

# High Frame Rate Contrast-Enhanced Ultrasound for Differential Diagnosis of Dromedary Hump Kidney and Renal Tumor: A Case Report



Liu Fan<sup>1,2</sup> and Zheng Jian<sup>1,2\*</sup>

<sup>1</sup>Guangdong Medical University, China

<sup>2</sup>Department of Ultrasound, School of Medicine, The Chinese University of Hong Kong, Shenzhen & Longgang District People's Hospital of Shenzhen, China

**Submission:** December 06, 2023; **Published:** December 15, 2023

**\*Corresponding author:** Zheng Jian, Department of Ultrasound, The Second Affiliated Hospital, School of Medicine, The Chinese University of Hong Kong, Shenzhen & Longgang District People's Hospital of Shenzhen, Shenzhen, China, Email: zhengjian@cuhk.edu.cn

## Abstract

Dromedary hump is a rare morphological abnormality of the left kidney that can be mistaken for a renal tumor in imaging studies, leading to unnecessary surgical intervention. This case report describes a 50-year-old male patient who was initially diagnosed with a left renal tumor based on conventional ultrasound. However, subsequent high frame rate contrast-enhanced ultrasound revealed a left dromedary hump, avoiding unnecessary surgery. The patient was followed up for 45 months with stable imaging findings and a favorable prognosis.

**Keywords:** Dromedary Hump; Renal Pseudotumor; High Frame Rate Contrast-Enhanced Ultrasound (H-CEUS); Embryonic Period; Malignant Renal Solid Tumors

## Case Report

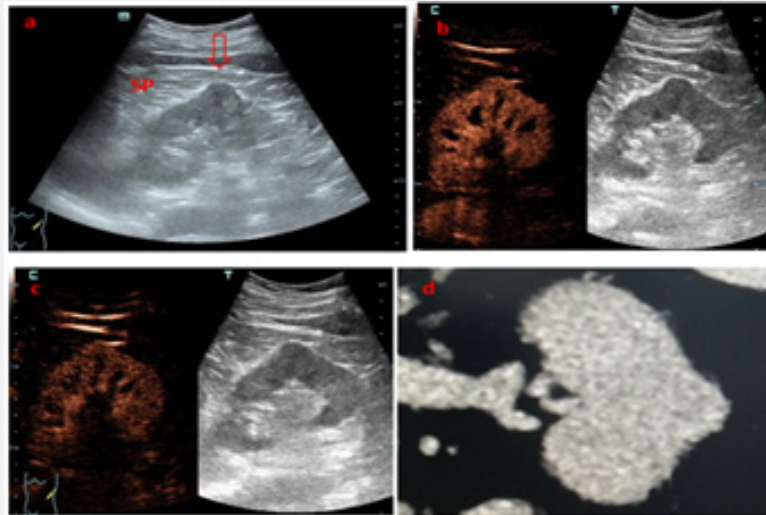
A 50-year-old male patient presented to the hospital with a left renal tumor detected on ultrasound at another medical facility. Physical examination showed no percussion pain in the renal regions, and routine urinalysis was negative. Conventional renal ultrasound indicated a convex outward bulge in the middle part of the left kidney, with non-uniform internal echogenicity, making it difficult to exclude the possibility of a renal tumor. To clarify the diagnosis, the patient underwent high frame rate contrast-enhanced ultrasound examination with the injection of 1.2 ml SoNoVue (Bracco, Italy) through the elbow vein. The H-CEUS showed enhanced local outward projection of the left kidney, which synchronously washed in and washed out with the surrounding renal parenchyma, and no signs of renal tumor such as pseudocapsule formation were observed (Figure 1). CT scan also supported the diagnosis of a left hump kidney by ruling out the presence of an obvious mass. The patient remained under observation for 45 months, during which imaging findings remained stable, and the prognosis was favorable.

## Discussions

Dromedary hump, also known as “left kidney splenic hump,” is a specific morphological abnormality of the left kidney, resembling the hump of dromedary camels in appearance, and has an incidence of approximately 0.5% [1]. It occurs due to compression of the adjacent spleen on the left kidney cortex during development and may also be associated with subrenal fusion in the embryonic period [2]. Ultrasound typically reveals a focal elevation at the lateral edge of the left kidney, with normal renal cortex and pyramidal structures within the elevated “hump”, necessitating differentiation from true renal tumors [3].

High frame rate contrast-enhanced ultrasound (H-CEUS) is a relatively recent technology that enhances temporal resolution by increasing the acquisition frame rate, providing comprehensive information on contrast agent microbubbles, and improving the clarity of microvascular structures. This technique has found widespread applications in the liver, gallbladder, and artery fields

[4-6]. Given the rich blood supply of the kidney, conventional contrast-enhanced ultrasound may present challenges in accurately diagnosing renal lesions [7]. Consequently, H-CEUS holds potential advantages in renal imaging.



**Figure 1:** A 50-year-old male patient. (a) Conventional ultrasound showing a local bulge in the middle of the left kidney with uneven internal echogenicity, raising suspicion of a renal tumor; (b) and (c) high frame rate contrast-enhanced ultrasound images showing synchronous wash in and wash out of the local outward bulge with the surrounding renal cortex; (d) CT scan confirming a local bulge in the middle of the left kidney without any apparent space-occupying lesions. The final diagnosis was a left hump kidney.

The CEUS guidelines [8] cautiously endorse the use of contrast-enhanced ultrasound for distinguishing benign and malignant renal solid tumors. However, it strongly recommends its application to ascertain the presence of renal mass lesions, particularly in reliably differentiating true renal tumors from “renal pseudotumors” caused by renal anatomical variations. The key criterion for differentiating renal tumors from renal pseudotumors lies in the perfusion pattern observed during contrast-enhanced ultrasound. Renal pseudotumors demonstrate vascular structures like normal renal parenchyma, with arterial branching from the renal hilum to the periphery during the early arterial stage, devoid of vascular destruction or abnormalities. In contrast, most renal tumors exhibit enhancement patterns differing from the surrounding parenchyma, with variations in degree or distribution during at least one vascular phase.

Thus, contrast-enhanced ultrasound, especially high-frame rate contrast-enhanced ultrasound (H-CEUS), can serve as a valuable tool for rapidly diagnosing “renal pseudotumors” with atypical appearances on conventional ultrasound.

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DOI: [10.19080/JOJUN.2023.07.555740](https://doi.org/10.19080/JOJUN.2023.07.555740)

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