Intracardiac migration of ureteral double-J stent: A case report and review

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Abstract

Ureteral double-J (DJ) stenting is a common urologic procedure in several ureteral surgeries and has been used to manage ureteral obstructions during pregnancy. It may result in early and late complications. We review a rare case of migration of the DJ stent into the cardiovascular system in a pregnant female. We also review the literature. The endoscopic procedure to remove this displacement has been done postnatally with no adverse effects.

Introduction

Double-J (DJ) stenting is performed to drain the upper urinary system in patients with obstruction, for urinary diversion and as a postoperative intra-urethral drainage. It is also an effective, safe and simple method to manage symptomatic or advanced hydronephrosis in pregnancy. Regardless of its technical improvements, DJ stenting may have serious complications, such as stent migration, encrustation, luminal occlusion, stone formation, and forgotten stent.

Case report

A 28-year-old female was referred for removal of a DJ stent in the right kidney. Her ureteral stenting was performed for recently diagnosed severe right-sided hydronephrosis and pyelonephritis; this was done 5 months prior in her 34th week of her second pregnancy. She had no history of nephrolithiasis. Ureteral stenting was performed by cystoscopy, without concurrently control imaging. Subsequently, ultrasonography was done and showed the upper end of DJ stent placed inside the renal pelvis. After the procedure, she was discharged from hospital with no unusual signs or symptoms.

Postnatally, she was referred for removal of her stent. She did not have any major problems during the postoperative period. She did not have overt hematuria and her physical examination was normal. KUB (kidney, ureter, bladder) scan was performed for preoperative control and revealed the upper curl of the DJ stent in the chest region. Both thoracoabdominal spiral computed tomography scan and echocardiography revealed the stent in the inferior vena cava (IVC) and right ventricle without any thrombotic effect, nor retroperitoneal hemorrhage (Fig. 1, Fig. 2). Fortunately, the distal tip of the DJ stent was in the ureteral lumen; according to the radiography and following cardiac surgery consultation, the patient was scheduled for uteroscopic removal of the stent.

During ureteroscopy, the lower end of the DJ stent was found in the renal pelvis. Retrieval of the DJ stent was successfully done with no complications; the patient was discharged 48 hours later. Her postoperative course was uneventful.

Discussion

A ureteral stent is unavoidable in common urological practice.[1] Since its introduction in 1978, the DJ stent has become the gold standard for treating obstructed ureters.[2] Advances in surgical techniques and improvement in stent materials have reduced complications.[3]

During pregnancy a ureteral obstruction due to stones or pure gestational hydronephrosis may pose risks for the mother and the fetus. The renal pelvises, calices and ureters dilate significantly in the first trimester, which may result in spontaneous rupture of the kidneys or collecting systems in rare cases. This may be precipitated in the presence of pyelonephritis.[4] When symptoms of urolithiasis in a pregnant patient are refractory to conservative treatments, such as analgesics, or if the patient becomes complicated by infection or acute renal failure or when symptomatic or severe hydronephrosis occur, temporizing measures such as ureteral stent or PCN are frequently used.[5,6] Increasing use of ureteral stents has

Fig. 1. KUB (kidney, ureter, bladder) double-J stent continues into the chest cavity.

