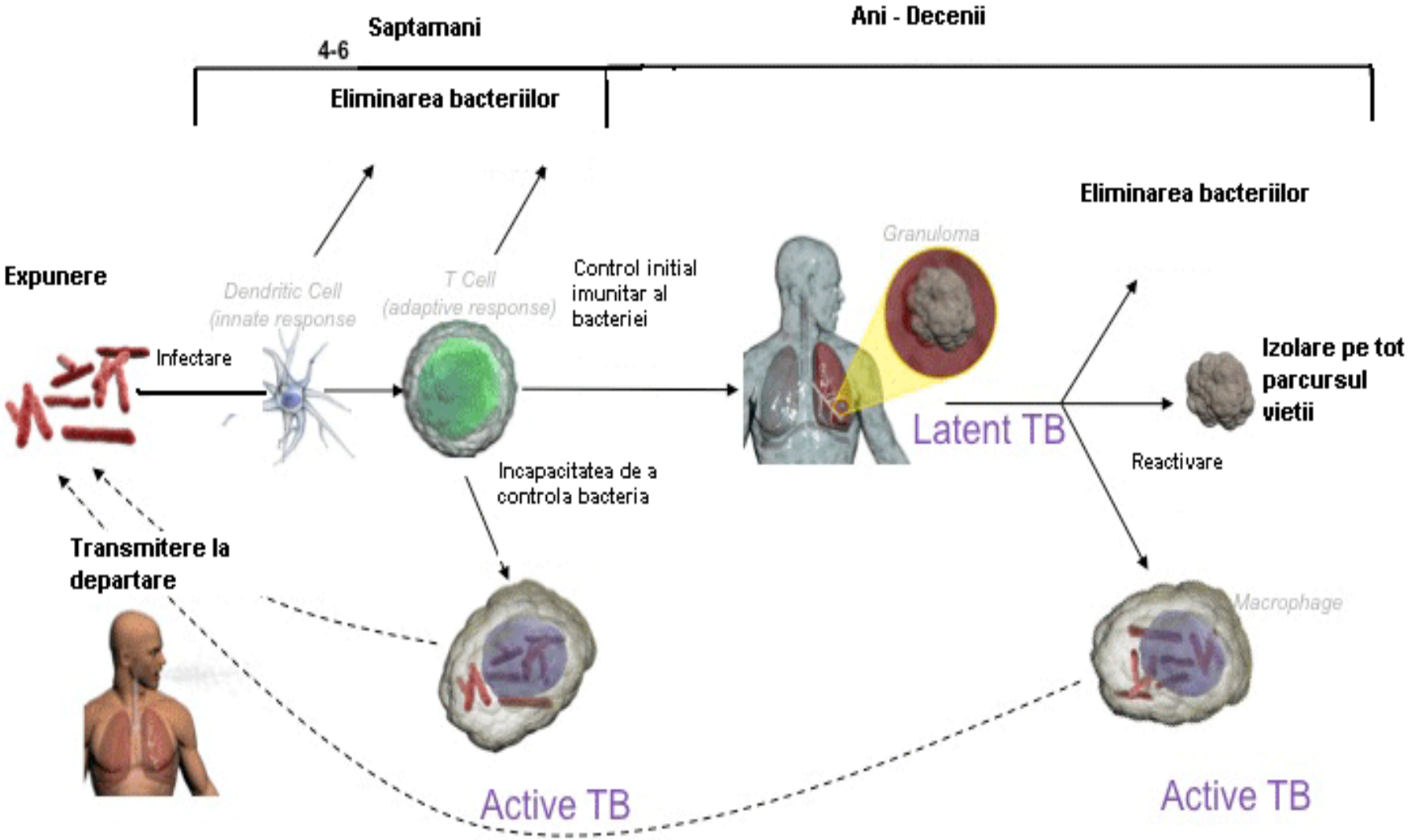
- Common symptoms of active lung TB are cough with sputum and blood at times, chest pains, weakness, weight loss, fever and night sweats.
- Many countries still rely on a long-used method called sputum smear microscopy to diagnose TB.
- Trained laboratory technicians look at sputum samples under a microscope to see if TB bacteria are present.
- Microscopy detects only half the number of TB cases and cannot detect drug-resistance.



Frotiu de spută colorat Ziehl-Nielsen, 1000x.Se observã bastonașe roșii (bacili acid-alcoolo-rezistenţi = BAAR) pe un fond albastru.



