CASE REPORT

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Encrustation of the Ureteral Double J Stent in Patients with a Solitary Functional Kidney – a Case Report

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ABSTRACT

Introduction: The efficacy of ureteric stents in the management of various urological conditions causing the upper urinary tract obstruction has been extensively proven, and their contribution to urology remains enormous. The clinical use of ureteric stents is associated with several complications. "Stent syndrome," encrustation, migration and urothelial hyperplasia are the most common problems related to long-term ureteral stenting. **Case report:** This work presents an interesting case from our practice: a complete encrustation of a classical polyurethane double J stent two and a half months after its initial instillation, in a 70 year old man, with a solitary functioning kidney, as well as successful removal of it by using a simultaneous treatment of extracorporeal lithotripsy and ureteroscopy with a contact disintegration of encrustations and with percutaneous nephrostomy, as an auxiliary procedure for providing of additional urine derivation. **Conclusion:** These problems can be overcome by the introduction of new advanced ureteral stent designs and biomaterials.

Key words: stent syndrome, encrustation, endocorporeal or extracorporeal lithotripsy

1. INTRODUCTION

Ureteral stents are basic and the most frequently used agents in the area of urology. A ureteric stent is a specially designed hollow tube, made of a flexible plastic material that is placed in the ureter. The length of the stents used in adult patients varies between 24 to 30 cm. Additionally, stents come in differing diameters or gauge, to fit different size ureters. Although there are different types of stents, all of them serve the same purpose.

The aim for their application is drainage of urine and quite often they are instilled after endocorporeal or extracorporeal lithotripsy in the treatment of urolithiasis. Sometimes surgical decompression by ureteral stent is necessary to ensure that all patients have access to this life saving therapy (1). Huge problems are significant adverse effects, associated with "indwelling ureteral stents" that include discomfort, infection and encrustation, the overall name of which is a stent syndrome, which may lead to significant morbidity (2–4).

Longer keeping of a stent in the ureter carries a risk of a higher tendency of microorganisms to develop a biofilm on the stent surface. Biofilm formation supports the phenomena of stent encrustation and adds to the morbidity, infection risk and encrustation, which can lead to renal failure or even death (2, 5).

Many different strategies have been developed to decrease the incidence of medical device related infection and encrustation. One way to prevent these related side-effects is by modifying the surface of the devices in such a way that no bacterial adhesion can occur. This requires modification of the complete surface with, mostly, hydrophilic polymeric surface coatings (6).These surface coatings incorporating antibacterial agents have been developed exactly for these devices in an attempt to prevent infections and the formation of bacterial biofilms. Despite the development in recent years of many strategies, no stent material has been designed to meet these requirements to eliminate stent-related complications such as infection or encrustation.

2. CASE REPORT

A 70 year old man, a domicile, contacted an Urologist of the University Hospital of the Clinical Center in Banja Luka for intermittent pains in the left side with irradiation towards the front, bottom and medially, which lasted for the last 10 days, which were also accompanied, in

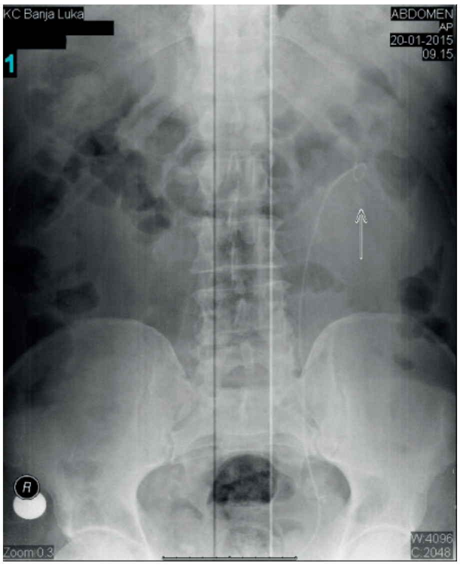

Figure 1. KUB after the initial placement of the JJ stent.

