



Research Article

ENDOCRINE DISORDERS AND THEIR ORAL TRIBULATIONS

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ABSTRACT

Endocrine glands are the ductless glands capable of synthesizing and releasing special chemical messengers called hormones. Endocrine system together with the nervous system acts as the body's communication system and it is composed of various endocrine glands and cells. Apart from other systemic signs they also produce signs in the oral cavity. These oral changes can sometime lead to their diagnosis. Therefore, the general dental practitioner should be well versed with the oral manifestations of these endocrine dysfunctions. The current review summarizes the various diagnostic features of the such disorders.

Key words:

Endocrine, Ductless, Signs, Diagnosis

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INTRODUCTION

In June 1905, Ernest Starling, a professor of physiology at University College London, UK, first used the word 'hormone' in one of four Croonian Lectures— 'On the chemical correlation of the functions of the body'—delivered at the Royal College of Physicians in London. Starling in 1905 defined the word, derived from the Greek meaning 'to arouse or excite', as "the chemical messengers which speeding from cell to cell along the blood stream, may coordinate the activities and growth of different parts of the body".

Numerous endocrine glands located in different parts of the human body constitute the system. Unlike other body systems, the endocrine system does not consist of organs that are anatomically connected.¹ Instead, the endocrine glands communicate with each other through chemicals called hormones.² Hormones are made and stored in the endocrine glands and are released directly in the blood and therefore known as ductless glands.

The hypothalamus is the main neurohormonal control center. Hypothalamic neurons extend to the posterior pituitary (neurohypophysis) and also control hormone release from the anterior pituitary (adenohypophysis). Other endocrine hormones such as pancreatic hormones, parathyroid hormone

(PTH), calcitonin and calcitriol, angiotensin II, aldosterone secreted are largely independent of the hypothalamic– pituitary axis. Amazing progress has been made in the life sciences in the one hundred years, since Starling first used the word "hormone".

Endocrine disorders are uncommon. The most common ones are diabetes mellitus and thyroid gland disorders. They rarely produce of oral symptoms but sometimes changes in the oral cavity due to endocrinal disturbance can help the dentist diagnose the disorder. Patients suffering from these may also require special precautions during dental procedures.

In this review we will discuss about the various oral manifestations of these endocrine disorders.

Hypopituitarism

The most striking feature of pituitary dwarfism is short stature of the affected patient and the low growth velocity for age.³

Oral findings: The dental arches are smaller than normal and cannot accommodate all the teeth resulting in dental malocclusion. Delayed Shedding of deciduous teeth, delayed root development of permanent teeth and delayed eruption of permanent teeth is seen. Complete absence of tooth bud can also be noted. Microdontia is a common finding.

In adult hypopituitarism, no dental changes are seen. Few changes like thinning of lips, eyelash and eyebrow hair loss is seen.

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Hyperpituitarism

a) Gigantism shows mandibular prognathism and malocclusion of teeth like interdental spacing. Intraoral radiograph may show hypercementosis.

Acromegaly manifests as Apertognathia, Mandibular prognathism⁴, Malocclusions likespacing in the teeth. Macroglossia and thus buccal tipping of the teeth due to macroglossia can be seen. Taurodontism and hypercementosis seen in radiographs. Marked alterations in the diameter of inferior alveolar canal is noticed.⁵ Myofacial pain dysfunction syndrome³ and speech abnormalities are seen too.⁵ In a morphologic analysis study conducted in Japan (Takakura M, Kuroda T, 1998), Male patients demonstrated downward mandibular advancement and Crossbite and Females showed extension of the ascending ramus, downward displacement of mandible, bimaxillary alveolar protrusion, and edge-to- edge bite.⁶

Hypothyroidism

Oral Manifestations of hypothyroidism are as follows: Macroglossia, transformed tooth morphology, deferred eruption, thinning of lamina dura⁷, stunted roots⁷, external root resorption⁷, delayed wound healing, poor health of the periodontium.

Hypothyroidism affecting the children is known as cretinism and is characterized by thick lips, large tongue (macroglossia), malocclusion and delayed eruption of teeth. Macroglossia is due to increased accumulation of subcutaneous mucopolysaccharides i.e., glycosaminoglycans due to the decrease in the degradation of these substances.⁸

Hyperthyroidism

Hyperthyroidism is characterized by burning mouth syndrome. Maxillary or mandibular osteoporosis may be seen.⁹ Premature shedding of deciduous teeth⁵ and faster dental eruption is noted in children⁹. Increased caries susceptibility and periodontal problems, enlargement of extra-glandular thyroid tissue (mainly in lateral posterior tongue) and development of connective-tissue diseases such as Sjögren's syndrome or systemic lupus erythematosus is seen in these patients.⁹

