Candidiasis

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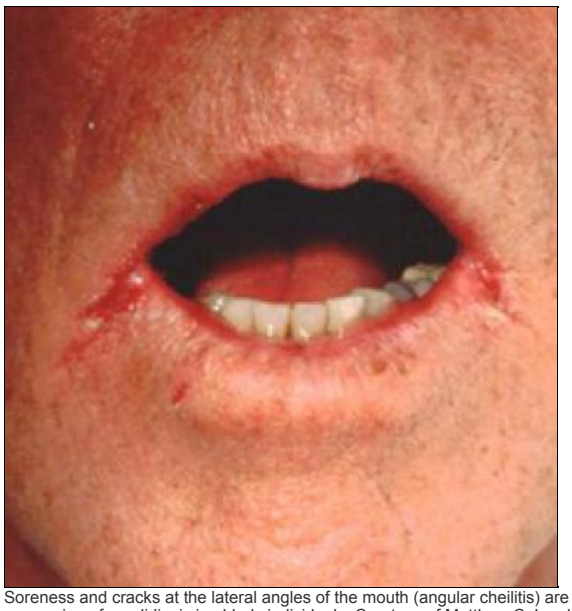
Practice Essentials

Candidiasis (see the image below) is a fungal infection caused by yeasts from the genus *Candida*. *Candida albicans* is the predominant cause of the disease.



Soreness and cracks at the lateral angles of the mouth (angular cheilitis) are a frequent expression of candidiasis in elderly individuals. Courtesy of Matthew C. Lambiase, DO.

Signs and symptoms

Chronic mucocutaneous candidiasis

Findings reveal disfiguring lesions of the face, scalp, hands, and nails. Chronic mucocutaneous candidiasis is occasionally associated with oral thrush and vitiligo.

Oropharyngeal candidiasis

Individuals with oropharyngeal candidiasis (OPC) usually have a history of HIV infection, wear dentures, have diabetes mellitus, or have been exposed to broad-spectrum antibiotics or inhaled steroids. Although patients are frequently asymptomatic, when symptoms do occur, they can include the following:

- Sore and painful mouth
- Burning mouth or tongue
- Dysphagia
- Thick, whitish patches on the oral mucosa

Physical examination reveals a diffuse erythema and white patches that appear on the surfaces of the buccal mucosa, throat, tongue, and gums.

The following are the 5 types of OPC:

- Membranous candidiasis - One of the most common types; characterized by creamy-white, curdlike patches on the mucosal surfaces
- Chronic atrophic candidiasis (denture stomatitis) - Also thought to be one of the most common forms of the disease; presenting signs and symptoms include chronic erythema and edema of the portion of the palate that comes into contact with dentures
- Erythematous candidiasis - Associated with an erythematous patch on the hard and soft palates
- Angular cheilitis - Inflammatory reaction characterized by soreness, erythema, and fissuring at the corners of the mouth
- Mixed - A combination of any of the above types is possible

Esophageal candidiasis

Patients with esophageal candidiasis may be asymptomatic or may have 1 or more of the following symptoms:

- Normal oral mucosa (>50% of patients)
- Dysphagia
- Odynophagia
- Retrosternal pain
- Epigastric pain
- Nausea and vomiting

Physical examination almost always reveals oral candidiasis.

Nonesophageal gastrointestinal candidiasis

The following symptoms may be present:

- Epigastric pain
- Nausea and vomiting
- Abdominal pain
- Fever and chills
- Abdominal mass (in some cases)

Genitourinary tract candidiasis

The types of genitourinary tract candidiasis are as follows:

- Vulvovaginal candidiasis (VVC) - Erythematous vagina and labia; a thick, curdlike discharge; and a normal cervix upon speculum examination [1]
- *Candida* balanitis - Penile pruritus and whitish patches on the penis
- *Candida* cystitis - Many patients are asymptomatic, but bladder invasion may result in frequency, urgency, dysuria, hematuria, and suprapubic pain
- Asymptomatic candiduria - Most catheterized patients with persistent candiduria are asymptomatic
- Ascending pyelonephritis - Flank pain, abdominal cramps, nausea, vomiting, fever, chills and hematuria
- Fungal balls - Intermittent urinary tract obstruction with subsequent anuria and ensuing renal insufficiency

See Clinical Presentation for more detail.