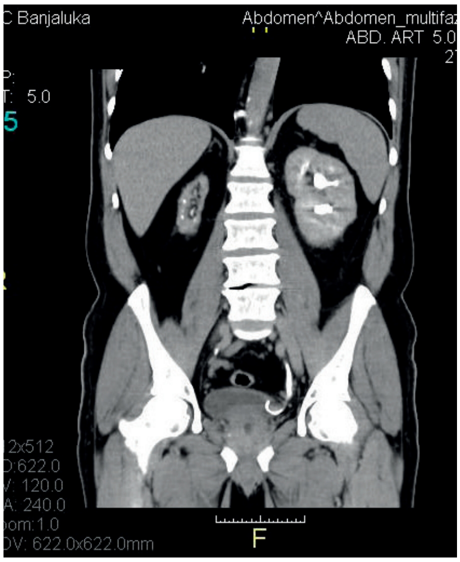

Figure 2. CT urography

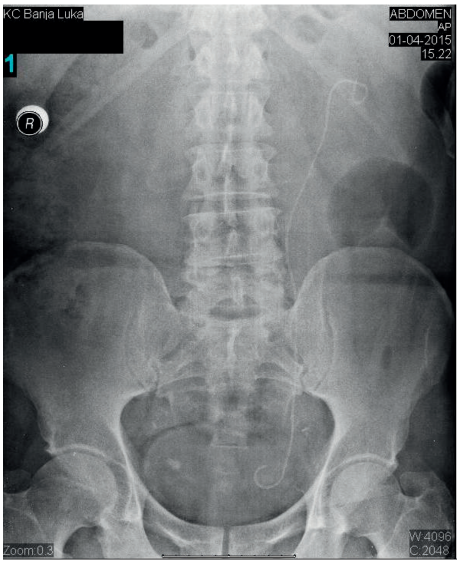

Figure 3. KUB one day prior to the attempt of removal of JJ stent.

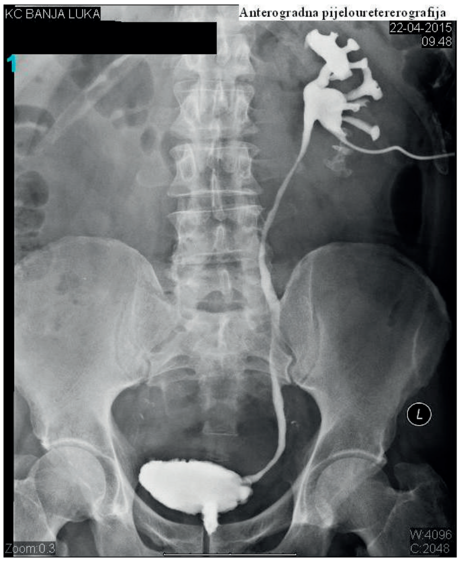

Figure 4. Anterograde pyeloureterography.

the last few days, with swelling of the abdomen and constipation, without giving anamnestic data about the reduction of the quantity of urinated urine. Two years before, the patient underwent a transurethral resection of the prostate because of chronic urine retention caused by a benign hyperplasia of the prostate, and, when a malfunction of the right kidney was verified (a relative function of it was 8.2%). Having performed the physical check, it was found out that the meteorism of the abdomen and pain of the left side when touched, with the rest of the general findings being NAD. In the initial diagnostic evaluation, laboratory tests of the blood and urine were done, ultrasonography of the abdomen and urinal tract and X-ray of the KUB. Serum analysis of the blood has shown the value of leukocytes to being 12.5, urea 82.3 mmol/l (normal range being 2.8-7.2 mmol/l), creatinine 2130 µmol/l (normal range 62.0-106.0 µmol/l), potassium 6.6 mmol/l (normal range 3.5-5.1 mmol/l), chlorides (Cl) 94 mmol/l (normal range 98.0-107.0 mmol/l), phosphates 3.93 mmol/l (normal range 0.87-1.45 mmol/l), CRP 125.6 mg/L (normal range (0.0-5.0 mg/L), uric acid 409 µmol/l (normal range 202.0-416.0 µmol/l), and acido-alkaline status of the metabolic acidosis, i.e. pH of the blood 7.124, BE-19.3 mmol/l and BF (ecf)-20.9 mmol/l. Ultrasonography of the abdomen and urinal tract has shown hypotrophy of the right kidney, without the presence of focal lesions, calculosis and hydronephrosis, as well as compensatory hypertrophy of the left kidney with hydronephrosis grade I/II, and in the projection of one of the calyces of the lower group hyperechoic zone of size 7 mm with acoustic echo.

