Effects of Systemic Diseases on Oral Health

Mayank Agrawal¹, Sugandha Agarwal², Sonam Agrawal³

Abstract

Systemic autoimmune and inflammatory diseases often manifest oral lesions in their earliest stages, and early diagnosis, which may be spurred by a dental examination, is key for improved outcomes. After systemic diagnosis, oral lesions benefit from specialized care by dentists in collaboration with the medical team. An understanding of the relationship between systemic disease and oral pathology is important with respect to establishing the diagnosis and determining the complexity of subsequent management.

Oral involvement precedes the appearance of other symptoms or lesions at other locations. These oral manifestations must be properly recognized if the patient is to receive appropriate diagnosis and referral for treatment.

Thus oral cavity is an important diagnostic area not just because it contains derivatives of all of the primary germinal layers, and includes tissues not demonstrable anywhere else in the body, but also because of its role played in diagnosing a number of systemic diseases just because of their oral manifestations.


Key words: oral, diseases, systemic, manifestation

Introduction

The mouth is a mirror of health or disease, a sentinel or early warning system. As the gateway to the body, a constant barrage of invaders like bacteria, viruses, parasites, and fungi, challenges the mouth. Many systemic diseases have oral manifestations.¹ A wide array of systemic diseases encountered in internal medicine have manifestations in the oral cavity. Most of these manifestations are nonspecific but should alert the surgeon to the possibility of concurrent systemic disease or latent systemic disease. Some diseases identified in the oral cavity may be specific.³ These lesions develop on the oral mucosa,
tongue, gingiva, dentition, periodontium, salivary glands, facial skeleton, extraoral skin and other related structures. These oral manifestations must be properly recognized if the patient is to receive appropriate diagnosis and referral for treatment.\textsuperscript{1}

Vitamin Deficiencies\textsuperscript{1}

**Vitamin A**

It is a vitamin that is needed by the retina of the eye, that is necessary for both low-light and color vision.

Oral manifestations are:
1. Tooth Eruption rate is retarded
2. Retarded alveolar bone formation,
3. Hyperplastic gingival epithelium followed by keratinization

**Riboflavin (Vitamin B\textsubscript{2})**

Participates in a wide range of oxidation-reduction reactions in the form of coenzymes.

*Riboflavinosis* is associated with number of oral alterations: Initially glossitis involving the tip and/or the lateral margins of the tongue, followed later by complete atrophy of all papillae. The tongue has a magenta color. Pallor, involving oral mucosa followed by cheilosis and fissuring at the angles of the mouth.

Oral manifestations are:
1. Sore throat
2. Swelling and erythema of the oral mucosa.
3. Cheilosis- Changes at the angles of the mouth.
4. Initially there is hyperkeratosis of the epidermis, inflammation in the dermis.
5. Later occur fissures radiating from the corners of the mouth which become secondarily infected.
6. Glossitis- Tongue is atrophic, glazed with red-blue coloration resembled to cyanosis.

**Niacin deficiency** (Vitamin B\textsubscript{3})

Acts as a coenzyme for oxidation reduction reactions. Foods containing niacin include lean meat and liner, peanuts, yeast. Niacin deficiency syndrome - pellagra. The clinical syndrome is identified as dermatitis, diarrhea, dementia.

Oral manifestations are:
1. Stomatitis (redness, thickening, roughening, scaling, fissures and chronic inflammation)
2. Glossitis (tongue red, swollen and beefy)
3. Oral mucosa becomes fiery red and painful.
4. Glossitis, pain, redness and ulceration begin at the interdental papillae and spread rapidly.

**Pyridoxine (Vitamin B\textsubscript{6})**

Participates in aminoacid synthesis. Occurs in animal and vegetable food. A deficiency is unusual.

Oral manifestations are:
1. Cheilitis
2. Glossitis

**Vitamin C deficiency (Scurvy)**

Necessary for the proper synthesis of collagen. Occurs mainly in citrus fruits. A deficiency is known as Scurvy. Hemorrhage (purpura and ecchymoses) of skin and gingival mucosa, subperiostal hematomas are common. Skeletal changes in infants and children.

