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Mini-Review

Recent advancements in the treatment of tertiary hyperparathyroidism

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Abstract

Tertiary hyperparathyroidism is a condition characterized by excessive production of parathyroid hormone (PTH) by the parathyroid glands, leading to increased calcium levels in the blood. It typically occurs in patients with long-standing secondary hyperparathyroidism, often as a result of chronic kidney disease (CKD). The primary treatment goal for tertiary hyperparathyroidism is to normalize PTH levels and maintain calcium and phosphorus balance. This typically involves the use of medications to control hypercalcemia and hyperphosphatemia. Calcimimetic agents, such as cinacalcet, can help lower PTH levels by increasing the sensitivity of the calcium-sensing receptors on the parathyroid glands. Additionally, phosphate binders can be prescribed to reduce serum phosphate levels.

Keywords: Tertiary hyperparathyroidism, Parathyroid hormone, Secondary hyperparathyroidism, Chronic kidney disease, Renal transplantation, Calcium, Phosphorus, Parathyroid glands, Parathyroidectomy

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Introduction

Tertiary hyperparathyroidism refers to a condition where the parathyroid glands overproduce parathyroid hormone (PTH) even after the underlying cause of the high PTH levels has been corrected (1,2).

In tertiary hyperparathyroidism, the parathyroid glands continue to produce excess PTH even after the underlying cause of secondary hyperparathyroidism has been resolved, such as through kidney transplantation or successful treatment of the underlying renal disease (1-4).

Search strategy

For this review, we searched PubMed, Web of Science, EBSCO, Scopus, Google Scholar, Directory of Open Access Journals (DOAJ) and Embase, using different keywords, including tertiary hyperparathyroidism, parathyroid hormone, secondary hyperparathyroidism, chronic kidney disease, renal transplantation, calcium, phosphorus, parathyroid glands, parathyroidectomy, hypercalcemia, hyperphosphatemia, calcimimetic agents, cinacalcet, vitamin D analogs, calcitriol, vitamin D analogs, phosphate binders and sestamibi scan.

Management of tertiary hyperparathyroidism

It is important to note that the choice of treatment depends on individual patient factors, including the severity of the disease, the presence of comorbidities, and patient preferences. A multidisciplinary approach involving nephrologists, endocrinologists, and surgeons is often necessary to optimize management strategies for tertiary hyperparathyroidism (5,6). The primary goal of treatment for tertiary hyperparathyroidism is to reduce PTH levels and normalize calcium levels in the blood. Historically, the mainstay of treatment is parathyroidectomy (1,7,8). However, recent advancements in medical management have provided alternative options for patients who are not suitable candidates for surgery or prefer non-surgical approaches.

Calcimimetics

These are medications that mimic the action of calcium on the parathyroid gland, thereby reducing PTH secretion. Cinacalcet is the most commonly used calcimimetic and has been shown to effectively lower PTH levels and improve calcium control in patients with tertiary hyperparathyroidism (2,9).

Vitamin D analogs

Active vitamin D (calcitriol) or synthetic vitamin D analogs (such as paricalcitol or doxercalciferol) can be used to suppress PTH secretion and maintain calcium balance. These agents work by increasing intestinal

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Implication for health policy/practice/research/medical education

Tertiary hyperparathyroidism is a condition characterized by excessive secretion of parathyroid hormone (PTH) due to long-standing secondary hyperparathyroidism. It typically occurs in patients with chronic kidney disease (CKD) who have undergone renal transplantation. The primary treatment goal for tertiary hyperparathyroidism is to normalize PTH levels and maintain calcium and phosphorus balance. Historically, the mainstay of treatment has been surgical removal of the overactive parathyroid glands (parathyroidectomy). However, recent advances in medical management have provided alternative options for patients who are not suitable candidates for surgery or prefer non-surgical approaches.

calcium absorption and reducing PTH synthesis and secretion (10,11).

Phosphate binders

Tertiary hyperparathyroidism is often associated with elevated phosphate levels in the blood. Phosphate binders, such as calcium-based or non-calcium-based agents, can be used to lower phosphate levels and indirectly reduce PTH secretion (2,12).

Dietary modifications

Restricting dietary phosphorus intake and ensuring adequate calcium intake can help manage tertiary hyperparathyroidism. This includes avoiding high-phosphorus foods and incorporating calcium-rich foods into the diet (13,14).

Surgical intervention

While medical management is preferred in most cases, surgical removal of the abnormal parathyroid glands may still be necessary in certain situations, especially if medical therapy fails or if there is evidence of severe hypercalcemia or progressive bone disease. Additionally, advancements in imaging techniques, such as ultrasonography and sestamibi scans, aid in the preoperative localization of hyperfunctioning parathyroid tissue, allowing surgeons to specifically target these glands during surgery (15, 16).

Subtotal parathyroidectomy

In certain cases, removing three and a half of the four parathyroid glands may be sufficient to control PTH levels (17,18).

Minimally invasive parathyroidectomy

Surgery to remove the abnormal parathyroid glands can now be performed using minimally invasive techniques, such as focused ultrasound or radio-guided techniques. These methods often result in less scarring, quicker recovery, and reduced surgical complications (19,20).

Novel medications

Innovative medications targeting specific mechanisms involved in regulating PTH secretion, such as antibodies against fibroblast growth factor 23 (FGF23), are currently being studied. These have shown promising results in clinical trials and may become available as alternative treatment options in the future (21, 22).

Close monitoring

Regular monitoring of PTH, calcium, phosphorus, and vitamin D levels is essential to assess treatment response and adjust therapy accordingly. Regular monitoring of calcium, phosphate, and PTH levels is essential to assess treatment response and adjust therapy as needed. Consulting with an endocrinologist or nephrologist experienced in the management of tertiary hyperparathyroidism is recommended for optimal care (23, 24).

Conclusion

It is important to note that treatment should be individualized based on each patient's unique circumstances, and decisions should be made in collaboration with healthcare professionals. Regular follow-up with a healthcare provider is crucial to monitor PTH, calcium, and phosphate levels and adjust treatment as needed.

Authors' contribution

Conceptualization: Yasaman Vahdani.
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Validation: Parisa Tajdini, Yasaman Vahdani.
Visualization: Parisa Tajdini,
Writing–original draft: Parisa Tajdini, Yasaman Vahdani.
Writing–review and editing: Yasaman Vahdani.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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