

# Case Report: Percutaneous Balloon Dilatation and Ureteral Stenting for Tuberculous Renal Infundibular and Ureteral Strictures

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## Abstract

A 23-year-old woman developed progressive obstructive uropathy due to multiple renal infundibular and ureteral strictures while on drug treatment for renal tuberculosis. Communication between isolated upper and mid-pole calyces, and the ureter, was established by percutaneous guidewire manipulation. The strictures were successfully managed using percutaneous balloon catheter dilatation and ureteral stenting without the need for open surgical exploration. Kidney function was preserved at one year follow-up.

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**Key words:** Interventional radiology, Tuberculous stricture, Urinary tuberculosis

## Introduction

The management of the non-functional tuberculous kidney is controversial and ranges from surgical intervention to conservative treatment.<sup>1</sup> Intra-renal scarring with stricture formation is common in the late stages of renal tuberculosis and results in greater loss of renal function than direct involvement by tuberculosis alone.<sup>2</sup> The time-honoured treatment of tuberculous strictures was hemi-nephrectomy for early cases and total nephrectomy for late cases.<sup>2-4</sup> However, these radical procedures are not considered ideal. Innovative operations aimed at relieving obstruction, such as pan-caliceal ileoneocystostomy in which the entire calyceal system is drained into an ileal ureter, have been described.<sup>5</sup> Recent advances in interventional techniques have increased the potential role of minimal access surgery. We report a patient with multiple ureteral and intra-renal strictures resulting from tuberculous infection, where the use of imaging-guided percutaneous guidewire manipulation, balloon catheter dilatation and ureteral stenting aided in salvaging a poorly-functioning kidney.

## Case Report

A 23-year-old woman first presented with frequency of urination and dysuria. Diagnosis of urinary tract

tuberculosis was made from positive acid-fast bacillus (AFB) smear and culture of *Mycobacterium tuberculosis* in her early morning urine. Anti-tuberculous treatment consisting of isoniazid, rifampicin and pyridoxine was started. Initial intravenous urogram (IVU) showed irregular calyceal contours in the lower pole, and moderate clubbing of the upper and mid-pole calyces of her right kidney (Fig. 1). The left kidney was normal. A repeat IVU six months later showed poor opacification of the right collecting system, with a progressively dense nephrogram. Another IVU done three months later showed further deterioration of contrast excretion with non-opacification of the right ureter. Ultrasound confirmed the diagnosis of right hydronephrosis. Renal 99m Tc-DTPA scintiscan showed decreased dynamic perfusion with a differential right-to-left renal function of 24.3% to 75.7%.

Cystoscopy and right retrograde pyelogram showed upper ureteral and pelvi-ureteral junction (PUJ) strictures with opacification of only part of the lower pole calyces (Fig. 2). Percutaneous nephrostomies and antegrade pyelograms were performed to better delineate the pelvicalyceal system. Under ultrasound guidance, the dilated calyces were punctured using a 22 G Chiba needle. Antegrade pyelography was performed

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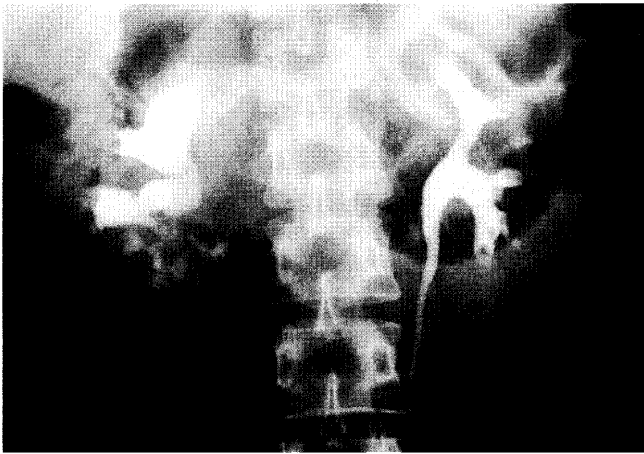


Fig. 1. Initial IVU shows clubbing of the upper and mid-pole calyces of the right kidney. The right lower pole calyces are irregular and destroyed. The left pelvicalyceal system is normal.

