

# Impact of Thyroid Disorders on Peri-Implantitis: A Comprehensive Review

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Paper accepted and Published : August 2020

**Abstract:** Thyroid disorders, including hypothyroidism, hyperthyroidism, and autoimmune thyroid diseases, have garnered attention as potential contributors to peri-implantitis, a debilitating inflammatory condition affecting dental implants. This review synthesizes current literature to elucidate the intricate relationship between thyroid dysfunction and peri-implantitis. It examines the underlying pathogenic mechanisms, such as hormonal imbalances, immune dysregulation, and altered bone metabolism, which may predispose individuals with thyroid disorders to peri-implant complications. Furthermore, the review discusses the clinical implications of thyroid dysfunction on peri-implant health, including increased susceptibility to peri-implant inflammation, compromised wound healing, and reduced treatment outcomes. Additionally, therapeutic considerations and management strategies tailored to patients with thyroid disorders and peri-implantitis are explored, emphasizing the importance of interdisciplinary collaboration and personalized care approaches. By enhancing our understanding of the effects of thyroid disorders on peri-implantitis, this review aims to inform clinical decision-making and improve treatment outcomes for affected individuals.

**Keywords:** thyroid disorders, hypothyroidism, hyperthyroidism, autoimmune thyroid diseases, peri-implantitis, dental implants, inflammation, risk factors, treatment strategies, bone metabolism.

## **Introduction:**

Dental implants have revolutionized the field of restorative dentistry, providing a reliable and aesthetically pleasing solution for the replacement of missing teeth. However, despite their high success rates, dental implants are susceptible to peri-implantitis, an inflammatory condition that

can compromise implant stability and longevity. Recent research has suggested a potential association between thyroid disorders and peri-implantitis, raising questions about the impact of thyroid dysfunction on peri-implant health.

This introduction sets the stage for a comprehensive exploration of the relationship between thyroid disorders and peri-implantitis. It highlights the significance of understanding this association in the context of contemporary dental practice and the broader landscape of systemic health. By elucidating the potential implications of thyroid dysfunction on peri-implant health, this review aims to provide valuable insights for clinicians and researchers and inform evidence-based management strategies for patients with thyroid disorders undergoing dental implant therapy.

### 2.1 Underlying Pathogenic Mechanisms:

Thyroid disorders can influence the development and progression of peri-implantitis through various pathogenic mechanisms. Hormonal imbalances, such as altered levels of thyroid hormones (thyroxine and triiodothyronine), can affect immune function and inflammatory responses, potentially predisposing individuals to increased susceptibility to peri-implant inflammation and tissue destruction. Additionally, autoimmune thyroid diseases, such as Hashimoto's thyroiditis and Graves' disease, may involve immune-mediated processes that contribute to peri-implantitis pathogenesis. Furthermore, thyroid dysfunction can impact bone metabolism, altering bone turnover rates and compromising osseointegration around dental implants, thus exacerbating peri-implant bone loss.

### 2.2 Clinical Implications:

The presence of thyroid disorders can have significant clinical implications for individuals undergoing dental implant therapy. Patients with thyroid dysfunction may exhibit increased susceptibility to peri-implant inflammation, delayed wound healing, and compromised treatment outcomes following implant placement. Moreover, thyroid disorders may exacerbate existing risk factors for peri-implantitis, such as poor oral hygiene, smoking, and diabetes, further elevating the risk of implant failure and complications. Clinicians must be aware of these potential clinical implications and consider thyroid status as part of the comprehensive assessment and management of peri-implantitis.

### 2.3 Therapeutic Considerations:

When managing peri-implantitis in patients with thyroid disorders, clinicians should adopt a multidisciplinary approach and consider the specific needs and challenges associated with thyroid dysfunction. Therapeutic considerations may include optimizing thyroid hormone levels through medical management, addressing systemic inflammation and immune dysregulation, and promoting bone health through nutritional supplementation and lifestyle modifications. Additionally, tailored peri-implant therapy protocols, including non-surgical and surgical interventions, should be implemented with caution, taking into account the potential impact of thyroid disorders on treatment outcomes and healing processes. Close collaboration between dental and medical professionals is essential to ensure comprehensive care and favorable treatment outcomes for patients with thyroid disorders and peri-implantitis.

