



CASE STUDY

IMPACT OF THYROID HORMONE DYSFUNCTION ON PERIODONTAL TISSUES: A CASE REPORT

*Smruti Lulla, Amita Mali, Vishakha Patil, Amit Chaudhari and Shraddha Gokhale

Bharati Vidyapeeth Deemed University Dental College and Hospital Pune, India

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ABSTRACT

Thyroid hormones play an important role in the regulation of physiologic processes. Thyroid dysfunction is the second most common glandular disorder of the endocrine system and is increasing predominantly among women. Thyroid disease can lead to imbalance in the homeostasis of the body and affect the healing capacity of tissues. The oral cavity is adversely affected by either an excess or deficiency of these hormones. This case report presents the influence of thyroid hormone dysfunction and its impact on periodontal disease progression, systemic health of the patient, and the management of periodontal disease. The report emphasizes the need for frequent professional evaluations, patient education, and consistent educational reinforcement by health care providers in patients with hypothyroidism. Thus, this case report determines the relationship between thyroid hormone imbalance and periodontal health.

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INTRODUCTION

Inflammation is a primary pathologic feature of periodontal disease. A number of risk factors including systemic diseases influence individual susceptibility to periodontitis. Periodontal infections influence overall health and the course of several systemic diseases such as diabetes, cardiovascular disease, respiratory diseases, and preterm low birth weight. It is thus, a two-way road with systemic host factors and periodontal inflammation generating widespread effects with the potential to induce adverse systemic outcomes. Thyroid hormones play an important role in the regulation of growth, development, and metabolic functions of the body. Thyroid disease can lead to imbalance in the homeostasis of the body and affect the healing capacity of tissues (Carlos, 2010). According to "UK Guidelines for the Use of Thyroid Function Tests" in women, the prevalence of newly diagnosed overt hypothyroidism increases from 0.3% in younger women to 2% in women over 60 years (*Harrisons Manual of Medicine, 19th edition, 2016*). Triiodothyronine (T3) and thyroxine (T4) are hormones secreted by the thyroid gland, and have been shown to be fundamental for normal bone turnover. Decreased or increased levels of these hormones may be pathologically secreted to the blood, characterizing the conditions known as hypothyroidism and hyperthyroidism, respectively (Ds, 2009). In hypothyroidism, for instance, bone turnover is slow, bone growth and maturation are retarded in childhood and adults

tend to exhibit osteosclerosis, accompanied by increased fracture risk. In contrast, hyperthyroidism is associated with accelerated bone maturation, high bone turnover, low bone mass and an increased life-time risk for fractures. Furthermore, the presence of thyroid hormone receptors (TRs) has recently been reported in osteoblasts, suggesting a direct skeletal effect of these hormones. It has been proposed that thyroid hormones have an important role in controlling bone resorption through their action on the osteoprotegerin (OPG) and receptor activator of nuclear factor- B ligand (RANKL) mechanism, and on bone regulating factors such as interleukin- 6 (IL-6) and interleukin-8 (Tokuda, 1998). Since changes in bone are prominent features of periodontal disease, alterations of thyroid hormone levels may be suggested to be a modulating factor in periodontal disease, as are other systemic conditions, such as smoking and diabetes (Siddiqi, 2017). The common oral findings in hypothyroidism include the characteristic macroglossia, dysgeusia, delayed eruption, altered tooth morphology, and delayed wound healing (Siddiqi, Young, 2017). This case report presents a patient with periodontal destruction that is associated and influenced by hypothyroidism.

Case report

A 22-year old female patient reported to the department of periodontology with the chief complaint of bleeding gums since 6 months. The patient was apparently normal 6 months earlier, after which she noticed bleeding from the gums any time of the day and mostly during brushing and had gradually

*Corresponding author: Smruti Lulla,
Bharati Vidyapeeth Deemed University Dental College and Hospital
Pune, India

increased since then. The patient did not give any past dental history of scaling. There was a past history of extraction of 46 around 5 years back due to caries and ongoing root canal treatment of 36. On intraoral examination, the oral hygiene index simplified score and suggested that the status of oral hygiene was Fair. Table 1 shows Sulcus Bleeding index (Muhlemann HR and Son S.1971) which was recorded at baseline, after 3 months that is 12 weeks of systemic treatment, at 8 weeks post initiation of treatment and at the end of 12 weeks. There was slight gingival inflammation seen with a reddish pink colour of the gingiva with rolled out margins and blunt interdental papillae.

