Parathyroid Adenoma: Review of Literature

Dr. Minu Kumari[1]; Dr. Deepika Saini[2]; Dr. Bikram Raina[3]

[1.] Assistant Professor, Oral and Maxillofacial Surgery, Subharti Dental College and Hospital, Meerut, India
[2.] Assistant Professor, Oral and Maxillofacial Surgery, Subharti Dental College and Hospital, Meerut, India
[3.] Assistant Professor, Oral and Maxillofacial Surgery, Subharti Dental College and Hospital, Meerut, India

Publication Date: 2026/06/24

Abstract: Parathyroid adenoma is a benign neoplasm of the parathyroid gland and is the most common cause of primary hyperparathyroidism, accounting for approximately 80–85% of cases. Hypercalcemia and disturbances with bone and mineral metabolism are caused by excessive parathyroid hormone (PTH) secretion. Patients may present with a wide range of manifestations, including skeletal pain, pathological fractures, nephrolithiasis, gastrointestinal symptoms, neuropsychiatric disturbances. Alternatively, they may be asymptomatic and receive a diagnosis by biochemical testing. Serum calcium and PTH measurements are used to make the diagnosis, which is then confirmed by imaging techniques including ultrasonography and sestamibi scintigraphy for lesion localization. The effective treatment is still surgical excision of the adenoma, which is linked to a good prognosis and the return of biochemical markers to normal.

***Keywords**: Parathyroid Adenoma, Primary Hyperparathyroidism, Hypercalcemia, Parathyroid Hormone, Brown Tumor, Parathyroidectomy.*

How to Cite: Dr. Minu Kumari; Dr. Deepika Saini; Dr. Bikram Raina (2026) Parathyroid Adenoma: Review of Literature. *International Journal of Innovative Science and Research Technology*, 11(6), 1167-1169. https://doi.org/10.38124/ijisrt/26jun766

I. INTRODUCTION

Parathyroid adenoma is a benign neoplasm of the parathyroid gland that causes autonomous secretion of parathyroid hormone (PTH) and disruption of calcium homeostasis due to the monoclonal proliferation of parathyroid chief cells. It represents the most common cause of primary hyperparathyroidism, accounting for approximately 80–85% of cases.[1,2]

The clinical profile of primary hyperparathyroidism has changed considerably over the past few decades. Historically, patients presented with severe symptomatic hypercalcemia and skeletal or renal complications. However, the widespread use of routine biochemical screening has resulted in earlier diagnosis, and many patients are now identified while asymptomatic. The first successful parathyroidectomy for hyperparathyroidism was performed by Felix Mandl in 1925, marking the beginning of modern surgical management of parathyroid disorders.[10]

II. EPIDEMIOLOGY

One of the most prevalent endocrine conditions is primary hyperparathyroidism, which is thought to occur 25–30 times per 100,000 people per year. It predominantly affects women, particularly in the postmenopausal age group and are affected three to four times more frequently than men, and the peak incidence occurs during the fifth to seventh decades of life.[4,5]

Eighty to eighty-five percent of instances of primary hyperparathyroidism are caused by a solitary parathyroid adenoma, ten to fifteen percent are caused by multiglandular hyperplasia, two to five percent are caused by double adenomas, and less than one percent are caused by parathyroid carcinoma.[6,7] Most cases are sporadic; however, approximately 5–10% occur as part of hereditary syndromes such as Multiple Endocrine Neoplasia (MEN) types 1 and 2A, Hyperparathyroidism-Jaw Tumor Syndrome, and Familial Isolated Hyperparathyroidism.[2,9]

III. ETIOLOGY AND MOLECULAR PATHOGENESIS

The exact etiology of parathyroid adenoma is yet unknown. Most lesions occur sporadically; however, hereditary syndromes such as Multiple Endocrine Neoplasia type 1 (MEN1), MEN2A, Hyperparathyroidism-Jaw Tumor Syndrome, and Familial Isolated Hyperparathyroidism have been implicated in a small percentage of cases.[2,5]

Numerous genetic changes linked to the development of adenomas have been found through molecular research. Among the most prevalent anomalies are overexpression of Cyclin D1 (CCND1) and mutations of the MEN1 tumor

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jun766

suppressor gene. These genetic alterations disrupt cellular growth and interfere with normal cell-cycle regulation.

IV. PATHOPHYSIOLOGY

In order to maintain calcium and phosphate balance, parathyroid hormone is essential. When adenomatous tissue secretes too much PTH, it causes:

- Enhanced resorption of osteoclastic bone
- Increased calcium reabsorption in the renal tubules
- Elevated excretion of phosphate
- Enhanced intestinal calcium absorption via vitamin D activation

Hypercalcemia, hypophosphatemia, hypercalciuria, and skeletal demineralization are the overall outcomes.[3]

V. CLINICAL PRESENTATIONS

Prolonged PTH excess and increased serum calcium levels are the main symptoms of parathyroid adenoma. The following statement is frequently used to characterize classical symptoms:

"Abdominal groans, stones, bones, and psychiatric overtones."

