

Microbiology - Mycetoma & Other Subcutaneous Mycoses

Team 437

Red : Important

Black: Doctors slides

Grey : Extra Info

Green: Notes

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frequently.

[Msk editing file](#)



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.

Features of Subcutaneous Mycoses:

- ❖ They are initiated by trauma to the skin. (e.g. surgery, accident, burn, needle)
- ❖ It is difficult to treat and surgical intervention is frequently employed. (most cases require surgery)
- ❖ Diseases in healthy host, however, more severe disease in immunocompromised host. (Superficial cutaneous: only affects the skin, nails, and hair while Subcutaneous: is a systemic response)
- ❖ Chronic fungal infections involving the dermis, subcutaneous tissues, muscle and may extend to bone. (it starts as subcutaneous, then develops and extends to bone)

Examples:

1. Mycetoma
2. Subcutaneous zygomycosis
3. Sporotrichosis (less common)
4. Chromoblastomycosis (less common)
5. Pheohyphomycosis (less common)
6. Rhinosporidiosis (less common)
7. Lobomycosis (less common)



Mycetoma

Features:

- Mycetoma is a chronic, granulomatous disease of the skin and subcutaneous tissue, which sometimes involves muscle. (if not treated it reaches the bone)
 - It is characterized by swelling, abscess formation, and multiple draining sinuses that exude characteristic mycetoma grains of clumped organisms (microcolonies).
 - It typically affects the lower extremities (e.g. foot) but also other areas of the body (e.g. hand), back, and neck.
 - The disease was first described in the Madura district of India in 1842, where it was initially named Madura foot.



Mycetoma

Classified as:

- Mycetoma is endemic in tropical, subtropical, and temperate regions such as: Sudan, Senegal, Somalia, India, Pakistan, Mexico, Venezuela.
- Common in people who work in rural areas (e.g. farmers).
- It is more common in men than in women (ratio is 3:1), **this is due to women less commonly being doing field/farm work.**

Mycetoma is acquired via trauma to the skin:

Trauma



Painless subcutaneous firm nodule is observed



Massive swelling with skin rupture, and sinus tract formation
(discharging pus)



Old sinuses close and new ones open, draining exudates with grains (granules)

Grains may sometimes be seen with the naked eye.



Mycetoma classified into



Eumycetoma

- Caused by several mould fungi
- The most common are:
 - **Madurella mycetomatis**
 - Madurella grisea
 - Pseudallescheria boydii

Color of grains:

Black or white.

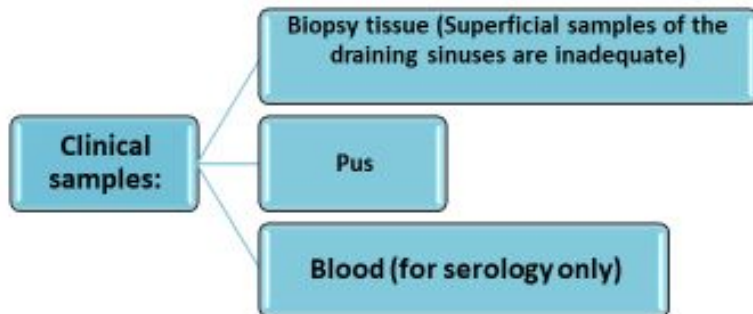
Actinomycetoma

- Caused by aerobic filamentous bacteria
- The most common are:
 - **actinomadura-Madurae**
 - Streptomyces somaliensis
 - Nocardia brasiliensis

Color of grains:

Yellow, white, yellowish brown, pinkish red.

DIAGNOSIS:



1. Direct microscopic examination

Histological sections:
Hematoxylin-Eosin

Smears: Stain with Giemsa , Gomori methenamine silver (Fungi) Stain with Gram (Actinomycetes)

Grains (Observing the size of the filaments , the color of the grain)

e.g.

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

2. Culture

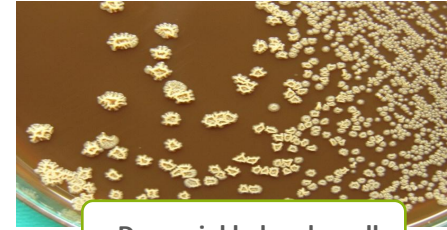
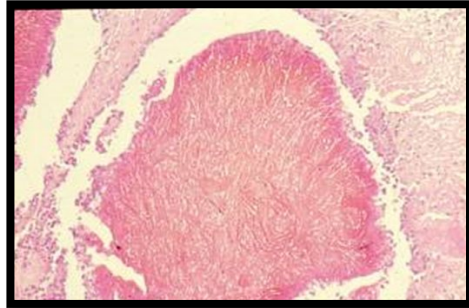
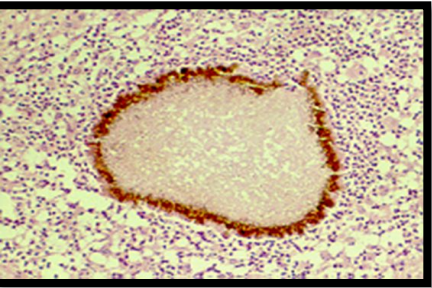
Media such as :
Sabouraud dextrose agar (SDA) to isolate fungi

