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ПАТОЛОГИЯ СЛИЗИСТОЙ ПОЛОСТИ РТА У ДЕТЕЙ

PATHOLOGY OF ORAL MUCOSA IN CHILDREN

Учебно-методическое пособие

Минск БГМУ 2020

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Посвящено проблеме манифестации вирусных, бактериальных и грибковых инфекций в полости рта у детей. Освещены вопросы этиологии и патогенеза наиболее распространенных детских инфекционных заболеваний, их клинических проявлений на слизистой оболочке полости рта. Представлены современные подходы к лечению и профилактике патологии слизистой у детей, определена роль врача-стоматолога.

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ANATOMICAL AND PHYSIOLOGICAL FEATURES OF ORAL MUCOSA IN CHILDREN

STRUCTURE OF NORMAL ORAL MUCOSA

Oral mucosa shows considerable variations in its normal structure and can be affected by a wide range of conditions. The identification of oral mucosa abnormalities is important because they can be harmless, minor primary conditions and secondary indications of systemic disease. Oral mucosa as the mirror reflects the condition of the whole body.

Oral mucosa can be divided into three main categories based on function and histology (Fig. 1, 2):

• **Lining mucosa**, nonkeratinized stratified squamous epithelium, found almost everywhere else in the oral cavity, including the:

– **Alveolar mucosa**, the lining between the buccal and labial mucosae. It is a brighter red, smooth, and shiny with many blood vessels, and is not connected to underlying tissue by rete pegs.

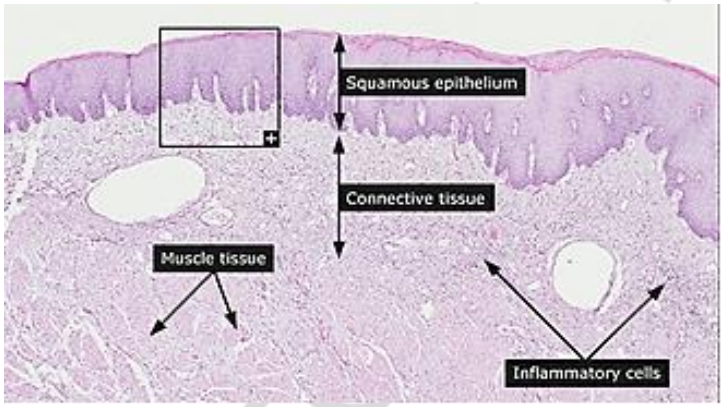

Fig. 1. Structure of normal oral mucose

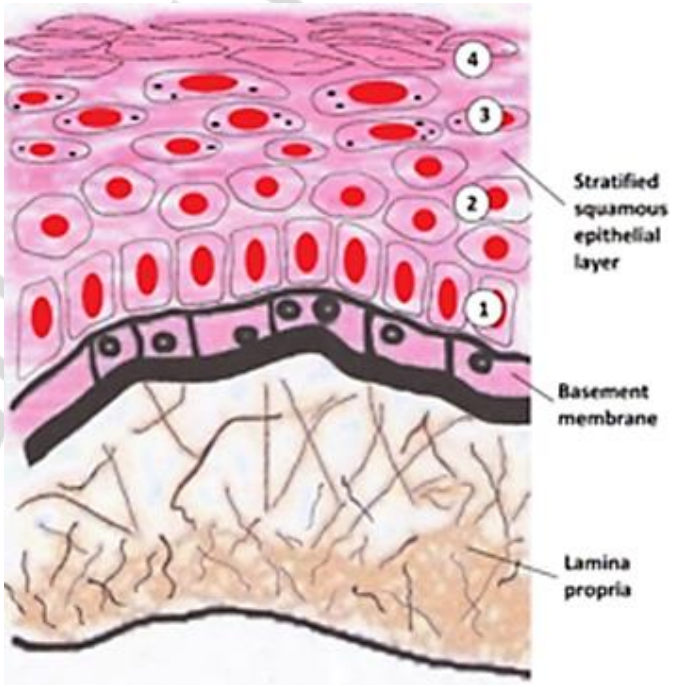

Fig. 2. Normal oral mucosa

– **Buccal mucosa**, the inside lining of the cheeks and floor of the mouth; part of the lining mucosa.

– **Labial mucosa**, the inside lining of the lips; part of the lining mucosa.

• **Masticatory mucosa**, keratinized stratified squamous epithelium, found on the dorsum of the tongue, hard palate, and attached gingiva.

• **Specialized mucosa**, specifically in the regions of the taste buds on lingual papillae on the dorsal surface of the tongue; contains nerve endings for general sensory reception and taste perception.

FUNCTIONS OF ORAL MUCOSA

Mechanical stress is continuously placed on the oral environment by actions such as eating, drinking and talking. The mouth is also subject to sudden changes in temperature and pH meaning it must be able to adapt to change quickly. The mouth is the only place in the body which provides the sensation of taste. Due to these unique physiological features, the oral mucosa must fulfil a number of distinct functions.

Protection. One of the main functions of the oral mucosa is to physically protect the underlying tissues from the mechanical forces, microbes and toxins in the mouth. Keratinised masticatory mucosa is tightly bound to the hard palate and gingivae. It accounts for 25 % of all oral mucosa. It supports underlying tissues by resisting the loading forces exerted during mastication. Lining mucosa in the cheeks, lips and floor of mouth is mobile to create space when chewing and talking. During mastication, it allows food to move freely around the mouth and physically protects the underlying tissues from trauma. It accounts for 60 % of oral mucosa.

Secretion. Saliva is the primary secretion of the oral mucosa. It has many functions including lubrication, pH buffering and immunity. The lubricating and antimicrobial functions of saliva are maintained mainly by resting; saliva results in a flushing effect and the clearance of oral debris and noxious agents. Saliva contains numerous antimicrobial proteins that help protect the oral ecosystem from infectious agent. The components like lysozyme, lactoferrin, salivary peroxidase, myeloperoxidase, and thiocyanate concentrations act as a defense mechanism in the saliva. Saliva is secreted from 3 pairs of major salivary glands (parotid, submandibular, sublingual) alongside many minor salivary glands. It also aids the initial chemical digestion of food as it contains the enzyme amylase, responsible for breaking carbohydrates into sugars.

Sensation. The oral mucosa is richly innervated, meaning it is a very good at sensing pain, touch, temperature and taste. A number of cranial nerves are involved in sensations in the mouth including trigeminal (V), Facial (VII), glossopharyngeal (IX) and Vagus (X) nerves. The dorsum of the tongue is covered in specialised mucosa. This contains the presence of taste buds allowing taste, and it accounts for around 15 % of oral mucosa. Reflexes such as swallowing, gagging and thirst are also initiated in the mouth.

Thermal regulation. Although not significant in humans, some animals e.g. dogs rely on panting to regulate their temperature, as sweat glands are only present in their paws.

Oral mucosa examination (Fig. 3):

– Lips and vestibulum;
– Gingivae;
– The tongue and floor of mouth;
– Buccal oral mucosa, hard and soft palate;
– Palatine arch, tonsils, pharynx.

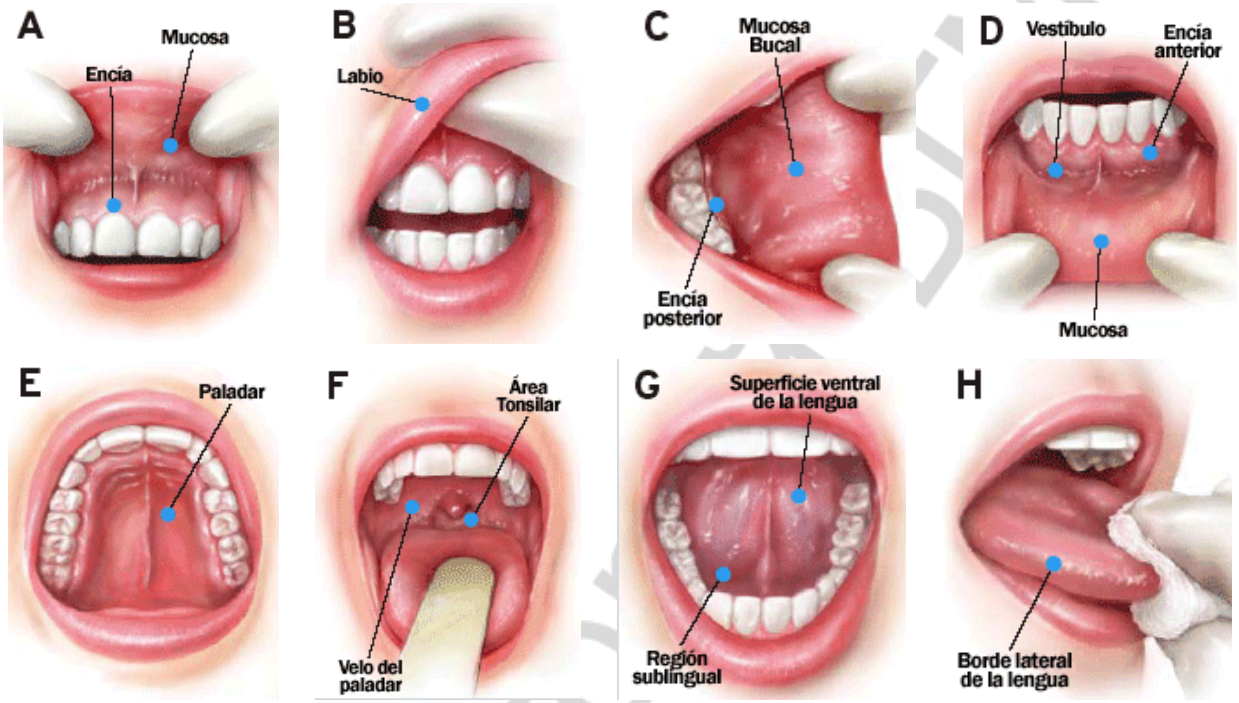

Fig. 3. Oral mucosa examination

ORAL MANIFESTATIONS OF THE VIRAL INFECTIONS

Viral infection. Infection caused by the presence of a **virus** in the body. Depending on the **virus** and the person's state of health, various **viruses** can infect almost any type of body tissue, from the brain to the skin. Diseases caused by viral infections include herpes, chicken pox, hepatitis, influenza, and the common cold. A virus has either a DNA or an RNA genome and is called a DNA virus or an RNA virus, respectively. The vast majority of viruses have RNA genomes. Plant viruses tend to have single-stranded RNA genomes and bacteriophages tend to have double-stranded DNA genomes.

DNA-viruses:
– Herpes simple (AHS, CRHS);
– Herpes zoster;
– Human papillomaviruses (HPVs);
– Adenovirus;
– Epstein–Barr virus.

RNA-viruses:
– Orthomixviruses;
– Paramixviruses;
– Enteroviruses;
– Rubivirus;
– HIV.

VARICELLA-ZOSTER VIRUS INFECTIONS

Varicella-zoster virus (VZV) causes primary, latent, and recurrent infections. The primary infection is manifested as varicella (chickenpox) and results in establishment of a lifelong latent infection of sensory ganglion neurons. Reactivation of the latent infection causes herpes zoster (shingles).

VZV is a neurotropic human herpesvirus with similarities to herpes simplex virus, which is also α-herpesvirus. These viruses are enveloped with double-stranded DNA genomes.

Epidemiology. Before the introduction of varicella vaccine in 1995, varicella was an almost universal communicable infection of childhood. Most children are infected by 15 yr of age, with fewer than 5 % of adults remaining susceptible. Patients with varicella are contagious 24–48 hr before the rash (Fig. 4, 5) is evident and until vesicles are crusted, usually 3–7 days after onset of rash.

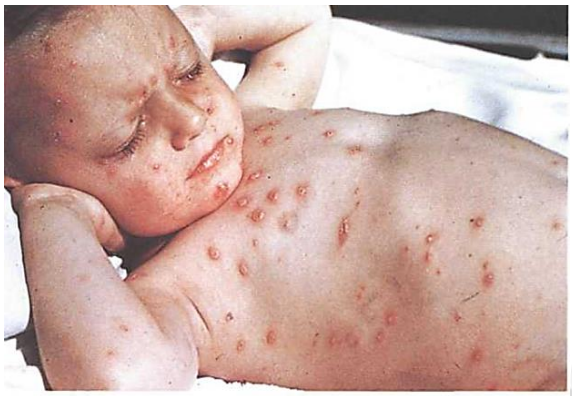

Fig. 4. Manifestation of Varicella-Zoster Virus Infections on body

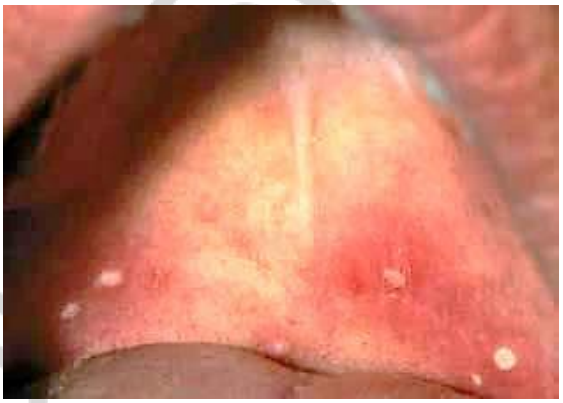

Fig. 5. Manifestation of Varicella-Zoster Virus Infections in oral cavity

Herpes zoster. Herpes zoster is due to the reactivation of latent VZV. It is uncommon in childhood and shows no seasonal variation in incidence. Zoster is not caused by exposure to a patient with varicella; exposures to varicella boost the cell-mediated immune response to VZV in individuals with prior infection, decreasing the likelihood of reactivation of latent virus. The lifetime risk for herpes zoster for individuals with a history of varicella is 10–20 %, with 75 % of cases occurring after 45 yr of age.

Herpes zoster is very rare in healthy children < 10 yr of age, with the exception of infants who were infected in utero or in the 1st year of life, who have an increased risk for development of zoster in the first years of life. Herpes zoster in children tends to be milder than disease in adults and is less frequently associated with postherpetic neuralgia (Fig. 6, 7).

Pathogenesis. VZV is transmitted in oropharyngeal secretions and in the fluid of skin lesions either by airborne spread or through direct contact. Primary infection (varicella) results from inoculation of the virus onto the mucosa of the upper respiratory tract and tonsillar lymphoid tissue. During the early part of the 10- to 21-day incubation period, virus replicates in the local lymphoid tissue, and then a brief subclinical viremia spreads the virus to

the reticuloendothelial system. Widespread cutaneous lesions occur during a second viremic phase that lasts 3–7 days.

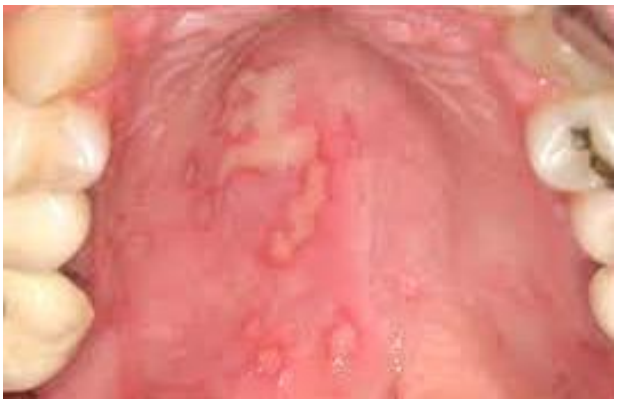

Fig. 6. Manifestation of Herpes zoster on oral cavity

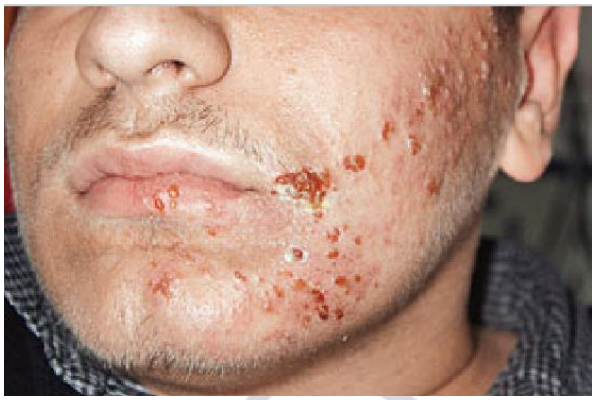

Fig. 7. Manifestation of Herpes zoster on the skin of the face

Varicella. The illness usually begins 14–16 days after exposure, although the incubation period can range from 10 to 21 days. Subclinical varicella is rare; almost all exposed, susceptible persons experience a rash.

Fever, malaise, anorexia, headache, and occasionally mild abdominal pain may occur 24–48 hours before the rash appears. Temperature elevation is usually moderate.

Varicella lesions often appear first on the scalp, face, or trunk (Fig. 8, 9). The initial exanthem consists of intensely pruritic erythematous macules that evolve through the papula stage to form clear, fluid-filled vesicles. Clouding and umbilication of the lesions begin in 24–48 hr. While the initial lesions are crusting, new crops form on the trunk and then the extremities; **the simultaneous presence of lesions in various stages of evolution is characteristic of varicella**. Ulcerative lesions involving the mucosa of oropharynx and vagina are also common; many children have vesicular lesions on the eyelids and conjunctivae.

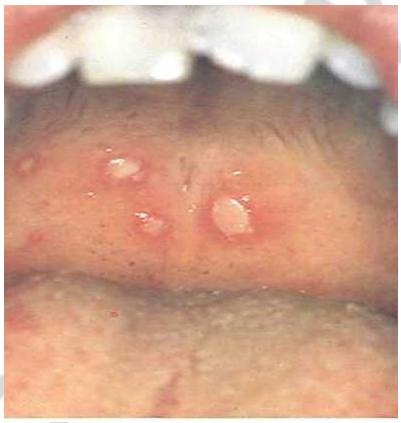

Fig. 8. Varicella lesions on the palate mucous

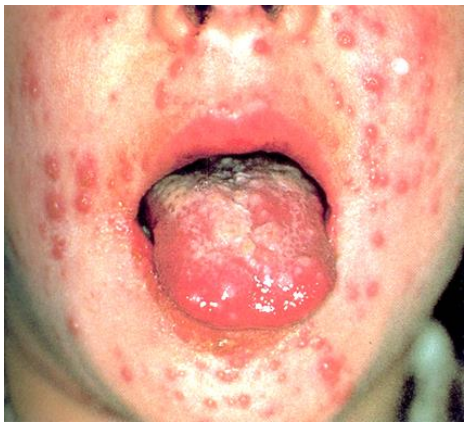

Fig. 9. Varicella lesions on the skin and tongue mucosa

Herpes zoster. Herpes zoster manifests as vesicular lesions clustered within 1 or, less commonly, 2 adjacent dermatomes. In the elderly, herpes zoster typically

begins with burning pain followed by clusters of skin lesions in a dermatomal pattern (Fig. 10). Trigeminal maxillary or mandibular zoster may cause a facial rash and pain (sometimes simulating toothache) and oral ulceration (Fig. 11).

