Case Report

Intravascular double J stent migration: A case report, review, and management algorithm

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Abstract

A double J stent (DJS) is the main therapy for ureteral obstruction when conservative treatment fails. Antegrade migration in the bladder – or retrograde migration in the ureter – are well-known complications. We present a case with intravascular migration of a DJS into the inferior vena cava. Inferior venocavagraphy confirmed the position of the stent, and thrombus formation was excluded at its tip. The stent was retracted endoscopically. After the procedure, limited contrast leakage was seen at the perforation site on venography. The current available literature is reviewed. Based on this, a management algorithm is drawn up.

Keywords: Complication, hematuria, hydronephrosis, ureteral stent, urolithiasis

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INTRODUCTION

The purpose of a double J stent (DJS) is to maintain low-pressure urine flow from the kidneys to the bladder, which can be endangered by ureteral obstruction or ureteral injuries. Retrograde cystoscopic placement is a simple procedure, which may result in hematuria, bacteriuria, urosepsis, migration, fragmentation, and encrustation. Most of these complications can be managed with supportive medical management.[1] We present a case in which vascular migration of a DJS was seen into the inferior vena cava (IVC) and which was retracted endoscopically. This complication has been reported eleven times, in which endoscopic removal of the intravascular DJS was performed thrice. To the best of our knowledge, this article is unique by providing a detailed management algorithm.

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CASE REPORT

A 44-year-old male patient presented with bilateral renal colic pain. Renal ultrasound showed mild hydroureteronephrosis on the left side. Blood analysis showed normal leukocytes counts, normal C-reactive protein, and normal creatinine and urea. On nonenhanced computed tomography (NECT), proximal ureteral stones were seen with left-sided hydronephrosis and a 6-mm stone and a right-sided 8-mm stone but no pyelocaliceal dilatation. Renal colic pain persisted despite adequate analgesic therapy. Therefore, the patient was admitted to the hospital and DJS was placed bilaterally. During placement of the DJS on the right side, some resistance was felt. Perioperative kidneys, ureters, and bladder radioscopy showed a somewhat medial position of the right stent, but a nice proximal curl was noted [Figure 1].

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During hospitalization, right renal colic pain persisted, gross hematuria occurred, and kidney function decreased. The next-day follow-up NECT was performed. A perforation in the right distal ureter with intravascular migration of the DJS in a branch of the internal iliac vein up into the IVC – at the level of the left renal vein – was seen in combination with right-sided hydronephrosis [Figure 2]. Inferior venocavagraphy was performed which confirmed the intravascular position of the stent and excluded the formation of significant thrombus at its tip [Figure 3a]. The DJS was removed cystoscopically. Immediate inferior venocavagraphy after DJS removal showed limited contrast leakage at the perforation site, and a fully clear image was noted after 10 min [Figure 3b].

The stones were treated by ureteroscopy and laser lithotripsy 4 weeks later. Another 4 weeks later, the DJS were removed. Follow-up was uneventful, and as far as, we know the patient had no stone remission.

DISCUSSION

Because the ureter is adjacent to the iliac vein and the vena cava, a DJS can be prone to vessel erosion or more rare, intravascular migration.[2] It is suggested that ureteral wall fragility, as a consequence of chronic ureteral trauma by ureteral wall inflammation or urolithiasis, forms a predisposing factor for ureteral perforation. Intravascular DJS migration to the heart or lung vasculature is considered the most severe complication as this possibly leads to tricuspid valve insufficiency, lung embolism, and endocarditis.[1,3-5]

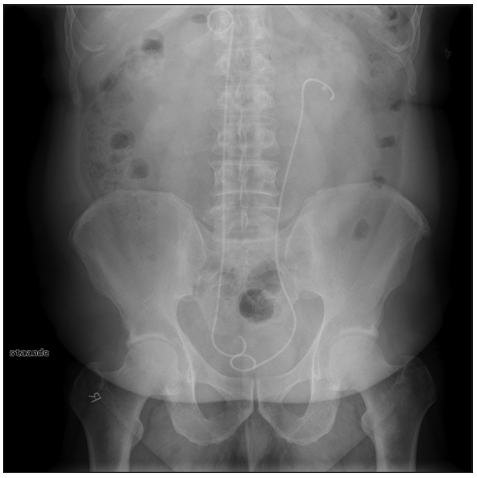

Figure 1: Peroperative kidneys, ureters, and bladder X-ray after the placement of double J stents bilaterally in a man with bilateral renal colic pain due to ureterolithiasis. The left stent was positioned correctly. The right stent projected cranially at T12 and showed a somewhat medial position, but a nice proximal curl was noted. Because of the suspicion of an aberrant position, a computed tomography scan was planned

Three approaches for the removal of a DJS after intravascular migration have been described, dependent on the position of the distal coil and the formation of thrombus at the stent: endovascular, open, or endoscopic approach [Table 1].[1-11] Furthermore, treatment of choice will also be determined by the general condition of the patient, expertise of the surgeon, and infrastructure.