Mycobacterium tuberculosis la microscopul electronic (magnitudine 15549x).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Eliminarea bacteriilor
Expunere
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Control initial
imunitar al
bacteriei
Granuloma
Infectare
Latent TB
Izolare pe tot
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vietii
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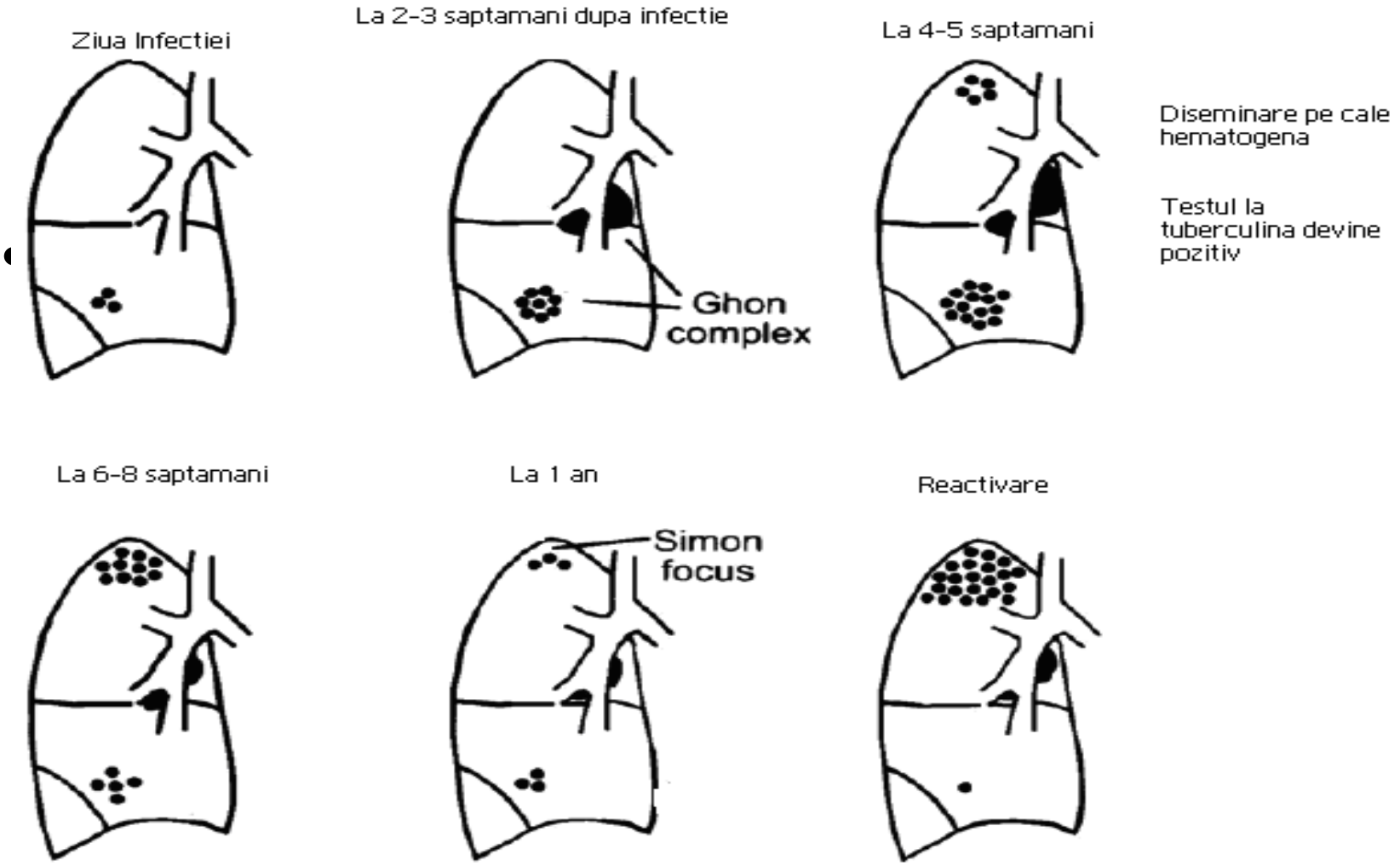
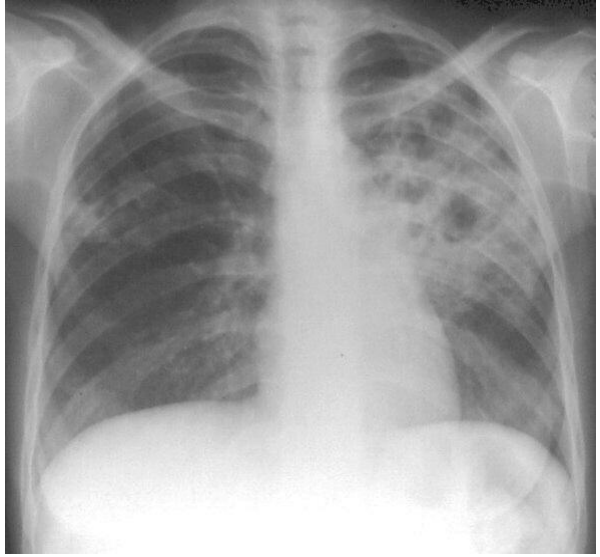
Macrophage
Active TB
Active TB



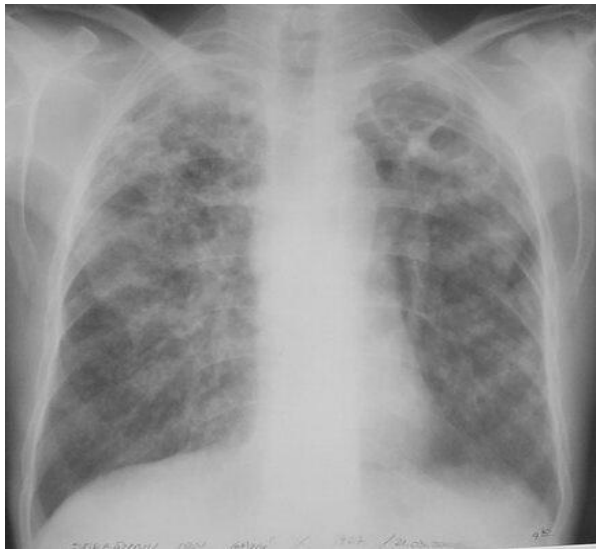
Reprezentarea schematică a infecţiei pulmonare



