



## Case Report

# Knotted Stent—Emphasizing the Need of Radiology Assistance in Urology

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## ABSTRACT

Ureteral double-J stents have become a part and parcel in contemporary urologic practice. As the use of stents is increasing, the complications are also increasing. Knot formation in the double-J stent is rare phenomenon. Twenty-seven cases have been reported till now. This case would be the 28th case to be reported, in a young male with solitary left kidney and who was on regular periodic stent substitution.

**Keywords:** Knotted stent, Stent complication, Stents in contemporary urology

## INTRODUCTION

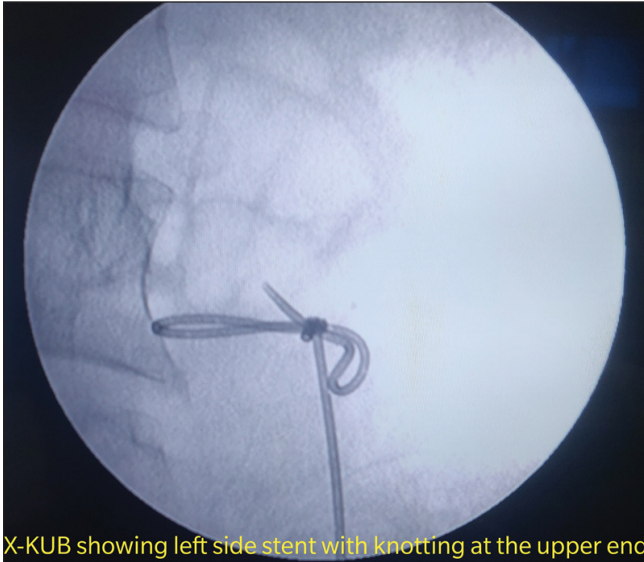
Ureteral double-J stents, introduced by Finney in 1978, have become a part and parcel in contemporary urologic practice.<sup>[1]</sup> Since its first description by Zimskind et al in 1967 ureteral stents are used in various urological procedures for different reasons.<sup>[2]</sup> They are used as a measure for temporary or permanent drainage for the upper urinary tract. The rationale is to bypass internal or external obstructions for unobstructed urinary flow. Because of its widespread use, complications related to the stent are also rising. Various complications include stent encrustation, stent migration, stent fragmentation, stone formation, recurrent urinary tract infections, fistulization, etc. Formation of knot is very rare. It was first described by Groeneveld in 1989.<sup>[3]</sup> Fewer than 30 cases have been reported till now in the literature.<sup>[4]</sup> We here report a case of upper ureteric knotting of the stent in a 28-year-old young man with solitary left renal kidney and emphasize upon the need of X-ray screening after stenting and before removing the stent.

## CASE REPORT

A 28-year-old male was under regular follow-up for recurrent left ureteric and renal calculi in the solitary functional left kidney. To decrease his emergency visits, he agreed for long-term stent placement and stent replacement at regular intervals. In spite of regular stent replacements he developed calculus formation over the lower end of the double-J stent. He underwent cystolithotripsy and the double-J stent was replaced. The coiling of the proximal end of the stent in the renal pelvis was documented by fluoroscopy. The distal end was seen coiled in the bladder under direct cystoscopic examination. Postoperative period was uneventful. He came for stent replacement after 4 weeks. The ultrasonography revealed mild to moderate hydronephrosis and an X-ray of kidney ureter and bladder region showed the double-J stent in situ with knotting

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X-KUB showing left side stent with knotting at the upper end

**Figure 1:** X-ray kidney, ureter, and bladder (KUB) showing left side stent with knotting at the upper end.

at upper portion [Figure 1]. Attempts at cystoscopic stent removal under local anesthesia failed, so, we planned to remove the stent under anesthesia. We did a diagnostic ureteroscopy by the side of the stent and confirmed the knot. We then applied graded traction over the stent under cystoscopic and fluoroscopic guidance. As the ureter was dilated because of the presence of the stent, it came out easily. No other maneuver was needed. Postoperatively, the patient recovered well.

