18-3161 Sporadic Primary Hyperparathyroidism and Stone Disease: a Comprehensive Metabolic Evaluation Before and After Parathyroidectomy

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Introduction and Objective

- The prevalence of kidney stones varies from 7% to 12%. Hypercalciuria is one of the hallmarks of primary hyperparathyroidism (PHPT). PHPT is a disease of mineral metabolism characterized by excessive secretion of parathyroid hormone (PTH) produced by one or more parathyroid glands.
- The pathophysiology of urinary tract lithiasis in patients with PHPT and the factors that would indicate a greater risk for renal calculi formation have not yet been elucidated. The purpose of our study was to characterize the stone risk and to evaluate the impact of parathyroidectomy on the metabolic profile of patients with confirmed PHPT and urolithiasis.

Methods

- We analyzed the prospectively collected charts of patients treated at our stone clinic from Jan/2001-Jan/2016 searching for patients with PHPT and urolithiasis. Imaging evaluation of the kidneys, bones and parathyroid glands were assessed
- We analyzed the demographic data, serum and urinary parameters before and after parathyroidectomy. Statistical analysis included paired T/Fisher/Spearman/ANOVA tests. Significance was set at p<0.05.

Results

- 51 patients were included. Mean age was 57.1±12.1years and 82.4% were female. Hypercalcemia was present in 84.3% of patients (Table 1). All eight patients with normal calcium had elevated PTH. Only two subjects did not have PTH above normal range, though both had elevated calcium.
- Before parathyroidectomy, mean calcium and PTH levels were 11.2±1.0mg/dL and 331±584pg/dL, respectively (Table 2). The most common urinary disorders were low urinary volume (64.7%), hypercalciuria (60.8%), high urinary pH (41.2%) and hypocitraturia (31.4%).
- After parathyroidectomy, the number of patients with hypercalcemia (n=4;7.8%), elevated PTH (n=17;33.3%) and hypophosphatemia (n=3;5.9%) significantly decreased (p<0.001). The number of urinary abnormalities decreased and there was a reduction in urinary calcium levels (p<0.001), pH (p=0.001) and citrate (p=0.003).
- A negative significant correlation was found between PTH and urinary calcium (R=-0.304; p=0.04).

Table 1 – Prevalence of serum and urinary metabolic abnormalities in patients with primary hyperparathyroidism and renal stones before (A) and after (B) parathyroidectomy.

	A) Before parathyroidectomy		B) After parathyroidectomy		
Serum	n	%	n	%	p
Hypercalcemia (>10.2mg/dL)	43	84.3%	4	7.8%	<0.001
Elevated PTH (>45pg/dL)	49	96.1%	17	33.3%	<0.001
Hyperuricemia (M>7.00; F>5.7mg/dL)	15	29.4%	12	23.5%	0.50
Hypophosphatemia (<2.7mg/dL)	22	43.1%	3	5.9%	<0.001
Urinary	n	%	n	%	p
Low Volume (<2L/d)	33	64.7%	28	54.9%	0.31
Hypercalciuria (M>240; F>200mg/vol.24h)	31	60.8%	7	13.7%	<0.001
Elevated pH (>6.2)	21	41.2%	10	19.6%	0.021
Hypocitraturia (M>320; F>290mg/vol.24h)	16	31.4%	18	35.3%	0.67
Hypernatriuria (>220mg/vol.24h)	6	11.8%	8	15.7%	0.56
Hyperoxaluria (>40mg/vol.24h)	4	7.8%	1	2.0%	0.36
Hyperuricosuria (M>0.75; F>0.60g/vol.24h)	2	3.9%	3	5.9%	0.99

Table 2 – Mean values of serum and urinary metabolic parameters in individuals with primary hyperparathyroidism before (A) and after (B) parathyroidectomy.

	A) Before parathyroidectomy				B) After parathyroidectomy				
Serum	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.	p
Total Calcium (mg/dL)	11.2	1.0	9.7	14.3	9.5	0.7	7.2	11.6	<0.001
Ionic Calcium (mg/dL)	6.2	0.7	1.9	8.4	4.9	0.3	4.2	6.3	<0.001
Phosphorus (mg/dL)	2.6	0.4	1.0	3.5	3.3	0.6	2.5	5.1	<0.001
Uric Acid (mg/dL)	5.75	1.53	2.2	9.0	5.7	2.0	3.4	13.6	0.87
PTH (pg/mL)	331.0	584.0	33.0	3567.0	49.1	36.4	7.0	233.0	0.002
Vitamin D (ng/mL)	19.7	7.2	6.0	32.0	27.6	9.8	11.5	53.0	<0.001
Urinary	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.	p
Volume (mL)	1654.8	662.7	510.0	4400.0	1696.0	531.6	490.0	3500.0	0.63
Calcium (mg/vol.24h)	269.1	145.4	28.8	634.7	146.2	91.9	7.6	381.8	<0.001
Oxalate (mg/vol.24h)	64.6	98.0	5.0	370.0	30.1	52.7	2.0	245.0	0.17
Citrate (mg/vol.24h)	424.7	264.4	52.8	1305.6	261.3	184.6	19.5	793.8	0.003
Sodium (mg/vol.24h)	171.2	75.3	74.0	374.0	172.1	83.6	42.0	351.0	0.72
Uric Acid (g/vol.24h)	0.43	0.17	0.19	0.83	0.40	0.18	0.11	0.75	0.59
pH	6.1	0.7	5.0	7.0	5.8	0.7	5.0	7.0	0.001

Discussion and Conclusions

- Our study corroborates the understanding that a high index of suspicion is necessary for the identification and adequate treatment of patients with renal lithiasis and PHPT. Complete serum and urinary metabolic assessment is indispensable for the recognition of all potential lithogenic factors in individuals with PHPT.
- Treatment with parathyroidectomy should be done rapidly and is effective in improving the body metabolism of calcium, reducing potential damage to the kidneys and bone. However, it does not culminate with normalization of all urinary parameters, which should be delineated and treated in a particularized manner. Oral citrate supplementation might be especially important in these patients.
- Prospective clinical studies and genetic risk evaluation constitute the next step to improve patient management. Ongoing coordinated follow-up by urology and endocrinology is warranted. Drawbacks of the investigation are the retrospective nature, limited number of patients, and lack of long-term follow-up to determine the impact of surgery on the metabolic risk and stone recurrence.