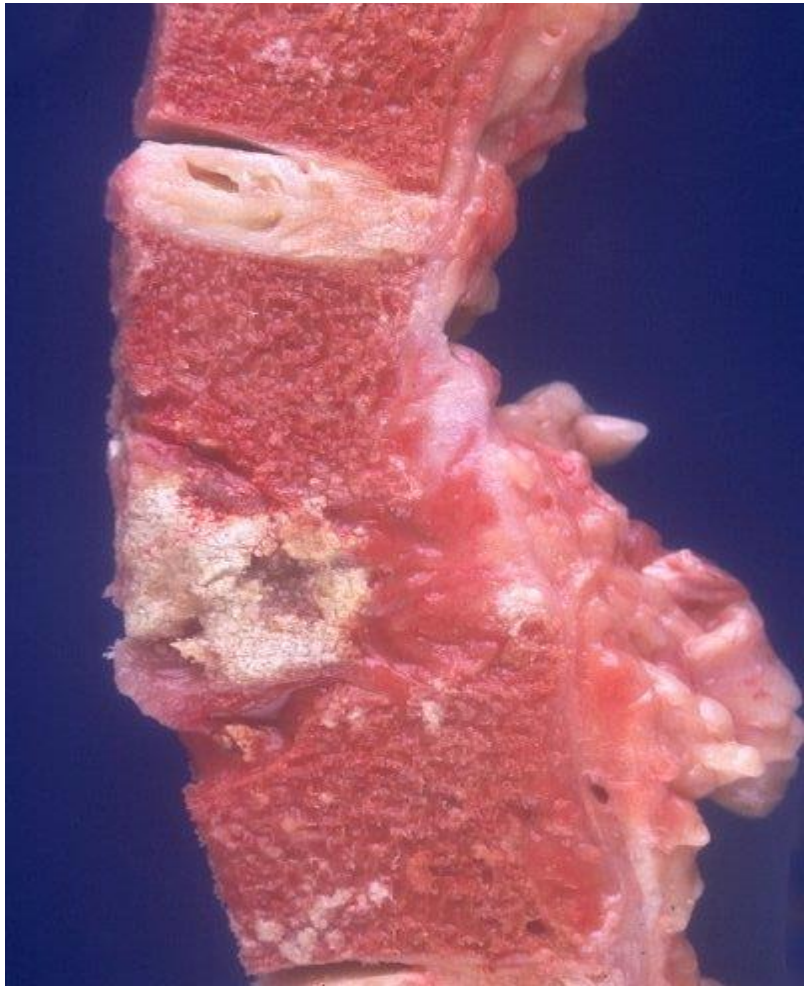
RX torace AP – tuberculoza fibro-cavitară

RX torace AP-infiltrate apicale bilateral, calcificari ganglionare stanga.

Caverna TBC - preparat anatomic



RX torace AP - caverne tbc



- The diagnosis in endemic areas generally can be made on clinical and radiologic examinations.
- However, whenever there is doubt because of an atypical clinical presentation or lack of clinical exposure, tissue diagnosis is mandatory.

- If osteoarticular tuberculosis is diagnosed and treated at an early stage, approximately 90% to 95% of patients would achieve healing with near normal function.

- The mainstay of treatment is multidrug antituberculous chemotherapy (for 12 to 18 months) and active – assisted nonweightbearing exercises of the involved joint throughout the period of healing.

- Operative intervention is required when the patient is not responding after 4 to 5 months of chemotherapy (synovectomy and debridement), the therapeutic outcome is not satisfactory (excisional arthroplasty for the hip or the elbow), or the healed status has resulted in a painful ankylosis (arthrodesis for the ankle, the wrist, or the knee).

- Joint replacement may be considered if the disease has remained inactive for 10 years or more.
- Multidrug resistance should be suspected if the activity of disease does not subside after 4 to 6 months of uninterrupted multidrug therapy.
- Such patients (5% to 10%) present a desperate therapeutic challenge. Second-line and potential antitubercular drugs, and possible im- munomodulations may control such a disease.

- Tuberculous bacilli have lived in symbiosis with mankind since time immemorial.6 Tuberculosis will effect mankind as long as there is malnutrition, poor sanitation, and overcrowding. Exanthematous fevers, diabetes, aging, repeated pregnancies, and immunodeficiency also predispose to the disease. Development of clinical tuberculosis of the skeletal system is a reflection of a weakened immune status of the patient.

Regional Distribution

- Currently, there are approximately 30 million people with tuberculosis worldwide, and of these **1% to 3% have involvement of the skele- tal system**.
- Vertebral tuberculosis is the most common form of skeletal tuberculosis, accounting for 50% of all cases in some series.

- **The major areas of predilection are, in order of frequency, the spine, hip, knee, foot, elbow, hand, shoulder, bursal sheaths, and other sites.**

- In general, tuberculosis is monoarticular or in a localized segment of the vertebral column; however, in approximately 10% of patients, multiple lesions can be detected clinically and radiologically.

