



# Parathyroid disease; a bridge between nephrologist and endocrinologist

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## Abstract

Nephrologists and endocrinologists work closely together in the diagnosis, treatment planning, and management of complications, surgical intervention, and also long-term management of parathyroid diseases. Their collaboration ensures holistic care for patients, addressing both the endocrine and nephrological aspects of the condition.

**Keywords:** Parathyroid disease, Parathyroid hormone, Hyperparathyroidism, Parathyroid glands, Hypoparathyroidism, Nephrologist, Calcium, Phosphorus, Parathyroid disorders

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## Introduction

Parathyroid disease refers to disorders that affect the parathyroid glands, which are responsible for producing parathyroid hormone (PTH). The primary parathyroid diseases include hyperparathyroidism, characterized by excessive PTH production, and hypoparathyroidism, where PTH production is deficient (1). Nephrologists, experts in kidney diseases, frequently encounter parathyroid disorders due to the kidneys' role in calcium and phosphorus regulation. In the case of hyperparathyroidism, the increased PTH production can lead to excessive calcium levels in the blood, commonly seen in individuals with chronic kidney disease (CKD) or renal failure, resulting in complications such as kidney stones, bone loss, or cardiovascular problems (2,3). Nephrologists manage these calcium imbalances in coordination with endocrinologists. Conversely, endocrinologists, specializing in endocrine disorders, play a vital role in diagnosing and treating parathyroid disease. They are skilled in diagnosing and treating a variety of endocrine disorders, including parathyroid disease (4,5). Endocrinologists work closely with nephrologists to evaluate and manage patients with hyperparathyroidism or hypoparathyroidism. They play a crucial role in determining the underlying cause of parathyroid disorders, such as benign tumors in the parathyroid glands, to guide appropriate treatment (6,7). The collaborative efforts of nephrologists and endocrinologists are essential for effectively managing parathyroid disease. They work together to assess patients'

calcium and phosphorus levels, identify complications and associated disorders, determine the need for surgical intervention, and provide ongoing medical management. Through this multidisciplinary approach, nephrologists and endocrinologists ensure comprehensive care for patients with parathyroid disorders, with the goal of optimizing their overall health and quality of life. In the case of parathyroid disease, the relationship between nephrologists and endocrinologists is critical for the comprehensive management of the condition (2,8).

## Search strategy

This review involved search on PubMed, Web of Science, EBSCO, Scopus, Google Scholar, Directory of Open Access Journals (DOAJ) and Embase, using following keywords: parathyroid disease, parathyroid hormone, hyperparathyroidism, parathyroid glands, hypoparathyroidism, nephrologist, kidney diseases, calcium, phosphorus, parathyroid disorders, chronic kidney disease, renal failure, kidney stones, bone loss and endocrinologist.

## Parathyroid disease: a nephrology point of view

Parathyroid glands regulate calcium and phosphate levels, essentials for bone health and organ function, including the kidneys (9).

Nephrologists are particularly involved in managing secondary hyperparathyroidism due to its close association with kidney disease. In patients with CKD, the kidneys are unable to properly excrete phosphorus,

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## ■ Implication for health policy/practice/research/medical education

Overall, the relationship between nephrologists and endocrinologists in parathyroid disease is characterized by a multidisciplinary approach to ensure comprehensive care for patients with complex hormonal and kidney-related issues.

resulting in elevated phosphorus levels in the blood. High phosphorus levels can trigger the release of PTH by the parathyroid glands, leading to secondary hyperparathyroidism. This condition can cause calcium to be leached from the bones and deposited in the blood vessels and other tissues, leading to adverse effects on the cardiovascular system (10,11). To manage parathyroid disease from a nephrology point of view, nephrologists typically focus on controlling the underlying cause, such as optimizing kidney function through appropriate medical treatment and dialysis if necessary. They may also work in collaboration with endocrinologists or surgeons, who specialize in parathyroid disorders, to determine the best course of action for managing the disease (7,12).

One common parathyroid disorder is primary hyperparathyroidism, which occurs when one or more of the parathyroid glands become overactive and produce excessive amounts of PTH. This condition leads to increased calcium levels in the blood, which can have detrimental effects on the kidneys. Elevated calcium levels can cause calcium deposits to form in the kidneys, leading to kidney stones. These stones can obstruct urine flow and cause pain and discomfort. Additionally, high levels of calcium can contribute to the development of CKD by promoting calcification within the renal arteries and tubules. Another consequence of primary hyperparathyroidism is secondary hyperparathyroidism (13,14). This occurs when there is long-standing kidney disease or vitamin D deficiency, leading to decreased calcium absorption from the intestines and reduced activation of vitamin D by the kidneys. In response, the parathyroid glands produce more PTH to compensate for low calcium levels. However, this compensatory mechanism can lead to bone loss and osteoporosis over time. In patients with CKD, secondary hyperparathyroidism is a common complication due to impaired renal function (15-17). As CKD progresses, there is a decline in active vitamin D production by the kidneys, resulting in decreased intestinal absorption of calcium. This triggers an increase in PTH secretion from the parathyroid glands as they attempt to maintain normal blood calcium levels. However, persistent elevation of PTH levels can lead to renal osteodystrophy, a condition characterized by abnormal bone metabolism and mineralization (11,18).

