



Microbiology

TEAM WORK 435

Lecture Two

Mycetoma

Please note that some mistakes might not be ruled out.
Gently contact Microbiology.435@gmail.com if you have any question/comment.

Original content
Important point
Team's note

وقل علمنا

OBJECTIVES

- 1 - Acquire the basic knowledge about **mycetoma** and the clinical features of the disease.
- 2 - Acquire the basic knowledge about other common **subcutaneous mycosis** and their clinical features.
- 3 - Know the main **fungi** that affect subcutaneous **tissues, muscles** and **bones**.
- 4 - Identify the clinical settings of such infections.
- 5 - Know the laboratory diagnosis, and treatment of these infections.

Subcutaneous Mycosis

1- What are they?

Fungal infections involving the **dermis** of the skin, **subcutaneous tissues**, **muscles** and may extend to bone. They are **difficult to treat** and surgical intervention is frequently employed.

2- How do they initiate? (Starting Point)

Trauma to the skin.

3- Where do they occur?

In **healthy hosts**, however, the disease exists more severely if the host is **immunocompromised** (weak).

4- What are their types?

Mycetoma	Subcutaneous Zygomycosis	Sporotrichosis	Chromoblastomycosis	Phaeohyphomycosis	Rhinosporidiosis	Lobomycosis
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we have so many types of subcutaneous mycosis but the most common one is **Mycetoma**.

LOCALIZED: not spreading to any other place. So let's say we have a patient that is suffering from mycetoma in his foot, it will affect the skin, muscles and bones of this area of the foot only.

1- Mycetoma

Definition:

It is a **chronic, granulomatous** disease of the skin and subcutaneous tissue, which sometimes involves muscle, and bones.

Characteristics:

- **Swelling**
- **Abscess formation**
- Multiple draining sinuses that exude characteristic **grains** of clumped organisms
- Typically affects the lower extremities, but also other areas of the body e.g. hand, back and neck.

Chronic:

Treatment course may last for 10 years (slowly progressive.)

Epidemiology:

- The disease was first described in the Madura district of India in 1842, (Madura foot).
- It is endemic in tropical, subtropical, and temperate (hot) regions like:
 - Sudan, Senegal, Somalia, India, Pakistan, Mexico, Venezuela.
- It is more common in men than in women (**3:1 ratio**).
- Common in people who work in **rural areas** such as farmers.

In Sudan, we see 7-8 cases per week, and it is **more common in men** because men usually go outdoor more than women.

Mostly infect people who walk without shoes.

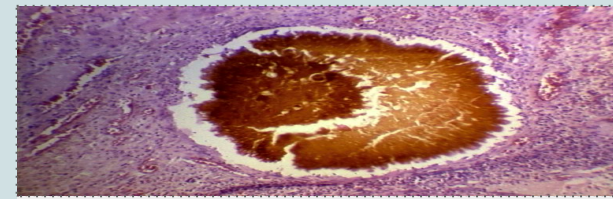
People think that mycetoma is a tumor but it is an infection that affect the foot.

Acquired via:

Trauma of the skin.

Possible events:

- Trauma
- Painless subcutaneous firm **nodule** is observed.
- massive **swelling** with **skin rupture**, and **sinus tract** formation.
- **Old** sinuses **close** and **new** ones **open**, draining **exudates** with **grains** (granules).
- Grains may sometimes be seen with the naked eye.



Granules are vesicles containing the pathogen.

Classified into:

Eumycetoma

- **Caused** by a several **mould fungi**.
- The **most common** are:
 - **Madurella mycetomatis**
 - Madurella grisea
 - Pseudallescheria boydii
- **Color of grains:**

Black or **white**



Actinomycetoma

- **Caused** by **aerobic filamentous bacteria**. (Actinomycetes); gram **positive**.
- The **most common** are:
 - **Actinomadura - Madurae**
 - Streptomyces somaliensis
 - Nocardia brasiliensis
- **Color of grains:**

Yellow, **white**, **yellowish-brown**, **pinkish-red**



Previous Slide:

Testing the grains is important for the diagnosis, differentiation between the 2 types and their treatment.

Color and size.

For example if we found the grains black we will know its Eumycetoma, after knowing the diagnosis now we can treat the patient.

the grains is the fungi itself being developed in the tissue.

Sometimes we find scars in the skin

actinomycetoma percentage is roughly 60% and the Eumycetoma 40% so the actinomycetoma occurs more than Eumycetoma.

Why does the doctor take the patient to radiology?
To check if the bones were affected or not

Most common place is in the foot but it is also common in hand.
(I think they would put a case that involves trauma in the hand and trick us not to choose mycetoma.)

Next Slide:

Sabouraud Dextrose Agar (SDA):

Used for the cultivation of yeasts, moulds and aciduric bacteria.

PH important for SDA Because of:

Bacteria culturing at 7

Fungi culturing at 5.6

So bacteria won't show at lower PH.

