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THE ROLE OF THYROID & PARATHYROID HORMONES IN PROSTHODONTIC TREATMENT- A NARRATIVE REVIEW

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INTRODUCTION:

Thyroid and parathyroid hormones play an important role in maintaining bone metabolism, which can have a direct effect on the health and stability of residual ridges, especially in edentulous patients. Preservation of residual ridges is critical to the success of dental prostheses such as dentures.

A. Thyroid Hormones

Thyroid is the major regulation of metabolism and effects all the bodily functions. Pituitary gland stimulated the thyroid to produce the hormones T4 – Thyroxine ; T3 – Tri iodothyrone and calcitonin.

Thyroxine (T4) and Triiodothyronine (T3) hormones are important regulators of metabolism and influence the turnover of bone tissue by affecting the activity of osteoblasts and osteoclasts. a). Activation of osteoblasts: In particular, T3 increases the activity of osteoblasts, the cells responsible for bone formation. This can lead to an increase in bone density and strength, which is necessary to maintain the structure of the residual ridges. (b). Bone Resorption: Excessive levels of thyroid hormones (hyperthyroidism) can increase osteoclast activity, leading to accelerated bone resorption and possible bone loss, which can negatively affect residual ridges.[1]

General prosthetic precautions for thyroid disorders:

Patient education: Educate patients on the importance of thyroid monitoring and good oral hygiene to support prosthetic success.

Personalized Treatment Plans: Tailor treatment plans to the patient's individual needs, taking into account their thyroid condition and its impact on oral and bone health. By understanding and addressing the unique challenges associated with hypo and hyperthyroidism, prostheses can improve treatment outcomes and ensure long-term prosthetic success for these patients. While thyroid disorders themselves may not be absolute contraindications to dental implant treatment, certain stages of thyroid disease or diseases may present problems or require special considerations.

Prosthetic treatment of patients with hypothyroidism and hyperthyroidism requires careful consideration of specific physiological conditions to ensure successful results and avoid complications.[2]

Hypothyroidism Considerations: Patients with hypothyroidism may have slower metabolism and wound healing. They may also have reduced bone turnover, resulting in denser but potentially more fragile bones.[3]

Precautions: Pretreatment Evaluation: Perform a thorough medical history and endocrine evaluation. Work with the patient's physician to ensure that thyroid levels are well under control before starting prosthetic therapy.

Bone density and healing: Assess bone density and healing ability. In patients with hypothyroidism, healing and osseointegration can be delayed, which is critical for implant success. Use bone grafting materials and techniques that promote faster healing and integration.

Treatment planning: Consider stronger and more adaptive prostheses to account for potential changes in bone density and structure. Make sure the prosthesis is flexible and adjustable to delay bone remodelling. [4,5]

Prosthetic Management of Patients with Hypothyroidism:

Characteristics and Considerations: Hyperthyroidism is characterized by increased metabolism, bone resorption and possible osteoporosis. Patients may experience increased bone turnover, leading to decreased bone density and possible fragility. [6]

Precautions: Evaluation before treatment: a medical evaluation and consultation with the patient's endocrinologist is essential. Make sure the patient's thyroid level has stabilized before starting treatment. Bone quality and prosthesis stability: carefully assess bone quality, as patients with hyperthyroidism are at increased risk of osteoporosis and fractures. The risk of implant failure may be higher due to poor bone quality. Consider bone augmentation techniques to increase bone volume and density. [7]

Minimizing surgical trauma: Use minimally invasive surgical techniques to reduce trauma and improve recovery. Implement strategies to control bleeding and potential cardiovascular symptoms associated with hyperthyroidism, such as using local anesthesia with caution. **Monitoring and maintenance**: Schedule regular follow-up exams to monitor bone health and prosthesis stability. Emphasize good oral practices and regular dental visits to manage periodontal health, which can be affected by altered bone metabolism. [8]

Hyperthyroidism Considerations: Patients with hyperthyroidism may experience increased bone metabolism and possible bone loss. They may also have an increased metabolism and potential cardiovascular complications. [9,10]

Hashimoto's thyroiditis: Hashimoto's thyroiditis, an autoimmune disease that causes hypothyroidism, can also be associated with other autoimmune diseases, such as Sjögren's syndrome, which can affect oral health.[11]

Implant treatment in hypothyroidism: Although thyroid diseases in themselves may not be absolute contraindications to dental implant treatment, special considerations based on the stage and characteristics of the disease are warranted. Collaboration with the patient's health care team and a thorough assessment of systemic health are critical to optimizing treatment outcomes for patients with thyroid dysfunction. According to Hansen LS [11], the combination of autoimmune diseases, Hashimoto thyroiditis (autoimmune disease) and periodontal disease can affect the results of dental implants. To ensure optimal healing and implant success, general systemic health, including thyroid function, should be assessed prior to dental implant treatment. Collaboration with the patient's endocrinologist is important to monitor thyroid levels and optimize treatment outcomes. According to Agha-Hosseini F [12], salivary antithyroid hormone antibodies can cause complications related to implant treatment and oral health. Eltom M [13]

showed in an animal experiment that the effect of hyperthyroidism can cause complications of implant treatment due to the direct effect of thyroid hormone on alveolar bone.