ORAL MANIFESTATIONS OF PATIENTS WITH THYROID GLAND DISORDERS	
HYPERTHYROIDISM	HYPOTHYROIDISM
1. Accelerated dental eruption in children	1. Delayed eruption
2. Maxillary or mandibular osteoporosis	2. Enamel hypoplasia in both dentitions, (being less intense in the permanent dentition)
3. Enlargement of extraglandular thyroid tissue (mainly in the lateral posterior tongue)	3. Anterior open bite
4. Increased susceptibility to caries	4. Macroglossia
5. Periodontal disease	5. Micrognathia
6. Burning mouth syndrome	6. Thick lips
7. Development of connective-tissue diseases like Sjögren's syndrome or systemic lupus erythematosus	7. Dysgeusia
	8. Mouth breathing

Oral manifestations in thyroid gland disorders²

Hypoparathyroidism

Oral Manifestations includes Alteration of the facial muscles, mandibular tori, delayed dental growth and development, hypodontia, enamel hypoplasia in horizontal lines, poorly calcified dentin, widened pulp chambers, pulp stones,

shortened roots⁹, impacted teeth⁴, fungal infections like candidiasis, tongue or lips paresthesia.⁹

Pseudohypoparathyroidism

Pseudohypoparathyroidism¹⁰ manifests in the oral cavity as oligodontia, delayed eruption of teeth, generalized enamel hypoplasia, widened pulp chambers with pulp stones ("dagger" shaped), blunting of teeth apices, external root resorption⁷ and dilacerated roots.⁷

Hyperparathyroidism

There is loss of bone density⁹ and loosening of teeth seen in hyperparathyroidism.⁵ Dental abnormalities such as development defects, alterations in dental eruption, widened pulp chambers and malocclusion is also seen. Sometimes soft tissue calcifications may be present.⁹

Radiographic features seen in the jaws.⁷

1. Demineralization and thinning seen in cortical boundaries such as the inferior border, mandibular canal, and the cortical outlines of the maxillary sinuses.
2. A change in the normal trabecular pattern may occur, resulting in a ground- glass appearance of numerous, small, randomly oriented trabeculae.
3. The density of the jaws is decreased, resulting in a radiolucent appearance that contrasts with the density of the teeth. The teeth stand out in contrast to the radiolucent jaws.

Brown tumor of hyperparathyroidism

- ✓ May appear in any bone but is frequently found in the facial bones and jaws, particularly in long-standing cases of the disease.
- ✓ These lesions may be multiple within a single bone.
- ✓ They have variably defined margins and may produce cortical expansion.
- ✓ If solitary, the tumor may resemble a central giant cell granuloma or an aneurysmal bone cyst.

Radiographic features of the teeth and associated structures:⁷

- ✓ Occasionally periapical radiographs reveal loss of the lamina dura in patients (only about 10%) with hyperparathyroidism.
- ✓ Depending on the duration and severity of the disease, loss of the lamina dura may occur around one tooth or all the remaining teeth.
- ✓ The loss may be either complete or partial around a particular tooth. The result of lamina dura loss may give the root a tapered appearance because of decreased image contrast.

Histopathology

The brown tumor of hyperparathyroidism is a benign tumor like lesion that usually affects teenagers and young adults. The lesion is characterized by a proliferation of exceedingly vascular granulation tissue, which serves as a background for numerous multinucleated osteoclast- type giant cells. Some lesions may also show a proliferative response characterized

by a parallel arrangement of spicules of woven bone set in a cellular fibroblastic background with variable numbers of multinucleated giant cells. This pattern is often associated with secondary hyperparathyroidism related to chronic renal disease (renal osteodystrophy).³

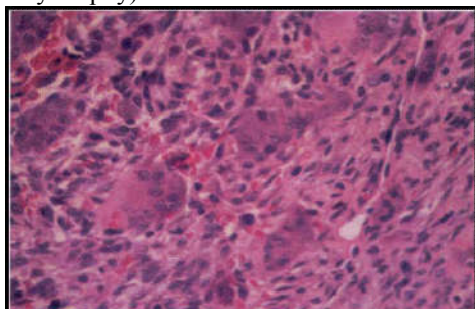


Figure 1a

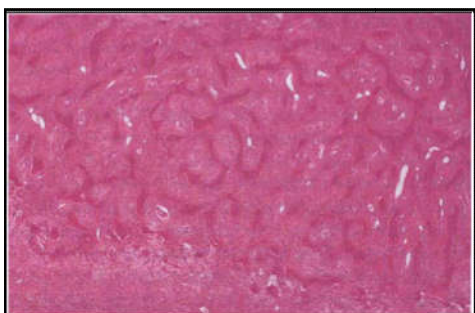


Figure 1b

1a: High-power photomicrograph of a brown tumor of hyperparathyroidism shows scattered multinucleated giant cells within a vascular and proliferative fibroblastic background.³