X-ray of the KUB, because of the expressed meteorism, has not shown positive mineral shadows in the projection of the left half of the upper part of urinal tract. The initial therapy approach included an acute hemodialysis in the first three days of hospitalization, as well as application of a wide-spectrum antibiotics, diuretics and other anti-hypertensive therapies with medicament correction of the acid-alkali status with a remaining symptomatic therapy with positive clinical effects, and, after stabilization of a general situation, the drop of nitrogen substances and correction of the acid-alkali status. On the fourth day of hospitalization, a left-sided ureteroscopy using a semi-rigid ureteroscope was done, and it has shown the presence of ureterolith below the pyeloureteric neck of the size of about 8 mm and, when attempted to do endocorporeal lithotripsy using a pneumatic lithotripter, the stone migrated (got pushed-up) into the kidney, after which a DJ stent was installed at 5CH.

In further post-intervention period, the nitrogen substances, blood electrolytes, acid-alkali status and infection parameters got stabilized, with a sterile urine culture. The control KUB shown the position of the DJ stent to be correct and also, less visible, 2 mineral shadows in the projection of the lower pole of the left kidney, of 7 and 8 mm size (figure 1). CT urography showed that the longitudinal diameter of the right kidney was 7.4 cm, a significant reduction of the parenchyma, without the presence of focal lesions, hydronephrosis and calculosis, as well as a longitudinal diameter of the left kidney being 13.2cm, and in the projection of the lower pole an oval nephrolith of 7 and 8 mm, as well as the correct position of the placed JJ stent (figure 2). The hospitalization lasted for 16 days.

Two weeks after hospitalization, there were 4 instances of extracorporeal lithotripsy performed on out-patient basis, with the Siemens lithotripter that produces shock waves by electromagnetic vibration of the metallic membrane, with the satisfactory destruction of the described nephroliths, but slowed emission of the fragments from the lower kidney pole. After the last ESWL treatment, an asymptomatic urinary infection was verified, and the urine culture showed the causative agent to be Acinetobacter 10/5, so the adequate antimicrobial therapy was administered and the indication for DJ stent removal/replacement was decided.

The control of native urinary tract has not shown the absolute presence of mineral shadows in the projection of the urinary tract (figure 3). Ultrasonography verified acoustic echo in the projection of the proximal part (pigtail) of ureteral stent. According to that, 2.5 months after the initial placement of the DJ stent, the urethrocystoscopy was performed under general anesthesia with the aim of DJ stent removal, and it showed that the distal part of the stent was macroscopically fine, without encrustation signs, but when tried for extracting the stent, there was the encrustation around the ureteral part of the stent that was inside ureter, and it was impossible to extract it. The next was the somewhat difficult introduction of the semi-rigid ureteroscope into intramural and juxtavesicular part of the left ureter that showed the presence of the compact film encrustation of DJ stent on its whole length.

The lithotripsy of the encrustations in the mentioned part of the ureter was performed, and the fragments looked like the egg shell. During the mentioned intervention it was not possible to remove the ureteral stent. Extracorporeal lithotripsy in the projection of the proximal part of JJ stent was performed the next day, although mineral shadows were not visible by fluoroscopy. During the hospitalization the hydronephrosis grade II developed and nitrogen materials increased (urea 16, creatinine 343, potassium 5.5), and even with the satisfying diuresis uric acid increased to 809 umol/l, allopurinol was administered and percutaneous nephrostomy was performed. After the stabilization of the nitrogen substances levels, repeated ureteroscopy with additional extracorporeal lithotripsy of the encrusted stent was performed and the stent was successfully removed.