➢ *Skeletal Manifestations*

- Bone pain
- Osteoporosis
- Osteopenia
- Pathological fractures
- Osteitis fibrosa cystica
- Brown tumor

➢ *Renal Manifestations*

- Nephrolithiasis
- Nephrocalcinosis
- Polyuria
- Renal insufficiency

➢ *Gastrointestinal Manifestations*

- Constipation
- Nausea and vomiting
- Peptic ulcer disease
- Pancreatitis

➢ *Neuropsychiatric Manifestations*

- Fatigue
- Depression
- Anxiety
- Cognitive dysfunction
- Muscle weakness

Currently, the most prevalent presentation in developed nations is asymptomatic disease found through standard laboratory testing.[3,4]

V. DIAGNOSTIC EVALUATION

➢ *Biochemical Investigations*

The diagnosis of parathyroid adenoma is primarily biochemical. Typical results consist of:

- Elevated serum calcium
- Elevated or inappropriately normal PTH levels
- Reduced serum phosphate
- Elevated alkaline phosphatase
- Increased urinary calcium excretion[3,11]

Recent research has identified normocalcaemic primary hyperparathyroidism as a unique clinical condition marked by increased PTH levels in spite of consistently normal serum calcium concentrations.

➢ *Imaging Studies*

Imaging is used for localization rather than diagnosis

➢ *Ultrasonography*

Due to its accessibility, affordability, and lack of radiation exposure, neck ultrasonography is frequently utilized as a first-line investigation. Usually, parathyroid adenomas show up as distinct, hypoechoic lesions next to the thyroid gland.

➢ *Technetium-99m Sestamibi Scintigraphy*

Sestamibi scanning has a high sensitivity for solitary adenomas and is still the most widely used nuclear imaging technique for preoperative localization.[6,8]

➢ *SPECT/CT*

By offering both functional and anatomical information, single-photon emission computed tomography in conjunction with CT enhances localization accuracy.

➢ *Four-Dimensional CT (4D-CT)*

4D-CT has emerged as an important modality, particularly in patients with negative or inconclusive conventional imaging and those with recurrent disease.[8,11]

➢ *MRI and PET/CT*

Ectopic adenomas and lesions missed by traditional imaging methods can be found with the help of MRI and fluorocholine PET/CT.

VI. MANAGEMENT

➢ *Surgical Management*

The most effective treatment for parathyroid adenoma is still parathyroidectomy, which has a 95% cure rate.[3,7]

Current surgical approaches include:

- Focused parathyroidectomy
- Minimally invasive parathyroidectomy
- Bilateral neck exploration

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jun766

Indications for surgery include:

- Symptomatic disease
- Serum calcium >1 mg/dL above normal
- Osteoporosis
- Nephrolithiasis
- Reduced renal function
- Age younger than 50 years[3,4]

To ensure that hyperfunctioning tissue is completely removed, intraoperative PTH monitoring is frequently utilized.[3]

➢ *Medical Management*

Medical treatment is reserved for patients who are not surgical candidates and includes:

- Cinacalcet
- Bisphosphonates
- Vitamin D supplementation
- Adequate hydration[4]

Medical treatment, however, just manages metabolic anomalies and does not offer a permanent remedy.

VII. CONCLUSION

Parathyroid adenoma is the most common cause of primary hyperparathyroidism, which is characterized by excessive parathyroid hormone release that causes hypercalcemia and related systemic symptoms.[1,2]Accurate localization and treatment planning depend on early diagnosis using biochemical tests, such as serum calcium and parathyroid hormone levels, in conjunction with suitable imaging scans. The most effective treatment is still surgical excision of the adenoma, which is linked to good results, biochemical parameter normalization, and a notable improvement in symptoms. To avoid long-term issues affecting the skeletal, renal, cardiovascular, and neuromuscular systems, prompt diagnosis and treatment are essential.

REFERENCES

[1]. Piciucchi S, Barone D, Gavelli G, et al. Primary Hyperparathyroidism: Imaging to Pathology. J Clin Imaging Sci. 2012;2:59.
[2]. Bilezikian JP, Cusano NE, Khan AA, Liu JM, Marcocci C, Bandeira F. Primary hyperparathyroidism. Nat Rev Dis Primers. 2016;2:16033.
[3]. Walker MD, Silverberg SJ. Primary hyperparathyroidism. Nat Rev Endocrinol. 2018;14(2):115–125.
[4]. Islam AK. Advances in the diagnosis and management of primary hyperparathyroidism. Ther Adv Endocrinol Metab. 2021;12:20406223211015965.
[5]. Khan AA, Hanley DA, Rizzoli R, et al. Primary hyperparathyroidism: Review and recommendations on evaluation, diagnosis and management. Osteoporos Int. 2017;28:1–19.
[6]. Aulakh A, et al. Imaging Recommendations for Diagnosis and Management of Primary Parathyroid Pathologies: A Comprehensive Review. Cancers (Basel). 2024;16(14):2593.
[7]. Preoperative Imaging in Primary Hyperparathyroidism: Literature Review and Recommendations. Can Assoc Radiol J. 2017;68(1):47–55.
[8]. DeLellis RA. Pathology of the Parathyroid Glands in Hyperparathyroidism. Semin Diagn Pathol. 2013;30(3):165–177.
[9]. Masi G, et al. Sporadic Parathyroid Adenoma: An Updated Review of Molecular Genetics. Front Endocrinol. 2023;14:1180211.
[10]. Mandl F. Therapeutic attempts in osteitis fibrosa generalisata. Wien Klin Wochenschr. 1926.
[11]. Chazen JL. Parathyroid Adenoma Imaging: Practice Essentials, Computed Tomography, Magnetic Resonance Imaging. Medscape. 2021