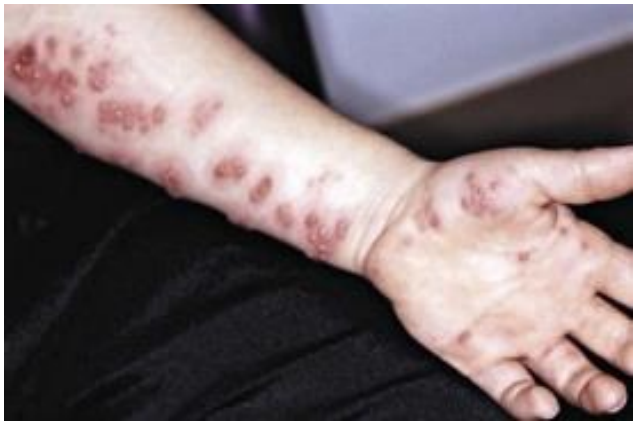

Fig. 10. Herpes zoster lesions on the skin of the arm

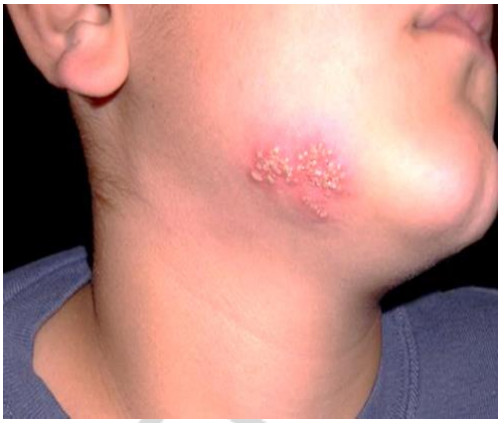

Fig. 11. Herpes zoster lesions on the skin of the submandibular region

Treatment. Antiviral treatment modifies the course of both varicella and herpes zoster.

Varicella. The only antiviral drug available in liquid formulation that is licensed for pediatric use is acyclovir. Given the safety profile of acyclovir and its demonstrated efficacy in the treatment of varicella, treatment of all children, adolescents, and adults with varicella is acceptable.

Herpes Zoster. Antiviral drugs are effective for treatment of herpes zoster. In healthy adults, acyclovir (800 mg 5 times a day for 5 days), famciclovir (500 mg for 7 days), and valacyclovir (1,000 mg for 7 days) reduce the duration of the illness and the risk for development of postherpetic neuralgia; concomitant corticosteroid use improves the quality of life in the elderly. In otherwise healthy children, herpes zoster is a less severe disease, and postherpetic neuralgia is rare.

EPSTEIN–BARR VIRUS

Infectious mononucleosis is the best-known clinical syndrome caused by Epstein–Barr virus (EBV).

It is characterized by systemic somatic complaints consisting primarily of fatigue, malaise, fever, sore throat, and generalized lymphadenopathy. Originally described as glandular fever, it derives its name from the mononuclear lymphocytosis (Fig. 12) with atypical-appearing lymphocytes that accompany the illness.

Infectious mononucleosis. EBV, a member of the γ-herpesviruses, causes > 90 % of cases of infectious mononucleosis. EBV infects > 95 % of the world's population. It is transmitted via penetrative sexual intercourse and sharing water bottles. Among children, transmission may occur by exchange of saliva from child to child, such as occurs between children in out-of-home child care.

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Primary EBV infection in adolescents and adults manifests in > 50 % of cases as the classic triad fatigue, pharyngitis, and generalized lymphadenopathy, which constitute the major clinical manifestations of infectious mononucleosis. EBV was the first human virus to be associated with malignancy.

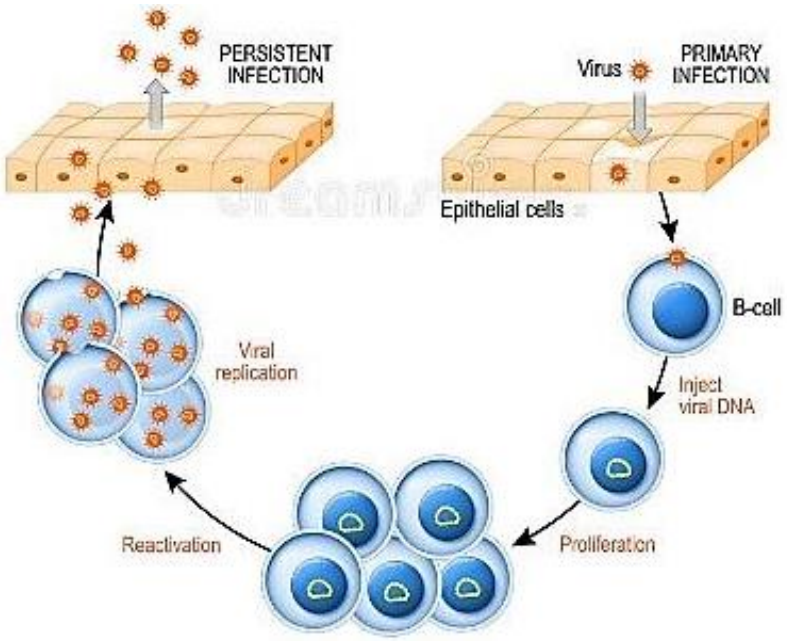

Fig. 12. Epstein–Barr Virus life cycle

Clinical Manifestations. The incubation period of infectious mononucleosis in adolescents is 30–50 days. In children, it may be shorter. The classic physical examination findings are generalized lymphadenopathy (90 % of cases), splenomegaly (50 % of cases), and hepatomegaly (10 % of cases). Lymphadenopathy occurs most commonly in the anterior and posterior cervical nodes and the submandibular lymph nodes and less commonly in the axillary and inguinal lymph nodes.

The sore throat is often accompanied by moderate to severe pharyngitis with marked tonsillar enlargement, occasionally with exudates. Petechiae at the junction of the hard and soft palate are frequently seen. The pharyngitis resembles that caused by streptococcal infection (Fig. 13).

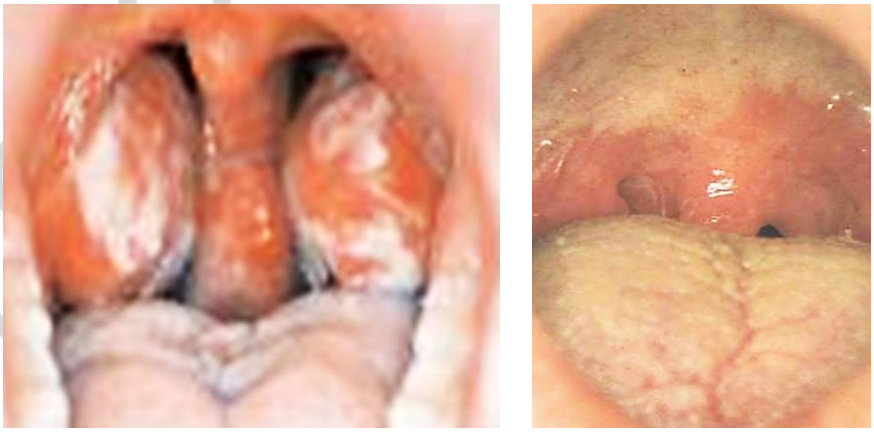

Fig. 13. Manifestation of Epstein–Barr Virus infection in the oral cavity

Treatment. There is no specific treatment for infectious mononucleosis. Therapy with high doses of acyclovir, with or without corticosteroids, decreases viral replication and oropharyngeal shedding during the period of administration but does not reduce the severity or duration of symptoms or alter the eventual outcome.

Rest and symptomatic treatments are the mainstays of management. Bed rest is necessary only when the patient has debilitating fatigue. Antiseptics and anaesthetics locally.

MEASLES

Measles virus is a single-stranded, lipid-enveloped RNA virus in the family Paramyxoviridae.

Transmission. The portal of entry of measles virus is through the respiratory tract or conjunctivae following contact with large droplets or small-droplet aerosols in which the virus is suspended. Patients are infectious from 3 days before to up to 4–6 days after the onset of rash. Approximately 90 % of exposed susceptible individuals experience measles. Face-to-face contact is not necessary, because viable virus may be suspended in air for as long as 1 hr after the patient with the source case leaves a room.

Pathology. Measles infection causes necrosis of the respiratory tract epithelium and an accompanying lymphocytic infiltrate. Measles produces a small vessel vasculitis on the skin and on the oral mucous membranes. Histology of the **rash** and **exanthem** reveals intracellular edema and dyskeratosis associated with formation of epidermal syncytial giant cells with up to 26 nuclei. Viral particles have been identified within these giant cells. In lymphoreticular tissue, lymphoid hyperplasia is prominent. Fusion of infected cells results in multinucleated giant cells, the Warthin–Finkeldey giant cells that are pathognomonic for measles, with up to 100 nuclei and intracytoplasmic and intranuclear inclusions.

***Clinical Manifestations*.** Measles is a serious infection characterized by high fever, an enanthem, cough, conjunctivitis, and a prominent exanthem. After an incubation period of 8–12 days, the prodromal phase begins with a mild fever followed by the onset of conjunctivitis with photophobia, coryza, a prominent cough, and increasing fever (Fig. 14).

Koplik spots represent the enanthem and are the **pathognomonic sign of measles**, appearing 1 to 4 days prior to the onset of the rash (Fig. 15). They first appear as discrete red lesions with bluish white spots in the center on the inner aspects of the cheeks at the level of the premolars. They may spread to involve the lips, hard palate, and gingiva. Koplik spots have been eported in 50–70 % of measles.

Symptoms increase in intensity for 2–4 days until the 1st day of the rash (Fig. 16). The rash begins on the forehead (around the hairline), behind the ears, and on the upper neck as a red maculopapular eruption. It then spreads downward to the torso and extremities, reaching the palms and soles in up to 50 % of cases. The exanthem frequently becomes confluent on the face and upper trunk. The rash

fades over about 7 days in the same progression as it evolved, often leaving a fine desquamation of skin in its wake.

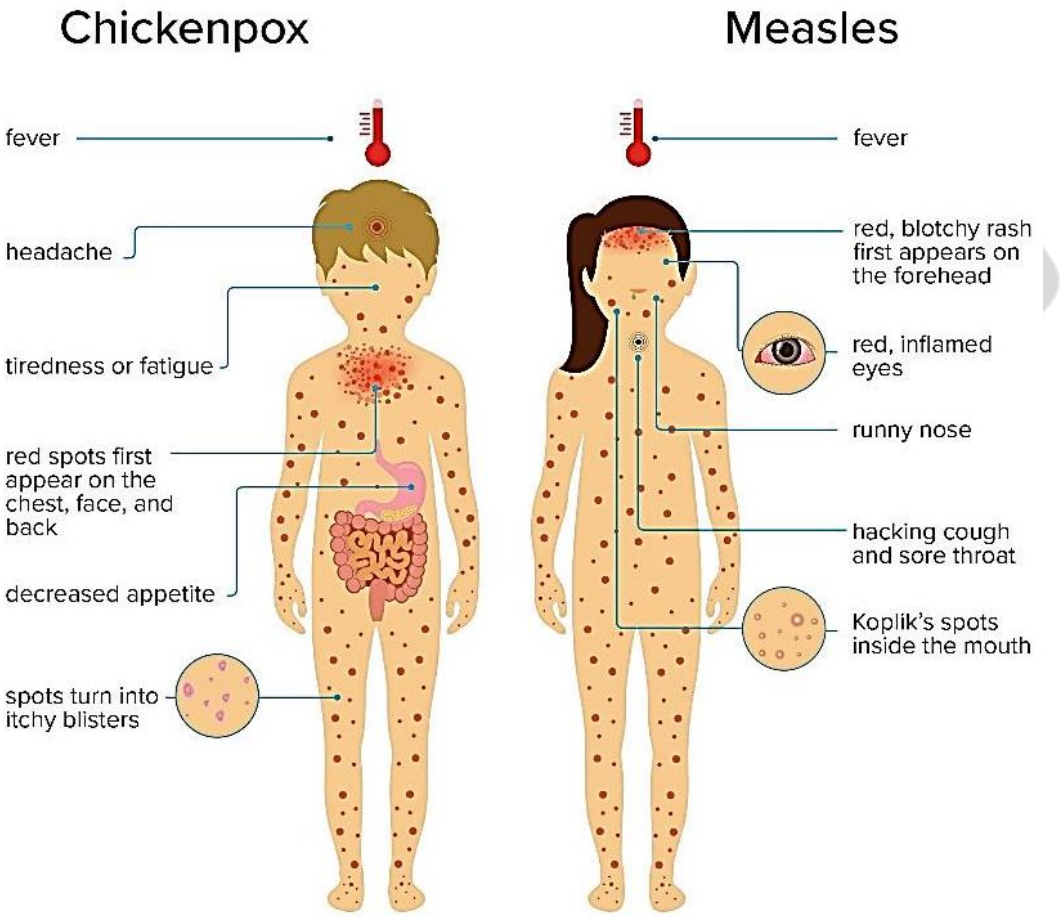

Fig. 14. Comparison of chickenpox and measles manifestations

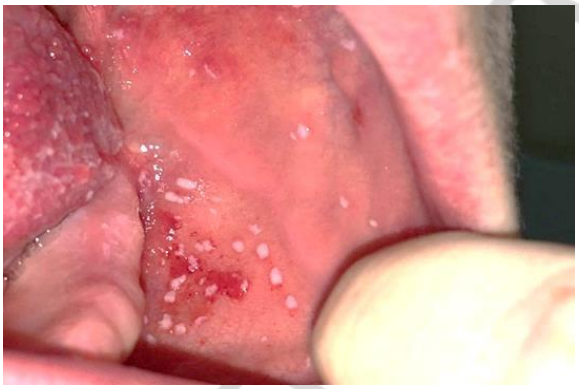

Fig. 15. Koplik spots on oral mucosa

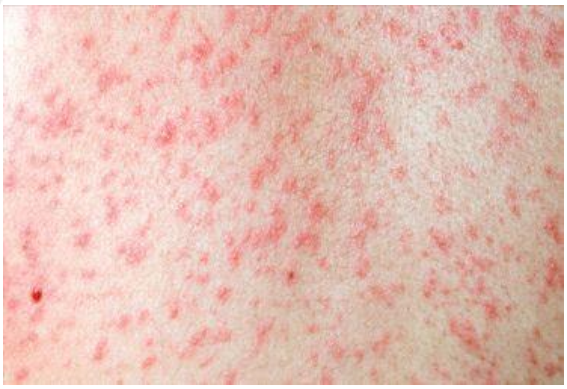

Fig. 16. Measles rash

A **child with measles displaying the characteristic red blotchy pattern on his face and body** (Fig. 17).

Differential Diagnosis. Typical measles is unlikely to be confused with other illnesses, especially if Koplik spots are observed.

Measles in the later stages or inapparent or subclinical infections may be confused with a number of other exanthematous immune-mediated illnesses and infections, including rubella, adenoviruses, enteroviruses, and Epstein–Barr virus.

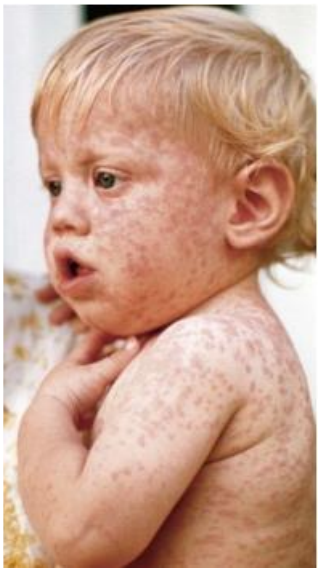

Fig. 17. The child with measles

Treatment. Management of measles is supportive. Antiviral therapy is not effective in the treatment of measles in otherwise normal patients. Maintenance of hydration, oxygenation, and comfort are goals of therapy.

Antipyretics for comfort and fever control are useful. Oral rehydration is effective in most cases. Ribavirin is active in vitro against measles virus. Anecdotal reports of ribavirin therapy with or without intravenous gamma globulin suggest some benefit in individual patients.

RUBELLA

Rubella (German measles or 3-day measles) is a mild, often exanthematous disease of infants and children that is typically more severe and associated with more complications in adults. Its major clinical significance is transplacental infection and fetal damage as part of the congenital rubella syndrome (CRS).

Etiology. Rubella virus is a member of the family Togaviridae and is the only species of the genus Rubivirus. It is a single-stranded RNA virus. The virus is sensitive to heat, ultraviolet light, and extremes of pH but is relatively stable at cold temperatures. Humans are the only known host.

Pathogenesis of Rubella. Following infection, the virus replicates in the respiratory epithelium, then spreads to regional lymph nodes. Viremia ensues and is most intense from 10 to 17 days after infection. Viral shedding from the nasopharynx begins about 10 days after infection and may be detected up to 2 week following onset of the rash. The period of highest communicability is from 5 days before to 6 days after the appearance of the rash.

The most important risk factor for severe congenital defects is the stage of gestation at the time of infection. Maternal infection during the 1st 8 week of gestation results in the most severe and widespread defects.

Clinical Manifestations. Following an incubation period of 14–21 days, a prodrome consisting of low-grade fever, sore throat, red eyes with or without eye pain, headache, malaise, anorexia, and ***lymphadenopathy*** begins. Suboccipital, postauricular, and anterior cervical lymph nodes are most prominent.

In children, the 1st manifestation of rubella is usually ***the rash*** (Fig. 18), which is variable and not distinctive. It begins on the face and neck as small, irregular pink macules.

About the time of onset of the rash, examination of the oropharynx may reveal tiny, rose-colored lesions ***(Forchheimer spots***) or petechial hemorrhages on the soft palate. The rash fades from the face as it extends to the rest of the body so

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that the whole body may not be involved at any 1 time. The duration of the rash is generally 3 days, and it usually resolves without desquamation.

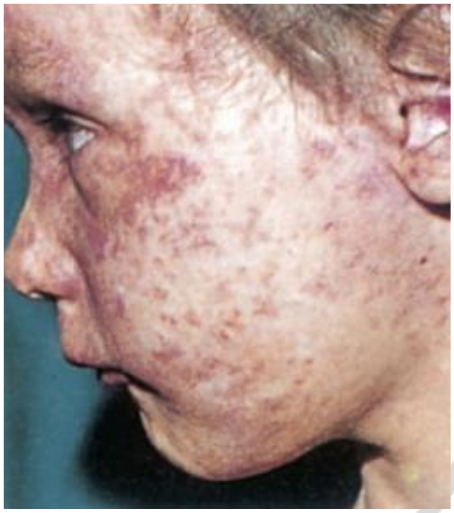

Fig. 18. Rubella rash

***Supportive Care*.** Postnatal rubella is generally a mild illness that requires no care beyond antipyretics and analgesics. Intravenous immunoglobulin or corticosteroids can be considered for severe, nonremitting thrombocytopenia.

MUMPS

Mumps is an acute self-limited infection, once commonplace but now unusual in developed countries because of widespread use of vaccination. It is characterized by fever, bilateral or unilateral parotid swelling and tenderness, and the frequent occurrence of meningoencephalitis and orchitis (Fig. 19).