1b: Low-power photomicrograph shows delicate, interconnecting trabeculae of woven bone within a background of cellular fibrous connective tissue. These features are characteristic of tissue changes seen in renal osteodystrophy.³

ORAL MANIFESTATIONS OF PATIENTS WITH PARATHYROID GLAND DISORDERS	
HYPERPARATHYROIDISM	HYPOPARATHYROIDISM
1. Dental abnormalities: - Widened pulp chambers - Development defects - Alterations in dental eruption - Weak teeth - Malocclusions 2. Brown tumor 3. Loss of bone density 4. Soft tissue calcifications	1. Dental abnormalities: - Enamel hypoplasia in horizontal lines - Poorly calcified dentin - Widened pulp chambers - Dental pulp calcifications - Shortened roots - Hypodontia - Delay or cessation of dental development 2. Mandibular tori 3. Chronic candidiasis 4. Paresthesia of the tongue or lips 5. Alteration in facial muscles

Oral manifestations of patients with parathyroid gland disorders.²

Addison's Disease

Oral signs include diffuse or patchy brown macular pigmentation of the oral mucosa (called as Oral Melanotic macule), caused by excess melanin production. It can also be seen on the gums, palate, tongue and lips.¹¹ Oral melanotic macule is a focal pigmented lesion that may represent an intraoral freckle or a postinflammatory pigmentation or the macules associated with Peutz-Jeghers syndrome/ Addison's disease. When oral melanotic macules are seen in excess in an

oral and perioral distribution, Addison's or Peutz-Jeghers Syndrome to be considered.⁵

Difference between Oral Melanotic macule and Café-au-Lait macule.⁵

	Oral Melanotic Macule	Café-au-Lait macule
Definition	<ul style="list-style-type: none"> Focal pigmented lesion 	<ul style="list-style-type: none"> Discrete melanin pigmented patches of skin that have irregular margins and a brown discoloration.
Systemic conditions associated	<ul style="list-style-type: none"> Peutz- Jegher's syndrome. Intestinal Polyposis. Addisons disease. Adrenal cortical insufficiency. LaugierHunziker syndrome. 	<ul style="list-style-type: none"> Neurofibromatosis. Neurofibromas of skin, oral mucosa and jaws. McCune Albright syndrome. Polyostotic fibrousDysplasia.
Histopathology	<ul style="list-style-type: none"> Accumulation of melanin in basal keratinocytes. Melanophagocytosis seen. Normal number of melanocytes. 	<ul style="list-style-type: none"> Subjacent macrophages seen. Normal / slightly increased number of melanocytes.

Cushing's Syndrome

Cushing's Syndrome oral findings: In children, growth and development including skeletal and dental age may be retarded.^{18,19} Premature teeth eruption and Partial loss of lamina dura is seen.⁷ Reduced bone density may lead to pathological fractures.¹⁹

Myasthenia Gravis

Three most common oral symptoms seen in Myasthenia Gravis are difficulty in chewing, difficulty in swallowing (dysphagia) and slurring of words (dysarthria)¹²

Sjogren's Syndrome

One third to one half of patients have diffuse firm enlargement of the major salivary glands during the course of their disease, usually bilateral, may be non-painful or slightly tender and may be intermittent or persistent in nature.⁹ Xerostomia is seen. The saliva may appear frothy, with a lack of the usual pooling of saliva in the floor of the mouth. Lack of salivary cleansing action predisposes the patient to dental decay, especially cervical caries. Other features are difficulty in swallowing, altered taste (Dysgeusia), difficulty in wearing dentures, fissured tongue which exhibits atrophy of the papillae. The oral mucosa may be red and tender, usually as a result of secondary candidiasis. Related denture sore mouth and angular cheilitis are commonly seen.

Diabetes Mellitus

Diabetes Mellitus is a group of metabolic disorders characterized by high blood sugar levels for a prolonged period. It affects the human body from the head to the toe. Systemic symptoms include 3 P's i.e., polyphagia (increased

hunger), polydipsia (increased thirst) and polyuria (increased urination). It affects various parts of the oral cavity, viz.