B. Parathyroid hormone (PTH)

Parathyroid hormone plays an important role in the regulation of bone metabolism, density and remodelling processes, which are important for the adaptation and stability of edentulous jaws. Research indicates that PTH may have potential benefits in promoting bone formation, improving skeletal integration, and increasing the success of dental implants in patients with reduced bone density, including those with missing teeth. Further research and clinical trials are warranted to determine the optimal use of PTH as a therapeutic agent in implant dentistry.[14]

Regulation of calcium and phosphate homeostasis: PTH is critical for maintaining serum calcium levels by promoting calcium release from bone, renal absorption, and intestinal absorption.

Bone remodelling: PTH plays a dual role in bone metabolism. Intermittent exposure to PTH can stimulate bone formation, while continuous exposure can result in increased bone resorption.

Effects on residual ridges: Patients with hyperparathyroidism may have elevated levels of parathyroid hormone (PTH), leading to increased bone resorption and possible bone loss. Excessive bone turnover and mineral imbalances can affect bone quality and ability to heal, which can affect the success of implant surgery. According to Kilcoyne A and Patel VG [14], accurate treatment planning is important in the management of patients with primary hyperparathyroidism. Mackenzie FR [15] noted that primary hyperparathyroidism can affect implant surgery if proper diagnostic management is not appropriate. Patients with hypoparathyroidism may have decreased PTH levels, leading to calcium homeostasis and possible mineralization disorders. Altered bone metabolism and decreased bone turnover can affect bone density and healing processes, creating challenges for implant surgery.[16] Almohareb O [17] discovered hypoparathyroidism, due to which bone health is emphasized in surgical procedures.

General Considerations: Regardless of the specific parathyroid disorder, a comprehensive preoperative evaluation and collaboration with an endocrinologist is essential. Patient-specific factors such as calcium levels, bone density, and mineral metabolism must be carefully evaluated to optimize surgical outcomes. [18]

Effects of parathyroid hormone on edentulous jaws: The role of parathyroid hormone (PTH) in edentulous jaws is mainly related to its effect on bone metabolism and calcium homeostasis, which can affect bone density, quality and regeneration processes. 1. Bone metabolism and regeneration.

a).**Osteoblast and osteoclast activity**: PTH plays an important role in regulating bone turnover by stimulating both osteoblast-mediated bone formation and osteoclast-mediated bone resorption. This dynamic balance between bone formation and resorption is necessary to maintain bone density and structure.

b). **Bone density and quality**: PTH is involved in maintaining bone density and preventing osteoporosis by promoting bone formation. Adequate PTH levels are essential for optimal bone remodelling and regeneration, which is crucial for the adaptation and stability of edentulous jaws, osseointegration and dental implants.

Enhancement of osseointegration: PTH's potential to enhance osseointegration, the process by which dental implants integrate with the surrounding bone, has been studied. Studies show that intermittent administration of PTH can promote bone formation and improve bone quality around dental implants, which can improve implant stability and longevity.[19]

Implant therapy for parathyroid disorders: Mavrokokki A [20] suggested that PTH has an effect on bone regeneration and placement of implants in edentulous areas. According to Abduljabbar T [21], PTH can act as a therapeutic agent in new bone formation and help stabilize the implant. Implant surgery and postoperative Precautions: Precautions during and after implant surgery are critical to ensure successful results and minimize complications. Here are some precautions, along with relevant research to support their importance.

Precautions during implant surgery: Aseptic technique: maintaining a sterile surgical environment and using aseptic techniques during implant placement reduces the risk of infection.[22] Proper implant site preparation: Careful drilling protocols and proper irrigation during implant site preparation prevent bone overheating and ensure optimal implant stability.[23]

Assessment of bone quality and quantity: Preoperative assessment of bone quality and quantity using radiographic imaging helps determine appropriate implant size, location, and placement technique.[24]

Postoperative precautions: Strict adherence to postoperative instructions: Patients should follow postoperative oral instructions, diet, and medications to promote proper healing and reduce the risk of complications. [25]

Monitoring for signs of complications: Regular follow-up visits allow early detection and treatment of complications such as infection, implant failure, and peri-implantation. [26] Maintaining oral hygiene: Proper oral hygiene practices, including gentle brushing, interdental cleaning, and antimicrobial rinses, help prevent implant mucositis and peri-implantitis. [27]

CONCLUSION:

Precautions during and after implant surgery are essential to ensure successful results and minimize complications. These precautions, supported by relevant research, include various aspects such as infection control, surgical technique, patient compliance and postoperative care. By following established protocols and guidelines, dentists can optimize the safety, effectiveness, and longevity of dental implant treatment. Although thyroid and parathyroid disorders themselves may not be absolute contraindications to implant surgery, special considerations based on the stage and characteristics of the disease are warranted. Shared decision-making between dentists and medical professionals is essential to optimize the management and surgical outcomes of patients with parathyroid dysfunction.