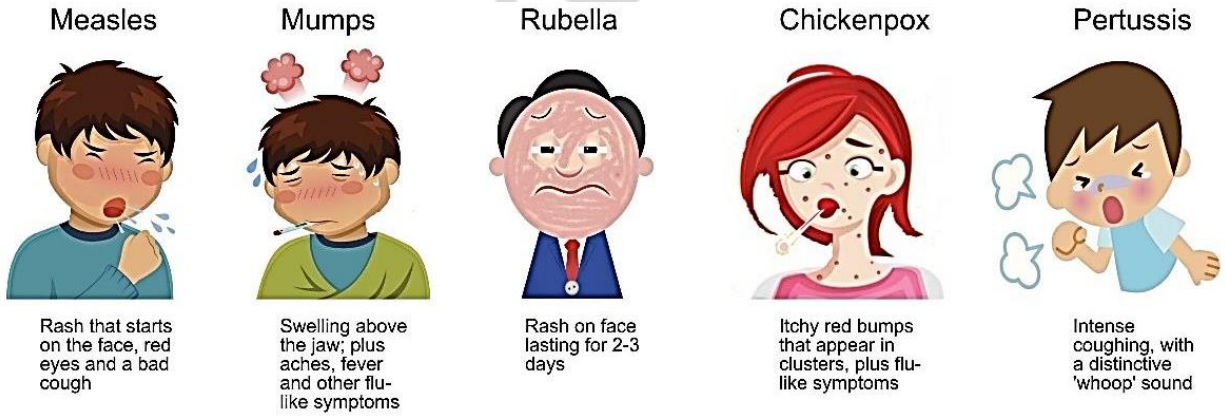

Fig. 19. Telltale signs of measles, mumps, rubella, chickenpox and pertussis

Etiology. Mumps virus is in the family Paramyxoviridae and the genus Rubulavirus. It is a single-stranded pleomorphic RNA virus. Mumps virus exists as a single immunotype, and humans are the only natural host. In the prevaccine era, mumps occurred primarily in young children between the ages of 5 and 9 yr and in epidemics about every 4 yr. Mumps infection occurred more often in the winter and spring months.

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Epidemiology. Mumps is spread from person to person by respiratory droplets. Virus appears in the saliva from up to 7 days before to as long as 7 days after onset of parotid swelling. The period of maximum infectiousness is 1–2 days before to 5 days after onset of parotid swelling (Table 1). Viral shedding before onset of symptoms and in asymptomatic infected individuals impairs efforts to contain the infection in susceptible populations.

Table 1

Transmission route, incubation period, and isolation period of vaccine-preventable diseases

Viral disease	Transmission routes	Incubation period (average days)	Isolation period
Measles	Droplet, airborne	10–12	4 days after rash develops
Mumps	Droplet	16–18	5 days after parotitis develops
Rubella	Droplet	16–18	5–7 days after rash develops
Varicella	Droplet, airborne, direct contact	14–16	1–2 days prior to rash until lesions are crusted

Pathology and Pathogenesis. Mumps virus targets the salivary glands, central nervous system (CNS), pancreas, testes, and, to a lesser extent, thyroid, ovaries, heart, kidneys, liver, and joint synovia. Following infection, initial viral replication occurs in the epithelium of the upper respiratory tract. Infection spreads to the adjacent ***lymph nodes*** by the lymphatic drainage, and viremia ensues, spreading the virus to targeted tissues. Mumps virus causes necrosis of infected cells and is associated with a lymphocytic inflammatory infiltrate (Fig. 20). ***Salivary gland ducts*** are lined with necrotic epithelium, and the interstitium is infiltrated with lymphocytes.

Fig. 20. Asymmetry of the face in a child with a mumps

Treatment. No specific antiviral therapy is available for mumps. Management should be aimed at reducing the pain associated with meningitis or orchitis and maintaining adequate hydration. Antipyretics may be given for fever.

NONPOLIO ENTEROVIRUSES

Enteroviruses are non-enveloped, single-stranded, positive-sense viruses in the Picornaviridae ("small RNA virus") family. The original human enterovirus subgroups — polioviruses, coxsackieviruses (named after Coxsackie, New York, where they were discovered), and echoviruses. The human enteroviruses have been reclassified on the basis of nucleotide and amino acid sequences into 5 species, polioviruses and human enteroviruses A-D.

***Epidemiology*.** Humans are the only known reservoir for human enteroviruses. Virus is primarily spread person to person, by the fecal-oral and respiratory routes, and vertically, from mother to neonate, prenatally or in the peripartum period, or, possibly, via breast-feeding. Enteroviruses can survive on environmental surfaces, permitting transmission via fomites. Enteroviruses also can frequently be isolated from water sources and sewage and can survive for months in wet soil. Although environmental contamination (of drinking water, swimming pools and ponds, and hospital water reservoirs) may occasionally be responsible for transmission, it is often considered the result, rather than the cause, of human infection.

Transmission occurs within families (if a member of a household is infected, there is ≥ 50 % risk of spread to nonimmune household contacts), daycare centers, playgrounds, summer camps, orphanages, and hospital nurseries; severe secondary infections may occur in nursery outbreaks. Handwashing decreases transmission.

***Pathogenesis*.** The incubation period is typically 3–6 days, except for a 1- to 3-day incubation period for acute hemorrhagic conjunctivitis. Infected children, both symptomatic and asymptomatic, frequently shed cultivable enteroviruses from the respiratory tract for < 1–3 wk, whereas fecal shedding continues up to 7–11 wk.

Initial replication in the pharynx and intestine is followed within days by multiplication in lymphoid tissue such as tonsils, Peyer patches, and regional lymph nodes. A primary, transient viremia (minor viremia) results in spread to distant parts of the reticuloendothelial system, including the liver, spleen, bone marrow, and distant lymph nodes. Enteroviruses can damage a wide variety of organs and systems, including the CNS, heart, liver, lungs, pancreas, kidneys, muscle, and skin. Damage is mediated by necrosis and the inflammatory response.

Hand-foot-and-mouth disease. One of the more distinctive rash syndromes, is most frequently caused by coxsackievirus. It is usually a mild illness, with or without low-grade fever. The oropharynx is inflamed and contains scattered vesicles on the tongue, buccal mucosa, posterior pharynx, palate, gingiva, and/or lips. These may ulcerate, leaving 4- to 8-mm shallow lesions with surrounding erythema.

Maculopapular, vesicular, and/or pustular lesions (Fig. 21) may occur on the hands and fingers, feet, and buttocks and groin; the hands are more commonly involved than the feet. Lesions on the hands and feet are usually tender, 3- to 7-mm vesicles that occur more commonly on dorsal surfaces but frequently also on palms and soles. Vesicles resolve in about 1 week.

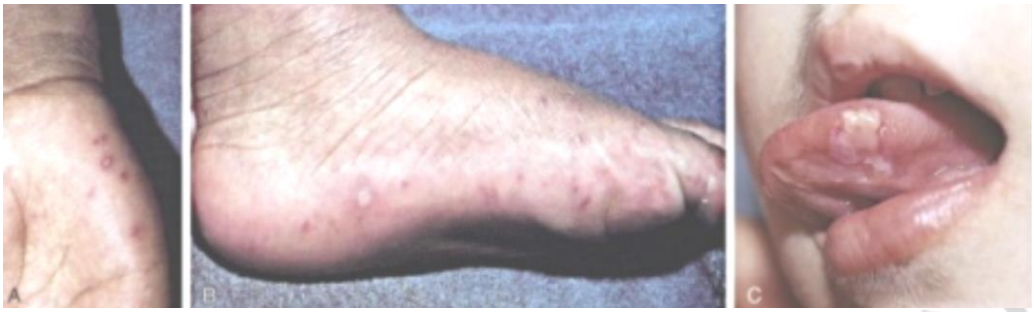

Fig. 21. Clinical manifestations of Hand-foot-and-mouth disease

Herpangina. Herpangina is characterized by sudden onset of fever, sore throat, dysphagia, and lesions in the posterior pharynx. Temperatures range from normal to 41 °C; fever tends to be greater in younger patients. Headache and backache may occur in older children, and vomiting and abdominal pain occur in 25 % of cases. Characteristic lesions, present on the **anterior tonsillar pillars** (Fig. 22), **soft palate, uvula, tonsils, posterior pharyngeal wall**, and, occasionally, the posterior buccal surfaces, are discrete 1- to 2-mm vesicles and ulcers that enlarge over 2–3 days to 3–4 mm and are surrounded by erythematous rings that vary in size up to 10 mm (Table 2). Typically about **5 lesions are present**, with a range of 1 to > 15. The remainder of the pharynx appears normal or minimally erythematous. Fever generally lasts 1–4 days, and resolution of symptoms occurs in 3–7 days. A variety of enteroviruses cause herpangina, including enterovirus 71, though coxsackie A viruses are implicated most often.

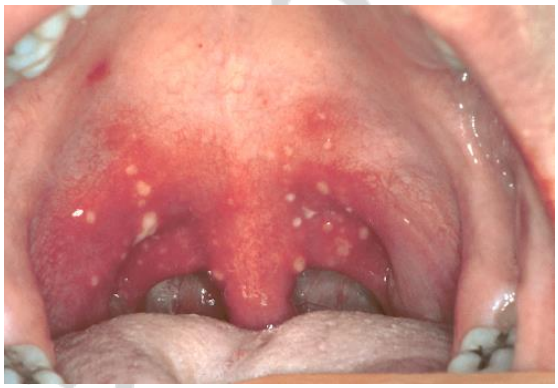

Fig. 22. Clinical manifestations of Herpangina

Table 2

Comparison of herpetic gingivostomatitis and herpangina

Diagnosis	Herpangina	Herpetic gingivostomatitis
Etiology	Coxsackie a virus	Herpes simplex virus type 1
Age	3–10 years	6 months – 5 years
Seasonality	Summer/early fall	None
Clinical features	– Fever – Pharyngitis – Gray vesicles/ulcers on posterior oropharynx	– Fever – Pharyngitis – Erythematous gingiva – Clusters of small vesicles on anterior oropharynx
Treatment	Supportive management	Oral acyclovir

Management of herpangina is supportive:

1) Aerosols (Chx, Miramistine, Oktinisept), painreleaf, for epithelisation (vit A, E);

2) Physiotherapy — helium-neon laser № 5–7.

RESPIRATORY VIRAL INFECTIONS

– virus influenza A;
– influenza B;
– influenza C4
– parainfluenza.

Influenza viruses have the potential for causing periodic global pandemics with even higher penetrance of illness.

Etiology. Influenza viruses are members of the family Orthomyxoviridae. They are large, single-stranded RNA viruses. Influenza viruses are divided into three types: A, B, and C. Influenza virus types A and B are the primary human pathogens and cause epidemic disease. Influenza virus type C is a sporadic cause of predominantly upper respiratory tract disease.

Influenza virus causes a lytic infection of the respiratory epithelium with loss of ciliary function, decreased mucus production, and desquamation of the epithelial layer. These changes permit secondary bacterial invasion, either directly through the epithelium.

Clinical manifestations. Influenza types A and B cause predominantly respiratory illness. The onset of illness is abrupt and is dominated by fever, myalgias, chills, headache, malaise, and anorexia; coryza, pharyngitis, and dry cough are associated features overshadowed by the other systemic signs. The predominant symptoms may localize anywhere in the respiratory tract, producing an isolated upper respiratory tract illness, croup, bronchiolitis, or pneumonia.

HIV INFECTION AND AIDS

The human immunodeficiency virus (HIV) is a retrovirus that infects mainly CD4+ cells, especially helper T-lymphocytes and brain microglia. It damages these over months and years, to eventually cause AIDS (acquired immune deficiency syndrome) with a predisposition particularly to infections with viruses, fungi and mycobacteria.

***Clinical features*.** Infections: with opportunistic pathogens, especially fungi, viruses, mycobacteria and parasites (e.g. candidosis, herpesvirus infections (Fig. 23), tuberculosis, toxoplasmosis, *Pneumocystis carinii* pneumonia)

Malignant neoplasms (Kaposi sarcoma, Fig. 24), non-Hodgkin lymphoma, cervical cancer): which often have a viral aetiology:

– Neurological disease (AIDS-related dementia);
– Autoimmune disorders (autoimmune thrombocytopaenia);
– Weight loss and wasting — “slim disease”.

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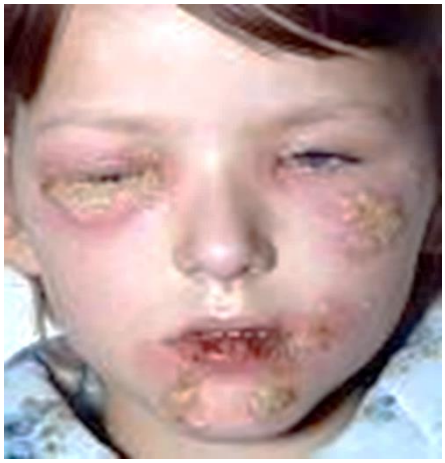

Fig. 23. Recurrent herpetic

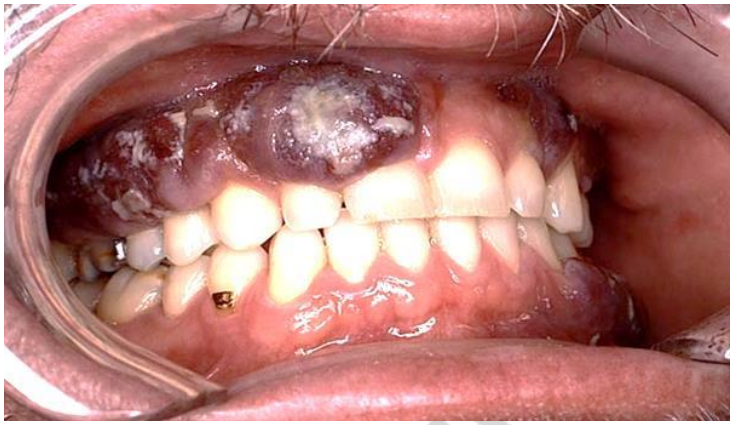

Fig. 24. Kaposi sarcoma

Common manifestations of HIV/AIDS include:

HIV-gingivitis:

– Linear erythema of gingiva (Fig. 25).

– Marginal gingiva bleeding when the attached gingiva is pale. These signs can disappear in 3–4 weeks but appear again soon.

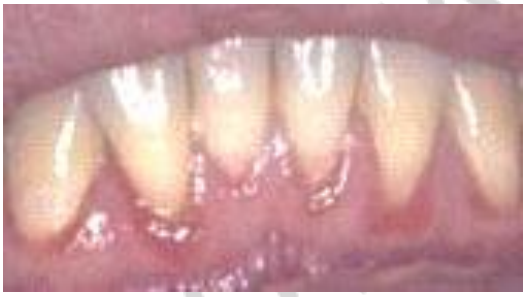

Fig. 25. HIV-gingivitis

Treatment. The treatment of HIV/AIDS with medicines is called antiretroviral therapy (ART). It is recommended for everyone who has HIV. The medicines do not cure HIV infection, but they do make it a manageable chronic condition. They also reduce the risk. There are several different types of HIV/AIDS medicines. Some work by blocking or changing enzymes that HIV needs to make copies of itself. This prevents HIV from copying itself, which reduces the amount of HIV in the body. Several medicines do this:

– ***Nucleoside reverse transcriptase inhibitors (NRTIs)*** block the reverse transcriptase enzyme;

– ***Non-nucleoside reverse transcriptase inhibitors (NNRTIs)*** bind to and later change the reverse transcriptase enzyme;

– ***Integrase inhibitors*** block the integrase enzyme;

– ***Protease inhibitors (PIs)*** block the protease enzyme. Blocking either of these molecules prevents HIV from entering the cells.

In some cases, people take more than one medicine:

– ***Pharmacokinetic enhancers*** boost the effectiveness of certain HIV/AIDS medicines. A pharmacokinetic enhancer slows the breakdown of the other

medicine. This allows that medicine to stay in the body longer at a higher concentration.

– ***Multidrug combinations*** include a combination of two or more different HIV/AIDS medicines.

HIV medicines are not just used for treatment. Some people take them to prevent HIV. PrEP (pre-exposure prophylaxis) is for people who don't already have HIV but are at very high risk of getting it. PEP (post-exposure prophylaxis) is for people who have possibly been exposed to HIV.

ORAL MANIFESTATIONS OF BACTERIAL DISEASES IN CHILDREN

Acute infectious diseases in children is often accompanied by involvement in the pathological process of the oral mucosa, what may complicate the main disease.

Since the bacterial diseases in the oral cavity appear characteristic mucosal changes, patients often first turn to the dentist. Therefore, dentist should know the possible clinical manifestations of these diseases in the oral cavity, diagnose them and participate in the prevention and treatment to prevent their spread.

SCARLET FEVER

Scarlet fever is an upper respiratory tract infection associated with a characteristic rash, intoxication and acute pharyngitis, which are caused by Group A Streptococcus in individuals who do not have antitoxin antibodies.

It is now encountered less commonly and is less virulent than in the past, but the incidence is cyclic, depending on the prevalence of toxin-producing strains and the immune status of the population.

The causative agent is β-hemolytic GAS (group A Streptococcus) which produce the erythrogenic toxin (pyrogenic exotoxin). The incubation period is from 1 day to 12 days. It most commonly affects children between five and 15 years of age. Ways of transmission:

• aerosol route. The bacteria are usually spread by people coughing or sneezing;

• contact route:

– it can be spread when a person touches an object that has the bacteria on it and then touches their mouth or nose;

– drink from the same glass or eat from the same plate as a sick person;

– touch sores on the skin caused by group A strep (impetigo).

Pathogenesis of scarlet fever. The entrance gate for typical scarlet fever is the mucous membrane of the pharynx and nasopharynx. In some situations, an atypical form of scarlet fever is possible, the entrance gate of which is a wound or burn surface, where the formation of an inflammatory-necrotic focus occurs. The pathogenesis of scarlet fever consists of 3 key components: septic, toxic and allergic. The causative agent produces exotoxin, which determines the development of symptoms of intoxication, rash and has an allergic effect.

After transferred scarlet fever, antitoxic immunity is formed, which neutralizes exotoxins of any type of streptococcus in subsequent contacts.

The diagnosis is typically confirmed by culturing the throat.

The signs and symptoms:

– acute development of the disease;

– fever (at or above 38 C);

– intoxication (headache, body aches, nausea, vomiting, and loss of appetite);

– a sore throat. A sore throat (or throat pain) is pain or irritation of the throat. A common physical symptom, it is usually caused by acute pharyngitis (inflammation of the throat);

– swollen lymph nodes;

– and a characteristic rash.

The main symptom of visual inspection is a characteristic rash. The rash appears within 24–48 hours after onset of symptoms (after the fever start), although it may appear with the first signs of illness. It is a diffuse, papular, erythematous eruption producing a bright red discoloration of the skin, which blanches on pressure. Rash begins around the neck and spreads over the trunk and extremities — spreads from the top down. It is often more intense along the creases of the elbows, axillae, and groin. The face, however, is usually flushed, most prominently in the cheeks, with a ring of paleness around the mouth — «*circumoral pallor»* (Fig. 26, 27).