Pathology and Pathogenesis

- An osteoarticular tubercular lesion results from hematogenous dissemination from a primarily infected focus, which may be active or quiescent, apparent or latent, in the lungs, lymph glands, or other viscera.
- The infection reaches the skeletal system through vascular channels, generally the arteries, as a result of bacteremia, or in the axial skeleton through Batson’s plexus of veins.

- Simultaneous involvement of the para- discal parts of contiguous vertebrae in a typical spinal tuberculous lesion lends support to the concept that the bacilli are blood-borne.

- On routine investigation 20% of patients, and on isotope bone scans of the entire body and mag- netic resonance imaging (MRI), 40% of patients have tuberculous involvement of viscera, lymph nodes, or other parts of the skeletal system which suggests spread of infection through the arterial blood supply.

Tuberculosis of Joints and Bones

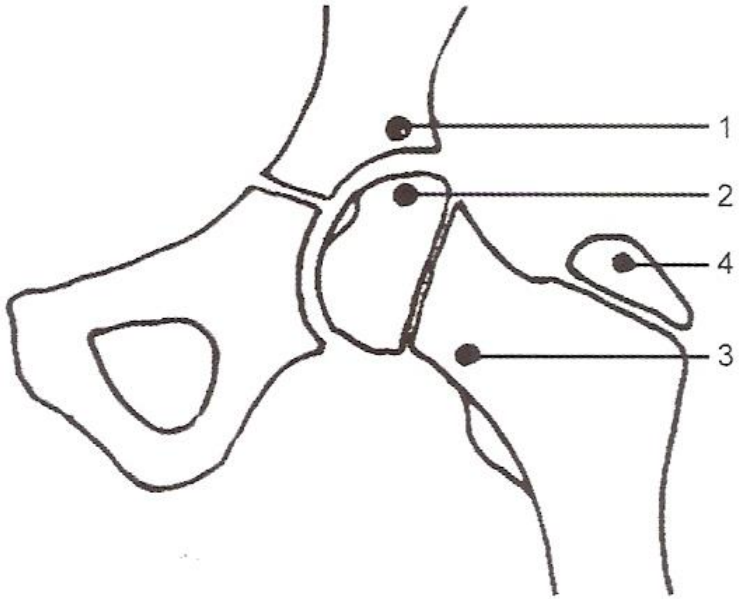
- Tubercular bacilli reach the joint space via the blood stream through subsynovial vessels, or indirectly from epiphyseal (more common in adults) or metaphyseal (more common in children) lesions, which erode into the joint space.

- Articular cartilage destruction begins peripherally and the weightbearing surfaces are preserved for a few months, providing the potential for good functional recovery with effective treatment in patients with early disease.

- The disease may start in bone or in the synovial membrane, but one rapidly infects the other.

- The initial focus starts in the metaphysis in childhood or at the end of the bone in adults.

- An example of articular tuberculosis of the typical osseous areas of predilection for hip disease is shown in Figure 1.



- **Fig 1.** Osseous tuberculosis foci, which may in- volve the hip, are shown. 1 acetabular; 2 epiphyseal; 3 trochanteric 4 metaphyseal (Reprinted with permission from Tuli SM: Tuber- culosis of the Skeletal System. New Delhi, Jaypee Brothers Medical Publishers 1997.)

- Radiologically, there is local destruction and marked demineralization. In bones with superficial cortical surfaces (such as the meta-carpals, metatarsals, phalanges, tibia, and ulna) the lesions may produce reactive subperiosteal new bone formation surrounding lytic areas.
- Metaphyseal tuberculous lesions may infect the neighboring joint through the capsule, or through destruction of the epiphyseal plate.

- Once the tubercular process has reached the subchondral region, the articular cartilage loses its nutrition and attachment to the bone, and may lie free in the joint cavity.
- Damage to the physis in childhood may result in shortening or angulation of the limb.

- When infection starts as tuberculous synovitis, the course usually is slow. The synovial membrane becomes swollen and congested and an effusion develops. The granulation tissue from the synovium extends over the bone at the synovial reflections, producing erosions.

- At the periphery of the articular cartilage, granulation tissue forms a pannus, which erodes the margins and surface of the joint. In long-standing disease, flakes or loose sheets of necrotic articular carti- lage and accumulations of fibrinous material in the synovial fluid may produce the rice bodies found in synovial joints, tendon sheaths, and bursae.

- Where articular surfaces are in contact, the cartilage is preserved for a long time because

of the prevention of spread of the pannus. Necro- sis of subchondral bone by the in-growth of tu- berculous granulation tissue produces kissing lesions or sequestra on either side of the joint.

Cold Abscess

- A marked exudative reaction is common in tuberculous infection of the skeletal system. This, and the products of liquefaction, form the cold abscess. It is composed of serum, leukocytes, caseous material, bone debris, and tubercle bacilli.

- The abscess penetrates the periosteum and the ligaments, and migrates or gravitates in various directions, following fascial planes and the sheaths of vessels and nerves. The cold abscess feels warm although the temperature is not elevated as high as in acute pyogenic infections.

- A superficial abscess may burst to form a sinus or an ulcer, lined with tuberculous granulation tissue.

- The size of a cold abscess is not proportionate to the degree of destruction caused by infection. The sinuses and superficial abscesses permit secondary bacterial infection that modifies the clinical, radiologic, and pathologic picture.