Oral manifestation are:
1. Gingival swelling with spontaneous hemorrhage, ulceration, tooth mobility, secondary periodontal infection and periodontal bone loss. The gingival lesions are called Scorbutic gingivitis.
2. Wound healing and localization of focal infections are impaired because of the derangement of collagen synthesis.
3. There is inflammation of the interdental and marginal gingiva followed by bleeding, ulceration, halitosis.
4. Hemorrhages and swelling of the periodontal membranes occur, followed by loss of bone and loosening of the teeth, which eventually exfoliate.
5. Scurvy
Vitamin D

Developmental anomalies of dentin and enamel, delayed eruption, and misalignment of the teeth in the jaws, there is often peri-apical involvement of grossly normal appearing deciduous or permanent teeth, followed by the development of multiple gingival fistulas and Rickets. Radiographically there is abnormal alveolar bone pattern. Cementum, and lamina dura around the teeth is absent or poorly defined.

Vitamin K

A deficiency or inhibition of syntheses of vitamin K leads to coagulopathy (inadequate synthesis of prothrombin and other clotting factors). Most common oral manifestation is gingival bleeding. Prothrombin levels below 35% result in bleeding after tooth brushing; and when below 20% result in spontaneous gingival hemorrhages, Gingival bleeding.

Diseases of Gastrointestinal Tract

Hepatitis

The hepatitis C virus (HCV) is an enveloped, single-stranded, positive-sense RNA virus whose primary target organ is the liver. Hepatitis is an acute inflammatory and infective infection causing the inflammation of the liver. HCV infection mainly targets the liver, causing hepatitis, cirrhosis, and hepatocellular carcinoma. The pathogenesis of HCV infection has become increasingly linked to multiple organs, not just limited to the liver. The symptoms include high grade fever with tenderness, enlargement of liver, vomiting, malaise etc.

Oral manifestations are Icterus of the oral mucosa in the palatal and the sublingual region.

Jaundice

It is the yellowish discoloration of the skin and mucosa resulting from accumulation of bilirubin in the tissue. It occurs when bilirubin is elevated in the blood.

Oral manifestations are:

1. Icterus of the oral mucosa in the palatal and the sublingual region.
2. In severe cases patient may present with spontaneous bleeding in the oral cavity.

Gastroesophageal Reflux Disease

Dental erosion is the loss of tooth structure due to chemical (usually acids) exposure. Sources of acids include diet (soft drinks, juices), gastric secretions or industrial chemicals. Additionally hyposalivation, the use of acidic medicaments intra-orally and improperly performed oral hygiene procedures have all been associated with dental erosion. Patients with dental erosion are more susceptible to attrition and may complain of dental sensitivity, Dental erosion.

Aquired Immuno Deficiency Syndrome (AIDS)

Defination by WHO- “One or more opportunistic infections listed in clinical feature that are atleast moderately indicative of underlying cellular immune deficiency. Absence of all known underlying causes of cellular immune deficiency and absence of all other causes of reduced resistance reported to be associated with atleast one of those opportunistic diseases.” 95% of AIDS patients have head and neck lesions and about 55% have important oral manifestations.

The oral signs of HIVD/AIDS are categorized as:
1. Fungal Infections
2. Viral Infections
3. Bacterial Infections
4. Neoplasms
5. Others

- FUNGAL LESIONS
  i) Candidiasis
  ii) Histoplasmosis
  iii) Cryptococcus Neoformans

- VIRAL LESIONS
  i) Herpes Simplex
  ii) Herpes Zoster
  iii) Human Papillomavirus Lesions
  iv) Cytomegalovirus
Hairy Leukoplakia and Epstein-Barr Virus

BACTERIAL LESIONS
- Periodontal Disease

NEOPLASTIC LESIONS
i) Kaposi’s Sarcoma
ii) Lymphoma

OTHER ORAL LESIONS ASSOCIATED WITH HIV DISEASE
i) Oral Ulceration
ii) Idiopathic Thrombocytopenic Purpura
iii) Salivary Gland Disease and Xerostomia