Development of tooth : An accelerated tooth development in diabetic children up to age 10.5 years has been reported^{20,21}. Following this initial acceleration, steady retardation of dental development with advancing age is eminent^{20,21}. Such a dual influence on tooth development has been credited to stimulation of the pituitary gland in the initial stage of diabetes that gradually becomes „exhausted“ over time in type-1 diabetics.¹³

Disorders of the mucosa: Atrophy of the mucosa, and Recurrent Aphthous Stomatitis, lichen planus or lichenoid mucositis is seen.¹⁴ In type 2 diabetes, acute hyperglycemia causes alteration in immune responsiveness. The ‘**Grinspan syndrome**’ (diabetes, lichen planus and hypertension) may be purely coincidental associations of common disorders probably related to drug use.¹⁵ Since drug therapy for diabetes mellitus and hypertension is capable of inducing lichenoid reactions of the oral mucosa, there is a speculation as to whether Grinspan’s syndrome is an iatrogenically and drug induced lichen planus.¹⁶ Atrophic erosive oral lesions are more common in patients with diabetes with Oral Lichen Planus.¹⁴

Oral Infections: Fungal Infections like Candidiasis, Mucormycosis, Aspergillosis is seen.¹⁵ Bacterial Infections like streptococcal infections are also seen.⁵

Tongue Abnormalities: Features like fissured tongue, atrophic tongue surface, median rhomboid glossitis and benign migratory glossitis are seen.

Palate: Redness of mucosa under upper denture and swollen appearance of palatal mucosa is seen.

Taste disturbances: Taste is a dire component of oral health and is affected adversely in patients with diabetes. Hypogeusia or diminished taste perception resulting in hyperphagia and obesity.¹⁵

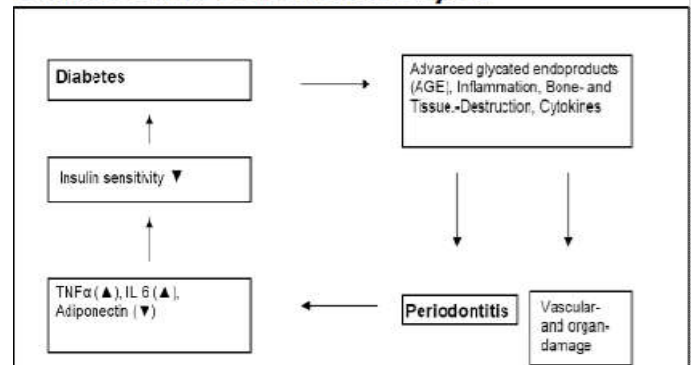
Neurosensory disorders: Includes burning mouth syndrome and glossodynia.¹⁵ In patients with insulin treated diabetes, circumoral parasthesia is a common and important sign of impending hypoglycaemia.¹⁵

Lips: Angular cheilitis is commonly seen.

Periodontal Diseases: It includes *Aggressive periodontitis*, *Chronic Periodontitis* and *Necrotising Periodontitis*. Periodontitis has been reported as sixth complication of diabetes along with retinopathy, nephropathy, neuropathy, microvascular and macrovascular diseases. Diabetes increases the risk of alveolar bone loss and attachment loss.¹⁵

Relationship between Diabetes and Periodontitis¹⁵

Diabetes and Periodontitis cycle



Gingivitis, Periapical Abscess and Halitosis are also seen.

Dental Caries: Type 2 diabetics are often associated with obesity and intake of high-calorie and carbohydrate-rich food which leads to increase caries activity.⁵

Salivary Gland Disorders: Diabetic sialadenosis, enlargement of the parotid glands¹⁷ and Xerostomia may be a secondary result of diabetes.¹³

Delayed wound Healing: Impaired wound healing is prominent in the hyperglycemic patient, this is attributed to compromised neutrophil adherence, chemotaxis, phagocytosis, bactericidal activity and cell-mediated immunity. An increased incidence of dry sockets (alveolar osteitis) and osteomyelitis, followed after mandibular extractions due to a decreased vascular supply to the mandible is seen in the diabetics.¹³

Hypergonadism

Bilateral brown facial pigmentations are seen in pregnant women, which disappears after delivery. Susceptibility to periodontal diseases and gingival hyperplasias are common.²²

Hypogonadism

Following are the features seen in hypogonadism. Decreased salivary flow, dental caries, unpleasant metallic taste, oral candidiasis, atrophy of gingival tissues, the higher tendency for plaque accumulation, increased risk of gingivitis and Periodontitis rapid resorption of edentulous ridge.¹

CONCLUSION

The dentist should be familiar with the oral and systemic manifestations of these endocrine disorders so that he or she can identify any complication and assess the level to which the condition is controlled. Patients suffering from these may also require special precautions during dental procedures. Dental treatment should be modified for these patients who are under medical management. Stress reduction, awareness of drug side effects or interactions, and vigilance for appearance of signs or symptoms of hormone toxicity are among the responsibilities of the oral health care provider. Thus, this review could be of help for the oral health care professionals.

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