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Internalization of Calcium Oxalate Calculi Developed in Narrow Cavities

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ABSTRACT

We describe the case of a patient with calcium oxalate monohydrate and calcium oxalate dihydrate calculi occluded in cavities. All those calculi were located inside narrow cavities covered with a thin epithelium that permits their visualization. Urinary biochemical analysis showed high calciuria, not hypercalciuria, hypocitraturia, and a ratio [calcium]/[citrate] >0.33. The existence of cavities of very low urodynamic efficacy was decisive in the formation of such calculi. It is important to emphasize that we observed a thin epithelium covering such cavities, demonstrating that this epithelium may be formed after the development of the calculi through a re-epithelialization process.

Introduction

The calcium oxalate stones are more than 70% of all urinary calculi. Two different types of calcium oxalate calculi can be found in humans, calcium oxalate monohydrate (COM) and calcium oxalate dihydrate (COD).[1]

It has been shown that the major etiologic factors for these types of calculi are different. Thus, the COM is observed to be more frequent in patients with urinary calcium excretion and concentration normal with a deficit of urine in the capacity to inhibit the crystallization, whereas the COD is associated with an elevated urinary calcium excretion and a urinary pH $\geq$6.[2-4]

COM calculi can be divided into 2 groups[5]: (1) papillary COM calculi, with an area of detectable attachment to the papilla that basically consists of a core near the junction with the papilla (concave region) and radially grooved concentric peripheral layers, and (2) COM calculi in which the attachment area to the papilla is not detectable, which develops in renal cavities; it consists of a central core that clearly serves as a nidus for the organization and development of calculus body. Therefore, the calculus body is constituted by columnar crystals of COM that emerge from the central core.

Case presentation

We describe the case of a patient with COD and COM calculi occluded in cavities with low urodynamic efficacy. The patient, a 39-year-old man, had a history of kidney stones. The x-ray imaging and abdominal computed tomographic scans showed many shades of stone in the left kidney and only a small stone in the right one. The left kidney was shaped with a totally abnormal dendritic branched pelvis (Fig. 1) with respect to the left kidney. The patient did not present any other previous disease. The patient underwent percutaneous nephrolithotomy with dual access to remove several calculi of the left kidney.

Discussion

This patient formed 2 different types of calculi. Eleven corresponded to COD calculi with hydroxyapatite as a minor component. The other was a nonpapillary COM calculus consisting of a spherical calculus developed around a central core surrounded by columnar COM crystals emerging from the core and with complete absence of an attachment to the epithelium (Fig. 2). All those calculi were located inside narrow cavities covered with a thin epithelium that permits their visualization (Fig. 3A). By removing this epithelium calculi was easily removed and the cavity in which are housed can be clearly observed (Fig. 3B). Biochemical blood analysis showed only elevated triglycerides (373 mg/dL), and urinary biochemical analysis showed high urinary calcium concentration, not hypercalciuria, (165 mg/24 hour, 130 mg/L), hypocitraturia (146 mg/L), and a ratio [calcium]/[citrate] >0.33.

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Figure 1. Radiography of the left kidney in which can be seen an anomalous branched dendritic pelvis.

As described previously,[5] the COM nonpapillary stone formers do not manifest clear alterations of common urinary biochemical parameters and in fact exhibited profile values similar to healthy population and are only associated with a loss of the ability to inhibit crystallization. In such case, the existence of cavities of very low urodynamic efficacy, as observed in the present study, were decisive in the formation of such calculi. It is important to emphasize that we observed a thin epithelium covering such cavities (Fig. 3), demonstrating that this epithelium may be formed after the development of the calculi through a re-epithelialization process. The re-epithelialization is a posterior process of an epithelial lesion, it finalizes with the formation of a scarring. The scar formation consists in the proliferation in all directions of epithelial cell rest present in inflamed lesions that form strands or islands of epithelium, which then are invaded by vascular fibrous connective tissue. The existence of COD calculi can be explained considering that because of the elevated calcium concentrations detected in urine of 24 hours, this must involve periods of higher values (formation of COD) and periods with low values (formation of COM).

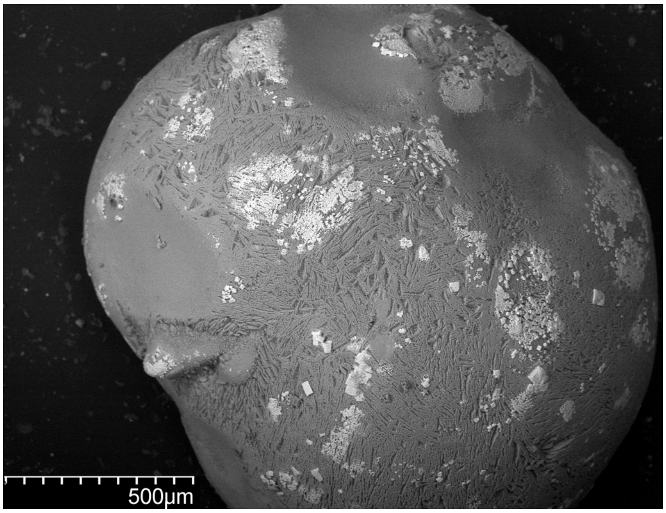

Figure 2. Observation, by scanning electron microscopy, of nonpapillary calcium oxalate monohydrate calculus located inside narrow cavities.

It is interesting that almost all stones developed in the same kidney (right). This clearly implies morphoanatomic differences between the 2 kidneys in such manner that one exhibits a complex internal structure with presence of narrow cavities of low urodynamic efficacy. This demonstrates the importance of morphoanatomy as a factor involved in lithogenesis. No similar cases have been previously described in the literature.

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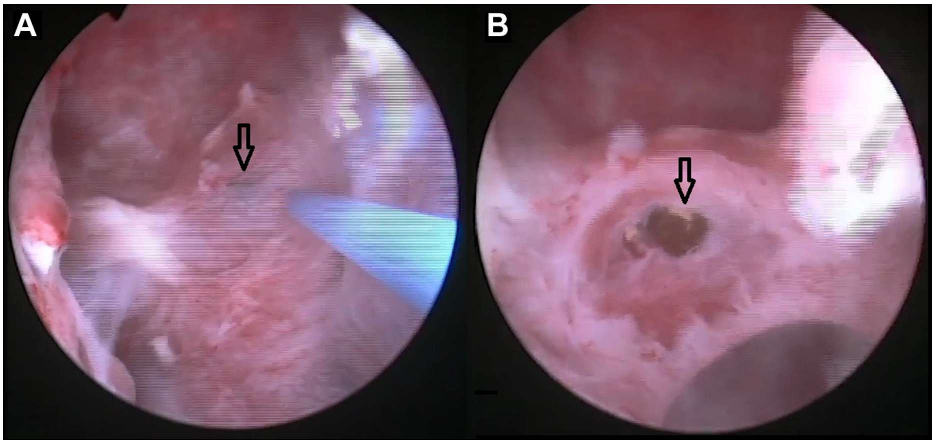

Figure 3. Observation of the thin epithelium that covered a cavity **(A)** which is being ripped with a clamp **(B)** and in this cavity are present the calculi.

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