## Impact on kidney function

Parathyroid disease, specifically hyperparathyroidism, can have a significant impact on kidney function.

Elevated levels of PTH and calcium, characteristic of hyperparathyroidism, can lead to the deposition of calcium in the kidneys, causing kidney stones and impaired kidney function. Nephrologists play a vital role in assessing and monitoring kidney function in patients with parathyroid disease (19,20).

## Monitoring calcium and phosphate levels

Nephrologists closely monitor calcium and phosphate levels in patients with parathyroid disease. In collaboration with endocrinologists, they interpret and analyze blood tests to determine the severity of parathyroid dysfunction and make appropriate treatment decisions. Monitoring these levels is crucial as imbalances can increase cardiovascular risk, bone disease, and other complications (21,22).

## Managing mineral and bone disorders

Parathyroid disease can result in mineral and bone disorders (renal osteodystrophy) due to abnormalities in calcium, phosphate, and vitamin D metabolism. Nephrologists play a key role in managing these disorders by closely monitoring bone health, assessing bone mineral density, and recommending interventions to prevent fractures or bone loss (23).

## Evaluating secondary causes

Nephrologists investigate and evaluate secondary causes of parathyroid disease, especially in patients with CKD. This disease can lead to chronic kidney mineral and bone disorders (CKD-MBD), where parathyroid dysfunction is a common feature. Nephrologists assess the underlying kidney disease, fluid and electrolyte imbalances, and vitamin D deficiency, which can contribute to parathyroid dysfunction (24).

## Dialysis management

For patients on dialysis, parathyroid disease can present unique challenges. Dialysis removes large amounts of calcium and phosphate from the blood, disrupting their balance. Nephrologists closely monitor PTH levels in dialysis patients and may recommend interventions such as phosphate binders, calcimimetic medications, or parathyroidectomy in severe cases (25,26).

## Collaboration with endocrinologists

Nephrologists collaborate closely with endocrinologists to ensure comprehensive care for patients with parathyroid disease. Together, they assess the overall impact of hormonal imbalances on kidney function, bone health, cardiovascular health, and other related aspects. This collaboration is essential in optimizing treatment plans, managing complications, and improving long-term outcomes. Here are some specific aspects of their collaboration (19,27).

## Diagnosis

Nephrologists and endocrinologists often work together to diagnose parathyroid disease. Nephrologists may be the first to encounter patients with symptoms or abnormal blood tests that indicate possible parathyroid dysfunction. They may notice kidney-related complications, such as kidney stones or impaired kidney function, which can be caused by parathyroid disease. Endocrinologists specialize in hormonal disorders and can confirm the diagnosis by analyzing blood calcium and PTH levels. They bring their expertise in hormonal imbalances to accurately diagnose hyperparathyroidism or hypoparathyroidism (19,20).

## Treatment planning

Once a diagnosis is confirmed, nephrologists and endocrinologists collaborate to develop an appropriate treatment plan. This plan may include a combination of medical interventions, lifestyle modifications, and surgical options. Nephrologists assess the impact of parathyroid disease on kidney function and provide recommendations accordingly, while endocrinologists focus on managing the hormonal imbalances associated with the condition (28).

## Managing complications

Parathyroid disease, particularly hyperparathyroidism, can lead to various complications, such as kidney stones, kidney dysfunction, and bone loss. Nephrologists are crucial in managing these complications due to their expertise in kidney-related conditions. They monitor kidney function and assess the impact of elevated calcium levels on the kidneys. Nephrologists may recommend interventions to prevent or treat kidney stones, and they work closely with endocrinologists to ensure comprehensive management of the complications related to parathyroid disease (20,29).

## Surgical intervention

In cases where surgical removal of the overactive parathyroid gland(s) is necessary, both nephrologists and endocrinologists play important roles. Nephrologists assess kidney function and ensure it is optimized before surgery. They also monitor the patient during and after the procedure to minimize any potential impact on kidney function. Endocrinologists provide input in terms of the surgical approach and collaborate with the surgical team to ensure the patient's hormone levels are appropriately managed before, during, and after the operation (10,30).

## Long-term management

Following surgical intervention or during the management of chronic parathyroid disease, ongoing collaboration between nephrologists and endocrinologists is necessary. They work together to monitor hormone and calcium levels, adjust medications, manage any residual kidney complications, and optimize long-term outcomes for

the patient. This collaboration ensures that the patient's overall health is comprehensively addressed, taking into consideration both the endocrine and nephrological aspects of parathyroid disease (31,32).

## Conclusion

From a nephrology perspective, parathyroid disease involves close monitoring of kidney function, managing mineral and bone disorders, evaluating secondary causes, addressing the challenges in dialysis patients, and collaborating with endocrinologists for comprehensive care. Nephrologists are crucial in diagnosing and managing the nephrological aspects of parathyroid disease, ensuring the best possible outcomes for patients. Additionally, the collaboration between nephrologists and endocrinologists is crucial in managing parathyroid disease, particularly in the context of secondary hyperparathyroidism associated with CKD. By combining their expertise, these specialists can provide comprehensive care to patients, improve outcomes, and optimize the management of parathyroid dysfunction.

## Authors' contribution

**Conceptualization:** Azadeh Khayyat.

**Data curation:** Azadeh Khayyat.

**Investigation:** Azadeh Khayyat.

**Resources:** Azadeh Khayyat.

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## 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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