VIRAL INFECTIONS

Herpes simplex

Herpes simplex virus (HSV) infection is common and affects mainly the mouth or genitals. Initial oral infection presents as primary herpetic stomatitis (gingivostomatitis). All herpes virus infections are characterized by latency and can be reactivated. Primary stomatitis presents with a single episode of multiple oral vesicles which may be widespread, and break down to form ulcers that are initially pinpoint but later fuse to produce irregular painful ulcers. Gingival edema, erythema and ulceration are prominent. The tongue is often coated and there may be oral malodor.

Chickenpox

A centripetal (concentrated mainly on trunk and head and neck) rash which passes through macular, papular, vesicular and pustular stages. Oral findings: Vesicles, especially in the palate, rupture to produce painful, round or ovoid ulcers, with inflammatory haloes.

Zoster (shingles)

A painful unilateral rash in a dermatome (distribution of a sensory nerve)

Oral findings: Unilateral, severe, pain and /or paresthesia occurs before, during and sometimes after (post-herpetic neuralgia, PHN) the rash. Maxillary zoster - rash over ipsilateral cheek, ulcers and pain in ipsilateral palate and maxillary teeth. Mandibular zoster - rash and pain over lower ipsilateral face and lip, ulcers and pain in tongue, soft tissues and mandibular teeth.

Sialadenitis (mumps)

An acute infectious viral infection of salivary glands. Mainly affected are children with no gender disparity.

Oral findings: Parotitis and trismus. Acute onset of painful, usually bilaterally, enlarged parotids, although in the early stages only one parotid gland may appear to be involved. The submandibular glands may also be affected.

Bacterial Infections

Tuberculosis

Rarely does tuberculosis manifest itself as an oral lesion, occurring in less than 5% of patients with Tuberculosis.

Oral lesions are almost always the result of contact between the oral tissue and infected sputum or hematogenous dissemination in an elderly patient (secondary oral Tuberculosis). Primary oral TB is exceedingly rare as intact oral tissues along with saliva provide an adequate barrier against direct mycobacterial invasion. Traumatized oral tissue, leukoplakias and recent dental extractions have been implicated in predisposing patients to oral Tuberculosis. Oral tubercular lesions appear as irregular, indurated, ulcerations, fissures or swellings. Lesions may be solitary or multiple and are often painful. Affected sites include the dorsal tongue, mucosa, palate and gingiva. Due to their variable clinical appearance the differential diagnosis should include fungal and bacterial infection, sarcoidosis, chronic aphthous ulcerations as well as malignancy. Other oro-facial manifestations of Tuberculosis include macroGLOSSIA, Parotid gland enlargement, facial nerve dysfunction and tubercular osteomyelitis.

Syphilis

It is also known as Lues. It occurs most exclusively by venereal contact, in overcrowded living and primitive housing condition. Classified
Primary syphilis, a primary chancre (hard or Hunterian chancre) may involve the lip, tongue or palate.

A small, firm, pink macule changes to a papule which ulcerates to form a painless round ulcer with a raised margin and indurated base. They are highly infectious and are associated with enlarged, painless regional lymph nodes. In secondary syphilis, which follows after 6–8 weeks, about one-third of patients have highly infectious painless ulcers (mucous patches, split papule and snail-track ulcers). Rash and lymphadenopathy are common. In tertiary syphilis a localized granuloma (gumma) that varies in size from a pinhead to several centimeters may arise, affecting particularly palate or tongue. Gummas break down to form deep chronic punched out ulcers that are not infectious. More common is leukoplakia on the dorsum of the tongue which has been considered as having a high potential for malignant change.