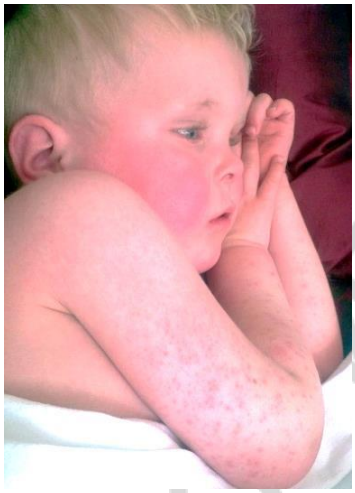

Fig. 26. Characteristic red cheeks and rash of scarlet fever

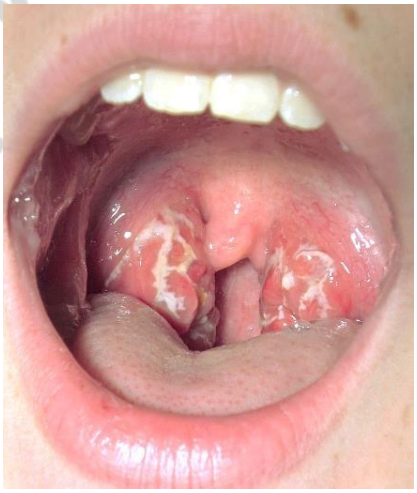

Fig. 27. Throat of a child with a positive throat culture for streptococcal pharyngitis

The skin has a goose-pimple appearance and feels rough. After 3–4 days, the rash begins to fade and is followed by desquamation.

The main symptom in the oral cavity for the clinical diagnosis of scarlet fever is characterized by inflammation of the throat. The streptococcal pharyngitis which is the usual presentation of scarlet fever in combination with the characteristic rash commonly involves the tonsils.

Tonsillitis occurs in the first hours of the disease. It is characterized by expressed and clearly limited hyperemia of pharyngeal mucosa — “flaming

fauces". The tonsils and back of the throat may have a whitish coating, or appear red, swollen, and dotted with whitish or yellowish specks of pus. Preceded this may be fleeting (transitory) enanthem (small, red spots) on the soft palate. The involvement of the soft palate can be seen as tiny red and round spots known as Forchheimer spots.

Changes on the dorsal surface of the tongue is characterized by desquamating process known as a "Strawberry tongue". The tongue starts out by having a white coating on it while the papillae of the tongue are swollen and reddened. The protrusion of the red papillae through the white coating gives the tongue a "white strawberry" appearance.

Stage I "Coated tongue" (1st day of disease): gray-yellow plaque on the dorsal surface of the tongue (necrosis of filiform papillae).

Stage II "bald, lacquered tongue" (3rd day of the disease): tongue is cleared on the edges and tip, filiform papillae exfoliated, tongue is bright red, dry, shiny.

Stage III "strawberry tongue" (7th day of the disease): After desquamation, the reddened papillae are prominent, giving the tongue a strawberry appearance as a result of hyperplasia of the mushroom-shaped papillae.

The main clinical symptoms of scarlet fever are extinguished in the following sequence: fever and symptoms of intoxication (2–3 day); lymphadenitis (3–4 day); rash (3–7 day); sore throat (6–7 day); changes on back of the tongue (10 days).

Complications associated with scarlet fever. In most cases, the rash and other symptoms of scarlet fever will be gone in about 10 days to 2 weeks with antibiotic treatment. However, scarlet fever can cause serious complications. These can include: rheumatic fever, kidney disease (glomerulonephritis), ear infections, throat abscesses, pneumonia, arthritis. It was a leading cause of death in children in the early 20th century.

Treatment. There is no vaccine. Prevention is by frequent handwashing, not sharing personal items, and staying away from other people when sick.

The disease is treatable with antibiotics, which prevent most complications. Treatment of scarlet fever is carried by pediatric practitioner or infectious disease physician. 85–90 % of children can be treated at home. Children under the 2 years, patients with moderate and severe forms of the disease have to be admitted to hospital. Outcomes with scarlet fever are typically good if treated.

The role of the dentist: a topical treatment, prevention of secondary infections of oral mucosa, maintenance of oral hygiene.

DIPHTHERIA

Diphtheria is an acute infection caused by the bacterium *Corynebacterium diphtheria* and characterized by an inflammatory process with the formation of pseudomembrane on the place of pathogen introduction and the phenomena of the general intoxication.

The causative agent — *Corynebacterium diphtheriae* (toxic strains) that produce exotoxin. The symptoms of disease are the primarily result of powerful toxin. Sources of infection: sick person; bacillicarriers of toxigenic strains.

Ways of infection *transmission*: human-to-human transmission of diphtheria typically occurs through the air when an infected individual coughs or sneezes. Breathing in particles released from the infected individual leads to infection. Contact with any lesions on the skin can also lead to transmission of diphtheria, but this is uncommon. Indirect infections can occur, as well. If an infected individual touches a surface or object, the bacteria can be left behind and remain viable.

***Pathogenesis of Diphtheria*.** Entrance gates for Corynebacterium diphtheria are the mucous membrane of the tonsils, nose, the pharynx, the larynx, eye conjunctiva and damaged skin (rarely) (Fig. 28).

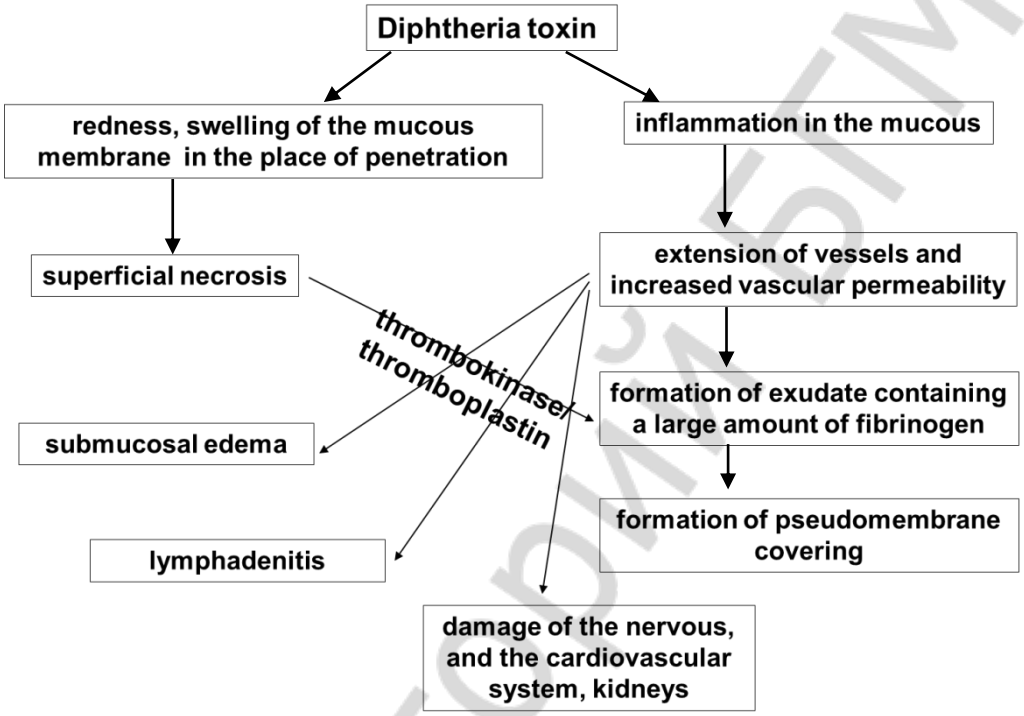

Fig. 28. Pathogenesis of Diphtheria

The major virulence of the organism lies in its ability to produce the potent 62-kd polypeptide exotoxin, which inhibits protein synthesis and causes local tissue necrosis.

Membrane of dead tissue builds up over the throat and tonsils, making breathing and swallowing difficult. Within the first few days of respiratory tract infection (usually in the pharynx), a dense necrotic coagulum of organisms, epithelial cells, fibrin, leukocytes, and erythrocytes forms, advances, and becomes a gray-brown, leather-like adherent pseudomembrane.

Classification

Depending on localization distinguish:

– diphtheria throat;
– nose;
– respiratory tract;
– eyes;
– genitals;
– skin.

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Depending on extension:
– localized;
– widespread.

According to the severity of intoxication:
– non-toxic;
– sub-toxic;
– toxic.

International classification of diseases (2008):
A 36 Diphtheria
A 36.0 Pharyngeal diphtheria
Diphtheritic membranous angina
Tonsillar diphtheria
A 36.1 Nasopharyngeal diphtheria
A 36.2 Laryngeal diphtheria
Diphtheritic laryngotracheitis
A 36.3 Cutaneous diphtheria
A 36.8 Other diphtheria
Diphtheritic:
– conjunctivitis
– myocarditis
– Polyneuritis
A 36.9 Diphtheria unspecified

The signs and symptoms. The manifestations of C. diphtheriae infection are influenced by the anatomic site of infection, the immune status of the host, and the production and systemic distribution of toxin.

A common symptom of diphtheria for any location is an inflammatory process with the formation of pseudomembrane covering having a number of features:

– it rises above the mucosal surface (“plus tissue”);
– color from grayish-white to grayish-dirty;
– the surface is smooth and shiny;
– adherent, dense, hard to be removed;
– removal reveals a bleeding edematous submucosa;
– the membrane has the ability to thicken and spread over the surface.

The symptoms of diphtheria usually begin two to seven days after infection. Symptoms of diphtheria include fever of 38 °C (100.4 °F) or above; chills; fatigue; bluish skin coloration (cyanosis); sore throat; hoarseness; cough; headache; difficulty swallowing; painful swallowing; difficulty breathing; rapid breathing; foul-smelling and bloodstained nasal discharge; and lymphadenopathy.

Within two to three days, diphtheria may destroy healthy tissues in the respiratory system. The dead tissue forms a thick, gray coating that can build up in the throat or nose. This thick gray coating is called a “pseudomembrane”. It can cover tissues in the nose, tonsils, voice box, and throat, making it very hard

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to breathe and swallow (Fig. 29). Symptoms can also include cardiac arrhythmias, myocarditis, and cranial and peripheral nerve palsies.

Diphtheritic membranous angina (diphtheria throat) — the most frequent localization of the diphtheria process (90–95 % of all cases of diphtheria).

Clinical manifestations of tonsillar and pharyngeal diphtheria:

– Mild pharyngeal injection is followed by unilateral or bilateral tonsillar membrane formation, which can extend to involve the uvula (which may cause toxin-mediated paralysis), soft palate, posterior oropharynx, hypopharynx, or glottic areas.

– Paralysis of the palate and hypopharynx is an early local effect of diphtheritic toxin.

– Regional lymph nodes are enlarged and painful.

Diphtheritic croup. Laryngeal diphtheria can lead to a characteristic swollen neck and throat, or "bull neck". The swollen throat is often accompanied by a serious respiratory condition, characterized by a brassy or "barking" cough, stridor, hoarseness, and difficulty breathing; and historically referred to variously as "diphtheritic croup", "true croup", or sometimes simply as "croup" (Fig. 30).

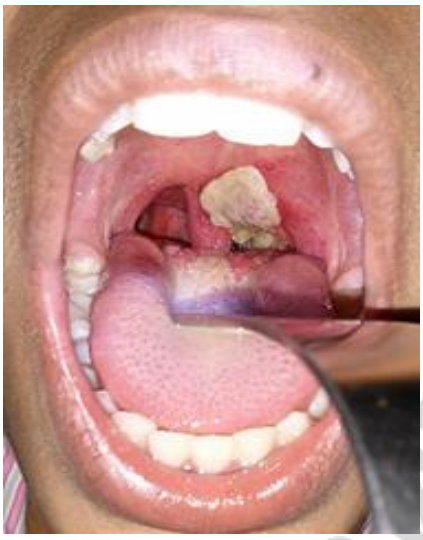

Fig. 29. An adherent, dense, grey pseudomembrane covering the tonsils is classically seen in diphtheria

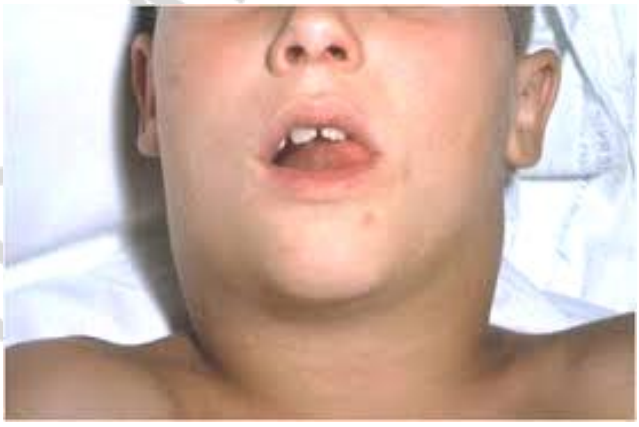

Fig. 30. Diphtheria can cause a swollen neck, sometimes referred to as a bull neck

Patients with laryngeal diphtheria are at significant risk for suffocation because of local soft tissue edema and airway obstruction by the diphtheritic membrane. Establishment of an artificial airway and resection of the pseudomembrane can be lifesaving.

Diphtheritic croup is extremely rare in countries where diphtheria vaccination is customary.

Complications. Toxin absorption can lead to systemic manifestations: kidney tubule necrosis, thrombocytopenia, cardiomyopathy, and/or demyelination of nerves. Toxic cardiomyopathy occurs in 10–25 % of patients with respiratory diphtheria and is responsible for 50–60 % of deaths.

***Prognosis*.** The prognosis for patients with diphtheria depends on the virulence of the organism, patient age, immunization status, site of infection, and speed of administration of the antitoxin.

Mechanical obstruction from laryngeal diphtheria or bull-neck diphtheria and the complications of myocarditis account for most diphtheria-related deaths. The case fatality rate of almost 10% for respiratory tract diphtheria has not changed in 50 yr.

Treatment. Hospitalization of patients with diphtheria and in suspected diphtheria is required.

Treatment should be comprehensive, include specific and pathogenetic therapy. Specific antitoxin is the mainstay of Specific therapy and should be administered on the basis of clinical diagnosis. Pathogenetic therapy is aimed at detoxification, restoration of hemodynamic disturbances. The role of antimicrobial therapy is to stop toxin production, treat localized infection, and prevent transmission of the organism to contacts.

The role of the dentist is the early diagnosis of the disease.

SYPHILIS

Syphilis is a chronic systemic sexually transmitted infection that can be easily treated if detected early but manifests with multiform clinical symptoms and significant morbidity if left unchecked.

Syphilis is caused by is caused by the anaerobic filamentous spirochete, Treponema pallidum belonging to the family Spirochaetaceae. According to epidemiological data 0.56 % cases of syphilis have manifestations in the oral cavity, including primary syphilis of oral mucosa (in 36 % of children and 41 % of adolescents) and secondary recurrent syphilis (in 9 % of children and 6 % of adolescents).

The signs and symptoms of syphilis vary depending in which stages it presents. Syphilis can present in one of four different stages: primary, secondary, latent, and tertiary, and may also occur congenitally.

Acquired syphilis in children is transmitted almost exclusively by sexual contact, including oral sexual exposure. Less common modes of transmission include transfusion of contaminated blood or direct contact with infected tissues.

Congenital syphilis in children results from transplacental transmission of spirochetes.

Primary syphilis. The mouth is rarely the site of primary syphilis, and because of its transient nature, the oral ulceration of primary syphilis often goes unnoticed by the patient or by any unsuspicious clinician. In addition, rarely, the lesions of primary disease may be confused with other pre-existing mucocutaneous disease.

Primary syphilis is characterized by a chancre and regional lymphadenitis.

A chancre develops within 1 to 3 weeks of acquisition. Primary syphilis is usually the consequence of orogenital or oroanal contact with an infectious lesion. Kissing may, very rarely, cause transmission; indeed, it has been suggested that

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intrafamilial oral acquisition of syphilis in a child may have occurred via this route, although more usually oral syphilis in a child is indicative of sexual abuse.

Primary syphilis of the mouth manifests as a solitary ulcer usually of the lip (upper) or, more rarely, the tongue. The pharynx or tonsils may rarely be affected. A chancre heals spontaneously in 1–2 months, leaving a thin scar.

The ulceration of primary syphilis may be confused with other solitary ulcerative disorders, most notably traumatic ulceration, herpes labialis, squamous cell carcinoma, and non-Hodgkin's lymphoma.

The ulceration is usually large (1–2 cm), painless, deep, with a red, purple, or brown base and an irregular raised border. Hard chancre has a firm, central punched-out defect with no undermining, the periphery and base are indurated.

Chancre is highly contagious ulcer and always full of microorganisms T. pallidum. There is usually an accompanying cervical lymphadenopathy.

Secondary syphilis. The features of secondary syphilis reflect the hematogenous spread of T. pallidum that enters the blood from the lymphatic system.

It usually presents with a cutaneous eruption within 2–10 weeks after the primary chancre and is most florid 3–4 months after infection. Secondary syphilis is characterized by:

– localized or diffuse mucocutaneous rash (coppery colored typically on palms and soles);

– condylomata lata and generalized lymph nodes enlargement;

– patchy alopecia;

– Oral Mucosal Changes — maculopapular lesions.

The oral manifestations of secondary syphilis can be more extensive and/or variable than those of the primary disease. Oral lesions arise in at least 30 % of patients with secondary syphilis, although very rarely oral ulceration may be the only manifestation of infection. The 2 principal oral features of secondary syphilis are mucous patches and maculopapular lesions, although nodular lesions may rarely arise.

Oral Maculopapular Lesions (Fig. 31–33) include:

– Papular syphilides: these are rare. They manifest as red, raised, firm round nodules with a grey center that may ulcerate. The papules usually arise on the buccal mucosa or commissures.

– Macular syphilides: macular lesions tend to arise on the hard palate and manifest as flat-to-slightly raised, firm, red lesions. One most readily recognizes the small red patches on the hard and soft palate or on the buccal mucosa. They are only erythematous for a short time.

– Mucous patches: Erythematous macules and papules soon become macerated and acquire a gray-white coating. Inflammation, edema, and infiltration lead to maceration, producing a gray veil and an opalescent papule. The lesions are called mucous or opaline patches.

Mucous patches in general manifest as oval-to-crescenteric erosions or shallow ulcers of about 1 cm diameter, covered by a grey mucoid exudate and with an erythematous border. The patches usually arise bilaterally on the mobile

surfaces of the mouth, although the pharynx, gingivae, tonsils, and very rarely the hard palate can be affected. At the commissures, the mucous patches may appear as split papules, while on the distal and lateral aspects of the tongue, they tend to ulcerate or manifest as irregular fissures. The mucous patches may coalesce to give rise to, or arise de novo as, serpiginous lesions, sometimes termed snail track ulcers. On the dorsum of the tongue, the normal papillae seem to fuse together with the coalescent papules, producing smooth plaques. When they thicken, then the tongue is described as a turtle-tongue.

