**Tuberculosis of the Skin**

Mycobacteria are small, nonmotile, slightly curved acid-fast rods. Mycobacterium tuberculosis causes 95% of human tuberculosis; Mycobacterium bovis is responsible for the rest.

Epidemiology: Only 10% of individuals with normal immune status who are infected with Mycobacterium tuberculosis develop active tuberculosis.

Factors that decrease host resistance include:

–Malnutrition, immunosuppression, malignancies, other major illnesses.

–Age: Children 3 years of age have a more severe course; 3–12 year-olds almost always have spontaneous healing. Later, resistance drops with increasing age.

Investigations:

Microscopic examination: Staining with Ziehl–Neelsen stain or auramine fluorescence staining can be used to examine tissue sections or bodily fluids.

Culture: Both species grow slowly on special media (Löwenstein–Jensen) under anaerobic conditions. Initial growth takes 3–10 weeks, followed by differentiation and determination of drug sensitivity, lasting total of 2–3 months.

PCR for mycobacterium tuberculosis DNA in skin biopsies; this technique has become important because it is so difficult to culture the organisms from the skin.

Pathogenesis:

Primary infection:

The usual site of infection is the lungs following droplet spread. A nonspecific leukocyte-rich inflammatory response develops, known as a tubercle. From there the bacteria move to regional lymph nodes (primary complex or Ghon complex). Then the bloodstream is invaded, so that the mycobacteria can be spread throughout the body. After 2–4 weeks a specific cell-mediated immunity develops and the host is usually able to bring the infection under control. Healing occurs with fibrosis and calcification.

Endogenous reactivation:

Organisms that have been spread about the body during the primary infection can survive in different organs for years. If the host immune response diminishes, then the bacteria can once again cause active disease. If the resistance is modest, the disease will remain localized; with sharp diminution in resistance, disseminated disease occurs.

Secondary infection:

Secondary infections are uncommon with specific immunity and good resistance, but they can occur.

Clinical forms of cutaneous tuberculosis

The clinical expressions of cutaneous tuberculosis all reflect an interplay between the virulence of the bacteria and the variations in host resistance and previous exposure.

Primary Cutaneous Tuberculosis (Inoculation Tuberculosis):

Lesion resulting from direct introduction of Mycobacterium tuberculosis or Mycobacterium bovis into skin of previously unexposed host.

Epidemiology: Uncommon; most patients are children.

Clinical features: At first small papules develop at inoculation site; they expand into a painless ulcer several centimeters across: primary lesion (analogous to tubercle in lung). Then after 3–8 weeks, regional lymphadenopathy appears: primary complex (analogous to Ghon complex). Healing within a year, usually with scarring.

Diagnostic approach: Culture and biopsy.

Therapy: Systemic therapy.

Disseminated Miliary Tuberculosis:

Clinical features: Hematogenous dissemination in infants or immunosuppressed individuals; many skin lesions, as well as systemic lesions, and a very poor prognosis.

Orificial tuberculosis:

Clinical features: Patients with a high load of Mycobacterium tuberculosis and poor resistance develop mucosal lesions, usually ragged, painful oral ulcers. Prognosis is poor.

Therapy: Systemic therapy.

Scrofuloderma:

Subcutaneous tuberculosis with development of cold abscesses and spread to skin. Epidemiology: Patients are usually young children or elderly people.

Pathogenesis:

Scrofuloderma: Spread of subcutaneous tuberculosis into subcutaneous fat and then skin from infected lymph node, bone, or other tissue.

Tuberculous gumma: Hematogenous spread of mycobacteria with multiple liquefying cold abscesses that break through to the skin.

Clinical features:

Usually the lymph nodes of the neck and submandibular region are involved. They are infected from the primary pulmonary tuberculosis or directly infected from the tonsils.

Initially indolent blue-red nodules (cold abscesses) that enlarge and break down. The ulcers are bizarre, undermined, and tend to form fistulas. Healing occurs after years, with typical strands of scarring.

Hematogenous lesions involve the trunk and extremities, often with simultaneous lesions in bones (fingers, sternum, ribs).

Diagnostic approach: Histology of edge shows typical tubercles; culture or PCR of discharged materials.

Therapy: Systemic therapy.

Lupus vulgaris:

Chronic dermal infection with Mycobacterium tuberculosis or Mycobacterium bovis. Most patients are elderly; women are affected twice as often as men.

Pathogenesis: Lupus vulgaris is usually the result of endogenous reactivation; the mycobacteria reach the dermis by direct spread from lymph nodes, or by hematogenous or lymphatic spread.

Clinical features:

Large red-brown atrophic patches or plaques with telangiectases. Sites of predilection include face (especially nose and ears), breasts, and thighs. Crusts, ulceration, and destruction of adjacent tissue (cartilage of ear or nose) lead to mutilation.

Classic lesion is the lupus nodule, 2–3 mm slightly elevated papule at periphery. On diascopy, characteristic “apple jelly” color surrounded by pale border.

Diagnostic approach:

Biopsy; very few organisms present so PCR more useful than Ziehl–Neelsen stain. Microscopic picture reveals granulomas with classic three-zone pattern of tuberculosis: central necrosis, band of epithelioid macrophages and Langhans giant cells, rim of lymphocytes.

Culture and sensitivity.

Therapy: Systemic therapy.

Warty tuberculosis:

Exogenous reinfection in individual with intact specific immune response.

Clinical features: Solitary verrucous papule or nodule, no lupus nodules.

Therapy:

Treatment plans all have two phases: an initial phase (more aggressive daily therapy; usually for 2 months) and a continuation phase (less aggressive, often 3× weekly, for 4–6 months).

Crucial points are:

* Use of multiple agents, often in combination to avoid resistance.
* Direct observation of patients where possible.
* Minimum of 3× weekly dosing; otherwise peaks and troughs not adequate.
* Rifampicin appears to be the single most important agent.

WHO essential drugs for tuberculosis:

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| Drug | Dosage (mg/kg) | |
| Daily | 3 x weekly |
| Isoniazid | 5 | 10 |
| Rifampicin | 10 | 10 |
| Pyrazinamide | 25 | 35 |
| Streptomycin | 15 | 15 |
| Ethambutol | 15 | 30 |