Based on literature, the following algorithm is suggested when thrombus formation is excluded:

1. Endoscopic approach, as described in our case. This is only possible when the distal part of the DJS is in the ureter or bladder lumen. If thrombus formation is excluded, vital signs are stable, abdominal CT excludes retroperitoneal hemorrhage, or active bleeding focus (to exclude the great trauma of the iliac wall) and adhesions are not present, the distal tip of the DJS can be captured by a peripheral snare, and endoscopic retraction of the stent can be expected uneventful. Venous valves, preventing retrograde blood flow, and low pressure in veins prevent the vessel from excessive bleeding and allow a spontaneous wall recovery
2. Endovascular approach which is urgent when there is a complete extrusion of the stent from the urinary tract into the vascular circulation, and endoscopic removal is not an option anymore. For the endovascular procedure to be safe and simple, vital signs must be stable, abdominal CT must exclude retroperitoneal hemorrhage, or active bleeding focus and adhesions should not be present. In this procedure, an access is

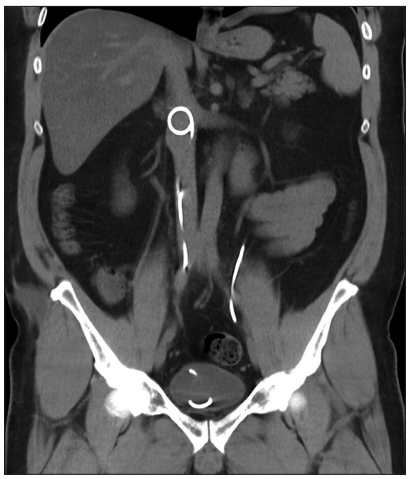

Figure 2: During hospitalization, right renal colic pain and high fever persisted after the placement of double J stents bilaterally. A follow-up multislice noncontrast computed tomography scan of the abdomen was performed which showed a perforated right distal ureter with intravascular migration of the double J stents in the internal iliac vein all the way up to the inferior vena cava. The proximal curl is noted at the level of the left renal vein. No free fluid or air intra-abdominally could be detected. The distal tip is still seen in the bladder

Table 1: Overview of case reports in the literature on intravascular double J stent migration

Author (year of publication)	Case details	Removal	Position of the stent
Endovascular removal			
Michalopoulos *et al*. (2002)	A 29-year-old woman with pulmonary thromboembolism (shortness of breath and pleuritic pain) after antegrade insertion of the DJS	Endovascular using the femoral vein as an access site with vascular retrieval forceps	The distal part of the DJS extended into the left pulmonary arterial tree, the proximal part formed a loop in the right atrium
Arab *et al*. (2016)	A 47-year-old man who developed hematuria after DJS placement	Percutaneously through the right femoral vein under fluoroscopic guidance	During pulmonary angiography, the DJS was seen completely in the pulmonary artery. The tip was fixed (thrombus formation or wedging)
Falahatkar *et al*. (2012)	A 52-year-old woman with gross hematuria after DJS placement. After removal, the patient presented with mild anemia and deep vein thrombosis, which needed special treatment	Percutaneous removal through the left femoral vein with fluoroscopic guidance and angiography	NECT showed the lower end in the left external iliac vein, the main part in the IVC, and the tip next to the right atrial inlet
Tang *et al*. (2012)	A 41-year-old woman underwent PCNL	Removal by percutaneous intravascular extraction under angiography	3D CT confirmed that the DJS was only with its distal portion in the right renal pelvis, the residual was along the course of the IVC
Hajji *et al*. (2015)	A 33-year-old pregnant patient with a right ureteral stent at week 12 because of acute obstructive pyelonephritis.	Endovascular retrieval through a puncture of the common femoral vein under fluoroscopic control	CT scan showed the stent extending from the IVC up to the right atrium
Open surgical removal			
Sabnis *et al*. (2013)	A 43-year-old female with lower ureteric calculus	Open chirurgical exploration with cardiopulmonary bypass. Exploration was done by a Gibson's incision and with a Satinsky clamp vascular control was gained	The DJS was migrated into the external iliac vein all the way up into the right atrium. The lower end of the stent was not seen in the bladder. Contrast CT showed a complete extrusion of the stent. Probably, the stent did not coil in the bladder
Hastaoglu *et al*. (2014)	During placement of a DJS in a 59-year-old male massive hematuria occurred	A holmium laser removed the calcifications on the stent endoscopically. The ureteral part was then removed. The rest of the stent was removed by open chirurgical exploration (bicaval technique) with cardiopulmonary bypass	Contrast CT showed displacement of the DJS through the retroperitoneum, through the right renal vein and the IVC with the tip in the apical portion of the right ventricle
Ioannou *et al*. (2009)	A 45-year-old female with obstructive pyelonephritis	Surgical treatment through a left retroperitoneal approach	The stent was seen in the left common iliac vein and the IVC. The distal end of the stent was not visible within the ureter. No retroperitoneal hemorrhage was seen
Endoscopic removal			
Farshi *et al*. (2015)	A 28-year-old pregnant female who received a DJS because of hydronephrosis	Endoscopic removal was done postnatally with no adverse effects	The stent was in the IVC and right ventricle without any thrombotic event nor retroperitoneal hemorrhage. The distal tip was in the ureteral lumen
Özveren *et al*. (2013)	Patient presented with persistent gross hematuria after DJS placement	The DJS was removed cystoscopically by grasping forceps	NECT revealed a correct position distally but a proximal course inside the iliac vein and then within the IVC up to the level of the hepatic veins
Marques *et al*. (2018)	A 63-year-old man. Diagnosis was made 3 months later after a renal CT scan. The patient was asymptomatic during this whole period	Stent was removed endoscopic. No complications	DJS was misplaced in the IVC after a perforation at the level of the crossing of the ureter with the (ipsilateral iliac vessels)