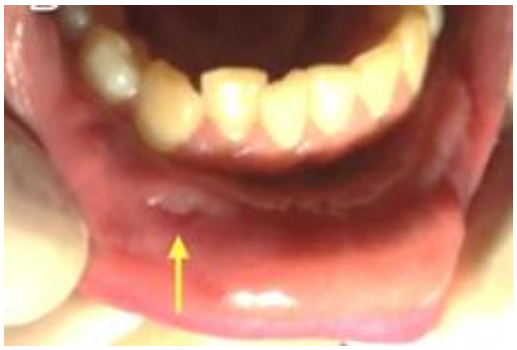

Fig. 31. Circular ulcer and well delimited in asymptomatic lower labial mucosa

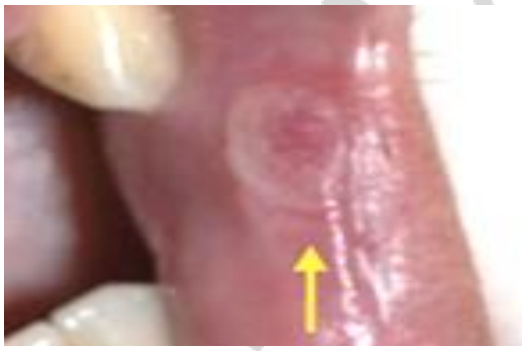

Fig. 32. Ulcerated lesion with fibrinous borders at the commissure of the lips

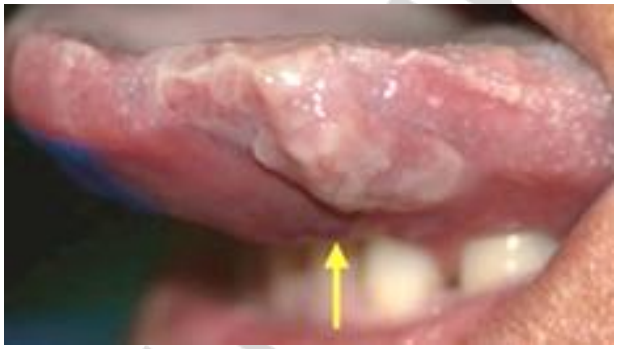

Fig. 33. Exuberant mucous plate present on the tongue (left) caused volume increase and remodeling on the superficial relief of the tongue

Every patient with secondary syphilis has diffuse unilateral or bilateral lymphadenopathy, known as polyscleradenitis because of the multiplicity and firm nature of the nodes.

The nodes are typically painless, not greatly enlarged, usually about 1–2 cm in size and freely movable. They may be sharply delineated, firm and smooth on the surface, movable from the underlying tissue. The overlying skin is not inflamed and the nodes never suppurate or ulcerate. The site of the primary enter is almost involved, but the cervical, axillary and many others nodes may be affected.

Diagnostic. If syphilitics lesions occur isolated in oral mucosa, the identification can be difficult. It is easy to distinguish the mucous patches from exactly circumscribed circular or oval painful aphthae, and also from the herpes simplex. Lichen planus, lupus erythematosus and leukoplakia produce stable

mucosal lesions that have typical morphological features and remain unchanged for a long time. In difficult case the diagnosis must be based on detecting the spirochetes and serological tests. Test material from oral lesions submitted on dry swabs using the polymerase chain reaction (PCR).

Congenital syphilis results from transplacental transmission of Spirochetes in women with primary and secondary syphilis and spirochetemia. Treponema pallidum crosses the placenta only after the 16th week of intrauterine life; hence, depending upon the time of infection, it may variably affect the facial structures.

Resembling its systemic features, the orofacial manifestations of congenital syphilis can be split into early and late. Early congenital syphilis occurs within the first 2 years of life. Late congenital syphilis emerges in children older than 2 years.

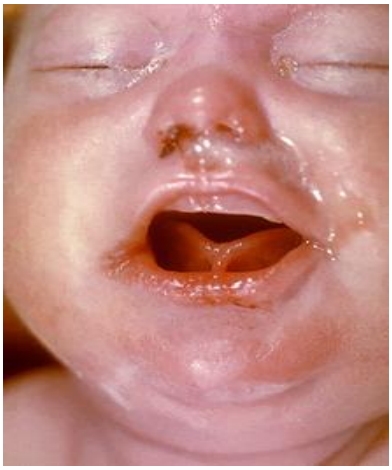

Fig. 34. The face of a newborn infant displaying snuffles indicative of congenital syphilis

Early congenital syphilis. Early features include diffuse maculopapular rash, periostitis (frontal bossing of Parrot), and rhinitis.

The earliest symptom is rhinitis (snuffles) (Fig. 34). Mucocutaneous rash manifests with erythematous maculopapular or vesiculobullous lesions followed by desquamation involving hands and feet. Mucous patches and condylomatous lesions are the characteristic lesions of mucous membrane. Also bones (osteochondritis the wrists, elbows, ankles, and knees, and periostitis of the long bones), internal organs (nephrotic syndrome, gastroenteritis, peritonitis, pancreatitis, pneumonia, eye involvement) and central nervous system are involved.

Late congenital syphilis. Late manifestations are rarely seen in developed countries. Late features, manifesting at least 24 months after birth, comprise the Hutchinsonian triad of interstitial keratitis of the cornea, sensorineural hearing loss, and dental anomalies.

The dental anomalies of congenital syphilis only arise in teeth in which calcification occurs during the first year of life, hence typically the permanent incisors and first molars. Of note, the maxillary incisors are more commonly affected than the mandibular ones. The incisors have a screwdriver shape, there being a convergence of the lateral margins towards the incisal edge (Fig. 35). In some, there may be notching of the incisal edge, while in others, there may be a depression on the labial surface. The first molar may be bud-shaped and reduced to the size of the adjacent second molar — Mulberry molars (Fig. 36). The normal mesiodistal convexity of the crown may be reduced. Enamel hypoplasia may occur. Yellow discoloration of the skin about the lips can arise soon after birth; the area then becomes increasingly rigid with crack formation and eventual (Parrot's) radial scars — rhagades of the lips. There may be a loss of the well-ircumscribed border of the vermillion.

Репозиторий БГМУ

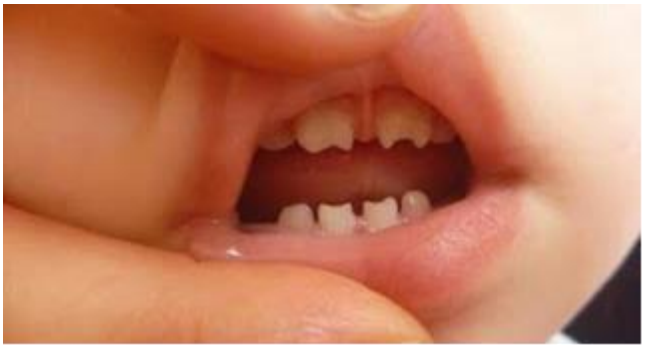

Fig. 35. Hutchinson teeth in infant

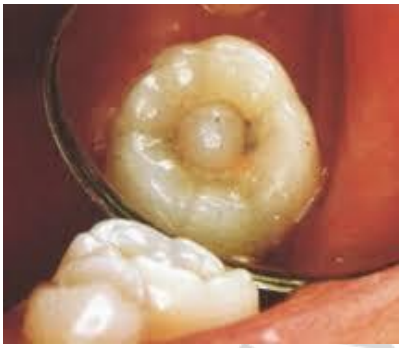

Fig. 36. Mulberry molars

Other, less common orofacial features include atrophic glossitis and a high, narrow palatal vault. Facial neuropathies may rarely occur as can palatal gumma in adulthood.

Treatment. Syphilis treatment is carried out in special hospitals. The role of the dentist is the administration of a local treatment including the maintenance of dental health, elimination of damaging factors, use of antiseptics and specific therapy.

GONORRHEA

Gonorrhea — infection with pronounced local phenomena, primarily affecting the mucous membrane of the urinary tract, thus can be affected by the conjunctiva and throat/nose mucosa.

Gonorrhea is caused by the bacterium *Neisseria Gonorrhoeae*. Previous infection does not confer immunity — a person who has been infected can become infected again by exposure to someone who is infected. Infected persons may be able to infect others repeatedly without having any signs or symptoms of their own.

Infection with Neisseria Gonorrhea in the mouth is uncommon or rarely recognized. Gonococcal infections in children are acquired rarely through household exposure to infected caretakers. Gonorrhea is the most common sexually transmitted infection found in sexually abused children. Pharyngitis may occur after orogenital or oroanal contacts. Rarely, Neisseria Gonorrhoeae may be spread by sexual play among children.

Gonococcal infection of neonates usually results from exposure to infected exudate from the cervix of the mother. An acute infection begins 2–5 days after birth.

Pathogenesis. Neisseria Gonorrhoeae infects primarily columnar epithelium, because stratified squamous epithelium is relatively resistant to invasion. Mucosal invasion by gonococci results in a local inflammatory response that produces a purulent exudate consisting of polymorphonuclear leukocytes, serum, and desquamated epithelium.

Clinical Manifestations. Oral gonorrhea rarely causes symptoms and is often hard to detect. This can result in delayed treatment, which increases the risk of transmitting the infection to others.

РЕПОЗИТОРИЙ БГМУ

Gonorrhea infections of mucosal membranes can cause swelling, itching, pain, and the formation of pus. The time from exposure to symptoms is usually between two and 14 days, with most symptoms appearing between four and six days after infection, if they appear at all.

Gonococcal stomatitis in children is characterized by the following symptoms:

– oral mucous is hyperemic, edematous, painful;

– thick yellowish exudate having a fetid smell on the gums, cheeks, sides of the tongue, soft palate, tonsils and on the mucous membrane of the nose;

– in untreated cases, the process can be extended - erosions and ulcers appear on the buccal mucosa, tongue, gums and soft palate;

– ulcers are superficial, small, slightly painful with a yellow-gray secretions contain gonococci, which confirms the diagnosis.

Other symptoms may include swollen lymph nodes around the neck. Submandibular lymph nodes are enlarged and painful on palpation.

Diagnostics. Tests that use polymerase chain reaction (PCR, aka nucleic acid amplification) to identify genes unique to N. gonorrhoeae are recommended for screening and diagnosis of gonorrhea infection. These PCR-based tests require a sample of mucosal swabs. Culture (growing colonies of bacteria in order to isolate and identify them) and Gram-stain (staining of bacterial cell walls to reveal morphology) can also be used to detect the presence of N. gonorrhoeae.

Treatment. Antibiotics per os and local are used to treat gonorrhea infections (amoxicillin or ciprofloxacin). Prevention of gonococcal stomatitis in infants born to mothers with gonorrhea — local treatment with 20 % solution of Sulfacetamide an hour after birth.

NECROTIZING ULCERATIVE GINGIVITIS

Necrotizing ulcerative gingivitis (NUG) is a non-contagious anaerobic distinct infection of the gums, characterized by rapid onset of gingival pain, interproximal gingival necrosis, and bleeding. This condition belongs to a group of necrotizing diseases, which also includes necrotizing ulcerative periodontitis (NUP), and necrotizing ulcerative stomatitis (NUS), and Noma.

The prevalence of necrotizing ulcerative gingivitis has varied over time, with particularly high rates noted among military populations during the First and Second World Wars. The informal name “trench mouth” arose during World War I as many soldiers developed the disease, probably because of the poor conditions and extreme psychological stress.

In developed countries, the incidence peaks in the late teens and early 20s in North America and Europe, but in less developed countries it is common in young children. In developing countries, NUG may occur in children of low socioeconomic status, usually occurring with malnutrition (especially inadequate protein intake) and shortly after the onset of viral infections (e.g. measles).

NUG rarely occurs in children of preschool age, sometimes in children 6–12 years of age. Uncommon, this typically affects adolescents and young adults,

especially in institutions, armed forces, etc., or people with HIV/AIDS. Cancrum oris (Noma) is a very rare complication, usually in weakened children.

Etiology. Various microorganisms have been isolated from affected tissues and include Fusobacterium nucleatum, Borrelia vincentii (spirochetes of Vincent,) Prevotella intermedia, Porphyromonas gingivalis, Selenomonas sputigena, and other anaerobic organisms. Additional theories for etiology include a role for viruses, such the human herpesviruses (HHVs).

Therefore, the microbial profile is complex, with high levels of spirochetes, fusiform bacteria, and Prevotella intermedia.

Several factors have been identified as potential triggers for these conditions, and these include local and general ones. The predisposing factors play a main role on NUG by the downregulation of the host immune response facilitating bacterial pathogenicity.

General predisposing factors include overcooling, psychological stress and insufficient sleep, exhaustion, poor diet and malnutrition, alcohol and tobacco consumption, preceding illness (e.g., measles), the transferred severe somatic diseases, viral respiratory infection, blood diseases, endocrinopathies and immunosuppression (e.g., human immunodeficiency virus infection).

According to the recent study, diabetes was discovered to be an important predictor, and it is presumably due to multiple aspects of the diabetic state including microangiopathy, delayed wound healing, impaired function of neutrophils, and disturbances in collagen formation due to glycation.

The proposed mechanisms to explain the association between psychological stress and NUG are based on reductions of the gingival microcirculation and salivary flow, increases in adrenocortical secretions which are associated with an alteration in the function of polymorphonuclear leukocytes and lymphocytes.

Besides, psychological stress alters not only the immune response but also the patient's behavior and mood, leading to inadequate oral hygiene, malnutrition, or increased tobacco consumption.

Regarding the poor diet, decreasing dietary protein results in an increase in histamine concentration and that leads to a hyperemia of the gingival due to increased capillary permeability and decreased polymorphonuclear leukocytes chemotaxis.

Local predisposing factors of NUG are the oral traumatic ulceration, poor oral hygiene and inflammation in the periodontal tissues.

Clinical features. Acute necrotizing ulcerative gingivitis (ANUG) refers to the clinical onset of NUG. The word acute is used because usually the onset is sudden. Other forms of NUG may be chronic or recurrent.

In the early stages some patients may complain of a feeling of tightness around the teeth.

NUG is fundamentally characterized by primary clinical symptoms: the interproximal gingival necrosis often described by “punched out,” gingival bleeding with little or no provocation, and intensive pain which is a hallmark of this gingival lesion (Fig. 37).

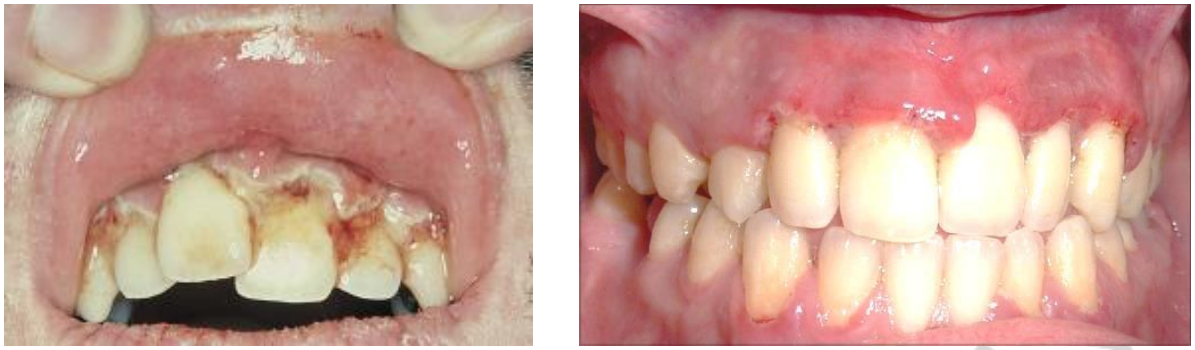

Fig. 37. Acute necrotizing gingivitis

However, it was found in an old data (Barnes et al., 1973) that 14% of cases of acute NUG had no pain and another 40 % suffered only mild pain (Barnes et al., 1973).

Fetid breath or "fetor ex ore" and pseudomembrane formation may be secondary diagnostic features.

Systemic signs and symptoms as lymphadenopathy, fever, and malaise have been also reported to occur in NUG. However, lymphadenopathy is an infrequent finding. Its presence is probably related to the severity of the disease since it is usually observed in advanced cases. Systemic reactions may be more pronounced in children.

The typically clinical appearance of NUG is related to its histopathological aspect. Four different layers have been described from the most superficial to the deepest layers of the lesion (Listgarten et al., 1965):

• The bacterial area with a superficial fibrous mesh composed of degenerated epithelial cells, leukocytes, cellular rests, and a wide variety of bacterial cells, including rods, fusiforms, and spirochetes.

• The neutrophil-rich zone composed of a high number of leukocytes, especially neutrophils, and numerous spirochetes of different sizes and other bacterial morphotypes located between the host cells.

• The necrotic zone, containing disintegrated cells, together with medium- and large-size spirochetes and fusiform bacteria.

• The spirochetal infiltration zone, where the tissue components are adequately preserved but are infiltrated with large- and medium-size spirochetes. Other bacterial morphotypes are not found.

Diagnosis is usually clinical. The microbiota composition associated with NUG and found in lesion layers includes Treponema spp., Selenomonas spp., Fusobacterium spp., and Prevotella intermedia. Other microorganisms have also been described, although these were defined as "variable" flora and were not present in all cases. As this typical microbiological description can also be detected in healthy, gingivitis, or periodontitis sites, the use of microbiological testing does not provide relevant diagnostic information.

NUG diagnosis may be mainly confused with some viral infections as acute herpetic gingivostomatitis and infectious mononucleosis, with bacterial infections like gonococcal or streptococcal gingivitis, and also with some mucocutaneous

conditions as desquamative gingivitis, multiform erythema, pemphigus vulgaris, and others.

Treatment. The treatment of NUG should be organized in successive stages:

– first, treatment of the acute phase;

– second, treatment of the preexisting condition; then, corrective treatment of the disease sequelae;

– finally, supportive or maintenance phase.

I. Treatment of the acute phase has two main objectives of therapy:

– to stop the disease process and tissue destruction;

– and to control the patient's general feeling of discomfort and pain that interfere with nutrition and oral hygiene practices.

These targets can be achieved by a careful superficial ultrasonic debridement and chemical detersion of the necrotic lesions with oxygen-releasing agents “local oxygen therapy”.

The use of systemic antimicrobials may be considered in cases that show unsatisfactory response to debridement or show systemic effects (fever and/or malaise). Metronidazole (250 mg, every 8 h) may be an appropriate first choice of drug because it is active against strict anaerobes. Other systemic drugs have also been suggested, with acceptable results, including penicillin, tetracycline, clindamycin, amoxicillin, or amoxicillin plus clavulanate.

Conversely, locally delivered antimicrobials are not recommended because of the large numbers of bacteria present within the tissues, where the local drug will not be able to achieve adequate concentrations. Antifungal agents are, especially, indicated in immunodepressed patients who are undergoing antibiotic therapy.

II. Once the acute phase has been controlled, *treatment of the preexisting chronic condition*, such as preexisting chronic gingivitis, should be started, including professional prophylaxis and/or scaling and root planning.

Oral hygiene instructions and motivation should be enforced.

Existing predisposing local factors, such as overhanging restorations and interdental open spaces, should be carefully evaluated and treated.

Systemic predisposing factors including smoking, adequate sleep, and reduction of stress should be controlled and taken into consideration.

Sometimes, the correction of the altered gingival topography caused by the disease should be considered because gingival craters may favor plaque accumulation and disease recurrence. Gingivectomy and/or gingivoplasty procedures may be helpful for treatment of superficial craters; periodontal flap surgery, or even regenerative surgery, is more suitable options for deep craters or for NUP.

