

## STONE DISEASE

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### **Association of urinary pH with body weight in nephrolithiasis**

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**Background:** The prevalence of kidney stone disease in the United States is progressively increasing, paralleling the growing rate of obesity. Uric acid nephrolithiasis, a condition associated with a low urinary pH, has been linked to obesity and insulin resistance. Based on these observations, we hypothesized that urinary pH may be inversely associated to body weight in nephrolithiasis.

**Methods:** Data were retrieved from 4883 patients with nephrolithiasis who underwent ambulatory evaluation at two established stone clinics in Dallas and Chicago. The patients collected 24-hour urine samples on an outpatient basis, while avoiding any drug that could alter urinary pH. Patients were divided in increasing sextiles of body weight, and urinary pH was adjusted for urinary creatinine and for age.

**Results:** Urinary pH had a strong, graded inverse association with body weight. Urinary creatinine and age were both found to be significant covariates of urinary pH, while gender was not a significant independent variable after adjustment for urinary creatinine. Mean 24-hour urinary pH, adjusted for age and urinary creatinine, were 6.09, 6.04, 6.01, 5.99, 5.97, and 5.91 for sextiles of body weight in increasing order from Dallas (P for linear trend < 0.0001), and 6.18, 6.10, 6.04, 6.02, 5.97, and 5.88 for the sextiles from Chicago (P for linear trend < 0.0001).

**Conclusion:** We conclude that urinary pH is inversely related to body weight among patients with stones. The results confirm the previously proposed scheme that obesity may sometimes cause uric acid nephrolithiasis by producing excessively acid urine due to insulin resistance.

### **Editorial Comment**

For those of us who treat a lot of stones and have a large referral practice for obese stone-forming patients, the observation that many of these patients have uric acid stones is no surprise. On the surface many of us have assumed that the high incidence of uric acid stone disease was due to overindulgence in salt, meat and dairy leading to low urine pH and high urinary uric acid. However, the group from Dallas has postulated a novel pathophysiologic mechanism for uric acid stone formation (1). By their theory, the acidic urine seen in obese uric acid stone formers is attributed to insulin resistance in the kidney, which leads to decreased renal ammonia excretion and subsequent reduced urinary buffering capacity, thereby causing an acidic urine.

In the current study, patient databases from 2 of the largest metabolic stone clinics in the country were searched to establish the relationship between urine pH and body weight in a large group of stone patients. A strong, inverse association was found between urine pH and body weight, a relationship which held even after adjustment for a variety of potential confounding factors. Interestingly, after adjustment for urinary sulfate, a marker for animal protein intake, the strong inverse association persisted, suggesting that the mechanism is independent of diet and not simply a result of dietary indiscretion. Indeed in their seminal work, the investigators confirmed low urine pH in obese uric acid stone patients maintained on a controlled metabolic diet.

These findings support the insulin resistance-mediated mechanism of increased urinary acidity in obese patients. Therefore, it is hoped that with weight loss (and dietary modification), insulin-resistance may be reversible and urinary acidity can be returned to normal, thereby reducing the risk of stone formation.

## Reference

1. Sakhae K, Adams-Huet B, Moe OW, Pak CY: Pathophysiologic basis for normouricosuric uric acid nephrolithiasis. *Kidney Int.* 2002; 62: 971-9

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## **Safety and efficacy of percutaneous nephrolithotomy in patients with neurogenic bladder dysfunction**

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**Objectives:** To review our experience performing percutaneous nephrolithotomy (PNL) on patients with neurogenic bladder dysfunction with special attention paid to the risks of surgical complications and stone recurrence. Patients with neurogenic bladder dysfunction with or without urinary diversion are at increased risk of urolithiasis, surgical complications, and recurrent stone disease.

**Methods:** We retrospectively reviewed the 23 patients with neurogenic bladder dysfunction who underwent PNL at our institution. Neurologic lesions included spina bifida, traumatic spinal cord injury, exstrophy/epispadias, neonatal meningitis, stroke, and spine chondrosarcoma. Bladder management included ileal conduit (n = 8), intermittent catheterization (n = 7), indwelling catheter (n = 7), and ureterosigmoidostomy (n = 1).

