Title

1644: Comparison of Urine Composition Between Mate Kidneys in Patients with Nephrolithiasis

Journal

Investigative Urology, 177(4)

ISSN

0021-0005

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Publication Date

2007-04-01

DOI

10.1016/s0022-5347(18)31832-9

Peer reviewed

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BISPHOSPHONATE PREVENTS CALCIUM PHOSPHATE STONES IN PATIENTS WITH OSTEOPOROSIS

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INTRODUCTION AND OBJECTIVE: Osteoporosis is associated with the pathogenesis of urinary stone formation and the risk of urolithiasis. Bisphosphonates are potent inhibitors of bone resorption, and are used in the management of bone disease. Thus, bisphosphonates (BPs) might also inhibit urinary stone formation. We suggest the use of BPs as a possible method of preventing calcium stone formation.

METHODS: We measured bone mineral density (BMD) by the DEXA method in Japanese urolithiasis patients (72 men and 57 women, 62.1 +/- 13.2 years old), and diagnosed osteoporosis in 8 men and 17 postmenopausal women. In this study, the subjects were 5 men and 7 postmenopausal women, 68.2 +/- 9.4 years old, stone composition; CaP: 4, CaOx 3, CaP+CaOx 5, without osteoporosis therapy. We administered 5 mg/day alendronate (ALN), an oral BP medicine, for over 3 months, measured BMD and serum parameters, and collected 24-hour urine both before and 3 months after the administration of ALN. The ion activity product of calcium oxalate, AP(CaOx) index, and calcium phosphate, AP(CaP) index was estimated with the Tisselius method for 24-hour urine collection. We examined the protective effect of ALN against urinary stones and osteoporosis.

RESULTS: The AP(CaP) index was reduced significantly (1.42+/-0.37 to 0.83+/-0.39, $p < 0.05$) by ALN administration (**Table**). Urinary calcium, oxalate, phosphate, and AP(CaOx) index were reduced, displaying a non-significant trend toward reduction. Urinary NTx, a bone absorption marker, was reduced significantly ($p<0.05$), and BMD improved in 11 of 12 cases by ALN administration.
There was no incidence of urinary stones in patients during ALN administration.

CONCLUSIONS: The results suggest that ALN not only improves BMD and osteoporosis, but also reduces the risk of calcium phosphate stone formation in osteoporosis patients.

Table

	Before	After	
Bone Mineral Density (PR to YAM) (%)	65.7 ± 7.87	67.5 ± 7.72	N.S.
Urinary deoxypyridinoline (DPD) (nmolBCE/mmol CRE)	5.00 ± 0.64	4.26 ± 1.74	N.S.
Urinary NTx (nmolBCE/mmol CRE)	58.2 ± 17.2	33.8 ± 18.2	p < 0.05
Urinary calcium (g/day)	0.135 ± 0.059	0.133 ± 0.093	N.S.
Urinary phosphate (g/day)	0.477 ± 0.217	0.468 ± 0.174	N.S.
Urinary oxalate (mg/day)	15.7 ± 11.4	12.4 ± 5.5	N.S.
AP (CaOx) index (Tisselius method)	0.681 ± 0.385	0.499 ± 0.297	N.S.
AP (CaP) index (Tisselius method)	1.422 ± 0.374	0.834 ± 0.390	p < 0.05

Source of Funding: None

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COMPARISON OF URINE COMPOSITION BETWEEN MATE KIDNEYS IN PATIENTS WITH NEPHROLITHIASIS

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INTRODUCTION AND OBJECTIVE: Twenty-four hour urinalysis is useful in the work-up of patients with urolithiasis. It has been assumed that both kidneys are exposed to identical plasma conditions and as such, 24 hour urinalyses reflect global metabolic defects. However, some patients present only with unilateral nephrolithiasis. We hypothesize that urinary composition may in fact be different between renal units and may contribute to unilateral urolithiasis.

METHODS: We collected selective urine specimens from 10 consecutive patients with nephrolithiasis who underwent unilateral percutaneous nephrolithotomy. In each case, we collected urine samples from both the post-operative nephrostomy tube and Foley catheter for 12 consecutive hours. The nephrostomy tube specimen reflected urine from the index kidney, and the specimen from the Foley served as a measure of urine from the contralateral renal unit. We analyzed the urine for sodium, potassium, chloride, citrate, oxalate, phosphate, calicium, uric acid, magnesium, creatinine, osmolarity, and pH. The concentrations of the chemical composition of each specimen were compared to that of its mate to determine the percentage difference between the two.

