

# Diagnosis and Treatment of Primary Hyperparathyroidism with Repeated Bilateral Renal Stones (13 Cases Report)

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**Abstract:** *Background* to discuss the clinical characteristics of primary hyperparathyroidism (PHPT) with renal stones. *Methods* Clinical data of 13 Patients diagnosed With Primary hyperparathyroidism with repeated renal stones during May. 2006 to Oct. 2019 were analyzed retrospectively. *Results* 13 patients, 4 males, 9 females, 7 kidney stones, 3 ureteral stones, 3 kidney and ureteral stones, 7 unilateral stones, 6 bilateral stones, 7 cases of rapid postoperative recurrence of kidney and ureteral stones were diagnosed with PHPT, 6 cases of preoperative diagnosis with pHPT; in all cases, blood calcium and parathyroid glandular hormone were significantly increased, 6 cases of blood phosphorus were decreased; 12 cases were diagnosed with thyroid ultrasound and neck CT, and the operation was performed One case was diagnosed as hyperparathyroidism by 99mTc-MIBI. *Conclusions* Parathyroidectomy is effective to treat the disease which can reduce recurrence of kidney stones remarkably. Early diagnosis and treatment of Primary hyperparathyroidism is helpful to reduce stone recurrence and Preserve renal function.

**Keywords:** Primary Hyperparathyroidism, Renal Stone, Minimally Invasive Treatment

## 1. Introduction

Primary hyperparathyroidism (PHPT) is a disease caused by parathyroid disease (including adenomas, hyperplasia, etc.) that causes excessive synthesis and secretion of parathyroid hormone (PTH), which leads to disorders of calcium and phosphorus metabolism. Involving multiple organs, the main clinical manifestations are peptic ulcers, urinary calculi, temperament changes, cardiovascular system manifestations and bone damage [1, 2]; the above symptoms can be single occurs alone or in combination. However, sometimes due to clinical experience and ignorance of test results, there is often a lack of corresponding understanding of early and atypical PHPT, which is easy to be misdiagnosed as a single system disease (such as rapid recurrence after treatment of urinary calculi, repeated recurrence, etc.), resulting in repeated disease or poor treatment effect. Analysis of the clinical and follow-up data of 13 patients with nephrolithiasis type PHPT in our hospital, to discuss the clinical characteristics, diagnosis and

treatment of PHPT complicated with kidney stones, the report is now as follows.

## 2. Materials and Methods

### 2.1. General Information

13 patients, 4 males, 9 females, 7 kidney stones, 3 ureteral stones, 3 kidney and ureteral stones, 7 unilateral and 6 bilateral; 11 cases had a history of repeated urinary calculi And treatment history; 7 cases of rapid recurrence of kidney and ureteral stones (2 weeks to 12 weeks after surgery) after surgery, the postoperative reexamination of parathyroid hormone was significantly increased, and the diagnosis was combined with PHPT, and 6 cases were clearly diagnosed with PHPT before operation; 13 Parathyroid hormone was significantly increased in 7 cases, blood calcium was high in 7 cases, blood phosphorus was decreased in 6 cases; 12 cases were diagnosed by thyroid ultrasound and neck CT, postoperative pathology was parathyroid adenoma, and 1 case

was diagnosed by <sup>99</sup>MTC-MIBI. The postoperative pathology was parathyroid hyperplasia. All patients were admitted to the hospital with urinary calculi at the first visit. There were 6 cases of renal colic, 2 cases of hematuria, and 5 cases of physical examination. The patients were 38-65 years old, with an average age of (35±16) years; the size of the stones was 0.8-3.2cm, and the average stone size was (1.6±0.7) cm.

## 2.2. Preoperative Determination of Calcium, Phosphorus and Parathyroid Hormone

Blood calcium 2.65-3.75mmol/L, average 3.25±0.4 mmol/L (normal value 2.25-2.75mmol/L); blood phosphorus 0.43-1.35, average 0.65±0.13) mmol/L (normal value 0.89-1.6 mmol/L); PTH 39.5 – 1245.6 pg/mL, average (318.3±79.5) pg/mL (normal value 15-65 pg/mL).