Diagnosis and Investigation

- Skeletal tuberculosis occurs mostly during the first 3 decades of life. In affluent societies, the disease is reported in the elderly.
- The characteristics are insidious onset, monoarticular or single-bone involvement, and the constitutional symptoms of low-grade fever, lassitude (especially in the afternoon), anorexia, loss of weight, night sweats, tachycardia, and anemia.

- Local symptoms and signs are pain and night cries, painful limitation of movement of the afflicted joint, muscle wasting, and regional lymph node enlargement.
- During the acute stage, protective muscle spasm is severe.
- During sleep, the spasm relaxes and permits movement between the in- flamed surfaces, resulting in pain and night cries.

Clinical Diagnosis

- In developing countries in general, the diagnosis of tuberculosis of bones and joints can be made reliably on clinical and radiologic examinations.
- However, in affluent countries tuberculosis has been reduced to the status of a rare disease, and the current generation of doctors is unfamiliar with the skeletal manifestations of the disease.

- In such situations and whenever there is doubt, positive proof of the disease must be obtained by semiinvasive investigations.

- Skeletal tuberculosis must be included in the differential diagnosis of chronic or subacute monoarticular arthritis, chronic abscess, a draining sinus, or chronic osteomyelitis.

- Local pain, swelling, and limitation of joint movement may precede discernible radiologic changes by 4 to 8 weeks.

- Pain usually is localized to the joint but can be referred to other areas. The imaging characteristics of osteoarticular tuberculosis were described by Griffith et al.

Blood

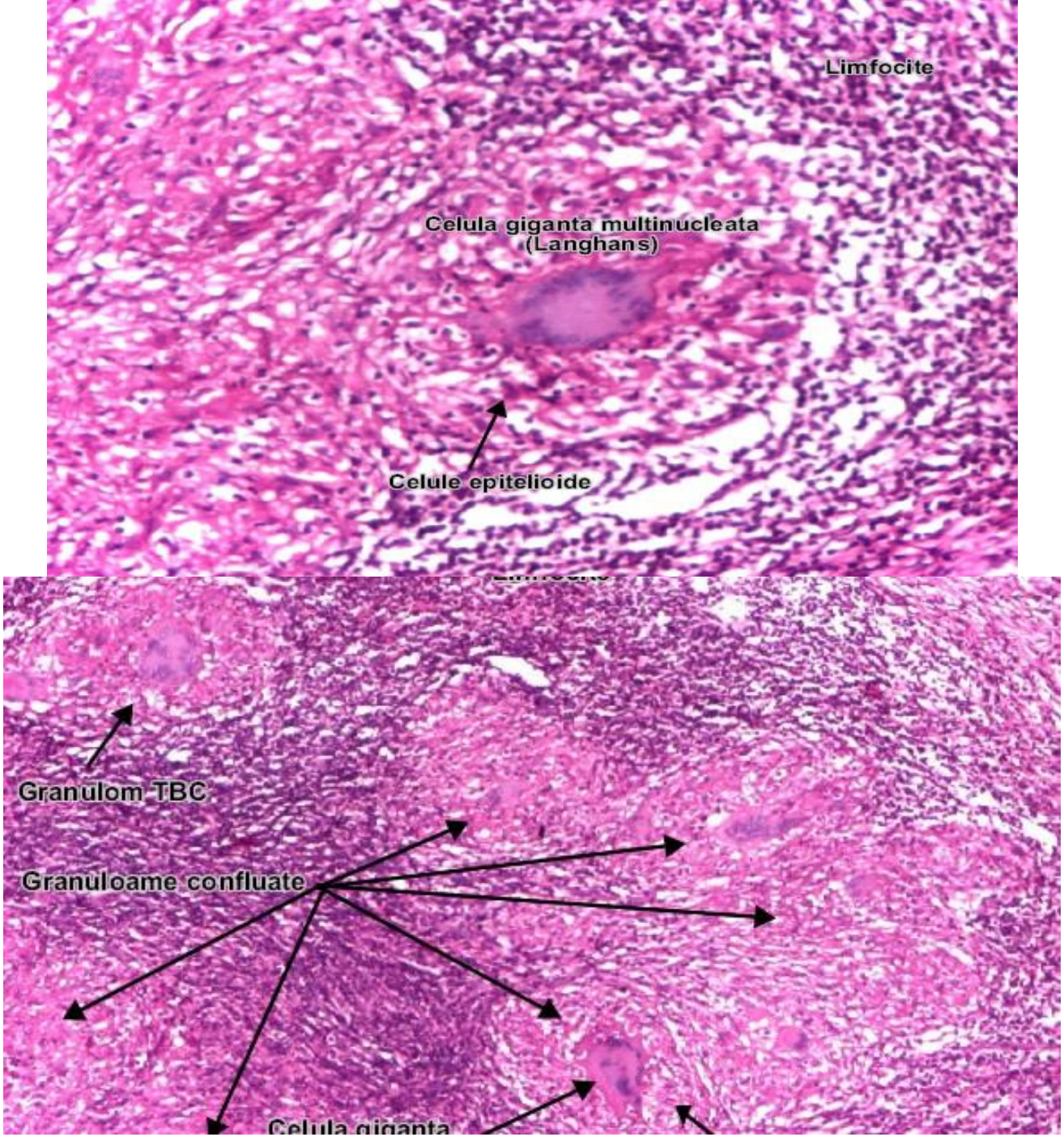
- A relative lymphocytosis, low hemoglobin, and increased erythrocyte sedimentation rate often are found in patients with the active stage of disease.
- An increased erythrocyte sedimentation rate, however, is not necessarily proof of activity of the infection. Its repeated estimation at 3- to 6-month intervals gives an index of the activity of the disease.

