Fungal Infections of the Oral Cavity

Learning Objectives

• To become familiar with the various fungal infections of the oral cavity
• To recognize the many nonfungal infections that make up differential diagnosis
• To understand the most effective treatment approaches to fungal infections

Fungi Introduction

• Eukaryotic (organized nucleus and cell structure)
• Non-motile
• Aerobic
• Saprophytic or parasitic; heterophilic
• Cell wall contains glucans, mannan and chitin
• Cell membrane contains ergosterol

Fungal cell structure

• Yeasts (unicellular, budding)
• Moulds (hyphae, mycelia, spores)
• Dimorphs (both)

Fungal cell structure

Yeast Characteristics
• solitary, unicellular
• reproduction via budding
• rounded shape
• moist & mucoid colonies

Mould Characteristics
• filamentous hyphae
• tips may be rounded (conidia/spores)

Mould forms of fungi

Conidiospore
Sporangiospore
Mould forms of fungi

- Blasto- and chlamidospore
- Sexual spores

Dimorphic fungus

Types of fungal diseases

1. **Superficial mycoses**
   - e.g. Pityriasis versicolor caused by Melassezia furfur
2. **Cutaneous mycoses**
   - e.g. Tinea or ringworm caused by fungi called dermatophytes
3. **Subcutaneous mycoses**
   - e.g. rhinosporidiosis caused by Rhinosporidium seeberi
4. **Systemic mycoses**
   - e.g. Histoplasmosis caused by Histoplasma capsulatum
5. **Mycotoxins**
   - e.g. Aflatoxins, a hepatocarcinogen caused by A. parasiticus

Fungi can be true pathogens or opportunistic pathogens.

Candidiasis (or is it Candidosis?)

- **Genus Candida** - diverse group of yeasts
- **Gram-positive**
- ID based on biochemical tests and morphology (corn meal agar)
- **C. albicans** - most important pathogen
- Other Candida spp: C. tropicalis, C. parapsilosis C. lusitaniae, C. krusei, C. glabrata, C. guilliermondii, and C. dubliniensis

Biology of Candida albicans

- A thin-walled dimorphic fungus – deuteromycetes
- **Morphogenesis**
  - Unicellular yeast
  - Filamentous (hyphae)
  - Forms germ tubes (pseudohyphae) in presence of serum
- **Principal Cell Wall Polymers**
  - Glucan
  - Mannan
- **Strict aerobe**, favors moist surfaces
  - Commensally found in gut, genitals, and lungs
  - **Body Temp 37ºC, neutral pH**
  - **Rapid Multiplication & Spread**

Morphology of C. albicans

- **25ºC**
  - Yeast
  - 37ºC
  - Hypha

- **37ºC**
  - Pseudohyphae
  - Pseudo-hyphae
Pathogenesis of Candida infections

- Primary host defenses:
  - Intact skin
  - Intact mucosa with normal pH and normal flora
  - Functioning lymphocytes
  - Functioning neutrophils
- Environmental changes
  - Wet skin
  - Changes in local flora
  - Hormones, foreign bodies
- Lymphocyte dysfunction
  - Immaturity
  - Destruction (HIV)

Pathogenesis of invasive Candida infections

- Breach in anatomic integrity (often biofilm on catheter)
- Defective PML function (first line of defense)

Factors causing Immunosuppression

- AIDS
- Bone marrow/ organ transplantation
- Cancer: Leukemia, lymphoma etc
- Drugs: Cytotoxic drugs, steroids etc
- Endocrine related: Diabetes
- Failure of organs: multi-organ

Predisposing Factors: Providing a Route/ Source

- Antibiotics
- Burns and other skin problems
- Catheter-related problems
- Devices (prosthetic)
- Effects on mucosal integrity

“Virulence” of Candida?

- Inherent “virulence”
  - Environmental tolerance
  - Secrete hydrolases, beta proteases, phospholipases
  - Can adhere to plastic
  - Can invade GI, renal epithelium
- Additional hyphal virulence
  - Protects against phagocytosis
  - Knockout strains
Classification of Oral Candidiasis

- **Primary**
  - Oral thrush (Acute pseudomembranous)
  - Erythematous candidiasis (Acute atrophic)
  - Antibiotic stomatitis
  - Hyperplastic candidiasis
  - Angular cheilitis

- **Secondary**
  - Chronic mucocutaneous candidiasis
  - Systemic mycoses: From lung
  - Opportunistic mycoses: From sinus / nose

Classification of Oral Candidiasis

- **Acute**
  - Pseudomembranous (oral thrush)
  - Atrophic (Candida glossitis, Antibiotic stomatitis)

- **Chronic**
  - Atrophic (Denture sore mouth)
    - Newton’s Type 1: Pinpoint
    - Newton’s Type 2: Diffuse erythema
    - Newton’s Type 3: Granular
    - Denture stomatitis with multiple fistulae
  - Hyperplastic (Candidal leukoplakia)
  - Chronic multifocal candidiasis

