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Open Removal Of Encrusted Forgotten Ureteral J-Stent: A Case Report Of 37-Year-Old Male Patient

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Abstract

Background

Stent encrustation refers to the accumulation of mineral crystals on the surface and inside of a ureteral stent. This creates significant morbidity, especially for chronically indwelling stents or forgotten stents. Upon encrustation it become calcified and brittle and lose its tensile strength, raising the risk of stent fracture or ureteral avulsion during removal**.**

Case presentation

This is a 37-year-old male presented with right side severe flank pain, absence of urine, non-bilious vomiting, and decreased appetite of 3 days. On examination he was tachycardic, afebrile and on the abdomen there was a right and left flank surgical scar and there was no tenderness, left costovertebral tenderness; normal white blood cell counts with Neutrophil predominance, hyperkalemia, hyponatremia and elevated creatinine and UTI and pre operative imaging shows right side solitary kidney with nephrolithiasis with hydroureteronephrosis and right side elongated ureteric intraluminal structure.

Result

This patient was diagnosed with obstructive uropathy secondary to forgotten stent and preoperatively stabilized and cystoscopy stent removal tried and failed the open urethrotomy and Vesicostomy done and stent removed and ureteroureterostomy and bladder repair done. And the patient discharged home after improvement.

Conclusion

Hence, in patients with ureteral stent the caring physician are required to advice the patient about stent complications and improve patient tracking which will decrease the completely avoidable morbidity.

Key words: Encrusted stent; forgotten Ureteral J-stent; Vesicostomy; Open removal

Introduction

Endourologic procedures have become more effective; and the use of ureteral stents has increased in recent years. They are mostly used after ureteral surgery to manage ureteral blockage caused by intrinsic or extrinsic reasons such as stones, strictures, uretero-pelvic junction obstruction, retroperitoneal fibrosis, malignancies, and congenital defects, as well as to protect the ureter following surgery.**[1, 2, 3, 4]**

The reason of encrustation is multifaceted. Long indwelling time, urinary infection, history of or contemporaneous stone illness, chemotherapy, pregnancy, chronic renal failure, and metabolic or congenital disorders have all been linked to stent encrustation.**[3]** Neglected ureteral stents occur in urologic practice due to patient noncompliance or poor patient counseling by the clinician. These

forgotten stents can cause major morbidity and death because to widespread encrustation with a high stone burden, knot formation, upward migration, and fragmentation. The formation of encrusted debris on retained ureteral stents may occur in both infected and sterile urine. Fragmentation is another key concern associated with forgotten stents. It is the outcome of stent polymer hardening and degradation, which causes tensile strength to decrease.**[1, 2, 5, 6]** Imaging modalities such as KUB X-ray, CT, and ultrasonography are essential for assessing patients with stents. If the stone burden is substantial, radionucleotide testing are advised.

Urologists face a tremendous issue while treating encrusted ureteral stents. Percutaneous nephrolithotomy and ureteroscopy are usually necessary to treat a heavily encrusted stent with a high stone load. According to Kawahara et al, 47.0% of the stents were encrusted. Stents smaller than 6F had significantly higher rates of encrustation than those larger than 7F, implying that large-caliber stents may have a longer indwelling period before becoming incrusted, resulting in a longer time to become encrusted; and the proximal end was the most common site of ureteral stent encrustation, followed by the distal end and body.

Treatment options include electrohydraulic lithotripsy, laser litholapaxy, ureterorenoscopy-guidewire, percutaneous nephrolithotomy, and percutaneous nephrostomy with solution chemolysis with Clearance rates range from 75 to 100 percent.**[8]** Encrustation can be prevented by educating patients about the temporary nature of and need for follow-up, frequent stent exchange in pregnant patients with existing stents, exteriorized ureteral stents connected to a urethral catheter after URS in presumably noncompliant patients, and the use of biodegradable stents.

Case Presentations

History and physical examination

This is a 37 years old male presented with severe right flank pain, anuria, non- bilious vomiting, and decreased appetite of 3 days duration. Otherwise, cough, no fever and no trauma. He had history of left kidney nephrectomy for an indication of post obstructive atrophied kidney seven years back and right side nephrolithotomy plus ureteral stenting for multiple obstructive urolithiasis three years back but he was lost follow up and discharge from the hospital. That he denied he was counselled for stent left inside and subsequent removal plan.