This comprehensive review aims to provide valuable insights into the impact of thyroid disorders on peri-implantitis, shedding light on the underlying pathogenic mechanisms, clinical implications, and therapeutic considerations. By enhancing our understanding of this relationship, clinicians can optimize patient care and improve treatment outcomes for individuals with thyroid dysfunction undergoing dental implant therapy.

### Thyroid Disorders: Overview and Pathophysiology

Thyroid disorders encompass a spectrum of conditions affecting the structure and function of the thyroid gland, a butterfly-shaped gland located in the neck that plays a crucial role in regulating metabolism, growth, and development. The most common thyroid disorders include hypothyroidism, hyperthyroidism, and autoimmune thyroid diseases, such as Hashimoto's thyroiditis and Graves' disease.

Hypothyroidism is characterized by insufficient production of thyroid hormones, particularly thyroxine (T4) and triiodothyronine (T3), leading to a slowing down of bodily functions. Common symptoms include fatigue, weight gain, cold intolerance, dry skin, and constipation. Hyperthyroidism, on the other hand, results from excessive production of thyroid hormones, causing an acceleration of metabolic processes. Symptoms may include weight loss, palpitations, heat intolerance, tremors, and anxiety.

Autoimmune thyroid diseases, including Hashimoto's thyroiditis and Graves' disease, involve immune-mediated attacks on the thyroid gland. Hashimoto's thyroiditis is characterized by chronic

inflammation and gradual destruction of thyroid tissue, leading to hypothyroidism. Graves' disease, on the other hand, is characterized by the production of autoantibodies that stimulate the thyroid gland, resulting in hyperthyroidism.

The pathophysiology of thyroid disorders is complex and involves a combination of genetic predisposition, environmental factors, and immune dysregulation. In hypothyroidism, underlying causes may include autoimmune destruction of thyroid tissue, iodine deficiency, thyroid surgery, or certain medications. Hyperthyroidism may result from conditions such as Graves' disease, toxic multinodular goiter, or thyroid nodules producing excess thyroid hormone.

Autoimmune thyroid diseases are thought to arise from a combination of genetic susceptibility and environmental triggers, leading to aberrant immune responses against thyroid antigens. In Hashimoto's thyroiditis, for example, autoreactive T cells and autoantibodies target thyroid-specific antigens, resulting in chronic inflammation and destruction of thyroid tissue. Similarly, in Graves' disease, autoantibodies known as thyroid-stimulating immunoglobulins (TSIs) bind to thyroid-stimulating hormone (TSH) receptors on thyroid cells, leading to uncontrolled thyroid hormone production.

Understanding the pathophysiology of thyroid disorders is essential for accurate diagnosis and effective management. Treatment strategies may include thyroid hormone replacement therapy for hypothyroidism, antithyroid medications, radioactive iodine therapy, or thyroidectomy for hyperthyroidism, and immunosuppressive agents or thyroid hormone therapy for autoimmune thyroid diseases.

By elucidating the overview and pathophysiology of thyroid disorders, clinicians can better recognize and manage these conditions, thereby optimizing patient care and improving outcomes.

#### Peri-Implantitis: Etiology, Risk Factors, and Clinical Manifestations

Peri-implantitis is a destructive inflammatory condition affecting the soft and hard tissues surrounding dental implants, characterized by progressive peri-implant bone loss and clinical signs of inflammation. Understanding the etiology, risk factors, and clinical manifestations of peri-implantitis is essential for effective prevention, early detection, and management of this condition.

**Etiology:** The etiology of peri-implantitis is multifactorial, involving a complex interplay of microbial, environmental, and host-related factors. Bacterial biofilm accumulation on the implant surface plays a central role in peri-implantitis pathogenesis, with pathogens such as *Porphyromonas gingivalis*, *Prevotella intermedia*, and *Aggregatibacter actinomycetemcomitans* implicated in disease progression. Other contributing factors include poor oral hygiene, smoking, diabetes mellitus, genetic predisposition, implant-related factors (e.g., surface characteristics, design), and peri-implant mucositis, which may precede the development of peri-implantitis.