Diagnosis

Diagnostic tests for candidiasis include the following:

- Mucocutaneous candidiasis - For a wet mount, scrapings or smears obtained from skin, nails, or oral or vaginal mucosa are examined under the microscope; a potassium hydroxide smear, Gram stain, or methylene blue is useful for direct demonstration of fungal cells
- Cutaneous candidiasis - Using a wet mount, scrapings or smears obtained from skin or nails can be examined under the microscope; potassium hydroxide smears are also useful
- Genitourinary candidiasis - A urinalysis should be performed; evidence of white blood cells (WBCs), red blood cells (RBCs), protein, and yeast cells is common; urine fungal cultures are useful
- Gastrointestinal candidiasis - Endoscopy with or without biopsy

See Workup for more detail.

Management

See the list below:

- Cutaneous candidiasis - Most localized cutaneous candidiasis infections can be treated with any number of topical antifungal agents (eg, clotrimazole, econazole, ciclopirox, miconazole, ketoconazole, nystatin)
- Chronic mucocutaneous candidiasis - This condition is generally treated with oral azoles
- Oropharyngeal candidiasis - This can be treated with either topical antifungal agents or systemic oral azoles
- Esophageal candidiasis - Treatment requires systemic therapy with fluconazole
- VVC - Topical antifungal agents or oral fluconazole can be used [2]
- *Candida* cystitis - In noncatheterized patients, *Candida* cystitis should be treated with fluconazole; in catheterized patients, the Foley catheter should be removed or replaced; if the candiduria persists after the catheter change, then patients can be treated with fluconazole

See Treatment and Medication for more detail.

Background

Candidiasis is caused by infection with species of the genus *Candida,* predominantly with *Candida albicans.Candida* species are ubiquitous fungi that represent the most common fungal pathogens that affect humans. The growing problem of mucosal and systemic candidiasis reflects the enormous increase in the number of patients at risk and the increased opportunity that exists for *Candida* species to invade tissues normally resistant to invasion. *Candida* species are true opportunistic pathogens that exploit recent technological advances to gain access to the circulation and deep tissues.

The increased prevalence of local and systemic disease caused by *Candida* species has resulted in numerous new clinical syndromes, the expression of which depends primarily on the immune status of the host. *Candida* species produce a wide spectrum of diseases, ranging from superficial mucocutaneous disease to invasive illnesses, such as hepatosplenic candidiasis, *Candida* peritonitis, and systemic candidiasis. The management of serious and life-threatening invasive candidiasis remains severely hampered by delays in diagnosis and the lack of reliable diagnostic methods that allow detection of both fungemia and tissue invasion by *Candida* species.

Advances in medical technology, chemotherapeutics, cancer therapy, and organ transplantation have greatly reduced the morbidity and mortality of life-threatening disease. Patients who are critically ill and in medical and surgical ICUs have been the prime targets for opportunistic nosocomial fungal infections, primarily due to *Candida* species. Studies suggest that the problem is not under control and, in fact, show it is worsening. On a daily basis, virtually all physicians are confronted with a positive *Candida* isolate obtained from one or more various anatomical sites. High-risk areas for *Candida* infection include neonatal, pediatric, and adult ICUs, both medical and surgical.[3] *Candida* infections can involve any anatomical structure.

Pathophysiology

Candida species are yeastlike fungi that can form true hyphae and pseudohyphae. For the most part, *Candida* species are confined to human and animal reservoirs; however, they are frequently recovered from the hospital environment, including on foods, countertops, air-conditioning vents, floors, respirators, and medical personnel. They are also normal commensals of diseased skin and mucosal membranes of the gastrointestinal, genitourinary, and respiratory tracts.

Candida species also contain their own set of well-recognized but not well-characterized virulence factors that may contribute to their ability to cause infection.[4] The main virulence factors include the following:

- Surface molecules that permit adherence of the organism to other structures (eg, human cells, extracellular matrix, prosthetic devices)
- Acid proteases and phospholipases that involve penetration and damage of cell envelopes
- Ability to convert to a hyphal form (phenotypic switching)

As with most fungal infections, host defects also play a significant role in the development of candidal infections. Host defense mechanisms against *Candida* infection and their associated defects that allow infection are as follows:

- Intact mucocutaneous barriers - Wounds, intravenous catheters, burns, ulcerations
- Phagocytic cells - Granulocytopenia
- Polymorphonuclear leukocytes - Chronic granulomatous disease
- Monocytic cells - Myeloperoxidase deficiency
- Complement - Hypocomplementemia
- Immunoglobulins - Hypogammaglobulinemia
- Cell-mediated immunity - Chronic mucocutaneous candidiasis, diabetes mellitus, cyclosporin A, corticosteroids, HIV infection
- Mucocutaneous protective bacterial flora - Broad-spectrum antibiotics

Risk factors associated with invasive or systemic candidiasis include the following[5] :

- Granulocytopenia
- Bone marrow transplantation
- Solid organ transplantation (liver, kidney)
- Parenteral hyperalimentation
- Hematologic malignancies
- Foley catheters
- Solid neoplasms
- Recent chemotherapy or radiation therapy
- Corticosteroids
- Broad-spectrum antibiotics
- Burns
- Prolonged hospitalization
- Severe trauma
- Recent bacterial infection
- Recent surgery
- Gastrointestinal tract surgery
- Central intravascular access devices
- Premature birth
- Hemodialysis
- Acute and chronic renal failure
- Mechanical ventilation for longer than 3 days

The first step in the development of a candidal infection is colonization of the mucocutaneous surfaces. All of the factors outlined above are associated with increased colonization rates. The routes of candidal invasion include (1) disruption of a colonized surface (skin or mucosa), allowing the organisms access to the bloodstream, and (2) persorption via the gastrointestinal wall, which may occur following massive colonization with large numbers of organisms that pass directly

into the bloodstream.

Frequency

United States

Candida species are the most common cause of fungal infection in immunocompromised persons. Oropharyngeal colonization is found in 30%-55% of healthy young adults, and *Candida* species may be detected in 40%-65% of normal fecal flora.

Three of every 4 women experience at least one bout of vulvovaginal candidiasis (VVC) during their lifetime.

More than 90% of persons infected with HIV who are not receiving highly active antiretroviral therapy (HAART) eventually develop oropharyngeal candidiasis (OPC), and 10% eventually develop at least one episode of esophageal candidiasis.[6]

In persons with systemic infections, *Candida* species are now the fourth most commonly isolated pathogens from blood cultures.[7]

Clinical and autopsy studies have confirmed the marked increase in the incidence of disseminated candidiasis, reflecting a parallel increase in the frequency of candidemia. This increase is multifactorial in origin and reflects increased recognition of the fungus, a growing population of patients at risk (eg, patients undergoing complex surgical procedures, patients with indwelling vascular devices), and the improved survival rates among patients with underlying neoplasms or collagen-vascular disease and patients who are immunosuppressed.

International

Similar rates of mucocutaneous and systemic candidiasis/candidemia have been observed worldwide.[8, 9] In fact, throughout the world, *Candida* species have replaced *Cryptococcus* species as the most common fungal pathogens affecting immunocompromised hosts.

Mortality/Morbidity

Mucocutaneous candidiasis: Most candidal infections are mucocutaneous and, as such, do not cause mortality. However, in patients with advanced immunodeficiency due to HIV infection, these mucosal infections can become refractory to antifungal therapy and may lead to severe oropharyngeal and esophageal candidiasis that initiates a vicious cycle of poor oral intake, malnutrition, wasting, and early death.

Candidemia and disseminated candidiasis: Mortality rates associated with these infections have not improved markedly over the past few years and remain in the range of 30%-40%. Systemic candidiasis causes more case fatalities than any other systemic mycosis. More than a decade ago, investigators reported the enormous economic impact of systemic candidiasis in hospitalized patients. Candidemia is associated with considerable prolongation in hospital stays (70 d vs 40 d in comparable patients without fungemia). Although mucocutaneous fungal infections, such as oral thrush and *Candida*esophagitis, are extremely common in patients with AIDS, candidemia and disseminated candidiasis are uncommon.

Sex

Neither sex is predisposed to candidal colonization; however, VVC is the second most common cause of vaginitis in women.

Age

Persons at the extremes of age (neonates and adults >65 y) are most susceptible to candidal colonization. Mucocutaneous candidiasis is also more prevalent in neonates and older adults. Very-low-birth-weight and extremely-low-birth-weight infants are at high risk for blood culture–proven late-onset candidiasis (defined as sepsis that develops after age 72 h).[10]

Clinical Presentation

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