The patient was discharged with percutaneous nephrostomy catheter, and the readmission was scheduled in 10 days in order to perform indicated anterograde pyeloureterography, which has shown defects in contrast filling in the lower lumbar and iliac part of the ureter, described as encrustation fragments. Repeated ureteroscopy with contact disintegration of the remaining fragments was performed. During the following days, the diuresis was forced parenterally and per orally, with temporal closure of nephrostomy catheter with the aim of better migration and spontaneous elimination of the remaining fragments, with positive clinical effect. The control anterograde pyeloureterography did not show the presence of remaining fragments, the closure of the nephrostomy catheter did not show the presence of hydronephrosis and increase of nitrogen materials, so the nephrostomy catheter was removed (figure 4).

3. DISCUSSION

The efficacy of ureteral stents in the management of various urological conditions causing upper urinary tract obstruction has been extensively proven, and their contribution to urology remains enormous. Nevertheless, the clinical use of ureteral stents is associated with several complications. “Stent syndrome”, encrustation, migration and urothelial hyperplasia are the most common problems related to long-term ureteral stenting. These problems can be overcome by the introduction of new advanced ureteral stent designs and biomaterials. Biodegradable polymeric stents and drug-eluting polymeric and metal stents are the most promising fields of urological stent research. Permanent antibacterial coatings have been developed by brush-like polyethyleneimine (PEI) on polyurethane (PU) ureteral stents since bacterial adhesion and biofilm formation with the following encrustation on stent surface limit their long term usage (7). The application of silver nano particles on the surface of medical devices has been used to prevent bacterial adhesion and subsequent biofilm formation. The nano particles are either deposited directly on the device surface, or applied in a polymeric surface coating. The silver is slowly released from the surface, thereby killing the bacteria present near the surface (6).

In our case study, we have used a classic polyurethane Double J stent. Cauda et al evaluated in their work “the ability of heparin coating to inhibit Double J stent encrustation and compare it with the classic polyurethane Double J stent, and concluded that Heparin coating reduces stent encrustation and that the heparin-coated stent appears to be a useful tool for long-term urinary drainage (8).

In general, most stents should only remain in for no longer than 3 or so months. In the patient presented in our study, an attempt to remove a ureteral stent was done 2.5 months after its instillation and the evident bacteriuria when having it was treated using an adequate anti-microbe therapy in line with the antibiogram of the urine culture. However, in addition to adhering to the guidelines about the duration of the period with the stent and adequate anti-microbe therapy because of the verified bacteriuria, adverse effects related to the stent-syndrome complication occurred.

An optimal method of urgent decompression of the collecting kidney system has not been clearly determined. Retrograde ureteral catheterization and percutaneous nephrostomy effectively relieve obstruction and infection due to ureteral calculi. Neither modality demonstrated superiority in promoting a more rapid recovery after drainage. Percutaneous nephrostomy is less costly than retrograde ureteral catheterization. The decision of which mode of drainage to use may be based on logistical factors, surgeon preference and stone characteristics (9). Ramsey et al pointed out their opinions, in their study, that the management of infected hydronephrosis secondary to ureteric stones is through prompt decompression of the collecting system and that there appears little evidence to suggest that retrograde stent insertion leads to increased bacteriemia or is significantly more hazardous in the setting of acute obstruction with conclusion that further region-wide discussion between urologists and interventional radiologists is required to establish management protocols for these acutely unwell patients, too (10).

4. CONCLUSION

Common complications associated with indwelling ureteral stents include discomfort, infection and encrustation.

Based on the current literature, biodegradable and drug-eluting technology appears to be the future of ureteral stent design in an attempt to alleviate these stent symptoms and complications.

CONFLICTS OF INTEREST: NONE DECLARED.

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