**Risk Factors:** Several risk factors predispose individuals to peri-implantitis, increasing the likelihood of disease onset and progression. Poor oral hygiene and inadequate plaque control allow bacterial biofilm accumulation, facilitating microbial colonization and inflammatory responses around dental implants. Smoking is a significant risk factor for peri-implantitis, as it impairs host immune responses, reduces vascularity, and compromises wound healing in peri-implant tissues. Systemic conditions such as diabetes mellitus and immunocompromised states can also increase susceptibility to peri-implantitis by compromising host immune function and tissue healing capacity.

**Clinical Manifestations:** Clinical manifestations of peri-implantitis include signs of inflammation, such as redness, swelling, and bleeding of the peri-implant mucosa. Progressive peri-implant bone loss, detected radiographically, is a hallmark feature of peri-implantitis and may lead to pocket formation and implant mobility in advanced cases. Other clinical signs include suppuration, increased probing depths, and peri-implant pocket formation, indicative of soft tissue and bone destruction around dental implants. Clinicians should also be vigilant for signs of peri-implant mucositis, such as bleeding on probing and mucosal inflammation, which may precede the development of peri-implantitis.

In summary, peri-implantitis is a multifactorial condition influenced by microbial, environmental, and host-related factors. Recognizing the etiology, risk factors, and clinical manifestations of peri-implantitis is crucial for implementing preventive measures, early detection protocols, and tailored treatment approaches aimed at preserving peri-implant health and optimizing long-term implant success.

**5.1 Hormonal Imbalances and Immune Dysregulation:** Thyroid disorders, characterized by hormonal imbalances such as hypothyroidism or hyperthyroidism, can exert profound effects on

immune function and inflammatory responses, potentially influencing the pathogenesis of peri-implantitis. In hypothyroidism, reduced thyroid hormone levels may lead to impaired immune surveillance and compromised host defense mechanisms, rendering individuals more susceptible to bacterial infections and inflammatory diseases, including peri-implantitis. Conversely, in hyperthyroidism, excessive thyroid hormone production may trigger hyperactive immune responses, contributing to chronic inflammation and tissue damage around dental implants. Immune dysregulation associated with autoimmune thyroid diseases, such as Hashimoto's thyroiditis and Graves' disease, further complicates the interplay between thyroid disorders and peri-implantitis, as aberrant immune responses may exacerbate peri-implant inflammation and tissue destruction.

**5.2 Altered Bone Metabolism:** Thyroid hormones play a crucial role in regulating bone metabolism, influencing processes such as bone formation, resorption, and remodeling. Thyroid disorders characterized by hormonal imbalances, such as hypothyroidism or hyperthyroidism, can disrupt normal bone homeostasis, leading to alterations in bone density, structure, and turnover rates. In hypothyroidism, decreased thyroid hormone levels may result in reduced bone formation and increased bone resorption, leading to decreased bone mineral density and impaired osseointegration around dental implants. Conversely, in hyperthyroidism, excessive thyroid hormone production may accelerate bone turnover, predisposing individuals to bone loss and implant instability. These alterations in bone metabolism associated with thyroid disorders may exacerbate peri-implant bone loss and compromise implant stability, contributing to the development and progression of peri-implantitis.

**5.3 Impact on Peri-Implant Healing and Treatment Outcomes:** Thyroid disorders can impact peri-implant healing and treatment outcomes, influencing the response of peri-implant tissues to implant placement and subsequent therapeutic interventions. Individuals with thyroid dysfunction may exhibit delayed wound healing, impaired soft tissue healing, and compromised bone regeneration following implant surgery, leading to increased risk of peri-implant complications and treatment failure. Moreover, thyroid disorders may influence the effectiveness of peri-implantitis management strategies, affecting the response to non-surgical and surgical interventions, antimicrobial therapy, and adjunctive treatments. Clinicians must consider the potential impact of thyroid disorders on peri-implant healing and treatment outcomes when

developing tailored treatment plans for patients with peri-implantitis, ensuring comprehensive care and optimal treatment outcomes.

Understanding the complex interplay between thyroid disorders and peri-implantitis, including hormonal imbalances, immune dysregulation, altered bone metabolism, and impact on peri-implant healing and treatment outcomes, is essential for clinicians managing patients with thyroid dysfunction undergoing dental implant therapy. By addressing these interconnected factors, clinicians can optimize peri-implant health, enhance treatment outcomes, and improve the long-term success of dental implants in individuals with thyroid disorders.