Mantoux Test

- As a rule, a positive reaction is present in a patient infected with tuberculosis for more than 1 month.
- A negative test, in general, rules out the disease.
- The tuberculin test rarely may be negative although active tuberculosis is pre- sent, such as in immune deficiency states.

Biopsy

- Whenever there is doubt (particularly in the early stages) it is mandatory to prove the diagnosis by obtaining a biopsy specimen of the diseased tissue (granulations, synovium, bone, lymph nodes, or margins of tuberculous ulcers).
- Microscopic examination of an aspiration, core biopsy, needle biopsy, or open biopsy will reveal typical tubercles in patients who are not treated.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- At the time of open biopsy of a joint or bone, the orthopaedic surgeon should do therapeutic synovectomy or curettage.

- The infections of bone and joint that present as granulomatous lesions in order of frequency are tuberculosis, mycotic infection, brucellosis, sarcoidosis, and tuberculoid leprosy.

Smear, Culture, and Serology

- The material prepared for guinea pig inoculation also may be submitted for smear and culture examination for acid-fast bacilli.
- In superficial joints, one may be able to aspirate synovial fluid.
- Analysis of synovial fluid does not provide pathognomonic information; how- ever, in general the leukocyte count is elevated to approximately 20,000 mm3, there is a lowered glucose level, and poor mucin.
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- Clear synovial aspirate is not an appropriate material for microbiologic investigation; however, it is an excellent material for polymerase chain reaction and nucleic acid probes.

Principles of Treatment of Osteoarticular Tuberculosis

- Modern drugs promote the healing of sinuses, ulcers, and abscesses in patients previously unresponsive to extensive surgery.
- They also eliminate the danger of postoperative miliary and meningeal disease caused by dissemination of the tuberculous infection.

- Death caused by uncontrolled disease, meningitis, miliary tuberculosis, amyloidosis, paralysis, and crippling now is rare. If a patient is diagnosed early and treated vigorously, healing can be accomplished without residual joint ankylosis or deformity.

- With the use of modern drugs, the indications for surgery have become universally more selective and directed toward the prevention and correction of deformities, and the improvement in function of the diseased joints.

- At the stage of tuberculous arthritis, if abscess formation has not occurred, the natural outcome generally is a fibrous ankylosis.
- If an abscess discharges and sinuses develop, the outcome may be a bony ankylosis.
- The prognosis in articular tuberculosis depends on the stage of the disease when the specific treatment is started

- Concomitant disease must be treated and hospitalization is necessary only for patients with complications, or for patients requiring traction under supervision to correct deformities

Rest, Immobilization, and Braces

- In the active stage of disease, the joints are rested in the position of function using remov able splints. Prolonged immobilization can lead to spontaneous ankylosis when joints are grossly destroyed.

- Patients with early disease are allowed 1 to 2 hours of intermittent, guarded active and assisted exercises while taking antitubercular drugs, with the aim of retaining a useful range of movement in the functional arc of the involved joint.

- Traction helps to correct deformity and to rest the diseased part. Gradual ambulation is encouraged with the help of suitable braces approximately 3 months after the start of treatment while healing is pro- gressing.

- As the disease heals and pain subsides, weightbearing and activity are permitted.
- If there is steady progress, activity is increased within the limits of discomfort.
- The use of a brace is discontinued gradually after approximately 2 years.

Treatment of Abscess, Effusion, and Sinus

- Palpable and large joint effusions are aspirated and 1000 mg of streptomycin alone or combined with injectable isoniazid (300 mg) is in- stilled at each aspiration. Local concentrations of antibiotics after parenteral administration may make this local instillation unnecessary.

- Open drainage of an abscess is indicated if aspiration fails. Radiologically visible paravertebral abscess shadows do not need to be drained, unless decompression is done in patients with paraplegia or when diseased vertebrae are debrided.

- A prevertebral abscess in the cervical region is drained if it causes difficulty in swallowing or breathing. Drainage of a large paravertebral abscess also may be considered when its radiologic size increases markedly despite treatment.


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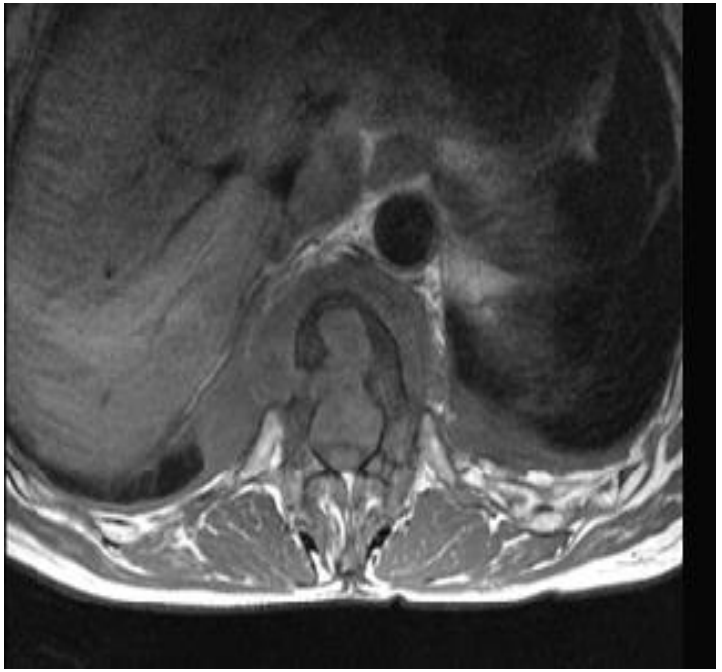