Objectively, sick looking. vital signs; BP-(100/75 – 132/80) mmHg, PR- (96- 112), RR- (22-25) T – (36.6 – 37.1)0c, S02 (95 – 99) % with atmospheric air, wet buccal mucosa, clear bilateral chest, S1 & S2 well heard no murmur no gallop, flat abdomen which moves with respiration and there was a right and left flank surgical scar and there was no tenderness, right costovertebral tenderness, conscious and oriented to person place and time.

Investigations

Laboratory blood work up CBC-WBC-8x103, Neutrophil predominance -75% Hgb-12.7g/L, Platlet-248x103, SCr-18.2mg/dl, Na+-130mEq/L, K+-7.4mEq/L; urinalysis – leukocyte +3, protein +3, blood +3; and pre operative non-contrast abdominal CT scan showing right side solitary kidney with nephrolithiasis with hydroureteronephrosis and right side elongated ureteric **(Figure 1).**

Management Outcome And Follow-Ups

The patient optimized and informed written consent, under spinal anesthesia positioned on dorsal lithotomy and cystoscopy trail of stent removal but fail to drag the stent and then the patient repositioned to supine approached through Gibson incision and the ureter approached retroperitoneally. Intraoperatively ureter opened and there was an encrusted ureteral stent **(Figure 2)** and stent pulled up, bladder opened posteriolateral and a stent was cut off the remaining segment removed at the ureterotomy site, ureter repaired after the J-stent and bladder repaired.

Postoperative he was antibiotics, urinary catheter for 7 days and his creatinine dropped to level of 1.26 mg/dl and advice on follow up with plan to remove the ureteral stent at 3rd week and stent removed on follow up and doing well.

