JBR–BTR, 2015, 98: 113-114.

LITHIUM-INDUCED NEPHROPATHY

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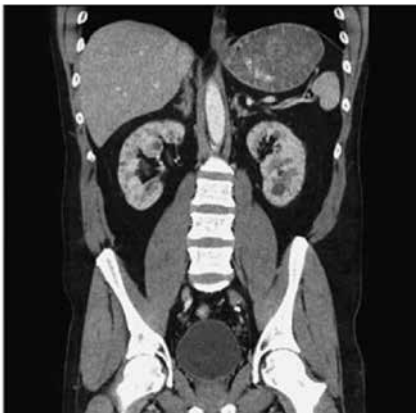
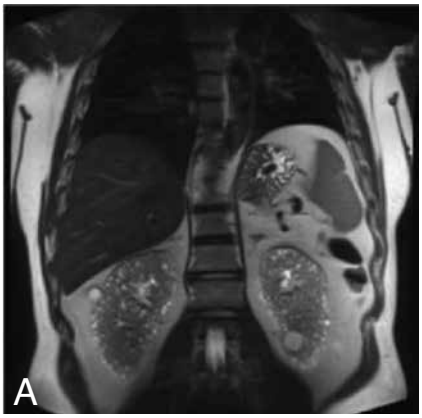
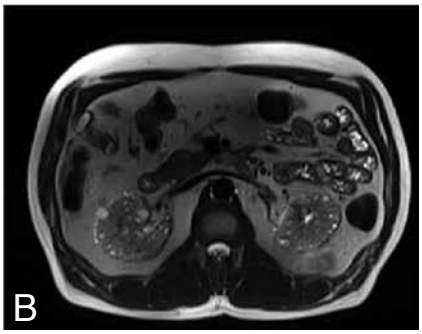
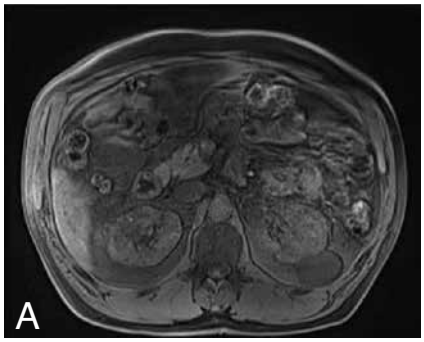
Key-word: Drugs, toxicity

Background: A 59-year-old man was referred for CT scan of the abdomen after repair of an eventrated appendectomy wound. The man had a known history of bipolar affective disorder, for which he had been on lithium therapy for many years. As an incidental finding, CT scan showed numerous small hypodense renal lesions. Subsequently a MRI examination was performed to further characterize these renal abnormalities.









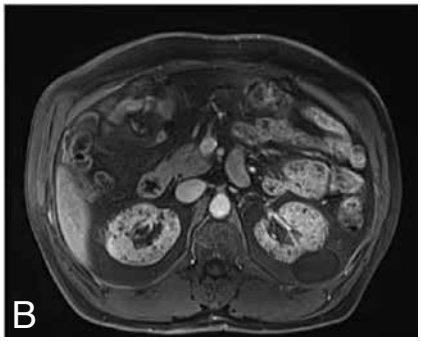


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Fig.	2A	2B
	3A	3B

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Work-up

Contrast-enhanced CT scan of the abdomen, reformatted image in the coronal plane (Fig. 1) shows normal sized kidneys with numerous small (1-2 mm) hypodense lesions revealed as adventitious finding.

MRI of the kidneys (Fig. 2) included a T2-weighted image in the coronal plane (A) and an image in the axial plane (B). T2-weighted images show numerous millimetric lesions, with a homogeneous high signal intensity (SI). The lesions are relatively uniform in size and are distributed in both the renal cortex and medulla.

T1-weighted fat-suppressed images (Fig. 3) included an image in the axial plane (A) and an image at the same level, following intravenous Gadolinium contrast administration. The unenhanced image (A) shows numerous millimetric hypointense lesions. After Gadolinium administration (B), the lesions do not enhance and can better be differentiated from the normal enhancing renal parenchyma.

Radiological diagnosis

The radiological findings combined with the history of lithium intake for bipolar affective disorder are pathognomonic for *lithium-induced nephropathy*.

Discussion

Lithium is a widely used drug in the treatment of bipolar affective disorder. It has a narrow therapeutic window, ranging from 0,6 to 1,2 mMol/L. Nephrotoxicity is classified as mild when the concentration is between 1,5 and 2,5 mMol/L and moderate when it is between 2,5 and 3,5 mMol/L. Lithium nephrotoxicity is divided into nephrogenic diabetes insipidus, acute toxicity and chronic renal disease. Characteristic treats of nephrogenic diabetes insipidus are polyuria and polydipsia. Lithium toxicity affects multiple organ systems and a diminution of renal concentrating ability. Nephrogenic diabetes insipidus is seen in as much as 40% of patients on chronic lithium therapy with onset as of 8 weeks after the start of the treatment. There are two therapies for this disorder. First, there is lithium withdrawal, but this does not ensure against progression to end stage renal disease. Second treatment option is the administration of Amiloride, which prevents epithelial sodium channel mediated lithium uptake.

As for the diagnosis, plain radiographs are not useful in the diagnosis of the disorder, as they cannot visualize the microcysts. Ultrasonography can suggest the diagnosis. It shows normal sized kidneys with increased echogenicity. The microcysts can be visualized with the new high-end ultrasound systems and with an experienced operator. On unenhanced CT scan (which is often performed because of decreased renal function), these microcysts are difficult to detect. Contrast-enhanced CT scan shows normal sized kidneys and can better depict the numerous millimetric hypodense lesions. MRI is the modality of choice for characterization of the lesions that are seen on CT. On T2-weighted sequences, the lesions appear as millimetric hyperintense lesions. On unenhanced T1-weighted images the lesions appear as millimetric hypointense lesions. After IV Gadolinium administration, the lesions can be well delineated. The cystic lesions still appear as millimetric hypointense lesions, in contrast to the high signal intensity of the normal enhancing renal parenchyma.

Concluding, T2-weighted MRI images with high contrast resolution and absence of radiation are an adequate non-invasive method for the visualization of the microcysts in lithium-related kidney disease. Radiologists should be familiar with this entity since patients with a psychiatric disorder often withhold this to their treating physician and imaging findings are almost pathognomonic. Although still debatable, in the future there might be a role for screening patients on lithium therapy with MRI.

Bibliography

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