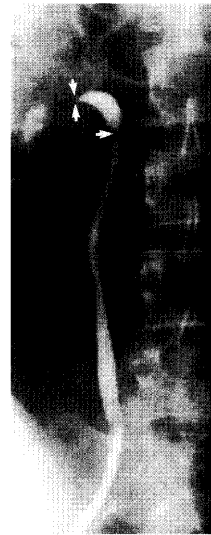


Fig. 2.

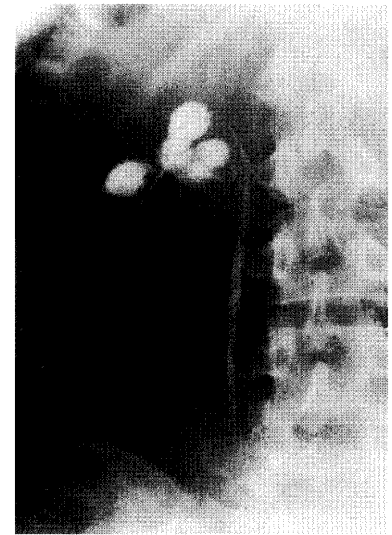


Fig. 3

Fig. 2. Right retrograde pyelogram shows upper ureteral and pelvi-ureteral junction strictures (arrows).

Fig. 3. Percutaneous puncture of the right lower pole calyces shows dilatation and calyceal abnormality, as well as a tight infundibular stricture. There is communication with the right ureter, but not with the upper and mid-pole calyces.

through the Chiba needle and a 0.018 inch steel guidewire was inserted with fluoroscopic visualisation. The right lower pole calyces were found to be moderately dilated and communicated via an infundibular stricture with the upper ureter (Fig. 3). The mid-pole and upper pole calyces were grossly dilated and did not communicate with each other, the lower pole calyces or the ureter. External drainage nephrostomy catheters were inserted into each of these three non-communicating calyceal segments, following progressive dilatation of the tracks to 8F size using a coaxial dilatation system and Teflon dilators. Using a 0.038 inch hydrophilic guidewire and following gentle probing, communication was established between the mid-pole and the upper pole calyces, and between the upper pole calyces and the right ureter. The guidewire was felt to pass through the previously-unopacified infundibular structures.

Balloon dilatations, using a 6 mm diameter angioplasty balloon catheter, were performed for the right PUJ and the ureteral strictures, as well as for the various infundibular strictures. A 14/7F endopyelotomy stent was inserted into the right ureter and left for six weeks, after which it was removed (Fig. 4a). Repeat right nephrostogram showed free flow of contrast between the upper and mid-pole calyces, and through the ureter, with marked diminution of the calyceal dilatation (Fig. 4b). Anti-tuberculous drug therapy was continued for another six months. Follow-up 99m Tc-DTPA scintiscans on two occasions showed persistence of right-to-left differential function (22.3%:77.7% and 21.0%:79.0%, respectively), but satisfactory right-sided drainage was present on diuretic renography. Magnetic resonance (MR) imaging done one year after diagnosis of the intra-renal and ureteral strictures showed relative preservation of the renal parenchyma of the right kidney, and communication between the upper pole calyces and the ureter. There was also continued

communication between the right upper and lower pole calyces (Fig. 5). At the latest follow-up 2 years 9 months after her initial presentation, she has remained asymptomatic.

