

## Oncology

# Ureteral Nephrogenic Adenoma in Chronic Recreational Ketamine Abuse

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Ureteroscopy detected only chronic inflammation but no tumour below the stricture and papillary masses in the bladder and ureter. The stricture was dilated. Biopsies of the papillary masses were taken using a holmium laser. At the end of the procedure, a double-J stent was placed on each side; these were removed after 3 months. After stent removal, the stricture and tumour in the ureters did not recur, however the bladder and ureter were still inflamed at 9 months follow-up. The patient is still being followed-up.

The pathological examination of the ureteroscopic biopsy revealed an adenoid tubular structure which consisted of a single layer of cuboidal epithelium in the lamina propria of the urothelium (Fig. 3). Immunohistochemical staining revealed the presence of Pax-8 and CK, the absence of  $\alpha$ -inhibin and calretin, and an expression level of Ki-67 of approximately 10%. These findings supported the diagnosis of nephrogenic adenoma.<sup>2</sup>

## 1. Introduction

Nephrogenic adenoma is a rare, benign lesion of the urinary tract, which can mimic malignant tumour.<sup>1</sup> Until now, less than 30 cases of nephrogenic adenoma of the ureter have been reported, and its aetiological factors have not been systematically described. Here, we describe a case of ureteral nephrogenic adenoma associated with chronic recreational ketamine abuse, which we suspected to be an aetiological factor.

## 2. Case presentation

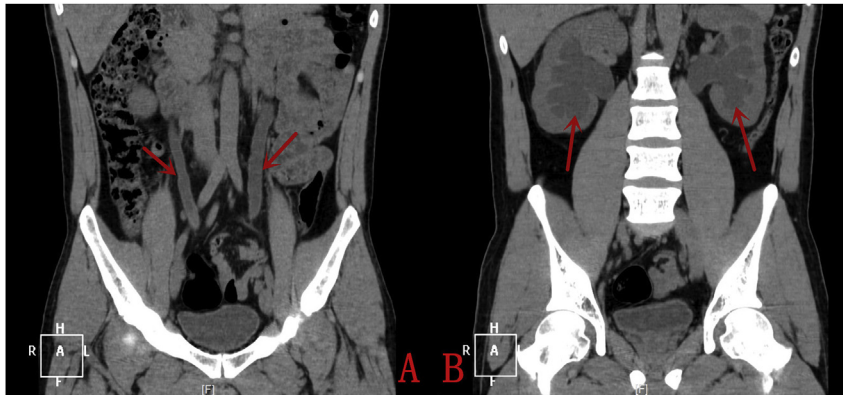
A 32-year-old man, who had a history of chronic recreational ketamine abuse for over 10 years, was admitted to our hospital with bilateral flank pain. Ultrasound and computed tomography revealed bilateral ureterectasis and hydronephrosis (Fig. 1). Ureteroscopy detected a stricture in the right-side lower ureter and several papillary masses in the left-side lower ureter (Fig. 2).

## 3. Discussion

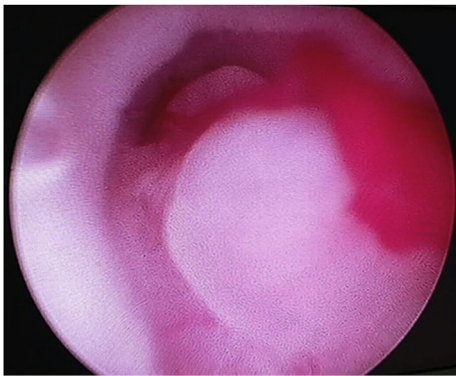
Nephrogenic adenoma is a rare, benign, metaplastic lesion of the urinary tract, which most commonly occurs in the bladder, followed by the urethra, the ureter and the renal pelvis.<sup>1</sup> Its aetiological factors, which have mostly been described for the urinary bladder and prostatic urethra, include a previous surgery, previous history of tuberculosis, interstitial cystopathy, lithiasis, permanent catheter and urethral stenosis. Its pathogenesis is defined as a metaplastic response of the urothelium to chronic inflammation and irritation.<sup>3</sup> Its clinical characteristics include haematuria, lower urinary tract symptoms, pelvic or flank pain, hydronephrosis or urinary incontinence.<sup>4</sup> The most common histological characteristics of ureteral nephrogenic adenoma include tubular and microcystic patterns.<sup>1</sup> The case we present here conform to the above clinical description, however, does not comply with the described aetiological factors.

Ketamine is commonly used for anaesthesia, however, its

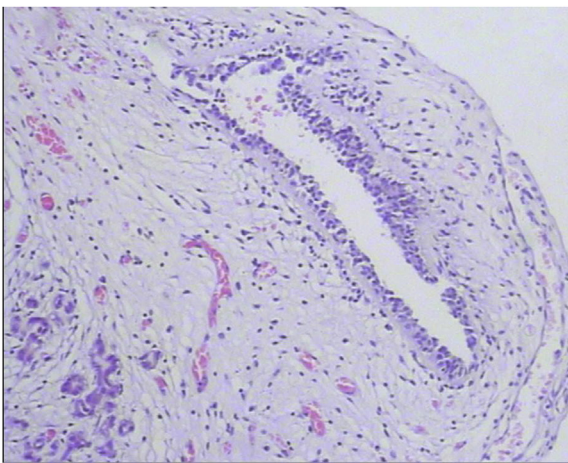
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**Fig. 1.** Computed tomography showing bilateral ureterectasis (arrow) (A) and hydronephrosis (arrow) (B).



**Fig. 2.** Ureteroscopy revealed several papillary masses at left-side lower ureter, which were clinically considered to be malignancies.



**Fig. 3.** Pathological examination of an ureteroscopic biopsy revealed an adenoid tubular structure consisting of a single layer of cuboidal epithelium in the lamina propria of the urothelium.

hallucinogenic properties have led to its exploitation as a recreational drug. Although ketamine cystitis and its pathogenesis are well known, there are limited reports suggesting that ketamine could be associated with ureteritis, ureteric intestinal metaplasia, or nephrogenic adenoma.<sup>5</sup> Here, we report a case of ureteral nephrogenic adenoma that was associated with ketamine abuse. We suspected its pathogenesis to be an adenomal metaplastic response of the urothelium to chronic inflammation by ketamine because in urinary tract ketamine may lead to a series of chronic irritation, inflammation and metaplasia.<sup>5</sup> As ketamine-associated cystitis is well known, we hypothesise that ketamine first influenced the bladder causing cystitis, it then caused ureteritis by affecting ureter's urothelium, finally resulting in ureteral stricture and nephrogenic metaplasia.

#### 4. Conclusion

Because ketamine may lead to a series of chronic irritation, inflammation, and metaplasia in the urinary tract, we presume that ketamine is also one of the aetiological factors for ureteral nephrogenic adenoma.

#### Conflicts of interest

The authors have no conflict of interest regarding this publication.

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