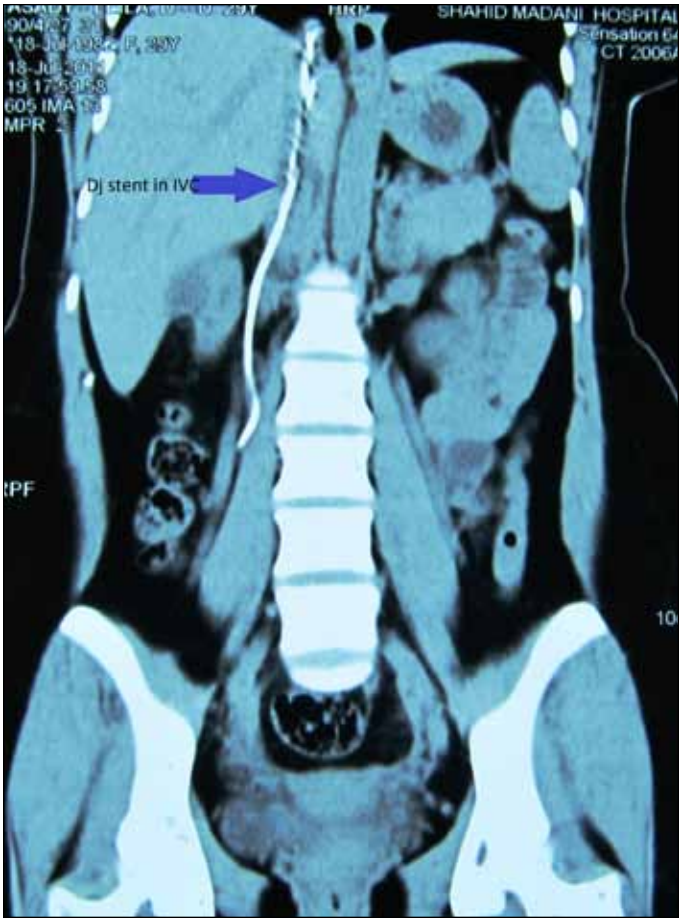

Fig. 2. Thoraco-abdominal spiral computed tomography scan shows the double-J stent in the inferior vena cava.

led to an increase in potential complications from minor clinical symptoms, such as frequency, dysuria or mild intermittent hematuria to more severe problems, such as stent slipping, upward migration, fragmentation, encrustation, stone formation, subsequent ureteral obstruction, infection, unresolved hydronephrosis and ureteral fistula.[3] Migration into the renal pelvis ranges from 0.6 to 8.2%).[3,7] There is little data on the extra-renal placement/migration of stents.

A migration of the ureteral stent into the IVC has been reported.[8] Sabnis and colleagues reported a case of migration of a DJ stent into the IVC and right atrium after an unsuccessful semi-rigid ureteroscopy for a lower ureteric calculus and stenting under cystoscopic monitoring.[9] Kim and colleagues reported a case of cardiac migration of a ureteral DJ stent after a hysterectomy and ureteroneocystostomy.[10] Michalopoulos and colleagues recently reported an acute pulmonary thromboembolism as a result of totally intravascular migration of a pigtail stent in the left pulmonary arterial tree. The stent was confirmed by its curl using a KUB x-ray.[11]

As mentioned by Michalopoules and colleagues, total intravascular migration might be developed most likely with erosion of the distal part of the stent into intercommunicating ovarian veins. The authors disregarded the direct erosion into the renal vein or IVC, across the renal pelvis, as an etiological mechanism, considering the position and configuration of the stent in the renal pelvis. On the other hand, complete intravascular migration of the stent did not occur in our reported case; the existing distal part of the stent within the ureter makes the presumptive etiology unlikely. They stated that the erosion of stents into the major veins – as a theoretical route for erosion – might result in significant retroperitoneal hemorrhage; this did not occur in our patient either.[11]

From a cardiologic point of view, embolism to several organs (the most severe potential complication of intracardiac and vascular foreign bodies), tricuspid valve insufficiency, myocardial damage and endocarditis, recurrent pericardial effusions, and chest pain are potential complications of all intracardiac or vascular foreign bodies.[12,13]

Control imaging

Several imaging modalities have been used to evaluate stent positioning, but in pregnant patients some considerations have to be made.