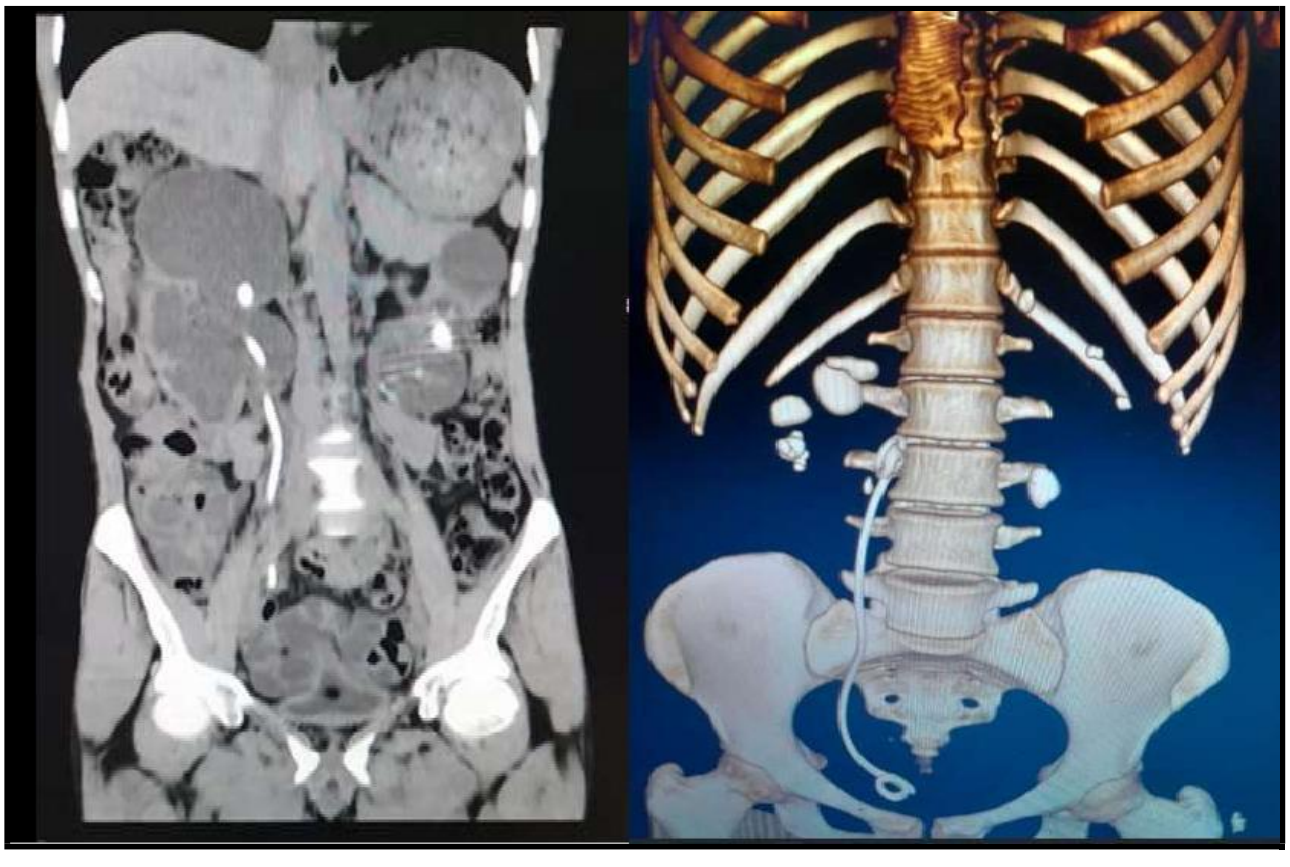

Figure 1: Coronal and three D view CT scan of abdomen shows right ureter J-stent insitu

Figure 2: and Intraoperative photograph of removed encrusted J-stent and control KUB-x-ray

Discussions

Zimskind and colleagues reported the first cystoscopic application of silicone ureteral splints in 1967. Endourologic procedures have grown stronger, and the use of ureteral stents has expanded in recent years. They are mainly indicated after any ureteral surgery and for managing ureteral obstruction due to intrinsic or extrinsic causes like stones, strictures, uretero-pelvic junction obstruction, retroperitoneal fibrosis, malignancies, and congenital anomalies and protect ureter postoperatively. the standard preference is usually for hollow lumen, side vented tube with high pressure dependent flow rate in stented ureters.**[1, 2, 3, 4]**

The indwelling duration of stents has been safely prolonged for up to 2 years in patients with malignant blockage, ureteral damage, or fistula.**[4]** The widespread utilization of these stents has led to a rise in problems, such as stent encrustation, stent fragmentation, stone formation, and recurring urinary tract infections.**[1]**

The cause of encrustation is complex. Known risk factors for stent encrustation are long indwelling time, urinary sepsis, history of or concurrent stone disease, chemotherapy, pregnancy, chronic renal failure, and metabolic or congenital abnormalities.**[3]**

Neglected ureteral stents are seen in urologic practice because to patient noncompliance or the physician's inadequate counselling of the patient. These forgotten stents can produce considerable morbidity and mortality, due to extensive encrustation with significant stone burden, knot formation, upward migration and fragmentation. Encrustation of forgotten stents associated with large stone burden is a serious problem, due to complications like recurrent urinary tract infection, hematuria, obstruction and renal failure. **[1, 2]**

The formation of encrusted debris on retained ureteral stents may

occur in both infected and sterile urine. The mechanism of encrustation in infected urine is a result of organic components in the urine crystallizing out onto the surface of biomaterial and becoming incorporated into a bacterial biofilm layer. Urease, generated by the adherent bacteria, hydrolyses urea to create ammonia. This raises urine pH, which promotes the precipitation of magnesium and calcium as struvite and hydroxyl apatite. The exact method of encrustation in sterile urine is unknown, however it appears to be reliant on the pH, ionic strength, and biomaterial hydrophobic characteristics. As stents encrusted it loses its tensile strength, increases the risk of stent breakage and ureteral avulsion during removal.**[1, 2, 5, 6]**

Calcium oxalate is the most common component of stent encrustation, with calcium ammonium phosphate and calcium phosphate being present in small quantities.**[7]**

As ureteral stent incrustation increased, resistance to guidewire insertion was characterized as "moderate incrustation," and when impossible, it was classed as "complete incrustation."**[2]** The degree of encrustation depends on the dwelling time. Chronic recurring stone formers, the metabolic propensity to stone disease, congenital renal abnormalities, malignant urinary obstruction, and pregnancy may all contribute to an increased frequency of encrustations.**[1, 8]**

The composition of the stent material evidently influences the likelihood of encrustation. Polyethylene is no longer used because it is brittle and at risk of fragmentation. Silicone is inert and relatively resistant to encrustation; however, it is extremely flexible and consequently difficult to use in many circumstances. Polyurethane is commonly used and combines the benefits of polyethylene and silicone. Many modern stents use a hydrophilic coating.**[3]**