## Discussion

Basic principles in the treatment of renal tuberculosis include adequate anti-tuberculous drug therapy, conservation surgery aimed at minimal loss of nephrons, and removal of any obstructive lesion.<sup>6</sup> Barrie et al<sup>2</sup> reported that intra-renal strictures were as common as ureteral strictures, and resulted in greater loss of renal function than direct involvement by the tuberculous disease itself. This view was shared by Kerr et al,<sup>3</sup> who found that intra-renal strictures resulted in the formation of closed pyocalyces which replaced renal parenchyma. Subsequent traction of the scarred infundibulum on the renal pelvis caused further obstruction of the remaining collecting system.

In our patient, an operation to deal with individual ramuli or rami completely occluded by scar tissue was not desirable, given the guiding principle of conservation surgery with minimal sacrifice of nephrons. The intra-renal location of some of the strictures and the severe scarring of the renal pelvis would have made surgical exposure very difficult. In our case, the pelvicalyceal system was so segregated that multiple punctures were required to delineate the entire system. External nephrostomies were performed initially to relieve the obstructive uropathy while awaiting renal recovery. However, as permanent nephrostomies are



Fig. 4a. Nephrostomy catheters in the right upper and mid-pole calyces, as well as the endopyelotomy ureteric stent, are well-positioned. The lower calyx nephrostomy catheter had been removed following balloon dilatation of the adjacent strictures.

known to be prone to complications, they were not thought to be an acceptable solution.

The management of benign ureteral and PUJ strictures using percutaneous interventional techniques, such as balloon dilatation, cold knife cutting or electrodiathermy, are being increasingly established. Long-term results of these forms of treatment are good, with reports of up to 70% to 80% success rates.<sup>7-12</sup> There have been very few descriptions of the percutaneous management of urinary tract strictures resulting from tuberculous infection.<sup>10,13-15</sup> The first successful balloon dilatation of a tuberculous ureteral stricture was reported by Waller et al in 1983.<sup>13</sup> Three of five cases in the series of Lang responded well to stenting alone, without requiring balloon dilatation.<sup>14</sup> The largest series to date is that of Kim et al,<sup>15</sup> who successfully treated 6 of 8 patients with tuberculous strictures of the urinary tract, using a combination of antegrade balloon dilatation and ureteral stenting. Hwang and Park<sup>16</sup> used a cold knife to incise tuberculous renal infundibular strictures, and found it to be a safe technique.

Our patient developed multiple infundibular, PUJ and upper ureteral strictures while still on anti-tubercu-



Fig. 4b. Contrast injection through the upper calyceal catheter shows opacification of the mid-pole calyces (short arrows) and the ureter (long arrows).



Fig. 5. Coronal FSE T2 fat-suppressed MR image (TR 4080 msec, TE 140 msec) shows residual fullness of the right pelvicalyceal system, with interconnection among the major calyces. There is moderate parenchymal thinning (arrows), especially in the right lower pole. The left kidney has a normal appearance.

lous drug therapy. We believe that these strictures were primarily “soft” inflammatory strictures and were therefore amenable to relatively less forceful manipulations. It was hoped that by percutaneous balloon stricture dilatation and ureteral stenting to relieve the obstruction, these “soft” strictures would not progress to tight fibrous strictures subsequently. These techniques were

preferable to major open operation or endoscopic incision into friable tissue. In our case, the various strictures were traversed by guidewires and yielded easily to balloon dilatation.

We inserted the endopyelotomy stent for a period of six weeks, based on our experience of endourological procedures for PUJ obstruction. This time frame was considered adequate as the patient had already been on anti-tuberculous drug therapy for nine months prior to the procedure and the intense tissue reaction more common at the commencement of anti-tuberculous drug therapy would not be expected. In a recent review, Carl and Stark<sup>17</sup> suggested a combination of temporary stenting and adjuvant corticosteroid therapy for management of ureteral stenosis. This case illustrates the usefulness of percutaneous guidewire manipulation, balloon catheter dilatation and ureteral stenting in the management of multiple tuberculous strictures. Besides avoiding the morbidity of major surgery, this procedure is safe and renal parenchymal-preserving.

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