X-ray exposure from a single diagnostic procedure in pregnant women is not harmful to the developing embryo and fetus. Specifically, exposure to a cumulative dose of less than 5 mGy has not resulted in any increases in fetal abnormalities or abortion.[14] No single diagnostic study exceeds this maximum.[15] Concerns about possible consequences of high-dose ionizing radiation exposure should not obviate medically indicated X-ray diagnostic exams from being performed on a pregnant woman. Nevertheless, during pregnancy, safer imaging procedures (e.g., ultrasound, magnetic resonance imaging) should be considered as substitutes for X-rays when appropriate.[14] During the 10th to 17th weeks of gestation, non-urgent x-ray exams should be avoided.[15]

For pregnant patients that are more than 2 weeks and less than 15 weeks of gestational age, the dose is an especially important factor. For diagnostic abdominopelvic fluoroscopy, doses are relatively substantial, but are not anticipated to exceed the threshold for inducing malformations in all but exceptional cases. The dose level evaluation by a qualified medical physicist is an appropriate consideration in these circumstances.[16]

Ultrasound sonography is used safely during pregnancy to confirm the presence of the guidewire in the renal pelvis, the location of the guidewire in the renal pelvis, and the presence of proximal stent coil in the renal pelvis. In comparison with single or two-way x-ray exam, ultrasound sonography may reveal more information about the position of the DJ stent in the renal pelvis according to its adjacent soft tissue landmarks (e.g., renal pelvic wall).

Well-designed studies are needed to compare the reliability of ultrasound sonography versus radiographic imaging (including a single anteroposterior abdominal radiograph, two-way x-rays or fluoroscopic studies) because the current evidence is not sufficient. Also, it is not well-determined that either intraoperative or postoperative imaging is preferred, although intraoperative studies have the advantage that any malposition of stents would be corrected during the same session and with no additional anesthetic procedures.

Although some authors have cautiously used low-dose fluoroscopy, it is not to be used as a routine imaging because of its potential risks to the fetus.[6] Nevertheless, prompt confirmation of the stent position within the ureter and renal pelvis during or after procedure, using different imaging modalities, may diminish the rates of misplacement rather than intravascular migration. Therefore, even though controlling imaging is an extreme necessity, it does not guarantee that complications will not develop.

In our case, ureteral stenting was performed cystoscopically. Although ureteroscopy is reported as efficient and safe in pregnancy,[17,18] there are no studies comparing its safety with a lesser-invasive technique of retrograde DJ placement using cystoscopy.

Expertise should be considered for safe ureteroscopy, especially in pregnant patients. Some authors prefer cystoscopically DJ stenting as the first choice in pregnancy,[19,20] but two recent reviews support the safe use of ureteroscopy.[17,21] Ureteroscopy is also preferable in a severely obstructed ureter due to an impacted stone. In such cases operative trauma during blind placement of a stent increases the risk of misplacement by possible unrecognized perforation at the site of obstruction. The studies are in small series[21] and more prospective, well-designed studies are needed to compare the efficacy and safety of these procedures in pregnant women.

The management of intracardiac migrated DJ stent has not been clarified owing to the scarcity of cases; some management modalities include removing the stent via the femoral vein with vascular forceps[11] and open vascular surgery.[9] Despite other cardiovascular foreign bodies, these migrated stents can almost always be accessed using ureteroscope.

Several considerations have been offered to prevent intraoperative misplacement or malposition of a ureteral stent. These include stent markings during the procedure, adequate coiling of distal part of DJ stent inside the bladder observation of the reflux of an intravesically-instilled methylene blue, fluoroscopically controlled stenting, and intraoperative ultrasonography of stent curl within the pelvic or postoperative imagings.[10] Moreover, avoiding excessive force during cystoscopic stenting, smoothly inserting the ureteroscope, and maintaining normal intrarenal pressures during the procedure, especially in the presence of considerable hydronephrosis and in females, may minimize the possibility perforation of the upper tract.

Conclusion

Although there are many causes of DJ stenting in the cardiovascular system, the appropriate endoscopic procedure with intraoperative real-time imaging might help prevent complications, such as fistulas, erosions, displacements and migrations of ureteral pigtail stents, including the rare event of intravascular placement or migration.

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