Author, case details, removal manner, and position of the stent are subsequently noted. DJS: Double J stent, CXR: Chest X-ray, CT: Computed tomography, NECT: Nonenhanced CT, IVC: Inferior vena cava, 3D: Three dimensional, PCNL: Percutaneous nephrolithotomy

made in the femoral vessel and the lower end of the DJS is grasped and retrieved under fluoroscopic and angiographic guidance

3. Open surgical exploration is indicated when there is a complete extrusion intravascular, vital signs are not stable, and retroperitoneal hemorrhage and/or

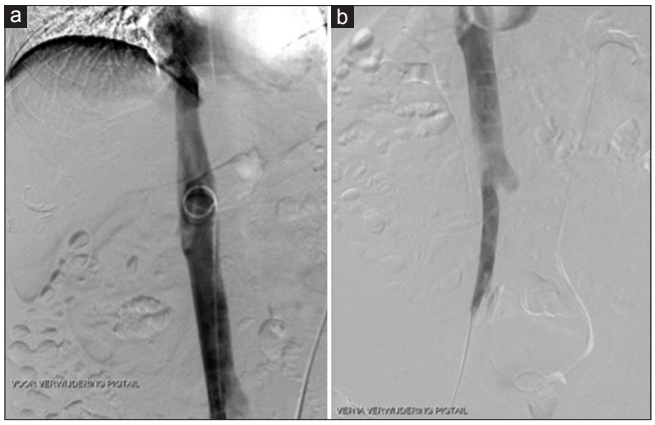

Figure 3: (a) Inferior venocavagraphy confirmed the intravascular position of the stent and excluded the formation of thrombus at the tip of the stent. (b) Ten minutes after stent removal only limited contrast extravasation was seen at the perforation site

adhesions are present. In the case of Hastaoglu *et al*., the DJS, with its position in the right ventricle, was removed by open chirurgical exploration with cardiopulmonary bypass. A standard median sternotomy and central cannulation was performed with the bicaval technique because endovascular removal could cause tricuspid valve disruption. This was followed by right atriotomy. With a sharp dissection, adhesions between the DJS and the tricuspid valve were divided.[9]

When thrombus formation is seen, the treatment algorithm changes. There are some strategies for the DJS removal with thrombus formation such as catheter-directed pharmacologic thrombolysis, pharmacomechanical thrombolysis, and surgical thrombectomy. Meissner *et al*. suggest pharmacomechanical strategies over catheter-directed pharmacologic thrombolysis alone.[12]

1. Pharmacomechanical thrombolysis is indicated when vital signs are stable, abdominal CT excludes retroperitoneal hemorrhage, or active bleeding focus and adhesions are not present
2. Surgical thrombectomy which urges when vital signs are not stable, retroperitoneal hemorrhage and adhesions are present and/or if thrombolytic therapy is contraindicated.

DJS placement has no single, universally accepted, or recommended technique. We conclude that peroperative real-time radioscopy should always be used when inserting a DJS to confirm a correct positioning. In case resistance is felt during placement when there is doubt about the position of the stent or in cases where large urethral obstruction was noted on preoperative imaging, an ascending ureterography should be performed. Some authors even recommend to systematically perform an ascending ureterography during DJS placement, to visualize the renal pelvis and the correct position of the proximal tail.[13] When resistance is felt, it is important not to force the DJS. When intravascular migration has occurred, the location of the stent should be assessed, and thrombus formation should be excluded by inferior venocavagraphy. A high degree of suspicion is needed when the patient presents with severe hematuria, severe (abdominal) pain, or no improvement of renal colic pain. An early intervention is a keystone in avoiding bigger complications.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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