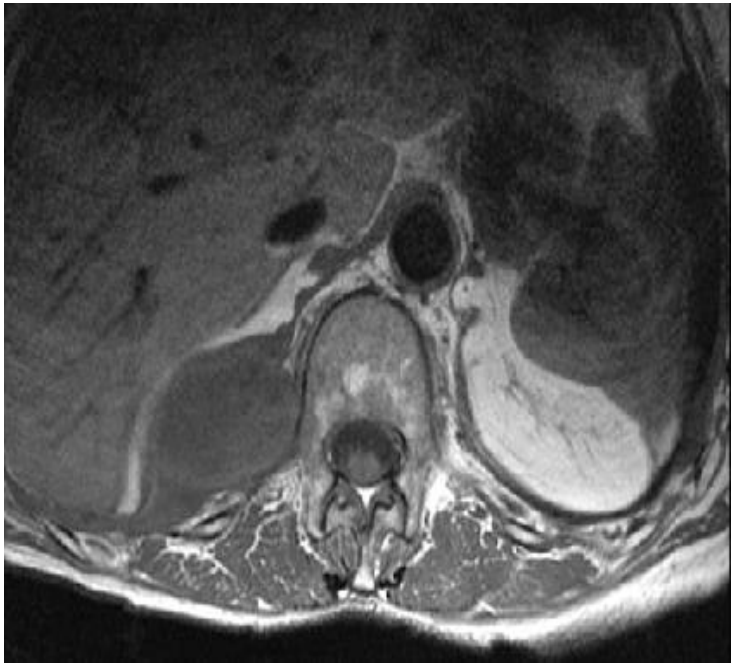

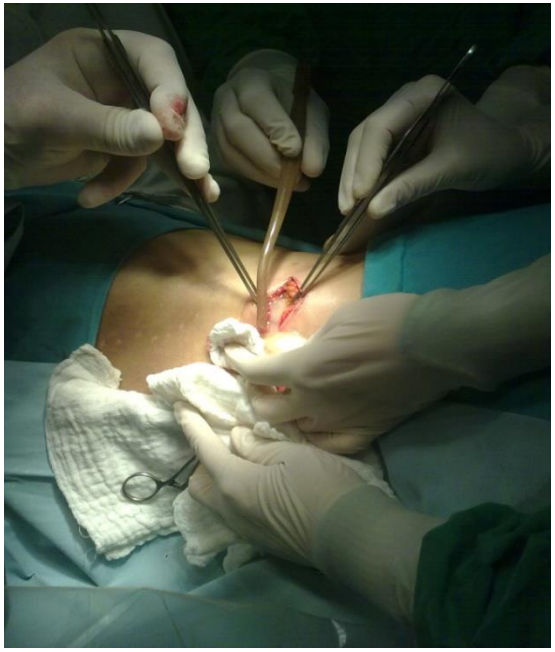

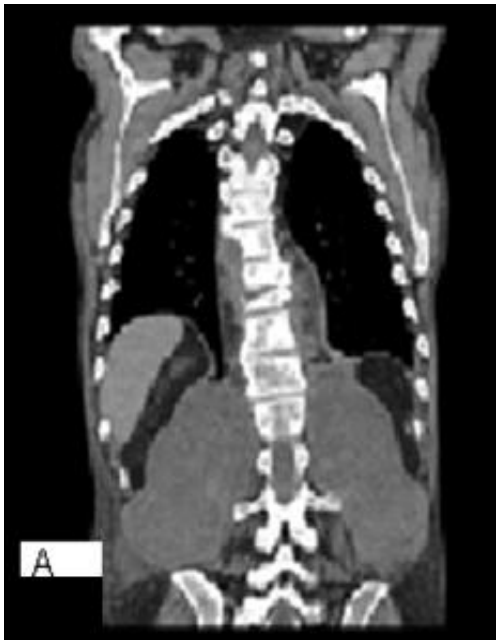
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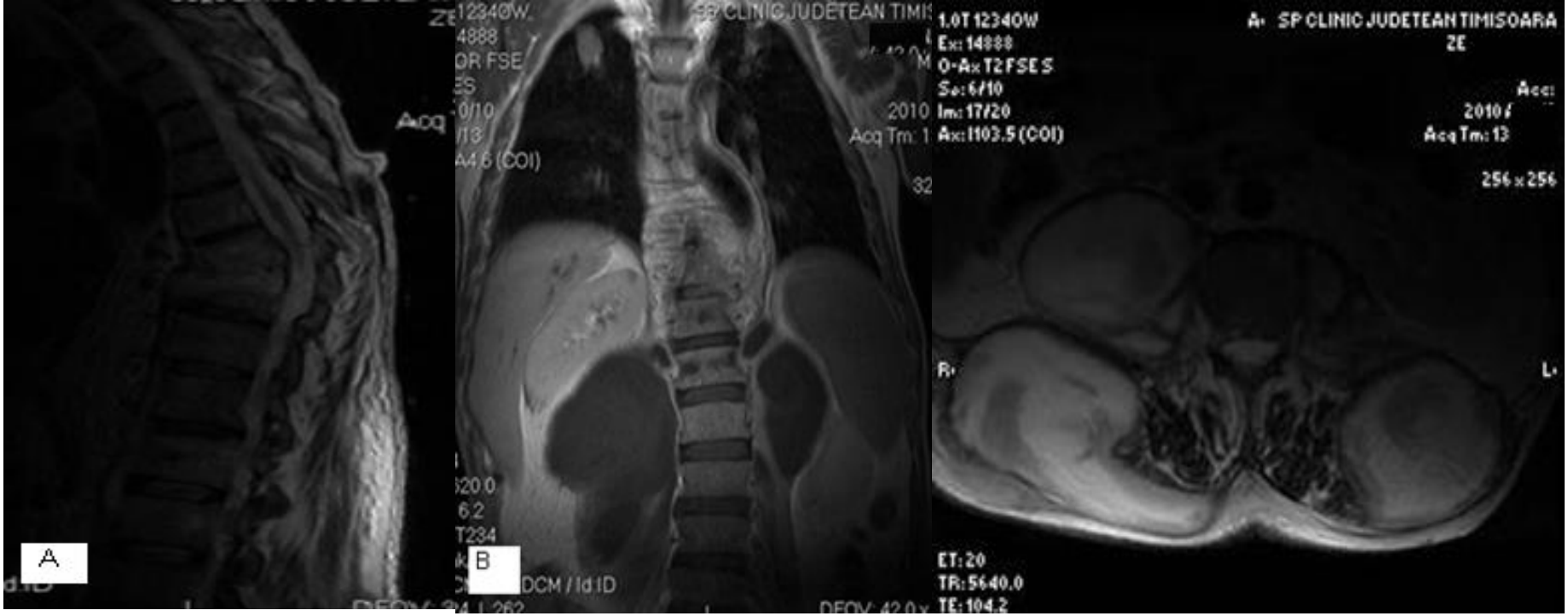
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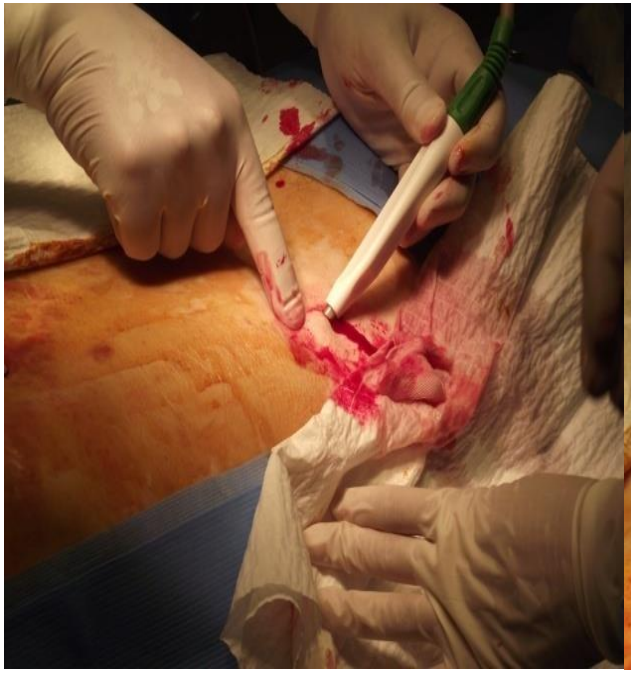

- A majority of ulcers and sinuses heal within 6 to 12 weeks under the influence of systemic antitubercular drugs.
- Less than 1% of patients with sinuses require longer treatment and excision of the tract, with or without debridement.
- Sinus ramification always is greater than can be appreciated and complete surgical excision therefore is impractical.

Antitubercular Chemotherapy

- Combination chemotherapy should be used for an adequate length of time.
- Most of the antitubercular drugs potentially are toxic and resistance or intolerance to the drugs should be suspected when a patient fails to respond.

Multidrug Resistant Tuberculosis and Patients Who do not Respond

- If the disease is caused by organisms resistant to isoniazid and rifampicin (multidrug resistant tuberculosis), if the disease is not controlled within 4 to 5 months, or if despite multidrug therapy, more active tuberculous lesions appear, one has to resort to second line drugs or potential antituberculous drugs.

- The situation is desperate in patients who do not respond. Immunomodulation in conjunction with drugs may be used in such patients.20 A favor- able response was reported in approximately 85% of patients.

- Pending the availability of better immuno-modulation techniques20 the current author has evolved the following outline during the past 12 years to upgrade cell-mediated im-munity. In brief, 150 mg of levamisol is given at night for 3 days at weekly intervals for a total of 45 tablets.25
- Four injections are administered once a month.

- The first and second infections are 0.1 mL intradermal (Bacillus Calmett-Guérin) injections and the third and fourth are intramuscular DPT in- jections (diphtheria vaccine tetanus vaccine Bordetella pertussis 20,000 million per 0.5 mL).