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

Mycetoma

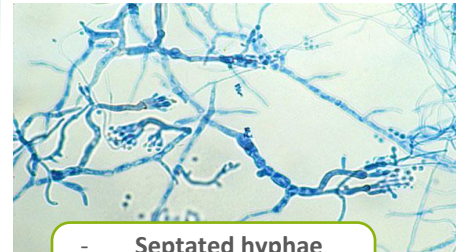
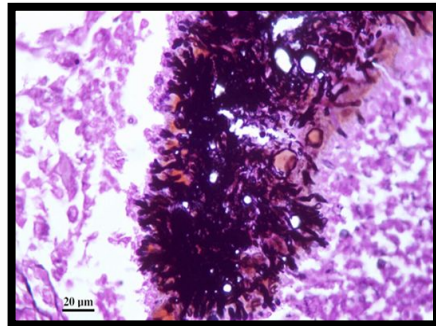
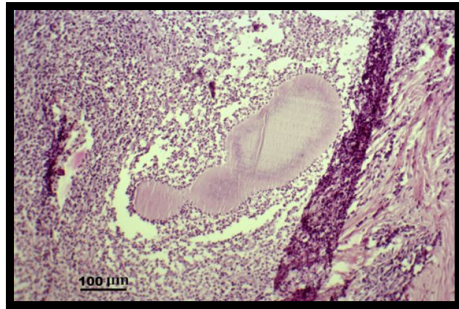
Culture:



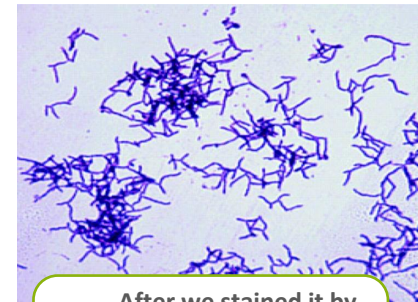
- Dry ,wrinkled and small

- SDA
- Brownish - wrinkled - seems to be dry - with orange pigmentation around it

Microscope images:



- Septated hyphae with conidia=spores



- After we stained it by gram stain
- Gram+ branching filaments bacteria

Treatment



1-Eumycetoma :

- Itraconazole

2-Actinomycetoma:

- Trimethoprim-sulfamethoxazole

With either **Dapsone** Or **Streptomycin** (Dapsone is more Common than Streptomycin, which requires IV to be given)

- **Combination** of 2 drugs is used

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

Subcutaneous zygomycosis:

There is no sinus formation and abscesses unlike Mycetoma, the most characteristic feature here is the necrosis.

Chronic localized firm Subcutaneous masses. (they are usually Localized – nodule – painless)

- **facial area** or other like hand, arm, leg, thigh.
- Firm swelling of site with intact skin-Distortion. with **NO abscess or sinuses** (differentiate with Mycetoma).
- Direct spread to adjacent bone and tissue.
- Acquired via **traumatic implantation of spores**, needle-stick, tattooing, contaminated surgical dressings, burn wound

Etiology:

-Mould fungi of the Zygomycetes:

1-Entomophthorales (chronic) :

Conidiobolus coronatus, *Basidiobolus ranarum*,

2- mucorales (acute).

Rhizopus, Mucos

(Black necrosis)

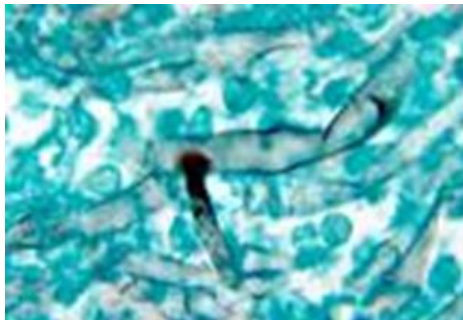
Mostly caused by mucorales → cause it mostly affected blood vessels

هذا يعني انها تسوي invasion necrosis and infarction which lead to
black necrosis.. →

- Mainly caused by entomophthorales
- it's more in male.
- It present according to the etiology:
 - If its conidiobolus we will find it in the face
 - If its basidiobolus we will find it in the limb
 - GI or **abdominal mass**

Diagnosis and treatment

| Diagnosis | Treatment |
|---|---|
| Specimen \longrightarrow Biopsy tissue | <ul style="list-style-type: none">★ Oral potassium Iodide (KI)★ Amphotericin B★ Posconazole |
| Direct microscopy \longrightarrow stained sections or smears: broad non-septate hyphae | |
| Culture \longrightarrow On SDA | |



Phaeohyphomycosis

- a group of fungal infections caused by dematiaceous (darkly pigmented) fungi widely distributed in the environment
- 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, *Bipolaris*

Diagnosis:

- ✓ Specimens: Pus, biopsy tissue
- ✓ Direct Microscopy: KOH & smears will show brown septate fungal hyphae
- ✓ Culture: On Sabouraud Dextrose Agar (SDA)

Treatment:

- ✓ The treatment of choice is Surgical excision of the lesion
- ✓ Antifungal (Itraconazole, Posaconazole)

Sporotrichosis

- Subcutaneous , deep cutaneous or **systemic** fungal infection (This infection is common in farmers and gardeners)
- Inoculation into the skin
- Can present as
 - 1- plaque (subcutaneous nodules)
 - 2- Lymphanginitic
 - 3- Dissimina (spread into lymph nodes)



Etiology:

- *Sporothrix schenckii*.
Dimorphic fungus (yeast or filamentous, depending on 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 -> yeast. At 25°C -> filamentous.