Treatment

In the present clinical scenario, the female patient was systemically compromised presenting an uncontrolled state of hypothyroidism with levels of thyroid-stimulating hormone (TSH) greater than 100 µIU/mL. Hence, she was referred to an endocrinologist prior to the commencement of any dental treatment. By choice, she started with homeopathic treatment and was prescribed the constitutional medicine according to the principles of Homeopathy which is “Pulsatilla 1M” and was also prescribed Vit C supplementation. After 12 weeks of systemic treatment, again chemiluminescent immunoassay was carried out which revealed TSH levels of 6.37µIU/mL. The etiotropic phase was initiated at the 12th week which comprised a thorough ultrasonic scaling with patient education and motivation regarding oral hygiene under physicians consent. She was then kept on a thorough maintenance program for a period of 8 more weeks to evaluate her compliance with systemic therapy as well as oral hygiene maintenance. Her bleeding index was again measured at the 20th week and the 24th week since baseline. Also, as mentioned in the clinical findings it was appreciated that the gingival status with severe and spontaneous bleeding from the tooth supporting tissues did not correlate with the presence of local deposits. Similarly, at the end of 20th week it was noticed that there was a further improvement in the oral hygiene maintenance but the gingival bleeding scores did not improve significantly.



Figure 1. Preoperative photograph showing slight gingival inflammation, Profuse bleeding on slight provocation and minimal plaque and calculus



Figure 2. Photograph showing pre-operative probing depth



Figure 4. Post operative photograph showing reduction in inflammation and no bleeding on provocation



Figure 3. IOPA x-rays showing no evidence of bone loss

Time Period	Gingival Bleeding Score
Baseline	5
12 th Week	3
20 th Week	2
24 th Week	1

On clinical examination, there was minimal local deposits and loss of stippling, profuse bleeding on slight provocation, and the presence of periodontal pockets of around 4-5 mm. there was no evidence of bone loss on IOPA X-rays (Ladenson, 2000). Since the patient had profuse bleeding with not much of gingival inflammation, routine blood investigations along with thyroid function tests were suggested. All the routine blood investigations were normal. On chemiluminescent immunoassay, increased thyroid stimulating hormone (TSH) level around 102µIU/mL was seen. Also there was increase in Serum free T4 level and reduction in Serum free T3 level.



Figure 5. Photograph showing post-operative probing depth

At the end of 24th week, there was an improvement in the thyroid hormone levels within the normal range that is TSH level of around 3µIU/mL, along with distinct reduction in the bleeding from gums. As there is a delayed response of tissues to healing, the patient was educated regarding the complication of delayed healing that is encountered in a state of hypothyroidism and was simultaneously motivated to follow a stringent maintenance program hereafter. She was then scheduled for a recall program every 6 weeks, keeping a check on the systemic thyroid hormone levels and her compliance with the supportive periodontal therapy. During the follow up period, the patient mentioned that there was reduction in the

bleeding of gums during brushing as compared to before. There was also an over-all improvement in oral hygiene.