## 2.3. Methods

7 cases underwent percutaneous nephrolithotomy with holmium laser lithotripsy, 6 cases underwent ureteroscopy and pyeloscope lithotripsy. Seven patients were diagnosed with rapid recurrence within 2-12 weeks and were diagnosed with PHPT before undergoing parathyroid adenoma resection, and uretero-pyeloscope lithotripsy was performed again 2-4 weeks after surgery. 6 patients were diagnosed with PHPT preoperatively and were transferred to tumor surgery for parathyroid adenoma resection. 2 weeks after the operation, 2 patients underwent percutaneous nephroscopic holmium laser lithotripsy, and 4 patients underwent ureteropyeloscope holmium laser lithotripsy. (Among them, 3 cases of bilateral surgery).

## 2.4. Follow-up

13 cases were followed up every 3 months. 4 cases were lost to follow-up after 15 consecutive months. 9 cases have been followed up so far, 2 cases have recurred, 1 case underwent extracorporeal lithotripsy, and 1 case was cured with ureteropyeloscope lithotripsy.

## 2.5. Missed Diagnosis

Misdiagnosis of 7 patients with preoperative biochemical routines indicating increased blood calcium and decreased blood phosphorus, the test results were not paid attention to, the patients with urinary tract recurrence rapidly after re-admission, re-examination after re-admission to detect PTH showed a significant increase, thyroid color Doppler ultrasound and Neck CT was clearly diagnosed as thyroid adenoma (4 cases were diagnosed by color Doppler ultrasound, and 2 cases were diagnosed by color Doppler ultrasound-negative neck CT).

1.6 Statistical methods Using SPSS 22.0 statistical software, measurement data are expressed as mean±standard deviation ( $\bar{X} \pm S$ ), and independent sample t test is performed;  $P < 0.05$  indicates that the difference is statistically significant.

## 3. Results

Seven patients underwent parathyroid adenoma resection after rapid recurrence was diagnosed with PHPT within 2-12 weeks, and ureteropyeloscope lithotripsy was performed again 2-4 weeks after operation. 6 patients were diagnosed with PHPT preoperatively, and were transferred to tumor surgery for parathyroid adenoma or partial resection. 2 weeks after the operation, 2 patients underwent percutaneous nephrolithotomy with holmium laser and 4 patients underwent ureteropyeloscope holmium laser. Stone surgery (including 3 cases of bilateral surgery). The blood calcium, blood phosphorus, and PTH gradually returned to normal after 2 weeks after the operation of the parathyroid glands (see Table 1). 13 cases were followed up every 3 months, 4 cases were lost after 15 consecutive months, 9 cases have been followed up so far, 2 cases have recurred, 1 case underwent extracorporeal lithotripsy, and 1 case was cured with ureteropyeloscope lithotripsy.

Changes of calcium, phosphorus and PTH indexes before and after parathyroid surgery.

**Table 1.** Changes of calcium, phosphorus and PTH indexes before and after parathyroid surgery.

index	Blood calcium (mmol/L)	Blood phosphorus (mmol/L)	PTH (pg/ mL)
Preoperative	3.25±0.4	0.65±0.13	318.3±79.5
2 weeks after surgery	1.95±0.3	1.45±0.2	45.5±15.5
3 months after surgery	2.15±0.4	1.25±0.15	55.8±20.5
P value	0.022 <sup>*</sup>	0.015 <sup>*</sup>	0.001 <sup>*</sup>

\*: The preoperative and postoperative differences were statistically significant.