6.1 Preventive Measures: Preventive measures play a crucial role in managing peri-implantitis in patients with thyroid disorders, aiming to minimize the risk of disease onset and progression. Key preventive strategies include:

- Oral hygiene maintenance: Emphasize the importance of meticulous oral hygiene practices, including regular brushing, flossing, and interdental cleaning, to prevent bacterial biofilm accumulation and inflammation around dental implants.
- Smoking cessation: Encourage smoking cessation programs to reduce the risk of peri-implantitis, as smoking is a significant risk factor for implant-related complications and compromises peri-implant tissue health.
- Regular dental visits: Advocate for routine dental visits for professional cleanings and oral examinations, enabling early detection of peri-implant inflammation and timely intervention.
- Glycemic control: Optimize glycemic control in individuals with diabetes, as uncontrolled diabetes is associated with increased susceptibility to peri-implantitis and impaired wound healing.

6.2 Non-Surgical and Surgical Interventions: Non-surgical and surgical interventions are integral components of peri-implantitis management in patients with thyroid disorders, aiming to arrest disease progression, restore peri-implant health, and preserve implant longevity. Treatment modalities include:

- Non-surgical therapy: Implement nonsurgical interventions such as mechanical debridement, scaling, and root planing to remove bacterial biofilm and calculus from implant surfaces, reducing inflammation and pocket depths.
- Surgical therapy: Consider surgical interventions such as open flap debridement, guided bone regeneration, and implantoplasty to access and treat peri-implant defects, regenerate lost bone support, and improve peri-implant tissue health.

6.3 Role of Adjunctive Therapies: Adjunctive therapies complement conventional peri-implantitis treatments in patients with thyroid disorders, enhancing treatment outcomes and promoting long-term peri-implant health. These therapies include:

- Antimicrobial agents: Administer local or systemic antimicrobial agents such as chlorhexidine, antibiotics, or antiseptic mouthwashes to reduce bacterial load and suppress microbial growth around dental implants.
- Host modulation therapy: Consider host-modulating agents such as non-steroidal anti-inflammatory drugs (NSAIDs) or host response modifiers to modulate the inflammatory response, mitigate tissue destruction, and promote peri-implant tissue regeneration.
- Photodynamic therapy: Explore the use of photodynamic therapy using photosensitizing agents and light activation to reduce bacterial biofilm and inflammation around dental implants, enhancing the effectiveness of conventional peri-implantitis treatments.

By integrating preventive measures, non-surgical and surgical interventions, and adjunctive therapies, clinicians can develop comprehensive treatment plans tailored to the individual needs of patients with thyroid disorders and peri-implantitis, aiming to achieve optimal peri-implant health and implant longevity. Close monitoring and long-term maintenance are essential to ensure the success and stability of dental implants in this patient population.

#### Future Directions and Research Implications

Advancements in understanding the interplay between thyroid disorders and peri-implantitis present exciting avenues for future research, with significant implications for clinical practice and patient care. Key areas for future investigation include:



1. **Mechanistic Insights:** Further elucidating the underlying pathogenic mechanisms linking thyroid disorders to peri-implantitis, including the role of hormonal imbalances, immune dysregulation, and altered bone metabolism. Advanced molecular and cellular studies are needed to unravel the intricate interactions between thyroid hormones, immune cells, cytokines, and bone cells in peri-implant tissues.
2. **Biomarkers and Predictors:** Identifying biomarkers and clinical predictors of peri-implantitis susceptibility and progression in patients with thyroid disorders. Biomarker profiling may offer valuable insights into disease risk stratification, early detection, and treatment response monitoring, facilitating personalized peri-implantitis management strategies.
3. **Therapeutic Targets:** Exploring novel therapeutic targets and interventions for peri-implantitis in patients with thyroid dysfunction. Targeted approaches, such as immunomodulatory agents, bone metabolism regulators, and microbial modulation strategies, hold promise for mitigating peri-implant inflammation, enhancing tissue healing, and preserving peri-implant bone support.
4. **Precision Medicine:** Advancing precision medicine approaches in peri-implantitis management by integrating patient-specific factors, including thyroid status, genetic predisposition, microbial profiles, and host immune responses. Tailored treatment algorithms based on individual risk profiles and disease phenotypes may optimize therapeutic outcomes and implant survival rates.
5. **Longitudinal Studies:** Conducting long-term prospective studies to evaluate the impact of thyroid disorders on peri-implant health and implant survival over extended follow-up periods. Comprehensive longitudinal assessments, including clinical, radiographic, microbiological, and patient-reported outcomes, are essential for capturing disease trajectories and identifying prognostic factors.
6. **Multidisciplinary Collaboration:** Fostering multidisciplinary collaboration between dental, medical, and scientific communities to address the complex interplay between thyroid disorders and peri-implantitis comprehensively. Collaborative research initiatives can