- Biopsy is the best in the diagnosis.
- We have to remember the colors!
Black > Fungal > Eumycetoma > Madurella species.

In the lab:

- If we see the grains it is mycetoma.
- If we see filaments then Bacteria.

We stain them first by E&H then if we notice something wrong we go to Giemsa or silver stain.

- SDA > Fungi
- Blood > Bacteria

REMEMBER: the **B** in **B**lood and **B**acteria.

P. boydii = Pseudallescheria boydii

Diagnosis:

Clinical samples

- Tissue biopsy: Superficial samples of the **draining sinuses** are inadequate
- Blood: For serology only
- Pus

Direct microscopic examination

Histological sections: **Hematoxylin-Eosin (H&E)** stain.

Smears:

- Fungi stain with **Giemsa**, **Gomori methenamine silver**.
- Actinomycetes stain with **Gram ZN**.

Grains:

Observing the **size** of the **filaments** and the **color** of the **grain**.

- **White-to-yellow grains** indicate:
P. boydii, **Nocardia species**, or **A. madurae** infection.
- **Black grains** indicate:
Madurella species infection.

Culture

Media:

- **Sabouraud dextrose agar (SDA)** to isolate fungi.
- **Blood agar** to isolate bacteria.
- Fungi are identified based on the **macroscopic** and **microscopic** features.
- For Actinomycetes **biochemical** and other tests are used for identification.

Treatment:

Subcutaneous infections needs prolong treatment.

- Therapy is suggested for several months or years (1-2 years or even more).
- **Actinomycetoma** generally respond better to treatment than **Eumycetoma**.
- **Bone radiographs:** Radiologic tests are required whenever bone involvement is suspected.
- **Surgical Care:** In **Eumycetoma**, surgical treatment (debridement or amputation) in patients who are not responding to medical treatment alone and if bone is involved.

Eumycetoma	Actinomycetoma
- Itraconazole	- Trimethoprim-sulfamethoxazole - Dapsone - Streptomycin Combination of 2 drugs is used.

It is a very serious condition that if it was not treated early the bone is going to be affected then we might need to amputate the foot.

Co-trimoxazole is the name of the combination (Trimethoprim-sulfamethoxazole).

Surgical treatment is important with the combination of antifungal in case the bone is involved.

In Actinomycetoma, if there is bone involvement we use Ciprofloxacin.

2- Subcutaneous Zygomycosis

Definition: Chronic, localized, firm, subcutaneous masses.

Sites and characteristics : Facial area or hands, arms, legs, thighs.

- Firm swelling of site with intact skin-distortion.
- Direct spread to adjacent bone and tissue.

Acquired via: Traumatic implantation of spores, **needle-stick, tattooing**, contaminated surgical dressings, burn, wounds.

Basidiobolus ranarum:

In children, it mostly affect the arm or chest.

Conidiobolus coronatus:

In adults, it mostly affect the face.

Zygomycetes (Grandfather)

Entomophthorales and Mucorales (Son)

1-Conidiobolus coronatus (Grandchild)

2_Basidiobolus ranarum (Grandchild)

we are interested in Entomophthorales

Etiology:

Mould fungi of the:

Zygomycetes

- Entomophthorales
 - Conidiobolus coronatus
 - Basidiobolus ranarum
- Mucorales

Diagnosis:

- **Specimen:** Biopsy Tissue.
- **Direct Microscopy:** Stained sections or smears, **broad non-septate hyphae.**
- **Culture:** On SDA.

Treatment:

- Oral Potassium iodide (KI)
- Amphotericin B
- Posaconazole

3- Phaeohyphomycosis

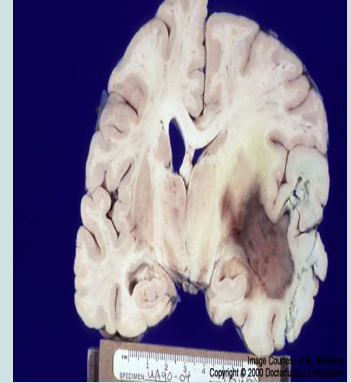
Definition:

It is a group of fungal infections caused by **Dematiaceous**.

Dematiaceous: darkly pigmented fungi that is widely distributed in the environment.

Characteristics:

- **Subcutaneous** or **brain Abscess**.
- Presents as nodules or erythematous plaques with no systemic involvement.
- Affected site: Thigh, legs, feet, arms.