## 4. Discussion

Primary hyperparathyroidism (PHPT) is a relatively rare endocrine disease. The main clinical manifestations are recurring urinary calculi, bone damage, hypercalcemia, mental and digestive symptoms, due to the complex clinical manifestations of the disease Diverse, easily misdiagnosed and missed [3]. About 30%-40% of PHPT patients have

urinary calculi [4]. Parathyroid hormone (PTH) promotes the production of 1,25-hydroxylated vitamin D3 in the kidneys, and promotes the absorption of calcium in the intestines, and promotes the role of osteoclasts, thereby increasing the reabsorption of calcium by the kidneys, resulting in increased blood calcium. At the same time, the excretion of calcium by the kidneys increases, and hypercalciuria occurs, which increases the incidence of calcium-containing stones in the urinary system [5]. Most PHPT patients with urinary tract

stones are bilateral or recurrent upper urinary tract stones. In the early stage, the blood calcium level of the patient did not increase significantly, but as the secretion of PTH gradually increased, the patient's clinical symptoms gradually appeared, and the obvious increase in blood calcium was the early manifestation of PHPT.

#### **4.1. PHPT Diagnosis: Qualitative Diagnosis and Location Diagnosis**

Through clinical manifestations and laboratory examinations (liver and kidney function, blood calcium, PTH, 24-hour urine calcium determination), a typical qualitative diagnosis of PHPT is not difficult, but for those with low laboratory indicators and single system or organ damage. Difficult to diagnose and missed diagnosis. Cervical color Doppler ultrasound and neck CT can assist in localization diagnosis, and 99mTC-MIBI can be used to confirm the diagnosis that cannot be determined by the above-mentioned examinations. Wang Gang et al. [5] obtained thyroid color Doppler ultrasound and neck CT through preoperative examination and postoperative pathological research., 99mTC-MIBI, the diagnostic positive rates were 67%, 100%, 100%, and the accuracy rates were 67%, 75%, and 100%, respectively. In this group, the positive rate of color Doppler ultrasound was 61% (8/13 cases), and the positive rate of neck CT was 92% (12/13 cases). One case of color Doppler ultrasound and neck CT could not be clearly diagnosed by 99mTC-MIBI. For most PHPT patients, thyroid color Doppler ultrasound and neck CT are the main diagnostic and screening methods.

#### **4.2. PHPT Treatment: Surgical Treatment Is an Effective Treatment for Parathyroid Adenoma or Hyperplasia Method**

Most PHPT is caused by parathyroid adenomas, accounting for about 85% to 90%, and the rest are caused by parathyroid hyperplasia [6]. In this group of cases, 12 patients had postoperative pathology of adenoma, and only 1 had postoperative pathology of parathyroid hyperplasia. Due to the missed diagnosis before operation, 7 patients caused rapid recurrence of urinary calculi within 1-3 months after surgery. After re-admission, surgery for parathyroid adenoma was performed first, and urinary calculi surgery was performed again 2 weeks later. 15 patients were followed up after operation. Only 1 case relapsed every month. Six patients were treated with parathyroid surgery first, and urinary calculi were treated 2-4 weeks later. At 7 months of follow-up, 1 case recurred. The stone was located in the upper part of the ureter and was cured by external lithotripsy. For patients with PTPH and urinary calculi, treating the primary disease first can reduce the number of treatments for urinary calculi and reduce the cost of treatment [8-11].

PHPT combined with urinary calculi often has renal colic or hematuria as the first symptom [11-12]. In the early stage, there is generally no severe bone damage, mental and gastrointestinal symptoms. Surgeons often treat it in isolation, delaying the treatment of the original disease, leading to

repeated recurrence of urinary calculi. The author believes that patients with the following manifestations are classified as high-risk groups for PHPT [7]: 1. Patients with urinary calculi who relapse quickly in a short period of time; 2. Those who are diagnosed as rheumatoid or rheumatoid arthritis but are not cured for a long time; 3. Patients with osteoporosis, spontaneous fractures, and bone damage patients who are not suitable for age; 4. Peptic ulcers that do not heal repeatedly, as well as unexplained nausea, vomiting, anorexia, and constipation; Drinking, polyuria but normal blood sugar. For the above population, surgeons should be vigilant and focus on screening PTPH to reduce or avoid misdiagnosis and missed diagnosis [13-15].

## **5. Conclusion**

Parathyroidectomy is effective to treat the disease. Which can reduce recurrence of kidney stones remarkably. Early diagnosis and treatment of Primary hyperparathyroidism is helpful to reduce stone recurrence and Preserve renal function.

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