**Results:** We performed 100 procedures on 47 renal units (17 bilateral, 7 with recurrent stones). Urinary tract infection/colonization was seen in 21 of 23 patients, most of whom had more than one organism. The stone-free rate was 96%. Six patients required three or more procedures, each had a complete staghorn calculus. In an average of 36 months of follow-up, 10 patients (46%) had recurrent stone disease requiring intervention, and 5 patients (23%) underwent repeat PNL. The stone composition analysis revealed mainly infection-related stones.

**Conclusions:** PNL in patients with neurogenic voiding dysfunction is safe and effective, with outcomes comparable to that of patients without such lesions. The complication rate is small but statistically significant. It is important to obtain adequate urine cultures, because renal pelvis and bladder culture data may differ and affect the outcome. Risk factors for recurrent stone disease include a high spinal cord lesion, indwelling urinary catheter, and ureterosigmoidostomy.

## **Editorial Comment**

Patients with neurogenic bladders with or without urinary diversion have a high incidence of chronic urinary tract infections and stones. Results with shock wave lithotripsy have been disappointing with regard to stone free rates and recurrent stone disease. As such, many of these patients are best managed with percutaneous nephrostolithotomy (PCNL). Unfortunately, infectious and other complications are common in this patient population.

Nadler and colleagues reviewed their series of 23 patients with neurogenic bladder dysfunction who underwent 100 PCNL procedures on 47 renal units to assess success and complication rates. With aggressive second look flexible nephroscopy in all but 2 patients, an impressive stone free rate of 96% was achieved. Moreover, despite documented urinary tract infection in 91% of patients, only one case of urosepsis occurred,

after initial percutaneous access. The authors attribute their low infectious complication rate to pre-operative treatment of positive urine cultures, percutaneous access and collecting system drainage the day prior to PCNL and aggressive culture-specific intravenous antibiotics after drainage. However, despite their high stone free rate, recurrent stones occurred in 46% of patients within 36 months.

This study highlights the potential complications of treating stones in this patient population as well as the high rate of recurrence despite a stone free state. However, it is encouraging that with careful pre- and intra-operative measures, complication rates can be minimized. While the practice of routinely obtaining percutaneous access a day or more prior to the procedure has never been shown in controlled trials to reduce infectious complications, and I personally have not adopted this practice, it does allow renal pelvic urine to be assessed prior to initiating lengthy manipulation of the urinary tract. In addition, although the authors advocate oral antibiotics for 2 days prior to admission, I favor a more prolonged course of 1-2 weeks of culture specific antibiotics to assure at least superficial sterilization of the urinary tract.

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## ENDUROLOGY & LAPAROSCOPY

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### **Use of a ureteral access sheath to facilitate removal of large stone burden during extracorporeal shock wave lithotripsy**

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Large renal stone burdens within a nondilated collecting system in patients with a relative contraindication to percutaneous nephrolithotomy can be a challenging problem. We describe a novel technique using a ureteral access sheath combined with extracorporeal shock wave lithotripsy to facilitate passage of stone fragments in such patients.

### **Editorial Comment**

A ureteral access sheath is a hollow sheath that is placed with an obturator over a wire into the ureter. After removing the obturator, the sheath allows rapid placement and removal of ureteroscopes and improves irrigant outflow. The internal diameter of the devices ranges from 9.5 to 16 F, with lengths from 20 to 55 cm. Although ureteral access sheaths have been available for many years, they did not become popular until some modifications by Applied Medical (Rancho Santa Margarita, CA, USA) made them easier to insert and more rigid. Further modifications by Applied and then others - there are now sheaths available from at least 3 other companies - have included additional kink resistance, hydrophilic coatings, extra channels for guidewires, and improved obturators. Many endourology experts have advocated their routine use in all flexible ureteroscopic procedures, to ease ureteroscope passage, minimize pressure in the upper tract, and facilitate rapid removal and re-insertion of the ureteroscope for fragment or biopsy retrieval. Others use them only for specific indications. I consider them to be most useful when there is a good reason to remove stone fragments rather than simply