## DISCUSSION

The increased use of ureteral stents in contemporary urological practice has resulted in an increased number of complications associated with the stents. Among all the complications, knotting of the indwelling double-J stent is the rarest complication. Till now 27 cases have been reported in the literature.<sup>[4]</sup> Our case will be the 28th case of stent knotting. Stent knotting represents a therapeutic challenge because of the risk of ureteral avulsion and subsequent renal damage. Conservative trial of the stent retrieval is difficult in patients with solitary kidney, ureteric implantation, or uretero-intestinal anastomosis. Our patient had solitary left kidney.

Knot in the stent can occur at upper, mid, or lower end with upper end being the most common. In our case also the knot was found at the upper end of the stent in the upper ureter [Figure 2]. Out of total 27 cases reported in the literature the knot was reported in the proximal end in most cases, mid-section in two cases, and one was reported in the distal portion.<sup>[4]</sup> Of the various knotted stents that have been reported till now the age varied from 4 years to 86 years.<sup>[4]</sup> Our patient was 28 years old.



**Figure 2:** Knotted stent after removal.

It is difficult to understand the exact reason of knot formation in an indwelling ureteral stent. Various reasons have been cited, namely excessive length of the stent with one end abutting the wall of a dilated renal pelvis and then passing through the open loop,<sup>[5,6]</sup> stent configuration (double-J or multicoil), individual patient factors such as dilated renal pelvis,<sup>[6,7]</sup> and anatomical abnormalities such as cystocele and ileal conduits.<sup>[8]</sup> Breau and Norman advocated the optimal stent-to-ureter length ratio of 1.04.<sup>[9]</sup> In our case dilated renal pelvis could be the reason for the stent knot formation.

The various reasons for stent placement were prior to extracorporeal shock wave lithotripsy, upper ureter stone or upper ureter obstruction, renal stone, ureter injury,

periodic stent substitution, retroperitoneal fibrosis, ureteric reimplantation, advanced bladder or prostatic malignancy, and postoperative ureterovesical anastomotic stricture.<sup>[4]</sup> In our case, the patient was on periodic stent substitution.

Various techniques have been described to deal with the knotted stent. These are retrograde ureteroscopy, continuous slight traction over the stent, removal with guidewire assistance, percutaneous removal, that is, antegrade approach, flexible/rigid ureteroscopy with laser, and open ureterotomy.<sup>[4,10]</sup> In our patient we did X-ray kidney, ureter, and bladder region before stent removal that we normally do not do. In our hospital we screen the patient under C-arm in the operation theater routinely just before stent removal to save patient's money. We used graded traction over the stent under fluoroscopic and cystoscopic guidance. There is serious risk of ureteral trauma or avulsion when applying graduated traction. We should stop traction when unusually higher resistance is needed while applying the traction. We here emphasize the need of confirmation of proper coiling of the upper end of the stent while insertion and confirmation of the position of the stent before removal. In countries like India, where most of the stents in the periphery are removed by trained urology assistants or trained resident medical officers, this practice of screening should be a must thing to do. In our hospital also the stents are removed by trained urology residents or trained urology assistants, but the urologist is always there to guide.

## CONCLUSION

Prevention remains the most important step for this complication. To prevent this complication, variable or multilength stents should be avoided, and excessive coiling at the upper end should be avoided. While removing the stents, we should be aware of the possibility of knotting, especially when there is moderately dilated renal pelvis and if there is significant resistance during withdrawal of the stent. Close follow-up of the patients is of utmost importance for the early detection of any complications.

## Consent for publication

The consent obtained from study participant was written.

## Availability of data and material

Yes.

## Author's contribution

I myself collected the data, analyzed, and interpreted the patient data. I drafted the work, substantively revised it. I have read and approved the manuscript

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## Conflict of interest

None declared.

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