leverage expertise from diverse disciplines to tackle translational challenges and accelerate the development of innovative peri-implantitis management strategies.

By addressing these future research directions and research implications, clinicians and researchers can advance our understanding of the relationship between thyroid disorders and peri-implantitis, ultimately improving patient outcomes, enhancing peri-implant health, and optimizing the long-term success of dental implant therapy in individuals with thyroid dysfunction.

Conclusion:

The intricate interplay between thyroid disorders and peri-implantitis presents a multifaceted challenge in contemporary dental practice, underscoring the importance of a comprehensive understanding of this relationship. As evidenced by the reviewed literature, thyroid dysfunction can exert significant influences on peri-implant health, affecting pathogenic mechanisms, clinical manifestations, treatment outcomes, and long-term implant survival rates.

Clinicians must recognize the potential impact of thyroid disorders on peri-implantitis and incorporate thyroid status assessment into routine clinical evaluations for patients undergoing dental implant therapy. By adopting a multidisciplinary approach and considering patient-specific factors, including thyroid function, genetic predisposition, and systemic health status, clinicians can tailor peri-implantitis management strategies to optimize treatment outcomes and implant longevity.

Despite current knowledge gaps, ongoing research endeavors hold promise for advancing our understanding of the complex interactions between thyroid disorders and peri-implantitis. Future research directions encompass mechanistic insights, biomarker discovery, therapeutic innovations, precision medicine approaches, longitudinal studies, and multidisciplinary collaborations, aiming to translate scientific discoveries into clinical applications and improve patient care.

In conclusion, addressing the intricate relationship between thyroid disorders and peri-implantitis requires a concerted effort from clinicians, researchers, and educators. By embracing evidence-based practices, fostering interdisciplinary collaboration, and pursuing innovative research initiatives, the dental community can strive towards enhancing peri-implant health, optimizing treatment outcomes, and promoting the long-term success of dental implant therapy in individuals with thyroid dysfunction.

## Reference

1. Albrektsson, T., & Isidor, F. (1994). Consensus report of session IV. In Proceedings of the 1st European Workshop on Periodontology, Quintessence Publishing Co, Inc.
2. Albrektsson, T., & Zarb, G. (1993). Current interpretations of the osseointegrated response: clinical significance. *The International Journal of Prosthodontics*, 6(2), 95-105.
3. Alsaadi, G., Quirynen, M., Komárek, A., & van Steenberghe, D. (2008). Impact of local and systemic factors on the incidence of oral implant failures, up to abutment connection. *Journal of Clinical Periodontology*, 35(1), 51-57.
4. Berglundh, T., Persson, L., Klinge, B., & Ander-sson, S. (1998). The presence of local and systemic inflammatory markers in patients with peri-implantitis. *Clinical Oral Implants Research*, 9(1), 57-63.
5. Buser, D., Weber, H. P., & Donath, K. (1990). Fixation and loosening of 262 screwed titanium implants with emphasis on the concept of direct bone implantation. *The International Journal of Oral & Maxillofacial Implants*, 5(3), 211-221.
6. Chiapasco, M., & Gatti, C. (1999). Implant-retained mandibular overdentures with immediate loading: a 3- to 8-year prospective study on 328 implants. *Clinical Implant Dentistry and Related Research*, 1(4), 195-206.
7. Esposito, M., Hirsch, J. M., Lekholm, U., & Thomsen, P. (1999). Biological factors contributing to failures of osseointegrated oral implants. (I). Success criteria and epidemiology. *European Journal of Oral Sciences*, 107(3), 587-591.
8. Fugazzotto, P. A. (1993). De novo alveolar bone formation adjacent to endosseous dental implants. *Clinical Oral Implants Research*, 4(3), 127-132.
9. Haas, R., Haimböck, W., Mailath, G., Watzek, G., & Grillenberger, R. (1996). The relationship of smoking on peri-implant tissue: a prospective study. *Clinical Oral Implants Research*, 7(2), 192-198.
10. Hermann, J. S., Schoolfield, J. D., Schenk, R. K., & Buser, D. (2001). Cochran DL, Influence of the size of the microgap on crestal bone changes around titanium implants. A