**Leprosy**

Chronic infectious disease which is mainly seen in skin nerves mucous membrane caused by Mycobacterium leprae. Nodules (lepromas) and superficial erosions in soft palate. The most varied types of lesions. They infiltrate, ulcerate, perforate, and are reddish or yellow-reddish nodules, sessile or pedunculated, varying from 2 to 10 mm, some confluent, and prone to ulceration. Also seen on tongue, uvula and gingival. Gingival hyperplasia and loosening of teeth are also found.

**Diphtheria**

Diphtheria is an upper respiratory tract illness caused by Corynebacterium diphtheriae which is a gram-positive bacterium. It is characterized by sore throat, low fever and an adherent membrane (a pseudomembrane) on the tonsils, pharynx, and nasal cavity.

**Tetanus**

Also called as lock jaw. Is characterized by intense activity of motor neurons, resulting in severe muscle spasm caused by Clostridium tetani.

Oral manifestations are pain and stiffness in the jaw, neck muscles with muscle rigidity producing trismus, dysphagia. Trismus may stimulate acute oral infection, trauma, and temporomandibular dysfunction.

**Renal Disorders**

**Renal Failure**

Renal failure (also known as kidney failure or renal insufficiency) is a medical condition in which the kidneys fail to adequately filter waste products from the blood.

**Oral manifestation**: Ammonic taste and smell is found in mornings. It is caused by high concentration of urea in saliva and its breakdown to ammonia. Xerostomia is also seen in patients with renal failure. Enamel hypoplasia, pulpal narrowing and calcification, severe tooth erosion and loss of lamina dura is also found.

**Uremia**

It is a clinical condition caused by retention of urinary constituents in the blood.

**Oral manifestations**: There is unpleasant taste and dryness of mouth. Oral bleeding tendency and candidiasis is also observed.

**Metabolic Disorders**

**Protein Deficiency**

It mainly includes marasmus and kwashiorkor disease. Marasmus is the overall deficit of food intake while kwashiorkor is associated with primary dietary protein deficiency.

**Oral manifestations** include bright reddening of the tongue with loss of papillae, dry mouth, Candidiasis. Edema of the tongue may also develop with scalloping of the lateral margins. Bilateral angular chelitis, fissuring of the lips, xerostomia and decreased over all growth of the jaws is seen. There is gingival and periodontal degeneration.

**Disturbances in Mineral Metabolism**
Zinc Deficiency

Oral manifestations include erythematous, pustular, moist erosions of the orofacial areas found on buccal mucosa, palate, gingiva and tonsil. The peri-oral area is affected by weeping erosions, angular fissures and spreading dermatitis, glossitis, papilloma, numerous small whitish papillomas on the buccal mucosa and borders of the tongue are seen. Lesion of the tongue is some times papilated with severe halitosis. The oral changes as in case of stomatitis, glossitis produce a thrush like picture.

Phosphorous

Daily requirement ranges from 240 mg for infants and nearly 800 mg for adults. Hypophosphatasia is a hereditary disease. There is deficiency of serum alkaline phosphatase

Oral manifestations: They lack cementum leading to poor support and premature loss in deciduous dentition. Delayed eruption of permanent teeth which may be hypoplastic. Large pulp Chambers and root canals with resorption of apices. Loss of alveolar bone support and inflammation of gingiva. Loss of alveolar bone support. Large pulp chambers.

Magnesium

Daily allowance is 50 mg for infants to 400 mg for teenage males.

Oral manifestations: There may be localized degeneration with enamel hypoplasia of teeth.

Conclusion

Often oral manifestations are the first sign or the most significant sign of systemic disease. Dentists must acquire familiarity with systemic conditions that can affect the oral cavity, so that appropriate referral can be made. The diagnosis of oral manifestations of blood systemic diseases is vital in dentist’s perspective. The knowledge on the systemic diseases is important in day to day clinical practice. Thus mouth presents a window for easy observation of signs and symptoms of many systemic diseases because of its easy accessibility for visual investigation, and examination by palpation.

References

2. Medical University of South Caroline, geriatric Education Education Center.
14. DF Kinane, G J Marshal. Periodontal manifestations of systemic diseases. Australian Dental Journal 2001;46:(1)2-12