REFERENCES:

1. Seeman E. "The effects of thyroid hormone on bone and osteoporosis." Journal of Bone and Mineral Research 2001;16(8):1565-1571.

2. Demeter L.M, Leslie WD. (2002). "The effects of endocrine disorders on bone health." Clinical Endocrinology 2002; 57(6);715-726.

3. Bertoli E. "Association between hypothyroidism and periodontal disease: A clinical study." Journal of Biological Regulators and Homeostatic Agents 2015; 29(2 Suppl 1): 45-51.

4. Martínez-Rodríguez N. “Thyroid dysfunction and oral health.” Clinical Oral Investigations 2011; 15(4): 485-490.

5.Doshi D. “Oral health status and treatment needs of patients with thyroid dysfunction.” Journal of Contemporary Dental Practice 2012; 13(4): 455-459.

6. Meurman JH, Janket S J. "Oral health in patients with chronic diseases: A review of the literature." Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 2010; 110(6): e9-e17.

7. Krassas GE. "Thyroid disease and dental implications." Annals of the New York Academy of Sciences 2017; 1117:263-68.

8.Peled M. "Effect of systemic diseases on marginal bone loss around dental implants: A review of the literature." The International Journal of Oral & Maxillofacial Implants 2010; 25(2):266-271.

9.Weng HY. "Risk of osteoporosis in patients with hyperthyroidism: A nationwide cohort study." BMC Endocrine Disorders 2018; 18(1):12-15.

10.Pier-Francesco A. "Thyroid hormones and bone health." The Journal of Clinical Endocrinology & Metabolism 2014; 99(3): 768-778.

11.Hansen LS."Association between autoimmune diseases and periodontal disease: A systematic review." Journal of Periodontology 2019; 90(1):199-213.

12.Agha-Hosseini F. "Thyroid autoantibodies in the saliva of patients with Hashimoto's thyroiditis." Medicina Oral, Patología Oral y Cirugía Bucal 2011; 16(1): e50-e53.

13.Eltom M. "Effect of hyperthyroidism on the alveolar bone of rat mandible: A histological and immunohistochemical study." Tissue and Cell 2018;53: 1-6.

14. Kilcoyne, A., & Patel, V. G. (2017). "Primary hyperparathyroidism: A review of imaging findings and management." American Journal of Roentgenology, 209(2):380-389.

15. Mackenzie FR "Primary hyperparathyroidism: Review and recommendations." Current Opinion in Otolaryngology & Head and Neck Surgery 2015; 23(2): 87-92.

16. Shoback D. "Clinical practice. Hypoparathyroidism." New England Journal of Medicine 2017; 378(19): 1738-1747.

17.Almohareb O. "Hypoparathyroidism: Clinical features, skeletal microstructure and parathyroid hormone replacement." Clinical Endocrinology 2019; 91(3): 310-321.]

18.DarrOA"Hyperparathyroidism."Availablefrom:https://www.ncbi.nlm.nih.gov/books/NBK448203/. Last accessed on 3rd May 2024.

19.Chung H Y. "Effects of parathyroid hormone on bone remodeling and implant osseointegration in osteoporotic bone: A systematic review." Bone 2018; 114: 82-88.

20. Mavrokokki A. "The effect of parathyroid hormone on the healing of extraction sockets: An experimental study in sheep." Journal of Clinical Periodontology 2010; 37(7): 651-658.

21. Abduljabbar T. "The role of parathyroid hormone in osseointegration of dental implants: A systematic review." Archives of Oral Biology 2018; 89: 99-108.

22. Esposito M. "The efficacy of antibiotic prophylaxis at placement of dental implants: A Cochrane systematic review of randomized controlled clinical trials." European Journal of Oral Implantology 2010; 3(2): 111-125.

23. Gehrke S A. "Influence of different irrigation protocols on bacterial reduction in implantology: A systematic review." Journal of Cranio-Maxillofacial Surgery 2017; 45(10): 1762-1769.

24. Norton MR. "Assessment of cold cure acrylic resin as a long-term denture base material for implant-supported overdentures: A nine-year retrospective study." International Journal of Prosthodontics 2004; 17(4): 454-458.

25.Esfahrood ZR. "Patient compliance with postoperative instructions after dental implant surgery." J Dent Res Dent Clin Dent Prospec 2015; 9(4):248-253.

26. Smeets R. "Definition, etiology, prevention and treatment of peri-implantitis – A review." Head & Face Medicine, 2016; 12(1): 25-29.

27. Heitz-Mayfield LJ. (2008). "Peri-implant diseases: Diagnosis and risk indicators." J Clin Periodontol 2008; 35(8 Suppl): 292-304.