III. Finally, if *proper maintenance* is not carried out, relapses are likely to occur that may lead to a loss of attachment. Moreover, the main goal of this phase is complying with the oral hygiene practices and controlling the predisposing factors.

Репозиторий БГМУ

ACUTE AND CHRONIC CANDIDIASIS OF THE ORAL MUCOSA IN CHILDREN

Oral candidiasis, also known as oral *thrush* among other names, is candidiasis that occurs in the mouth. That is, oral candidiasis is a mycosis (yeast/fungal infection) of Candida species on the mucous membranes of the mouth.

***Etiology*.** The causative organism is usually Candida albicans, or less commonly other Candida species such as (in decreasing order of frequency) Candida tropicalis, Candida glabrata, Candida parapsilosis, Candida krusei, or other species (Candida stellatoidea, Candida pseudotropicalis, Candida famata, Candida rugosa, Candida geotrichium, Candida dubliniensis, and Candida guilliermondii). C. albicans accounts for about 50 % of oral candidiasis cases, and together C. albicans, C. tropicalis and C. glabrata account for over 80 % of cases.

Candida exists in 3 morphologic forms: oval to round blastospores or yeast cells (3–6 mm in diameter); double-walled chlamydospores (7–17 mm in diameter), which are usually at the terminal end of a pseudohypha; and pseudomycelium, which is a mass of pseudohyphae and represents the tissue phase of Candida. Pseudohyphae are filamentous processes that elongate from the yeast cell without the cytoplasmic connection of a true hypha.

Several Candida species are polymorphogenic, that is, capable of growing in different forms depending on the environmental conditions. C. albicans can appear as a yeast form (blastospores), which is thought to be relatively harmless; and a hyphal form associated with invasion of host tissues. Apart from true hyphae, Candida can also form pseudohyphae — elongated filamentous cells, lined end to end. As a general rule, candidiasis presenting with white lesions is mainly caused by Candida species in the hyphal form and red lesions by yeast forms (Fig. 38).

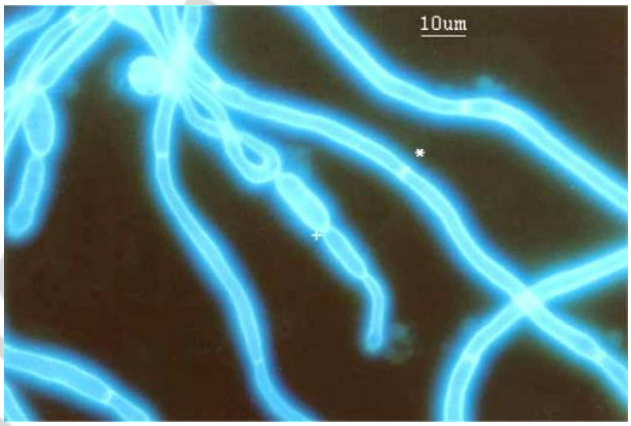

Fig. 38. Calcofluor white stained Candida albicans showing true hyphae (*) and pseudohyphae (+)

The properties of Candida albicans providing the oral colonization and their pathogenicity:

- Candida species have prevalent growth in nutrient rich culture media at 37 °C.
- Candida species have optimal activity at acidic pH (pH 2–7 activity range).

• Candida species are characterized be the presence of adhesion receptors to fibrinogen and factors complement system. The ability of Candida to adhere to host surfaces is a prerequisite for both successful commensal carriage as well as persistence during active infection.

• Candida produces several extracellular enzymes (proteolytic, lipolytic) that could have a locally damaging effect on host structures. C. albicans proteinases have keratinolytic activity that can both serve to facilitate initial penetration of keratinised cells as well as providing a valuable source of nitrogen during colonization.

• C. albicans activity can cause sensibilization of the body and also degrade host immunoglobulins and other defence proteins.

Candida albicans is the species most frequently associated with normal oral carriage in humans, occurring in the mouths of up to 80 % of healthy individuals. This candidal carrier state is not considered a disease, since there are no lesions or symptoms of any kind. But these can act as opportunistic pathogens in debilitated individuals.

A change from the harmless commensal existence of Candida to a pathogenic state can occur following alteration of the oral cavity environment to one that favours the growth of Candida. The causes of such changes are the so-called predisposing factors for Candida infection (candidosis) and most often these relate to a weakening of host immune defences (Table 3).

Table 3

Predisposing host-related factors associated with oral Candidosis

Local host factors	Systemic host factors
Denture wearing Steroid inhaler use Reduced salivary flow High sugar diet	Extremes of age Endocrine disorders (e.g. diabetes) Immunosuppression Receipt of broad spectrum antibiotics Nutritional deficiencies

Predisposing factors. The host defenses against opportunistic infection of candida species are:

– The oral epithelium, which acts both as a physical barrier preventing micro-organisms from entering the tissues, and is the site of cell mediated immune reactions.

– Competition and inhibition interactions between candida species and other micro-organisms in the mouth, such as the many hundreds of different kinds of bacteria.

– Saliva, which possesses both mechanical cleansing action and immunologic action, including salivary immunoglobulin A-antibodies, which aggregate candida organisms and prevent them adhering to the epithelial surface; and enzymatic components such as lysozyme, lactoperoxidase and antileukoprotease.

Disruption to any of these local and systemic host defense mechanisms constitutes a potential susceptibility to oral candidiasis, which rarely occurs without predisposing factors. It is often described as being “a disease of the diseased”, occurring in the very young, the very old, or the very sick.

Репозиторий БГМУ

Immunodeficiency. Immunodeficiency is a state of reduced function of the immune system, which can be caused by medical conditions or treatments.

Acute pseudomembranous candidiasis occurs in about 5 % of newborn infants. At very young ages, the immune system is yet to develop fully and there is no individual immune response to candida species, an infant's antibodies to the fungus are normally supplied by the mother's breast milk.

Other forms of immunodeficiency which may cause oral candidiasis include HIV/AIDS, active cancer and treatment, chemotherapy or radiotherapy.

Corticosteroid medications may contribute to the appearance of oral candidiasis, as they cause suppression of immune function either systemically or on a local/mucosal level, depending on the route of administration. Topically administered corticosteroids in the mouth may take the form of mouthwashes, dissolving lozenges or mucosal gels; sometimes being used to treat various forms of stomatitis. Systemic corticosteroids may also result in candidiasis.

Inhaled corticosteroids (e.g., for treatment of asthma or chronic obstructive pulmonary disease), are not intended to be administered topically in the mouth, but inevitably there is contact with the oral and oropharyngeal mucosa as it is inhaled. In asthmatics treated with inhaled steroids, clinically detectable oral candidiasis may occur in about 5–10 % of adults and 1 % of children. Where inhaled steroids are the cause, the candidal lesions are usually of the erythematous variety. Candidiasis appears at the sites where the steroid has contacted the mucosa, typically the dorsum of the tongue (median rhomboid glossitis) and sometimes also on the palate. Candidal lesions on both sites are sometimes termed "kissing lesions" because they approximate when the tongue is in contact with the palate.

Denture wearing. Denture wearing and poor denture hygiene, particularly wearing the denture continually rather than removing it during sleep, is another risk factor for both candidal carriage and oral candidiasis. Dentures provide a relative acidic, moist and anaerobic environment because the mucosa covered by the denture is sheltered from oxygen and saliva. Loose, poorly fitting dentures may also cause minor trauma to the mucosa, which is thought to increase the permeability of the mucosa and increase the ability of C. albicans to invade the tissues. These conditions all favor the growth of C. albicans. Sometimes dentures become very worn, or they have been constructed to allow insufficient lower facial height (occlusal vertical dimension), leading to over-closure of the mouth (an appearance sometimes described as "collapse of the jaws"). This causes deepening of the skin folds at the corners of the mouth (nasolabial crease), in effect creating intertriginous areas where another form of candidiasis, angular cheilitis, can develop. Candida species are capable of adhering to the surface of dentures, most of which are made from polymethylacrylate. They exploit micro-fissures and cracks in the surface of dentures to aid their retention. Dentures may therefore become covered in a biofilm, and act as reservoirs of infection, continually re-infecting the mucosa. For this reason, disinfecting the denture is

РЕПОЗИТОРИЙ БГМУ

a vital part of treatment of oral candidiasis in persons who wear dentures, as well as correcting other factors like inadequate lower facial height and fit of the dentures.

Dry mouth. Both the quantity and quality of saliva are important oral defenses against candida. Decreased salivary flow rate or a change in the composition of saliva, collectively termed salivary hypofunction or hyposalivation is an important predisposing factor. Xerostomia is frequently listed as a cause of candidiasis, but xerostomia can be subjective or objective, i.e., a symptom present with or without actual changes in the saliva consistency or flow rate.

Diet. Malnutrition, whether by malabsorption, or poor diet, especially hematinic deficiencies (iron, vitamin B_{12}, folic acid) can predispose to oral candidiasis, by causing diminished host defense and epithelial integrity. For example, iron deficiency anemia is thought to cause depressed cell-mediated immunity. Some sources state that deficiencies of vitamin A or pyridoxine are also linked.

There is limited evidence that a diet high in carbohydrates predisposes to oral candidiasis. In vitro and studies show that Candidal growth, adhesion and biofilm formation is enhanced by the presence of carbohydrates such as glucose, galactose and sucrose.

Smoking. Smoking, especially heavy smoking, is an important predisposing factor but the reasons for this relationship are unknown. One hypothesis is that cigarette smoke contains nutritional factors for C. albicans, or that local epithelial alterations occur that facilitate colonization of candida species.

Antibiotics. Broad-spectrum antibiotics (e.g. tetracycline) eliminate the competing bacteria and disrupt the normally balanced ecology of oral microorganisms, which can cause antibiotic-induced candidiasis.

Other factors. Several other factors can contribute to infection, including endocrine disorders (e.g. diabetes when poorly controlled), and/or the presence of certain other mucosal lesions, especially those that cause hyperkeratosis and/or dysplasia (e.g. lichen planus). Such changes in the mucosa predispose it to secondary infection with candidiasis. Other physical mucosal alterations are sometimes associated with candida overgrowth, such as fissured tongue (rarely), tongue piercing, atopy, and/or hospitalization.

Modes of candida transmission. *Primary infection* of the child may occur in utero or passing through the mother's birth canal, who has candidiasis or is candidacarrier.

In *postnatal period* can occur by contact:

– the main source of infection for baby — a mother’s oral cavity,

– from medical serving staff of children’s institutions.

Moniliasis/Candidialis: Classifications (Table 4, Fig. 39).

Репозиторий БГМУ

Table 4

Classification of oral candidosis (Axell et al., 1997)

Primary oral candidosis	Secondary oral candidosis
Acute forms Pseudomembranous Erythematous **Chronic forms** Hyperplastic (nodular or plaque-like) Erythematous Pseudomembranous **Candida-associated lesions** Denture stomatitis Angular cheilitis Median rhomboid glossitis **Keratinized primary lesions with candidal super infection** Leukoplakia Lichen planus Lupus erythematosus	**Oral manifestations of systemic mucocutaneous candidosis** Thymic aplasia Candidosis endocrinopathy syndrome

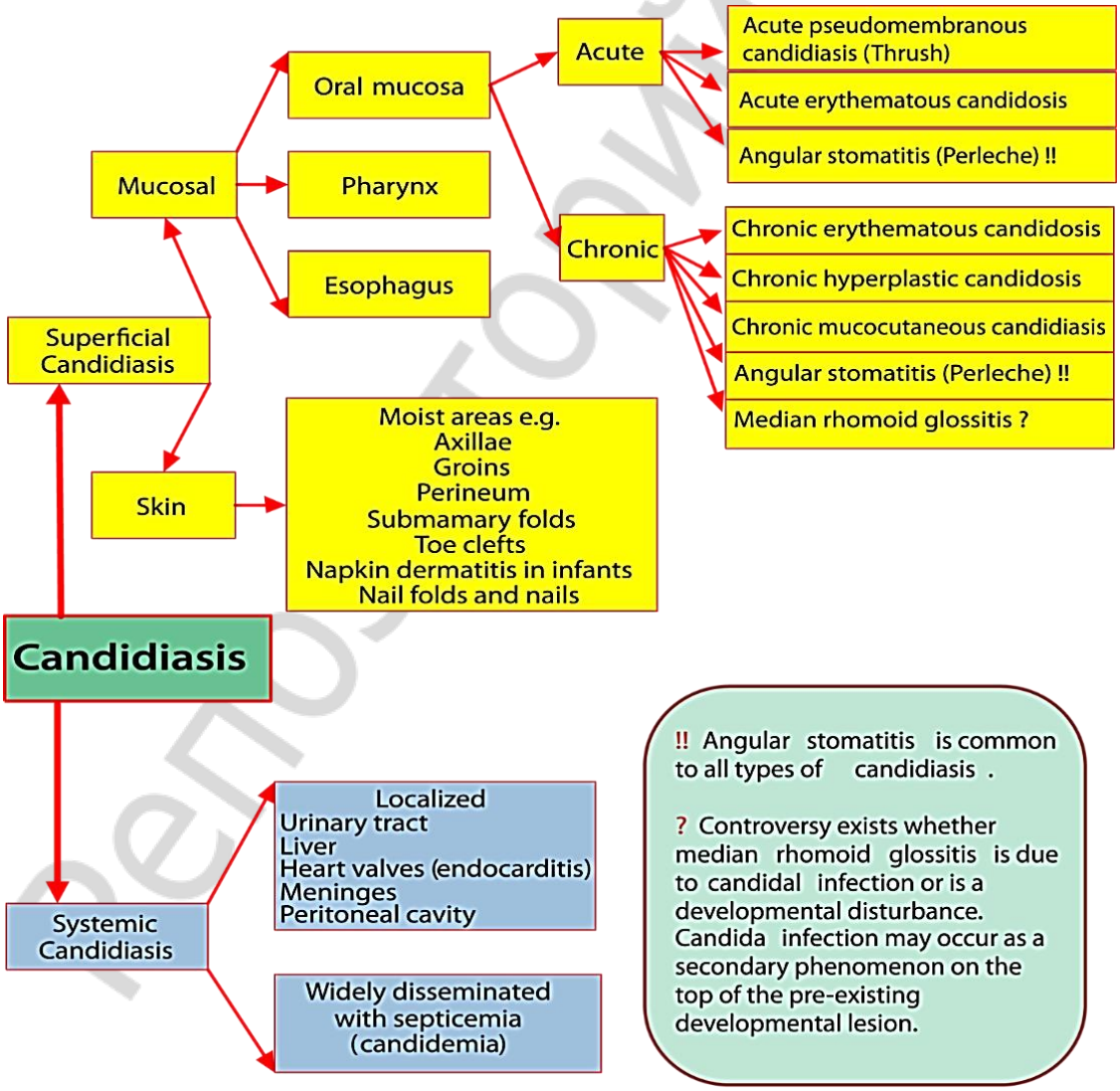

Fig. 39. Classification of human Candida infection

Репозиторий БГМУ

ACUTE CANDIDIASIS (CLINICAL SPECTRUM)

Acute pseudomembranous candidiasis (Thrush). Oral thrush is a superficial mucous membrane infection. Oral candidiasis in neonates is reported to be 0.5–20 %. The most common form of candidiasis affecting this age group is the acute pseudomembranous candidiasis. Candida species isolated from these lesions include C. albicans, followed by C. glabrata, C. tropicalis and C. krusei.

Rapid colonization of the oral cavity of newborns and infants is caused by fungi of the genus Candida and provided by following:

– high ability of fungi Candida to adhesion;

– the low level of the child immunity and protective properties of oral mucosa;

– lack of competitive microflora;

– physiological hyposalivation and oral acidosis;

– high content of glycogen in the oral mucosa of young children;

– morphofunctional immaturity of the oral mucous membrane in newborns and infants.

Oral thrush can develop as early as 7–10 days of age. The major predisposing factors for Oral Candida Infection in Newborns were low birth weight, prolonged hospital stay and associated increased risk of exposure to environmental factors. The use of antibiotics, especially in the first year of life, can lead to recurrent or persistent thrush.

It is uncommon after first year of age but can occur in older children treated with antibiotics. Persistent or recurrent thrush with no obvious predisposing reason, such as recent antibiotic treatment, requires investigation of an underlying immunodeficiency, especially vertically transmitted HIV infection.

Clinical symptoms of Acute pseudomembranous candidiasis (Thrush):

– affects infants, elderly and immunosuppressed persons;

– on the oral surfaces, the superficial component presents as white to whitish-yellow creamy confluent plaques resembling milk curds or cottage cheese that can be scraped off leaving a raw red bleeding surface (Fig. 40);

– clinically, any part of the oral mucosa may be affected especially the tongue, palate and buccal mucosa, mucobuccal folds and oropharynx;

– pseudomembranous candidiasis is rarely painful, however, some cases complain of burning sensation;

– extension of infection to the area of the oral commissures may occur and is known as angular stomatitis or perleche.

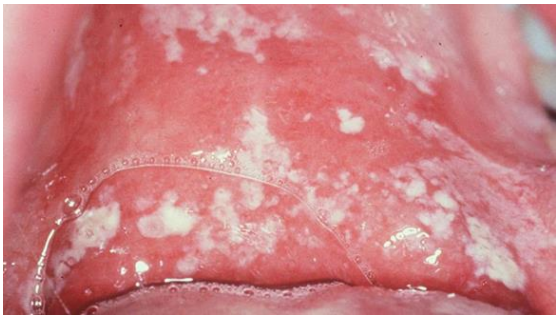

Fig. 40. Pseudomembranous candidiasis

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Histologically pseudomembrane consists of masses of monilial organisms, fungal mycelium, bacterial, desquamated epithelial cells and fibrin. Destruction of the epithelium may be due to the combined effects of toxins and enzymes (lipases and proteases) produced by the monilial organisms.

Mild form of acute pseudomembranous stomatitis. Majority of the lesions are asymptomatic. They mainly present as white scrapable pseudomembranous lesions. Patches are point, white, like curdled milk located in restricted areas of oral mucosa. The superficial pseudo-membrane can be easily removed by wiping gently, leaving behind an underlying hyperemic surface without damage and bleeding.

Moderate form of acute pseudomembranous stomatitis. Children restless, bad sleep. They may complain of an unpleasant taste in the mouth, feeling of burning, pain at the irritating foods.

In the mouth patches present on an erythematous background extended to a few topographic areas of oral mucosa (Fig. 41). Plaque is difficult to scrape off and after removal mucosa is exposed, sometimes with bleeding. Regional lymph nodes can be more enlarged and painful.

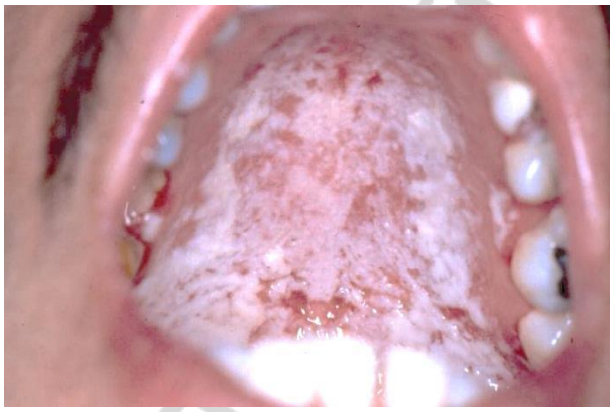

Fig. 41. Pseudomembranous candidosis on the palate of a young male with AIDS

Severe form of acute pseudomembranous stomatitis. General condition is violated, the child refuses a meal, the body temperature rises, there is dryness of the oral mucosa, increasing the viscosity of saliva.

