

Heterotrophic bone formation with bone marrow in the kidney parenchyme

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Abstract Extrasosseous metaplasia of the urinary tract is an uncommon condition first described in 1923 by Phemister. Bone formation can occur anywhere along the urinary tract but most has been described in renal pelvis, calyx or along the urothelial layer. We report a case of extrasosseous bone formation within the kidney parenchyme appearing as a calcified multiseptated mass.

Keywords Heterotrophic bone formation · Kidney · Partial nephrectomy

Case report

A 34-year-old man with a complicated right renal mass admitted for laparoscopic partial nephrectomy. Abdominal computed tomography revealed about 2.7-cm sized calcified thick walled mass in lower portion of right kidney (Fig. 1) and a hyperdense calcified lesion in gall bladder. A differential diagnosis of calcified RCC or complicated cyst was considered. Laparoscopic partial nephrectomy was performed. Histopathologic examination revealed heterotopic bone formation with bone marrow in kidney. The stroma was calcified, and areas of metaplastic bone with bone marrow were seen (Fig. 2), consistent with osseous metaplasia. No evidence of malignancy was found.

Discussion

The etiology and pathogenesis of heterotrophic ossification has been a source of interest to researchers for more than a century [1]. Renal extrasosseous metaplasia appears to be induced by mucosal injury, ischemia, trauma or carcinogens [2, 3]. Kagawa [4] postulated that infiltration of polymorphonuclear cells with an increase in alkaline phosphatase and acid phosphatase activity resulted in ectopic bony tissue formation. Phemister [5] postulated whether a stone formed at a breach in the urothelium with ossification of its fibrous pedicle or lying free in the renal pelvis caused erosion and subsequent attachment with an ossified pedicle to the urothelium. It is possible that because the kidney is an end organ, interference with its blood supply is followed by degeneration, which creates a milieu for calcification and ossification [3]. Sequential steps of ectopic osteogenesis, from appearance of small cysts to calcification and then to organized osseous tissue, were confirmed by Huggins [6] in his experiments on urothelial tissue. These stones were fixed to the wall of the renal pelvis or ureter, and it was hypothesized that the primary osseous metaplasia had served as a focus for superimposed urinary stone formation. This view is supported by Fernandez-Conde et al. [7] who postulate that the development of bone metaplasia within the connective tissue of the urinary tract is the primary event. This ossification nidus may then perforate the urothelium and come in contact with urine. The direct and continuous action of urine on altered tissue induces bone formation by deposition of successive layers of lithiasic mineral [3]. Bone formation can occur anywhere along the urinary tract. Of 1,693 calculi Cifuentes Delatte et al. [3] found osseous tissue in 16 renal, 1 ureteral and 2 vesical calculi. However, all the reported renal extrasosseous bone formation (EOB)

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Fig. 1 Computed tomographic finding of 2.7-cm sized calcified thick walled mass on the lower pole of right kidney

was located in renal pelvis, calyx or along the urothelial layer. In our case, the site of EOB formation was within the kidney parenchyma appearing as a calcified multiseptated mass.

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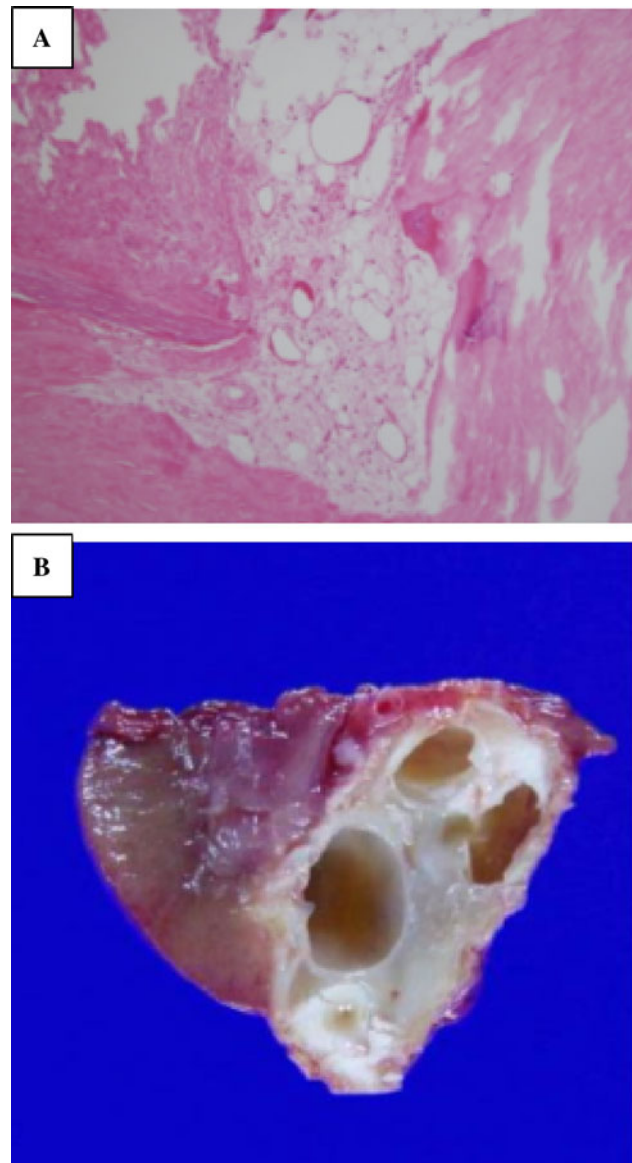


Fig. 2 **a** Microscopic finding of extraosseous bone formation with bone marrow. **b** Cross finding of calcified multiseptated mass

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