Urinary Crystals due to X-Ray Contrast Medium

A.C.

Adrian C.

Sewell

Department of Pediatrics, University Children's Hospital, Frankfurt, Germany

Adrian C. Sewell, PhD, Department of Pediatrics, University Children's Hospital, Theodor-Stern-Kai 7, D-60590 Frankfurt am Main (Germany)

Dear Sir,

In the course of studying patients with suspected renal calculi, 24-hour urine collections for the determination of calcium and phosphate are mandatory [1]. Recently such an analysis was performed on 3 consecutive 24-hour urines from a patient who had suffered from renal colic for the past 4 years. After admission he underwent a transverse ureterolithotomy for a small left ureteric calculus. On storing the acidified collections at 4°C, a heavy, crystalline deposit was noted in the first sample. Analysis of this deposit was negative for all the normal constituents of renal stones. Microscopic examination showed crystals unlike those seen in urinary sediments (fig. 1). Heating a small amount of the dried deposit resulted in the release of a purple vapor which on condensing formed black needles giving a positive starch reaction. A survey of the patient's notes revealed that he underwent intravenous urography (IVU) during the first 24-hour collection period.

During the IVU the patient received 50 ml of Urografin 325 (18% w/v meglumine diatrizoate and 40% w/v sodium diatrizoate containing 325 mg iodine/ml; Schering Pharmaceuticals). This contrast medium crystallized in a shape similar to that found in the patient's urine (fig. 1). Thin-

layer chromatography of dilute Urografin and a solution of the patient's urinary crystals in n-butanol/1 M ammonia/ethanol (5:2:1) showed the same migration pattern. Crystal formation was investigated with respect to both temperature and pH.

Ten random urines were analyzed for pH, protein, calcium, phosphate, creatinine, urea and uric acid. One-milliliter aliquots of each urine were spiked with 25 µl of Urografin (representing an IVU using 50 ml of contrast medium and a 24-hour urinary output of 2,000 ml). One set of aliquots was incubated at 25 °C, the other at 4°C. No crystal-luria was noted in those samples incubated

at 4°C.

Fig. 1. Light microscopy of crystals present in the patient's urine (a) and that of a solution of Urografin pH 2.0 (b). ×75.

KARGER

E-Mail karger@karger.ch Fax + 41 61 306 12 34

© 1996 S. Karger AG, Basel 0028-2766/96/0723-0487\$ 10.00/0

at 25 °C, whereas at 4 °C a few crystals were noted in some but not all urines. This was repeated after acidification with 25 µl of 2 M hydrochloric acid to bring the pH to about 3.0. Crystalluria was present in all urine samples both at 25 and 4°C, the latter forming crystals within 6 h of incubation. No correlation was found between the degree of crystalluria and any of the measured

urinary parameters. A 'pH profile' showed crystal formation to occur at pH 4.0 and below; the heaviest deposit occurring at pH 2.0.

The iodinated crystals found in the patient's urine after IVU with Urografin displayed similar morphology to the parent dye crystals, thin-layer chromatography confirming that the crystals were also similar in composition to that of the parent dye compound. These findings confirm those of a

report [2] in which the effect of pH was noted but no attempt was made to correlate the degree of crystalluria with any measured urinary parameters. The effect of pH on the urinary excretion of diatrizoate has been documented in animals [3], the present results confirming maximum crystallization at pH 2.0. The question of whether in situ crystal formation would occur in vivo during IVU is doubtful. The findings suggest that this is a collection and storage effect and does not appear to be related to any degree of renal disease. Since the presence of crystalluria is important in the work-up of patients with renal stone disease, urine for calcium and phosphate analysis should not be collected during IVU as the formation of crystals due to contrast media could confuse an evaluation.

References

Black DAK, Stewart CJ: Renal function; in Brown SS, Mitchell FL, Young DS (eds): The Chemical Diagnosis of Disease. Amsterdam, Elsevier, 1979, p475.

Ramsey AW, Spector M, Rodgers AL, Miller RL, Knapp DR: Crystalluria following excretory urography. *Br J Urol* 1982;54:341-345.

McChesney EW, Hoppe JO: Studies of the tissue distribution and excretion of sodium diatrizoate in laboratory animals. *Am J Roentgenol* 1957;78:137-144.

488

Nephron 1996;72:487-488

Sewell