In the mouth the patches are membranous, tight, adherent and dirty-gray color, extend diffusely on all areas oral mucosa. Plaques partially is scraped off but remained part of the plaque is firmly soldered with mucosa. After removal of plaque mucosa is bleeding and the underlying tissues are infiltrated.

Angular cheilitis is determined. Submandibular lymph nodes enlarged.

Treatment for superficial infection is topical administration of antifungals such as 1 % clotrimazole solution thrice daily for 7 days. In case of invasive or disseminated candidiasis, systemic interventions are obligatory.

Acute erythematous candidiasis (Acute antibiotic stomatitis). Persistence of acute pseudomembranous candidiasis may result in loss of the pseudomembrane with presentation of a red lesion known as acute erythematous candidiasis. Remnants of the pseudomembrane may be noted in some areas.

Erythematous candidiasis is relatively rare and manifests as both acute and chronic forms. Previously was known as “antibiotic sore mouth”, due to its association with prolonged use of broad-spectrum antibiotics. Withdrawal of the antibiotic, if possible and institution of oral hygiene lead to improvement

The chronic form is usually seen in HIV patients involving the dorsum of the tongue and the palate and occasionally the buccal mucosa.

It is the only form of candidiasis associated with pain. Children complain of pain at the meal, dry mouth, tongue burning.

***Clinical picture*.** Clinically, it manifests as painful localized erythematous area. Red patchy areas are typically on palate and dorsum of tongue, may be a cause of linear gingival erythema. The lesions are seen on the dorsum of the tongue typically presenting as depapillated areas (Fig. 42). There are also multiple erosions and intense inflammation associated with burning sensation. Palatal lesions are more common in HIV patients.

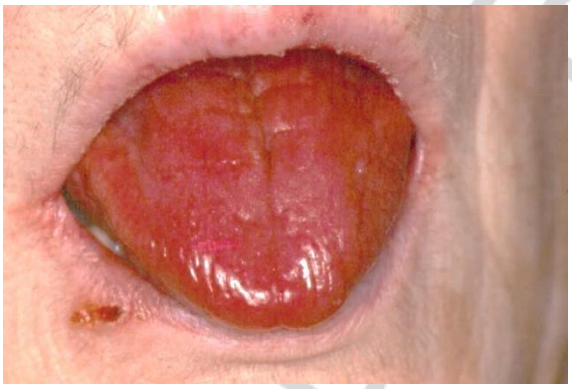

Fig. 42. Acute, painful erythematous candidosis on the tongue, after antibiotics

CHRONIC CANDIDIASIS (CLINICAL SPECTRUM)

- Chronic erythematous candidosis (denture stomatitis, denture sore mouth, chronic atrophic candidiasis).
- Chronic hyperplastic candidosis (candidal leukoplakia).
- Angular cheilitis (angular stomatitis, perleche) common to all types of oral candidosis.
- Median rhomboid glossitis (Central papillary atrophy).
- Chronic mucocutaneous candidosis syndromes:

A) Localized form;

B) Diffuse form (candidal granuloma);

C) Familial form (endocrine candidosis syndrome);

D) Thymoma associated (late onset mucocutaneous candidosis).

Chronic erythematous candidiasis *or Denture stomatitis.*

It is also known as “chronic atrophic candidiasis”. As the name indicates, it is chronic inflammation of the mucosa typically restricted to the denture-bearing area, seen in association with candidiasis. It is seen in almost 50–65 % of the denture wearers.

This pathology is in the elderly who wear complete upper dentures. In children are extremely rare. Possible in children undergoing orthodontic treatment. The associated etiological factors include poor oral hygiene practice, nocturnal denture wear, ill-fitting prostheses and limited flow of saliva.

Clinically, the lesion appears as a bright red, velvety surface with little keratinization (Fig. 43, 44). Typical symptoms are the swelling and erythema of oral mucosa. It occurs frequently along with angular cheilitis (perleches). The lesions are usually asymptomatic, though occasionally patients may complain of burning sensation or soreness. It commonly affects the palate although mandibular mucosa may also be affected.

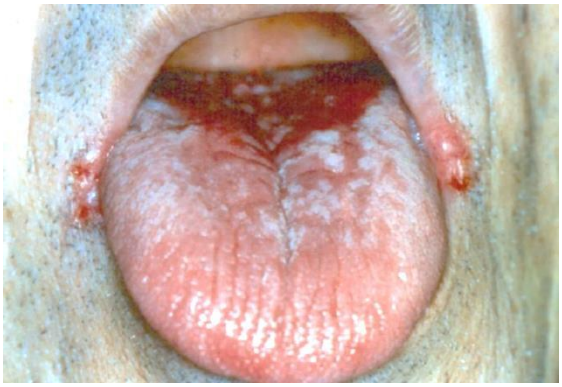

Fig. 43. Angular cheilitis and erythematous candidosis on the tongue of a male. Patient wore dentures

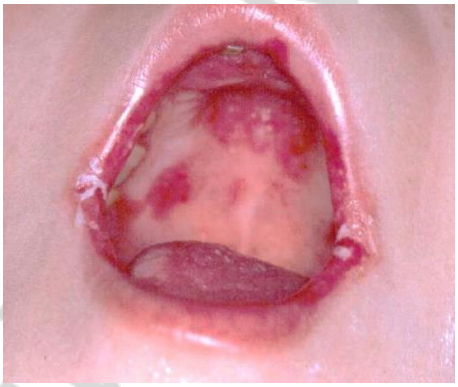

Fig. 44. Erythematous candidosis on the palate of a 7 year-old girl, with vertical HIV transmission

Chronic hyperplastic candidiasis. The hyperplastic candidiasis mainly presents as chronic form. It has been commonly referred previously as “candidal leukoplakia”.

Patients complain of pain while taking acidic, spicy food; feeling of dry mouth or dysgeusia and sometimes painless.

Clinically, it may manifest as one of the two variants: homogeneous adherent white plaque-like (Fig. 45) or erythematous multiple nodular/speckled type. Hyperemia around the plaques sometimes is observed. The lesions usually occur bilaterally in the commissural region of the buccal mucosa and less frequently on the lateral border of the tongue and palate. Unlike the pseudomembranous type, hyperplastic candidiasis lesions are non-scrapable.

There appears to be a positive association with smoking and in addition may present with varying degrees of dysplasia. A confirmed association between Candida and oral cancer is yet to be recognized, although in vitro studies have shown that the candida organisms can generate carcinogenic nitrosamine. Sometimes it occurs in adults with no apparent predisposition to infection by candida albicans and it is believed by some clinicians to represent a premalignant lesion. A small percentage of cases occur in association with iron and folate deficiencies and with defective cell-mediated immunity.

When occurring in the retro-commissural area, the lesion resembles speckled leukoplakia and in some classifications is known as candidal leukoplakia.

Differential diagnosis may include leukoplakia, lichen planus, angular cheilitis and squamous cell carcinoma.

Papillary Hyperplasia of the Palate is considered to be a subtype of chronic hyperplastic candidiasis (Fig. 46). These are individual nodules or papules measuring 2 to 3 mm in diameter on an erythematous background found usually under ill-fitting upper dentures.

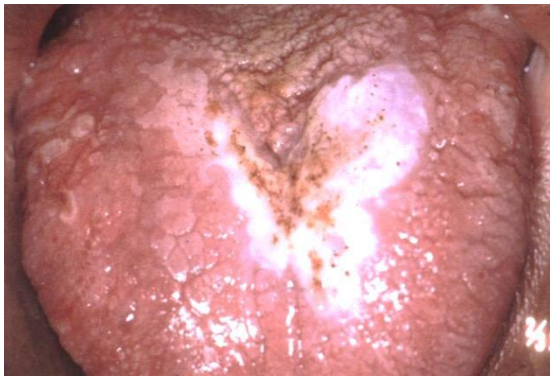

Fig. 45. Chronic Hyperplastic Candidosis

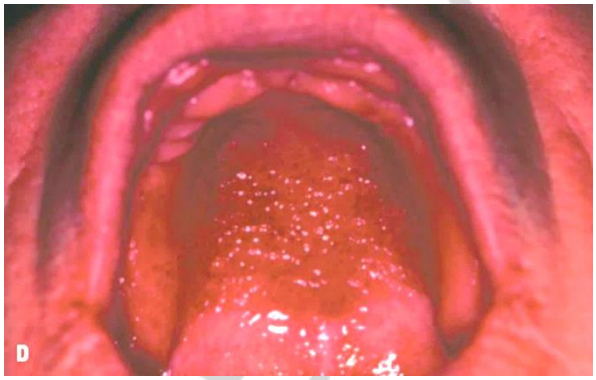

Fig. 46. Papillary Hyperplasia of the Palate

Angular cheilitis. Angular cheilitis (angular stomatitis, perleche) common to all types of oral candidosis.

Angular stomatitis is typically caused by leakage of candida infected saliva at the angles of the mouth. Angular cheilitis often represents an opportunistic infection of fungi and/or bacteria, with multiple local and systemic predisposing factors involved in the initiation and persistence of the lesion.

The factors associated include:

– old age and denture-wearers (due to reduced vertical dimension);

– in children with malocclusion,

– bad habit of thumb sucking, licking or biting the corners of the mouth, addiction to chewing gum;

– it can be seen in infantile thrush;

– predisposing factors also include vitamin B_{12} deficiency, iron deficiency anemia and saliva spreading to skin.

Hence, angular cheilitis can associate other types of candidiasis and is a characteristic feature of candidal infection. Saliva will accumulate in the skin folds at the oral commissures and is subsequently colonized by Candidal yeasts associated sometimes with Staphylococcus Aureus or β-haemolytic Streptococci.

Clinical symptoms. This form of candidiasis usually manifests as erythematous or ulcerated fissures, typically affecting unilaterally or bilaterally the commissures of the lip (Fig. 47). Clinically it characterized by:

– crusted cracked lesions at the angle of the mouth;

– the lesions are somewhat painful (at opening the mouth and lip movements), fissured, eroded;

– and covered with easily removable plaques.

In acute pseudomembranous candidiasis, extension of infection may occur to the area of the oral commissures.

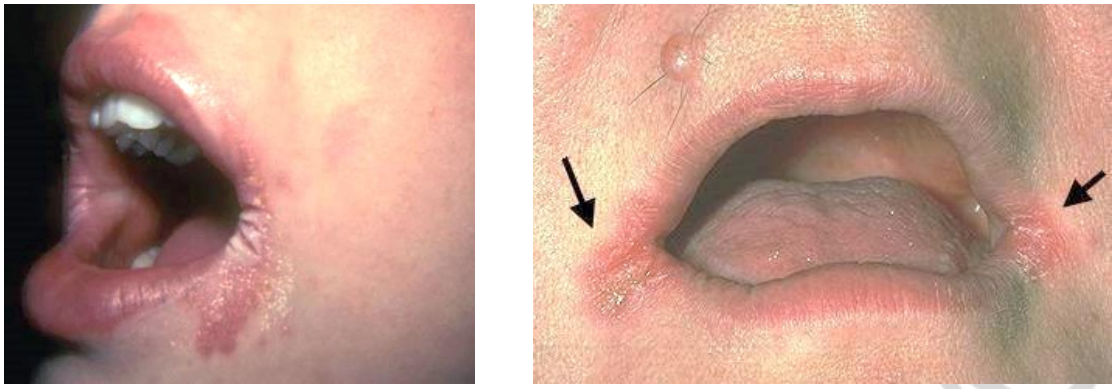

Fig. 47. Angular cheilitis. Is considered to be caused by Candida albicans fungus and sometimes is termed "Oral Perleche"

Treatment of intra-oral candidal infection alone causes angular stomatitis to resolve. If there is co-infection with staphylococcus aureus, local application of topical antibiotics may be required (miconazole + hydrocortisone cream).

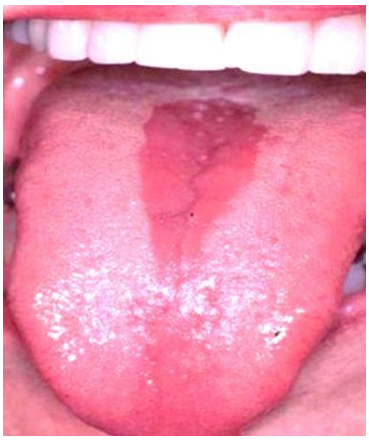

Fig. 48. Median rhomboid glossitis

Median rhomboid glossitis (Central papillary atrophy). Median rhomboid glossitis appears as the central papillary atrophy of the tongue and is typically located around the midline of the dorsum of the tongue. It occurs as a well-demarcated, symmetric, depapillated area arising anterior to the circumvallate papillae (Fig. 48). The surface of the lesion can be smooth or lobulated. While most of the cases are asymptomatic, some patients complain of persistent pain, irritation, or pruritus.

The lesion is now believed to be a localized chronic infection by C. albicans. It is commonly seen in tobacco smokers and inhalation-steroid users. Since MRG (Management Research Group) is never seen in children, its developmental etiology is denied by some authors. The role of candida albicans as the primary etiology of the condition is still controversial because of the fixed site and shape of the lesion. Therefore, the etiology of median rhomboid glossitis remains speculative.

Treatment is only normally indicated if the lesion gives to discomfort.

Chronic mucocutaneous candidiasis. Chronic mucocutaneous candidiasis is a persistent candidal infection of the skin and mucous membranes secondary to defective immune response. Four forms have been recognized:

– Localized form.
– Diffuse form.
– Familial form (endocrine candidosis syndrome).
– Thymoma associated.

Localized form is seen as a persistent candidiasis of the oral mucosa, vaginal mucosa, nails and skin. This form begins early in life (first decade) as pseudomembranous candidiasis and is soon followed by nail and skin

involvement. Lesions are resistant to treatment with only temporary remissions following the use of standard antifungal drugs.

Diffuse form is similar to the localized form but there is diffuse and widespread involvement of the oral mucosa, vaginal mucosa, pharyngeal mucosa, skin and nails. This form is known as "candidal granuloma" (Fig. 49) because of the extensive disfiguring warty overgrowths on the skin. However, there is no granuloma formation microscopically, instead, there is extreme epithelial proliferation.

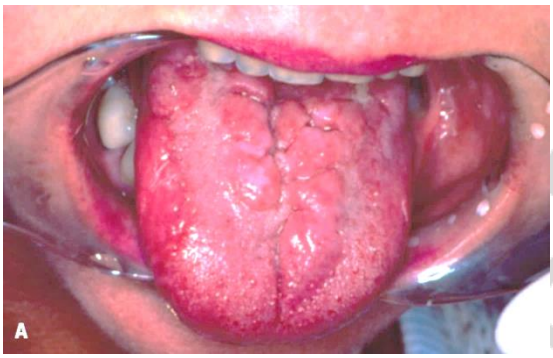

Fig. 49. Localized granulomas and nodules on the tongue

Familial form (*Familial Chronic Mucocutaneous Syndrome*). A rare autosomal recessive disorder in which the cause and effect relationship between the candidosis and the endocrine deficiency is unknown. The condition is characterized by:

1. Candidal infection may precede the onset of the endocrine deficiency by as long as 15 years but occasionally the sequence is reversed.
2. Hypothyroidism.
3. Hypoparathyroidism.
4. Diabetes mellitus.
5. Addison's disease (adrenal cortex insufficiency).
6. Hypoplastic dental defects are frequently present.

Thymoma associated (*Late onset Mucocutaneous Candidosis*). This syndrome has a clear immunological basis, in that there is a persistent defect in the T-cell mediated immunity produced by a thymoma. The condition is characterized by:

1. Candidal infection.
2. Thymoma.
3. Myasthenia gravis (a disease characterized by progressive weakness of voluntary muscles and caused by an autoimmune attack on acetylcholine receptors at neuromuscular junctions).
4. Red cell aplasia.

CANDIDIASIS ASSOCIATED WITH HIV

Oral thrush is the most common Candida infections in HIV-infected children and is characterized by a large area of destruction. Besides oral thrush, 3 other types of oral Candida infections can occur in HIV-infected children: atrophic candidiasis, chronic hyperplastic candidiasis and angular cheilitis (Fig. 50).

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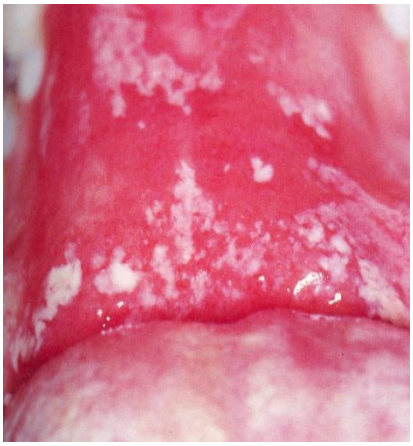

Fig. 50. Candida infections in HIV-infected child

Candidiasis is a marker of the disease and a precursor of other opportunistic infections.

Candida infections in HIV-infected adults can be appeared as Linear gingival erythema. It was previously referred to as "HIV-gingivitis" since its typical occurrence was in HIV associated periodontal diseases. It manifests as linear erythematous band of 2–3 mm on the marginal gingiva along with petechial or diffuse erythematous lesions on the attached gingiva. The lesions may present with bleeding. In addition to C. albicans, C. dubliniensis has been reported as an emerging pathogen in this form of candidiasis.

CANDIDA SPECIES INFECTIONS IN PATIENTS WITH DIABETES MELLITUS

Higher Candida sp. colonization rates were reported in patients with Diabetes Mellitus type 1 when compared to DM type 2 patients (84 % vs. 68 %, respectively), while the percentage in nondiabetic subjects was around 27 %.

The causes influencing the higher incidence of oral candidiasis in diabetic patients are: uncontrolled hyperglycemia and high glucose levels in saliva, lower salivary pH, poor oral hygiene, xerostomia and reduced tissue response to injury. It is also probable that the host oral epithelium of patients with diabetes favors the adhesion of colonization and subsequent infection. Higher expressions in enzymatic activity and the biofilm forming capacity of Candida sp. are two of the most important features in oral candidiasis.

There are following features of oral Candida infection clinical manifestation in patients with Diabetes Mellitus:

– severity and frequency of candidiasis is directly dependent on the type of diabetes, duration and course of treatment;

– the ability to regress when compensation of carbohydrate metabolism, diet, insulin therapy;

– relapses can occur with an increase in blood sugar levels;

– long chronic course with a tendency to deep tissue lesions with ulceration without the expressed inflammatory infiltrates (Fig. 51);

– resistance to treatment.