Classification of Oral Candidiasis

- **Acute / Chronic**
  - Angular cheilitis
  - Cheilo candidosis

- **Chronic mucocutaneous**
  - Diffuse
  - Familial
  - Endocrinal

- **Candidosis assoc with Immunodeficiency**

Classification of Oral Candidiasis

- **Also called Moniliasis**
  - Monilia albicans

- **Most common oral fungal infection in humans**
- **In 30-50% - commensal**

Acute Pseudomembranous Candidiasis

- **Also called Oral Thrush**
- **Caused by**
  - Decreased resistance: New born, old people, debilitated people
  - Antibiotics
- **White curd-like or cottage cheese lesions**
  - Can be easily wiped off
  - white plaques composed of yeasts, hyphae, desquamated epith cells
- Underlying mucosa normal or erythematous ± bleeding
- **Buccal mucosa, tongue, soft plate & floor of the mouth**
- **Symptoms:** Burning sensation, unpleasant taste

Hermit Thrush
Cottage Cheese

Oral Thrush

Acute Pseudomembranous Candidosis

Oral thrush in infants

Differential Diagnosis

Acute atrophic (erythematous) Candidiasis
• Can start de novo or as a result of acute pseudomembranous type
• More common than oral thrush, but often overlooked
• Red macules with burning sensation
• Location: Posterior hard palate, buccal mucosa, dorsal tongue
• May follow prolonged or continuous antibiotic therapy (antibiotic stomatitis) xerostomia, immunosuppression
Erythematous Candidiasis

Chronic Atrophic Candidiasis
- More common in females
- Usually associated with diabetes mellitus
- Usually confined to the denture-bearing areas - so also called as denture sore mouth
- Appears as a red lesion in the hard palate area and granular; whitish nodules may be present.

Chronic atrophic candidiasis

Median Rhomboid Glossitis
- Also called central papillary atrophy of the tongue
- Previously thought to be a development disorder – failure of tuberculum impar to disappear
- Well-demarcated erythematous zone in the midline of dorsal part of the tongue, posteriorly
- Smooth to lobulated
- Asymptomatic
- Predisposing cause: immunosuppression
Median Rhomboid Glossitis

Chronic Multifocal Candidiasis
- Oral mucosal candidal infection at multiple sites
- Erythematous areas + white plaques
- Burning sensation
- Sites: Posterior palate, posterior dorsal tongue, angles of the mouth
- “kissing lesion” – when tongue contacts palate

Chronic Multifocal Candidiasis

Chronic hyperplastic candidiasis
- Least common of all types
- Sites: buccal mucosa, dorsal tongue, commissures
- Well-defined, variable in size, non-scrapable thick indurated lesion.
- May undergo dysplastic changes if left untreated (pre-malignant lesion) – esp speckled leukoplakia

Chronic hyperplastic candidiasis

Chronic hyperplastic candidiasis
Chronic hyperplastic candidiasis

ANGULAR CHEILITIS

- Also called perlèche
- Common in elderly with ed VD of occlusion and accentuated folds at the corners of the mouth
- 20% of cases – Candida albicans
- 20% of cases – Staph aureus
- 60% of cases – both

Mild Angular Cheilitis
Prominent Angular Cheilitis

Cheilocandidosis

Differential Diagnosis

Atrophic Candidiasis
Geographic Tongue

Geographic tongue
**Differential Diagnosis**

Atrophic Candidiasis  
Bald tongue of Vitamin Def

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**Diagnosis**

- Smear taken from the lesion is spread over the glass slide. Two to three drops of KOH are added and cover slip placed over it.
- The organisms appear budding yeast forms.
- In tissues, one can do PAS stain organisms appear pink filamentous structure.

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**Candida culture**

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**Treatment**

- **Angular Cheilitis**
  - Miconazole 2% cream
  - Clotrimazole 1% cream
  - Ketoconazole 2% cream
  - Nystatin Ointment 100,000 units/gm
- **Denture Stomatitis**
  - Nystatin topical powder 100,000 units/gm
- **Intraoral candidiasis**
  - Nystatin oral suspension 100,000 units/ml
  - Amphotericin B 100mg/ml
  - Ketoconazole 200mg tabs (1st day 2; later 1/day)

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**Deep Fungal Infections**

- Histoplasmosis
- Coccidioidomycosis
- Blastomycosis
- Cryptococcosis

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**Deep Fungal Infections**

- **Pathogenesis:** Inhalation of spores; haematogenous spread
- **Symptoms:** Cough, fever, weight loss, night sweats, chest pain, haemoptysis
- **Primary site:** Lung
- **Oral lesions:** Chronic, non-healing ulcers
- **Microscopy:** Granulomatous inflammation with organisms
- **Rx:** Ketoconazole, Fluconazole, Amphotericin B
Deep Fungal Infections

Histoplasmosis + oral hairy leukoplakia (tongue) & oral thrush (buccal mucosa)

Histoplasmosis histopathology

Deep Fungal Infections

Histoplasmosis

Histoplasmosis organisms in the cytoplasm of cells

Histoplasma capsulatum – methenamine silver stain

Differential diagnosis

Tuberculosis

Syphilis

THANK YOU

for your undivided attention!!