Cormio et al, states that silicone stents are regarded as the most appropriate prosthesis for prolonged ureteral stenting. hydrogel-coated stents less superficial epithelial destruction and were less prone to encrustation than the silicone which make them suitable for long-term ureteral stenting. But Choong et al and Desgran Dch et al, argue that from the frequently utilized ureteric stents evaluated, the silicone based ureteric stents exhibited the least encrustation. Hydrogel-coated ureteric stents encrusted more than uncoated stents.**[9, 10, 11]**

Fragmentation is another major issue with forgotten stents. It is the result of loss of tensile strength caused by hardening and degradation of the stent polymers. The danger of encrustation and fragmentation depends on the stent's material. Silicone was shown to be the least susceptible to encrustation, followed by polyurethane, silitek, percuflex, and hydro gel coated polyurethane.**[1]**

Imaging techniques such as KUB X-ray, CT, and ultrasonography are critical in evaluating patients with stents. If the stone load is high, radionucleotide tests are recommended to determine differential renal function, which has two purposes: it determines pre-procedural renal function in a potentially litigious scenario and evaluates the function of the afflicted renal unit.**[5]**

Endourologists have a difficult challenge when dealing with ureteral stents that have become encrusted. Encrustations and the related stone load, which can affect the bladder, ureter, and kidney, frequently necessitate various endourological methods. Percutaneous nephrolithotomy and ureteroscopy are frequently required to treat a heavily encrusted stent and concomitant stone burden. Restoration of renal function is possible during an extended duration of partial blockage caused by encrusted stents.**[1, 12]**

Kawahara et al, state that 47.0% of stents were found to be encrusted. Stent length and patency did not show a meaningful correlation. Stents smaller than 6F had significantly greater rates of encrustation compared to those larger than 7F, thus Large-caliber stents may endure a longer indwelling period before becoming incrusted, resulting in a longer time to get encrusted; and the most common site of ureteral stent encrustation was the proximal end (upper curl), followed by the distal end (lower curl) and body (mid-stent).

Bultitude et al, reported 75.5% ureteral stent encrustation of which 42.8% become encrusted within 4 months and 14.3% in 2 months. Therefore, the suggested stent removal or change within 4 months and preferably within 2 months. But Singh et al reported 3.72% of its stent encrustation from 1450 stent procedures. Similarly, reported 6.4% stent incrustation which was associated with increased indwelling time; and for an indwelling time of up to six weeks, the stent patency percentage was 93%.**[4]**

Treatment options include ESWL, electro-hydraulic-lithotripsy, laser- litholapaxy, uretero-renoscopy-guidewire, percutaneous nephrolithotomy, and percutaneous nephrostomy with solutionG chemolysis. Clearance rates range from 75% to 100%. **[8]**

In cases with mild encrustation, appropriate therapy involves attempting removal under general anesthesia, followed by ureteroscopic surgery if the stent proves difficult to extract. All attempts to remove impacted stents must be under fluoroscopic control. highly encrusted stents, particularly in the proximal ureter and renal pelvis, require a percutaneous approach to ensure total stone removal.**[3, 12]**

Prevention of this encrustation can be achieved by educating patients about the temporary nature of and need for follow-up, frequent stent exchange in pregnant patients with existing stents, exteriorized ureteral stents connected to a urethral catheter after URS in presumably noncompliant patients, and the use of biodegradable stents.**[5]**

Conclusion

Despite the current recommendation of less invasive encrusted stent removal; we were obliged to remove the use open surgical method because of resource limitation.

Authors' Contributions

All authors had involved in the process of edition and approved the final manuscript document

Tilaneh Leyeh Demilow - Conceptualization, supervision, data curation, validation

Ermias Tadesse Woldegiorgis - writing original draft, review editing, data curation, Software

Murtii Teressa Obolu - review editing, Data curation, Methodology, Software

Tizazu abebayew- conceptualization, data curation, supervision , and validation.

Yared Assefa Beyene - Data curation & Investigation

Mahider Zegeye Demisse- Data curation & Investigation

Informed Consent

Formal written informed consent is taken from parents for publications along with accompanying images, any identification part has been anonymised for the privacy and confidentiality of patients and it will be available up on request by journal chief editor.

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