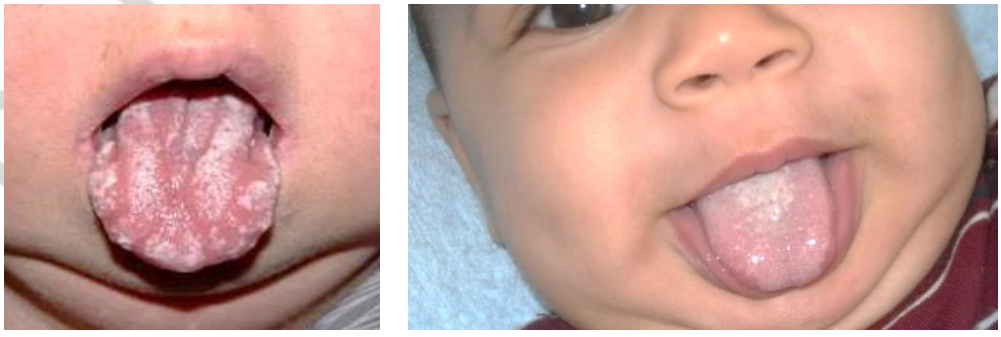

Fig. 51. Candidiasis in child with Diabetes Mellitus

Diagnosis of fungal infections. The diagnosis can typically be made from the clinical appearance alone, but not always. As candidiasis can be variable in appearance, and present with white, red or combined white and red lesions, the differential diagnosis can be extensive. In pseudomembraneous candidiasis, the membranous slough can be wiped away to reveal an erythematous surface underneath. This is helpful in distinguishing pseudomembraneous candidiasis from other white lesions in the mouth that cannot be wiped away, such as lichen planus, oral hairy leukoplakia. Erythematous candidiasis can mimic geographic tongue. Erythematous candidiasis usually has a diffuse border that helps distinguish it from erythroplakia, which normally has a sharply defined border.

Special investigations to detect the presence of candida species include oral swabs, oral rinse or oral smears. Smears are collected by gentle scraping of the lesion with a spatula or tongue blade and the resulting debris directly applied to a glass slide. Oral swabs are taken if culture is required. Some recommend that swabs be taken from 3 different oral sites. If candidal leukoplakia is suspected, a biopsy may be indicated.

Smears and biopsies are usually stained with periodic acid-Schiff, which stains carbohydrates in fungal cell walls in magenta. Gram staining is also used as Candida stains are strongly Gram positive (Fig. 52, 53).

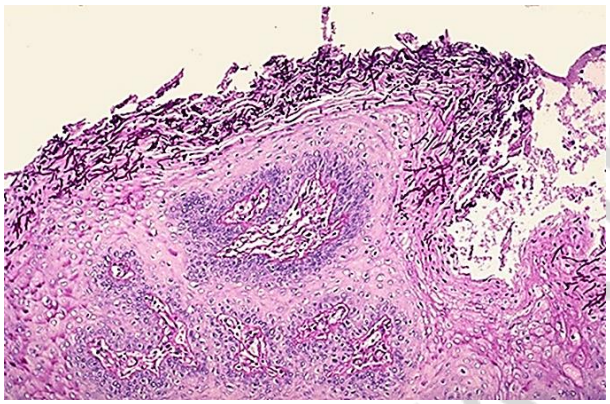

Fig. 52. A PAS stain reveals the budding cells and pseudohyphae of Candida on the surface of the tongue

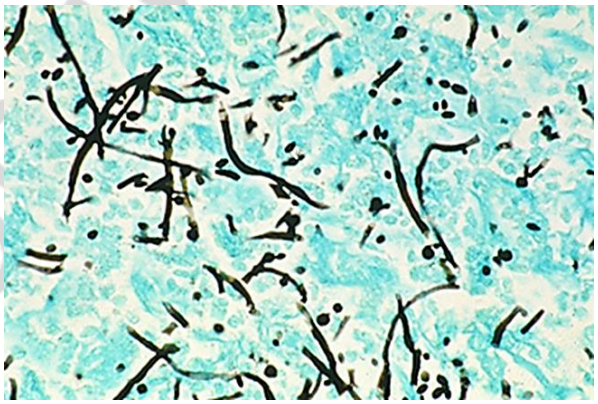

Fig. 53. Candida Infection — GMS (Grocott Methenamine Silver) stain shows characteristic pseudohyphae and buds of Candida

Additional methods of diagnostics:

– microscopic;
– microbiological;
– immunofluorescence;
– serological;
– histological;
– radioimmunoassay;
– immunoassay;
– chromatography;
– polymerase chain reaction.Sometimes an underlying medical condition is sought, and this may include blood tests for full blood count and hematinics.

MANAGEMENT OF ORAL CANDIDOSIS

An effective management of oral candidiasis can be achieved by adhering to the following simple guidelines:

1. Diagnosis through detailed medical and dental history, clinical manifestations confirmed with laboratory tests.

2. Correction of predisposing factors where achievable.

3. Maintenance of proper hygiene of the oral cavity and oral prostheses, if any.

4. Selection of antifungal therapy based on severity of the infection and susceptibility of the Candida species prevalent in that patient.

Diagnosis of oral candidosis includes identification of clinical signs and symptoms, presence of the candida organisms on direct examination of a smear from the lesion or biopsy examination showing hyphae in the epithelium, positive culture, and serological tests.

A priority in the treatment of oral candidosis is the alleviation of any identifiable predisposing factor.

Parents should control a balanced diet for the child, for which they should:

– avoid excess carbohydrates in the diet, daily use dairy products containing live bifidobacteria (yogurt);

– introduce the biological products containing live cultures of acidophilic bacteria (lactobacterin, bifidumbacterin);

– and vitamins and drugs to stimulate non-specific immunity.

Since smoking is associated with many of forms of oral candidiasis, cessation may be beneficial.

If candidiasis is secondary to corticosteroid or antibiotic use, then use may be stopped, although this is not always a feasible option. Candidiasis secondary to the use of inhaled steroids may be treated by rinsing out the mouth with water after taking the steroid. Use of a spacer device to reduce the contact with the oral mucosa may greatly reduce the risk of oral candidiasis.

Certain predisposing factors are, however, more difficult if not impossible to eradicate such as where there is an underlying disease (e.g. leukaemia or AIDS). In these cases, targeted antifungal therapy, plays an important role in the management strategy. Prophylactic use of antifungals is employed in persons who are immunocompromised, either with HIV/AIDS or as a result of chemotherapy, during radiotherapy, during immunosuppressive or prolonged antibiotic therapy as the development of candidal infection in these groups may be more serious.

The candidal load in the mouth can be reduced by improving oral hygiene measures, such as regular toothbrushing and use of anti-microbial mouthwashes.

Both the physical and chemical reduction of Candida load in the oral cavity can be achieved by good oral hygiene practices including tooth brushing and the use of antimicrobial mouthwashes. Manual tooth brushing is limited to accessible oral surfaces, although powered or electrical tooth brushing may be more effective as cavitation within surrounding fluids could disrupt Candida biofilms at otherwise inaccessible sites. Several mouthwashes exhibit anti-

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candidal activity including triclosan, chlorhexidine gluconate, and essential oil formulations. The latter tend to contain natural plant extracts such as thymol, eucalyptol, and bioflavanoids and these can have a direct anti-candidal activity in vitro through cell membrane disruption and enzyme inhibition.

Good *denture hygiene* involves regular cleaning of the dentures, and leaving them out of the mouth during sleep. This gives the mucosa a chance to recover, while wearing a denture during sleep is often likened to sleeping in one's shoes. In oral candidiasis, the dentures may act as a reservoir of Candida species, continually reinfecting the mucosa once antifungal medication is stopped. Therefore, they must be disinfected as part of the treatment for oral candidiasis. There are commercial denture cleaner preparations for this purpose, but it is readily accomplished by soaking the denture overnight in a 1:10 solution of sodium hypochlorite (Milton, or household bleach). Bleach may corrode metal components, so if the denture contains metal, soaking it twice daily in chlorhexidine solution can be carried out instead. An alternative method of disinfection is to microwave the dentures in 200 mL water for 3 minutes at 650 watts. Microwave sterilization is only suitable if no metal components are present in the denture. Antifungal medication can also be applied to the fitting surface of the denture before it is put back in the mouth. Other problems with the dentures, such as inadequate occlusal vertical dimension may also need to be corrected in the case of angular cheilitis.

Improving *oral hygiene for infants* includes:

– necessarily to process all baby care items with the 2–5 % solution of bicarbonate of soda (pacifier, cup, spoon, etc.);

– intake sweetened water, and lubrication of nipple before breastfeeding or pacifiers by sweetened water or syrup should be excluded.

Treatment. ***Antifungal agents*** that are available for the treatment of candidosis fall into four main categories: the polyenes (nystatin and amphotericin B); the ergosterol biosynthesis inhibitors — the azoles (miconazole, clotrimazole, ketoconazole, itraconazole, and fluconazole); and DNA analog 5-fluorocytosine, and newer agents such as caspofungins (Table 4).

Classification of antifungal agents is based on the target of activity, and in the treatment of candidosis the two classes most commonly used are the polyenes and the azoles. The used antifungal agents in the management of Candidiasis is listed in Table 4.

There are three main antifungal drug targets in Candida: the cell membrane, cell wall, and nucleic acids (Fig. 54).

Polyenes include the drugs amphotericin B and nystatin. Polyenes are fungicidal drugs that act through direct binding to the ergosterol within the fungal cell membranes, inducing leakage of cytoplasmic contents leading to the fungal cell death.

At high therapeutic concentrations, polyenes do exhibit a degree of toxicity in humans. The use of polyenes is limited as they are poorly absorbed through the gut and, therefore, topical application in the form of lozenges and oral suspensions are the principle means of administration in oral infection.

Table 4

Antifungals used in the management of candidosis

Antifungal	Mode of action	Administration	Frequently recommended treatment
POLYENES – Nystatin – Amphotericin B	Binds to ergosterol and disrupts fungal cell membrane	 Topical Topical	 CEC CEC
AZOLES – Fluconazole – Miconazole – Ketoconazole – Clotrimazole – Itraconazole – Voriconazole – Posaconazole	Inhibits ergosterol biosynthesis	 Systemic Topical Topical/systemic Topical Systemic Systemic Systemic	 PMC, AEC, CHC CEC PMC, AEC, CHC CEC PMC, AEC, CHC
PYRIMIDINE ANALOGS 5-flucytosine	Inhibition of DNA/protein synthesis	Systemic, often in combined therapy with amphotericin	
ECHINOCANDINS – Caspofungin – Micafungin – Anidulafungin	Inhibits ß 1, 3 D-glucan synthesis	Intravenous	

Abbreviations: CEC, chronic erythematous candidosis; PMC, pseudomembranous candidosis; AEC, acute erythematous candidosis; CHC, chronic erythematous candidosis.

Nystatin is used as an ointment or oral suspension. Amphotericin B is used as a lozenge. Miconazole is used as an oral gel and cream. Clotrimazole is used as a cream and pessary. Other antifungals are available and more frequently used in hospitalised patients.

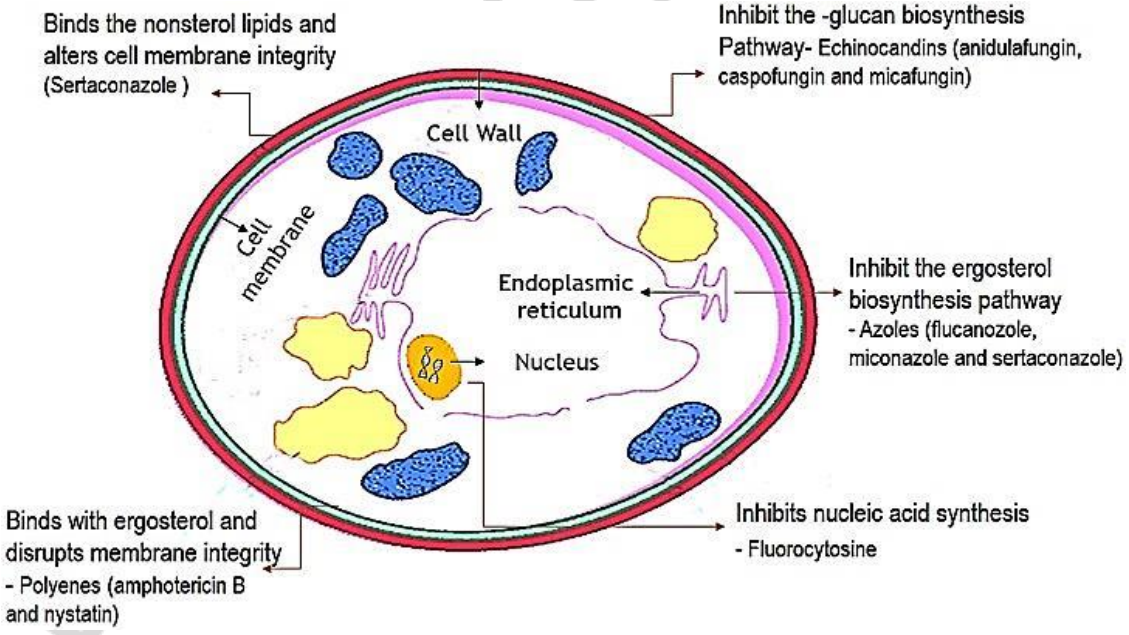

Fig. 54. Cellular targets of antifungal agents (The antifungal agents target three cellular components of fungi. Azoles inhibit the synthesis of ergosterol in the endoplasmic reticulum of the fungal cell. Polyenes such as amphotericin B bind to ergosterol in the fungal membrane causing disruption of membrane structure and function. Flucytosine is converted within the fungal cell to 5-fluorouracil which inhibits DNA synthesis.)

Unlike the polyenes, azole antifungals are fungistatic rather than fungicidal. The mechanism of action is by inhibiting the fungal ergosterol synthesis and growth of pathogenic yeasts by altering cell membrane permeability.

Since azoles are fungistatic, complete resolution of the infection will be aided by simultaneously addressing predisposing host factors. The two most frequently administered azole antifungals in the treatment of oral candidosis are fluconazole and itraconazole and these drugs have the advantage of being readily absorbed through the gut with the result that oral administration is an effective means of delivery. Furthermore, fluconazole is secreted in high levels in saliva making the agent particularly suitable for treating oral infection.

Unfortunately, in recent years Candida resistance to azole antifungals has been detected.

Recently, the echinocandin class of antifungals have emerged as alternatives to the azoles and polyenes. Echinocandins act through inhibition of the D-glucan synthase, which is an enzyme required for the synthesis of the fungal cell wall. This enzyme is absent from mammalian cells thereby reducing potential host cell toxicity. Whilst echinocandins such as caspofungin, micafungin, and anidulafungin are fungicidal against Candida, their use is somewhat limited by their large molecular size that dictates the need for intravenous administration. Echinocandins are primarily used in the treatment of invasive fungal infections.

The choice of antifungal treatment depends on the nature of the lesion and the immunological status of the patient.

Oral candidiasis can be treated with topical anti-fungal drugs. However, there is strong evidence that drugs that are absorbed or partially absorbed from the GI tract can prevent candidiasis more effectively than drugs that are not absorbed in the same way.

Superficial oral candidosis in generally healthy patients can be treated topically and oral candidosis in immunocompromised patients should be treated systemically as well as topically. Patients with persisting risk factors and relapsing candidosis should be treated with antifungals with the lowest risk of development or selection of resistant strains.

Topical Antifungals. Topical antifungals are usually the drug of choice for uncomplicated, localized candidiasis in patients with normal immune function. High levels can be achieved in the oral epithelium with topically administered antifungals.

Nystatin or amphotericin B solutions are used for 4 weeks. In recurrent cases the duration of treatment should be for at least 4–6 weeks.

Topically administered miconazole gel is also suitable for the treatment of uncomplicated infections in generally healthy patients. It should also be used for 1 week after resolution of symptoms. Repeated use of miconazole, however, may cause a risk of development of azole-resistant strains.

Systemic antifungals are usually indicated in cases of disseminated disease and/or in immunocompromised patients.

РЕПОЗИТОРИЙ БГМУ

Azoles are fungistatic drugs that inhibit the fungal enzyme lanosterol demethylase responsible for the synthesis of ergosterol. Among the azoles, fluconazole attains a higher concentration in the saliva making it principally the suitable drug for treating this oral infection. Fluconazole and itraconazole are administered orally and it gets secreted onto mucous membranes. The oral solution also has a topical effect. The other antifungals, echinocandins, and flucytosine act through inhibition of d-glucan synthase and DNA/protein synthesis, respectively. Posaconazole, is available only as an oral solution and is used in immunocompromised patients and patients' resistant to other drugs.

Alternative Anti Candidal Agents.

• A few natural anti-yeast substances can be used as an alternative treatment. These agents with recognized activity against C. albicans includes berberine-containing plants; caprylic acid; grapefruit seed extract; garlic; probiotics; tea tree oil and enteric-coated volatile oil preparations containing cinnamon, ginger, oregano, peppermint and rosemary; propolis and thyme.

• Xylitol is known to inhibit microbial metabolism in the oral cavity. It is therefore incorporated in chewing gums and tablets as well as in health care products such as dentifrice and oral rinses. Although it has a limited effect on Candida, it could be beneficial in prevention of the mixed biofilm infection. The essential oil of Melaleuca alternifolia, also known as tea tree oil has been shown to be promising as a topical antifungal agent, with recent clinical data indicating efficacy in the treatment of oral candidiasis

• Successful treatment of candidosis can be hampered where there is an established biofilm. Candida biofilms exhibit significantly higher tolerance to both antimicrobial mouthwashes and also traditional antifungal agents. As a consequence, alternative strategies have been suggested to combat such infections. These have included the modification of biomaterials such as those used in denture prosthesis to inhibit adherence of Candida. Examples include the use of coatings with silanes, chlorhexidine, histatins, antifungals, as well as the incorporation of surface-modifying groups.

• Alternative possible strategies could involve the use of probiotics, which would induce an added microbiological pressure on Candida within the oral cavity and may also promote local immune function. Recent experimental studies and results from randomized controlled trials have shown that certain gut bacteria, in particular species of Lactobacillus and Bifidobacterium, may exert beneficial effects in the oral cavity by inhibiting cariogenic streptococci and Candida sp. Lactic acid bacteria can produce different antimicrobial components such as organic acids, hydrogen peroxide, carbon peroxide, diacetyl, low molecular weight antimicrobial substances, bacteriocins, and adhesion inhibitors, which also affect oral microflora.

Prevention of Oral Candidosis. Good oral hygiene practices may help to prevent oral thrush in people with weakened immune systems. Careful mechanical cleaning of teeth and dentures with a toothbrush is the cornerstone of the prevention of candida infections.

Oral decontamination using antifungal and antibacterial rinses is one of the approaches often used to manage oral mucositis. Chlorhexidine digluconate, and cetylpyridinium chloride are two antiseptics often incorporated in mouth rinses and used as prophylaxis for both chemotherapy and radiotherapy induced mucositis.

People who use inhaled corticosteroids may be able to reduce the risk of developing thrush by washing out the mouth with water or mouthwash after using an inhaler.

For susceptible denture wearers, it is advisable to remove the denture at night and soak in 0.2 % Chlorhexidine solution or 15–30 min in white vinegar (diluted 1:20) or 0.1 % hypochlorite solution.

The elimination or at least regulation of the predisposing factors for candidiasis is essential. Failure to recognize this may only provide a temporary relief using antifungal therapy, but with inevitable relapse of the infection.

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CONTENT

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