Etiology:

- **Dematiaceous** mold fungi.
- **Common:**
 - Cladosporium
 - Exophiala
 - Wangiella
 - Cladophialophora
 - Bipolar

Diagnosis:

- **Specimens:**
 - Pus, biopsy tissue.
- **Direct Microscopy:** KOH & smears will show **brown septate fungal hyphae**.
- **Culture:** On SDA

Treatment:

- The treatment of choice is **surgical excision** of the lesion.
- Antifungal:
 - Itraconazole
 - Posaconazole

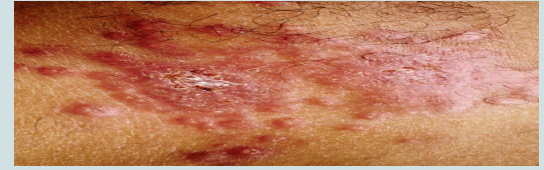
4- Sporotrichosis

Definition: Subcutaneous, deep cutaneous or systemic fungal infection.

Site: Inoculation (embedded) into the skin.

Can be present as:

- Plaques (subcutaneous nodules)
- Lymphangitic
- Disseminated



Other name is Rose Gardener's disease because it mostly affect the farmers' hands or feet.

Lymphangitic: it can spread into proximal lymph.

Etiology:

- **Sporothrix Schenckii.**
- **Dimorphic** fungus.
- Can be mould or yeast depending on the temperature.

Diagnosis:

- **Specimen:** Biopsy tissue, pus.
- **Direct Microscopy:**
 - Smear will show **Finger-like yeast cells** or **Cigar shaped.**
- **Culture:** On SDA at room temperature and at 37°C

Treatment:

- **Itraconazole**
- **Potassium iodide "KI"**

Other subcutaneous fungal Infections

	Sporotrichosis	Phaeohyphomycosis	Chromoblastomycosis	Rhinosporidiosis	Lobomycosis
Clinical features	Subcutaneous or systemic infection Nodular subcutaneous lesions, verrucous plaques or Lymphatic	Subcutaneous or brain Abscess Nodules and erythematous plaques	Subcutaneous Verrucous plaques, cauliflower aspect, hyperkeratotic, Ulcerative	Granulomatous, mucocutaneous polyps	Subcutaneous Nodular lesions, keloids
Etiology	Dimorphic fungus <i>Sporothrix schenckii</i>	Dematiaceous (darkly pigmented) mould fungi	Dematiaceous mould fungi	Obligatory parasitic fungus <i>Rhinosporidium seeberi</i>	Obligatory parasitic fungus <i>Lacazia loboi</i>
Clinical sample	Biopsy tissue	Biopsy tissue	Biopsy tissue	Biopsy tissue	Biopsy tissue
Direct Microscopy	Elongated yeast cells	Brown setpate hyphae	Muriform cells (sclerotic bodies)	Spherules with endospores	Chains of yeast cells
Treatment	Potassium iodide Itraconazole	Surgery (Antifungal therapy)	Surgery (Antifungal therapy)	Surgery	Surgery

Study Smart.. Read this table.

Bone and Joint Infections

They are **uncommon**, not as isolated clinical problem.

Result from:

- Hematogenous dissemination.
- Presence of foreign body.
- **Direct** inoculation of organism (trauma, surgery, etc.)
- Spared through direct extension of infection to the bone.



Etiology:

- **Candida species**
- **Aspergillus species**
- Mould fungi
- Blastomyces dermatitidis
- Coccidioides immitis
- Histoplasma capsulatum
- Paracoccidioides brasiliensis

Examples:

- Rhinocerebral zygomycosis
- Aspergillosis
- Mycetoma
- Osteomyelitis
- Joint infections.

Summary:

- **Mycetoma:**

- Chronic granulomatous disease.
- **Characterized by:** swelling, abscess formation and multiple draining sinuses that exude grains.
- **Classified as:**

Eumycetoma: caused by fungi, treated with Itraconazole.

Actinomycetoma: caused by filamentous bacteria, treated with Dapsone, Trimethoprim-sulfamethoxazole, Streptomycin.

- **Sporotrichosis:**

- Deep cutaneous or systemic fungal infection embedded into the skin.
- **Present as:** subcutaneous nodules, Lymphangitic ,Disseminated caused by Sporothrix schenckii or Dimorphic fungus.
- **Treated with** Itraconazole or Potassium iodide “KI”

- **Phaeohyphomycosis:**

- Group of fungal infections caused by dematiaceous.
- **Characterized by:** Subcutaneous or brain Abscess.
- **Caused by:** Dematiaceous (darkly pigmented) fungi Presents as nodules
- **Treated with:** Surgical excision of the lesion, otherwise Antifungal such as Itraconazole, Posaconazole.

- **Subcutaneous zygomycosis:**

- Chronic, localized, firm, subcutaneous masses.
- **Characterized with:** forming of subcutaneous mass and swelling
- **Caused by:** zygomycetes family
- **Treated with:** Oral potassium iodide, Amphotericin B , Posaconazole.

Great job, now take an online quiz:

1- <https://www.onlineexambuilder.com/mycetoma/exam-51762>

2- <https://www.onlineexambuilder.com/subcutaneous-mycoses/exam-51804>

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TEAM WORK 435
DREAM BUILDERS



“Life begins at the end of your comfort zone.”

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