Treatment:

- Itraconazole

Other subcutaneous fungal infections

| Chromoblastomycosis | Phaeohyphomycosis | Sporotrichosis | |
|--|---|--|--------------------------|
| Subcutaneous Verrucous plaques, cauliflower aspect, hyperkeratotic, Ulcerative | Subcutaneous or brain Abscess Nodules and erythematous plaques | Subcutaneous or systemic infection Nodular subcutaneous lesions, verrucous plaques or Lymphatic | Clinical features |
| Dematiaceous mould fungi | Dematiaceous (darkly pigmented) mould fungi | Dimorphic fungus <i>Sporothrix schenckii</i> | Etiology |
| Biopsy tissue | Biopsy tissue | Biopsy tissue | Clinical sample |
| Muriform cells (sclerotic bodies) | Brown septate hyphae | Elongated yeast cells | Direct Microscopy |
| Surgery (Antifungal therapy) | Surgery (Antifungal therapy) | Potassium iodide Itraconazole | Treatment |

Summary of less common infections.

We use biopsy tissue in all cases.

Overall, surgery is a common treatment for these infections.

Bone and joint infections



- They are considered uncommon

Result from:

- 1- Hematogenous dissemination
- 2- Presence of foreign body
- 3- Direct inoculation of organism (trauma, surgery , etc)
- 4- Spread through direct extension of infection to the bone
e.g. **Rhinocerebral zygomycosis, Aspergillosis, mycetoma**

Etiology:

- 1- ***Candida species***
- 2- ***Aspergillus species***
- 3- mould fungi
- 4- Blastomyces dermatitidis
- 5- Coccidioides immitis
- 6- Histoplasma capsulatum
- 7- Paracoccidioides brasiliensis

Examples:

- Osteomyelitis
- Joint infections
- Rhinocerebral zygomycosis
- Aspergillosis

Types of mycetoma

Chronic and Granulomatous disease

Characteristics :
Swelling

Abscess formation

Multiple draining sinuses that exude grains.

mycetoma

- Eumycetoma : caused by fungi, treated with itraconazole .
- Actinomycetoma: caused by aerobic filamentous bacteria, treated by Trimethoprim-sulfamethoxazole, Dapsone, Streptomycin
"Combination of 2 drugs is used"

Chronic localized firm Subcutaneous masses

characteristics :

Firm swelling of site with intact skin-Distortion

Direct spread to adjacent bone and tissue.

Treatment:

Oral Potassium iodide (KI)
Amphotericin B
Posaconazole

Sporotrichosis

Sporotrichosis

- Subcutaneous , deep cutaneous or systemic fungal infection
- Can present as:
- plaques (subcutaneous nodules) , Lymphanginitis and Disseminated .

- Is a group of fungal infections.
- caused by : dematiaceous (darkly pigmented) fungi widely distributed in the environment
- Characterized by:
- Subcutaneous or brain Abscess
treated with: The treatment of choice is Surgical excision of the lesion Antifungal (Itraconazole, Posaconazole)

Phaeohyphomycosis

Quiz

1-Mycetoma is acquired via?

- a) *Virus* b) *Infection* c) Pathogen d) Trauma to the skin

2- Caused by aerobic filamentous bacteria (Actinomycetes) gram positive?

- a) Eumycetoma zygomycosis b) Actinomycetoma c) Subcutaneous
d) Sporotrichosis

3- The most common Eumycetoma?

- a) *Madurella mycetomatis* b) *Nocardia brasiliensis* c)
Actinomadura madurae

4-They appear as black grains under the microscope?

- a) Actinomycetoma b) Eumycetoma c) Subcutaneous zygomycosis

5-Actinomycetoma generally respond better to treatment than eumycetoma

- a) True b) False

6- The best treatment of subcutaneous zygomycosis ?

- a) Itraconazole b) Penicillin c) Amphotericin B d)
Trimethoprim-sulfamethoxazole

7- The best laboratory diagnosis of mycetoma is biopsy tissue

- a) True b) False

8- They appear as broad non-septate hyphae under the microscope?

- a) *Madurella mycetomatis* b) Actinomycetoma c) Eumycetoma
d) Subcutaneous zygomycosis

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Some videos for understanding the lecture:

https://youtu.be/5ukM_hggPso

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