DISCUSSION

Hypothyroidism is a clinical disease state occurring when there is insufficient thyroid hormone available to the target tissues. Serum TSH concentrations represent the most reliable indicators of thyroid status. The American thyroid association recommends that all patients should obtain a serum TSH determination at the age of 35 years and be followed up every 5 years (Ladenson, 2000). In general, results demonstrating elevated TSH (>5.5 $\mu\text{IU/mL}$) and low circulating free t_4 levels are indicative of hypothyroidism (Carayon, 2003). Hence, the determination of the influence of thyroid hormone imbalance in periodontitis may be important for the prevention of morbidity related to this condition. In the present clinical scenario, the patient complained about bleeding gums with minimal amount of local factors. As the therapy for periodontitis and hypothyroidism (the restoration of thyroid hormone levels within normal limits and TSH levels at the baseline that were 100 $\mu\text{IU/mL}$ were reduced to 5 $\mu\text{IU/mL}$) was initiated, there was an improvement in the oral hygiene status and immense reduction in the bleeding scores. This finding of increased gingival bleeding with minimal local factors may be due to the susceptibility of hypothyroid patients to infection. In hypothyroidism, delayed wound healing occurs due to decrease in the metabolic activity of the fibroblasts (Chandna, 2011) Delayed wound healing may be associated with an increased risk for infection due to the longer exposure of the unhealed tissue to pathogenic organisms manifesting clinically with increased gingival bleeding.

Patients with hypothyroidism have increased subcutaneous mucopolysaccharides due to decrease in the degradation of these substances. The presence of excess subcutaneous mucopolysaccharides may decrease the ability of small blood vessels to constrict and may result in increased bleeding from infiltrated tissues including the mucosa and skin (Smith, 2014). Hence, when treating patients with thyroid dysfunction in the oral healthcare setting, the goal should be to develop and implement timely preventive and therapeutic strategies compatible with the patient's physical and emotional ability to undergo and respond to dental care.

Dental management of hypothyroidism

Hemostasis: Patients with long standing hypothyroidism may have increased subcutaneous mucopolysaccharides due to decrease in the degradation of these substances. In presence of excess subcutaneous mucopolysaccharides, the ability of the small blood vessels to constrict, decreases and that results in increased bleeding from infiltrated tissues, including mucosa and skin. Local pressure for a few minutes helps to control the bleeding from the small vessels (Pikalo, 1997)

Susceptibility to infection

Patient with hypothyroidism may have delayed wound healing due to decreased metabolic activity in fibroblasts. Delayed wound healing may be associated with an increased risk for infection because of the longer exposure of the unhealed tissue to pathogenic organisms. Hypothyroid patients are not considered to be immunocompromised. Patients who have hypothyroidism are susceptible to cardiovascular disease from

arteriosclerosis and elevated LDL. Before treating such patients, physicians consent who can provide information on their cardiovascular statuses has to be taken. Patients who have atrial fibrillation can be on anticoagulation therapy and so antibiotic prophylaxis before invasive procedures, depending on the severity of the arrhythmia is required. If valvular pathology is present, the need for antibiotic prophylaxis must be assessed.

Drug actions and interactions

Patients who have hypothyroidism are sensitive to central nervous system depressants and barbiturates, so these medications should be used carefully (Young, 2017). Recent exposure to a surgical antiseptic that includes iodine (such as Povidone) increases the risk of thyroiditis or hypothyroidism. Patients with underlying thyroid antibodies and a tendency toward autoimmunity appear to be at more risk (Sherman, 2017). Drug interactions of l-thyroxine include increased metabolism due to phenytoin, rifampicin and carbamazepine, as well as impaired absorption with iron sulfate, sucralfate and aluminum hydroxide. When l-thyroxine is used, it increases the effects of warfarin sodium and, because of its gluconeogenic effects; the use of oral hypoglycemic agents must be increased. Concomitant use of tricyclic antidepressants elevates l-thyroxine levels (Carlos, 2010). Appropriate coagulation tests should be available when the patient is taking an oral anticoagulant and thyroid hormone replacement therapy (Chandna, 2001).

Conclusion

Oral manifestation of hypothyroidism is rare and dentists should be aware of such conditions for appropriate diagnosis and proper patient care. When such cases are encountered in routine practice, hypothyroidism can be considered as a differential diagnosis for commonly encountered nutritional deficiency or rickets (Oral Manifestations, 2014). The diagnosis of thyroid dysfunction leads to the proper management of hypothyroidism.

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