RESULTS: Ten patients were studied (4 with unilateral nephrolithiasis; 6 with bilateral). All variables measured showed differences between renal units with the largest average difference of 46% for phosphate and the smallest for pH, 10%. Ranges of the differences measured varied between 0% to more than 95% (see Table 1). This variability was noted in patients with unilateral and bilateral urolithiasis.

CONCLUSIONS: While 24 urine collections consist of pooled urine from both kidneys, there exist wide variations in urinary composition from each renal unit. We appreciate the drawbacks of the study, including examining a percutaneously manipulated kidney in the immediate postoperative period as well the Foley catheter collection representing urine from both kidneys. However, our data may provide insight into why some patients present with unilateral nephrolithiasis and why some studies have shown poor correlation between 24 hour urinalysis and the risk of stone formation.

Percent differences between each measured variable collected from the nephrostomy tube and Foley

Measured Variable	Average Difference (Percentage)	Minimum Difference (Percentage)	Maximum Difference (Percentage)
Phosphate	46.2	2.1	96.5
Creatinine	39.8	12.7	79.0
Calcium	37.4	8.0	69.7
Uric Acid	34.9	1.8	82.4
Chloride	33.0	0.0	69.5
Oxalate	28.8	3.8	65.8
Potassium	26.2	9.5	47.1
Citrate	25.4	5.2	47.4
Magnesium	25.5	0.0	75.0
Sodium	24.9	1.0	71.8
Osmolarity	22.1	1.9	47.1
pH	10.3	0.1	24.1

Source of Funding: None

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EFFECTS OF DIFFERENT HYDRATIONAL STATES ON URETERAL DYNAMICS AND STONE MOVEMENT IN A PORCINE MODEL: AN IN VIVO STUDY

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INTRODUCTION AND OBJECTIVE: The effects of different hydrational states (normal urine output, diuretic and oliguric) on stone passage and changes in ureteral peristalsis and intrapelvic pressure was studied.

METHODS: Intravenous fluid infusion was controlled to produce a normal urine output, diuretic or an oliguric state. Eighteen domestic pigs were randomized to 3 groups (6 normal urine volume, 6 diuretic and 6 oliguric). Ureteral peristalsis was measured by a magneto-resistive sensor and bipolar electromyographic electrodes deployed on the extraluminal ureteral surface through a lumbotomy incision. The intrapelvic pressure (IPP) was monitored through a catheter in the renal pelvis. Ureteral peristalsis, IPP (Fig.1), urine output and arterial pressure were recorded before and for 6 hours after placement of a 4mm radio opaque stone in the proximal ureter. Stone movement was monitored using digital fluoroscopy for a maximum of 5 days or until the stone passed.

RESULTS: The mean IPP before and after stone placement in the normal urine output, diuretic and oliguric groups were 5, 8, 4 and 7 (max. 20 during peristalsis), 10 (max.15), 5 (max. 23) mmHg respectively ($p<0.05$ during peristalsis). The mean peristaltic rates before and after stone placement in the normal urine output, diuretic and oliguric pigs were 6, 20, 6 and 16, 34, 12/10 min. respectively ($p=0.03$). In 4/6, 1/6 and 0/6 of normal urine volume, diuretic and oliguric animals respectively, the stone moved down to distal urete or bladder during the first 6 hours of observation.. However, all pigs passed stones in <4 days. The peristalsis was weak and often incomplete in oliguric animals. The ureter was dilated with poor cooptation during peristalsis in the diuretic pigs.

CONCLUSIONS: In the acute phase there was an increase in IPP during peristalsis and rate of peristalsis in all groups following stone placement. There was an increase in IPP during the interperistaltic phase in the diuretic group with no stone movement. Stone movement was quicker in the normal urine volume group compared to the oliguric or diuretic pigs. Effective peristalsis with good cooptation of ureteral walls may be important than the rate of peristalsis or intrapelvic pressure for stone passage.