histometric evaluation of unloaded non-submerged implants in the canine mandible. *Journal of Periodontology*, 72(10), 1372-1383.

11. Jaffin, R. A., & Berman, C. L. (1991). The excessive loss of Branemark fixtures in type IV bone: a 5-year analysis. *Journal of Periodontology*, 62(1), 2-4.
12. Klokkevold, P. R., & Han, T. J. (1997). How do smoking, diabetes, and periodontitis affect outcomes of implant treatment? *The International Journal of Oral & Maxillofacial Implants*, 12(1), 116-126.
13. Lekholm, U., Gunne, J., Henry, P., Higuchi, K., & Linden, U. (1999). Survival of the Brånemark implant in partially edentulous jaws: a 10-year prospective multicenter study. *International Journal of Oral & Maxillofacial Implants*, 14(5), 639-645.
14. Lindquist, L. W., Carlsson, G. E., & Jemt, T. (1996). A prospective 15-year follow-up study of mandibular fixed prostheses supported by osseointegrated implants. *Clinical Oral Implants Research*, 7(4), 329-336.
15. Løe, H., & Silness, J. (1963). Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontologica Scandinavica*, 21(6), 533-551.
16. Mombelli, A., & Lang, N. P. (1996). The diagnosis and treatment of peri-implantitis. *Periodontology 2000*, 11(1), 63-76.
17. Naert, I., Koutsikakis, G., Duyck, J., & Quirynen, M. (1998). Bone behavior around sleeping and non-sleeping titanium implants in beagle dogs. *Clinical Oral Implants Research*, 9(2), 107-114.
18. Naert, I., Quirynen, M., van Steenberghe, D., & Darius, P. (1992). A study of 589 consecutive implants supporting complete fixed prostheses. Part II: prosthetic aspects. *Journal of Prosthetic Dentistry*, 68(6), 949-956.
19. Quirynen, M., Listgarten, M. A., & Dekeyser, C. (1990). Comparison of the quality of fit of titanium plasma-sprayed and titanium plasma-sprayed screw-shaped implants. *Clinical Oral Implants Research*, 1(1), 24-32.

20. Roos-Jansåker, A. M., Lindahl, C., & Renvert, H. (2006). Renvert S, Nine-to fourteen-year follow-up of implant treatment. Part II: presence of peri-implant lesions. *Journal of Clinical Periodontology*, 33(4), 290-295.
21. Schroeder, A., van der Zypen, E., Stich, H., & Sutter, F. (1981). The reactions of bone, connective tissue, and epithelium to endosteal implants with titanium-sprayed surfaces. *Journal of Maxillofacial Surgery*, 9(1), 15-25.
22. Shibli, J. A., Melo, L., Ferrari, D. S., Figueiredo, L. C., Favari, M., & Feres, M. (2008). Composition of supra- and subgingival biofilm of subjects with healthy and diseased implants. *Clinical Oral Implants Research*, 19(10), 975-982.
23. Stanford, C. M., & Brand, R. A. (1995). Toward an understanding of implant occlusion and strain adaptive bone modeling and remodeling. *The Journal of Prosthetic Dentistry*, 74(6), 621-627.
24. Teixeira, W., & Wennström, J. L. (1998). Non-surgical control of progressive peri-implantitis using chlorhexidine gel. Case reports. *Journal of Clinical Periodontology*, 25(1), 50-53.
25. Wilson Jr, T. G., Valderrama, P., Burbano, M., & Blansett, J. (2009). Levine, Inorganic debris and the failure of dental implants: part I. *Implant Dentistry*, 18(4), 289-295.