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Percutaneus Nephorlithotomy Procedure for Realese Encrusted Double J Stent

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ABSTRACT

Installation of a DJ Stent is a procedure performed in the field of urology to prevent or relieve ureteral obstruction. Technological developments in the field of medicine have changed the approach to surgical intervention in cases of kidney stones (especially kidney stones with a stone burden > 2 cm), from open surgery to endoscopic surgery, one of them is by percutaneous nephrolithotomy (PCNL). We report the case of a man with a right double J (DJ) stent that was placed 5 months previously. The patient underwent anamnesis, physical examination, supporting examinations and was then treated with ureteroscopic lithotripsy and PCNL. Complete clearance of the stone can be performed and the DJ stent can be removed uninterruptedly from the percutaneous access. Encrusted stents are still a challenge in urology where endourology remains the best choice of treatment. The management of DJ stents should also be based on follow-up and prevention by taking into account predisposing factors to encrustation such as urinary tract infections, diabetes mellitus, chronic renal failure, history of urolithiasis, diet and malabsorption.

Keywords: double J stent; encrusted; kidney stone; ureteroscopic lithotripsy; percutaneus nephrolithotomy

INTRODUCTION

DJ Stent placement is a procedure performed in urology to prevent or relieve ureteral obstruction. If a ureteral stent is left in place for a long time, the stent can cause morbidity due to migration, occlusion, scaling, damage, stone formation and even death due to life-threatening urosepsis or complications related to operative intervention. Extracorporeal shockwave lithotripsy, ureterorenoscopy, laser lithotripsy and percutaneous nephrolithotomy (PCNL) are the management of encrusted stents but at present there are no standard guidelines for this situation and only some algorithms have been introduced by studies.[1]

Percutaneous nephrolithotomy was the most common procedure (64%) for circular encrustation completely encasing both portion or diffuse and bulky encrustations completely encasing the proximal, distal and ureteral portions of DJ stent. Meanwhile PCNL procedure for realese the encrsuted DJ stent bound to the surrounding tissue are less common studied.[2]

Technological developments in the field of medicine have changed the approach to surgical intervention in cases of kidney stones (especially kidney stones with a stone burden > 2 cm), from open surgery to endoscopic surgery, one of which is percutaneous nephrolithotomy (PCNL)[3].

CASE PRESENTATION

The patient is willing to be the subject of the case presentation based on the informed consent that I have given orally to the patient. I guarantee the confidentiality of the patient's data and identity.

A 47 years old patient came to the polyclinic at UNS Hospital with complaints of right low back pain. Low back pain was felt since 2 weeks before entering the hospital. Low back pain is felt continuously as if squeezed, does not improve with rest. The patient also complains of pain when urinating, urination is not smooth and urination feels dripping. The past medical history was 5 months ago the patient underwent PCNL and the installation of the Right DJ Stent. After anamnesis, physical examination, and supporting examinations, the patient was diagnosed with multiple nephrolithiasis dextra.

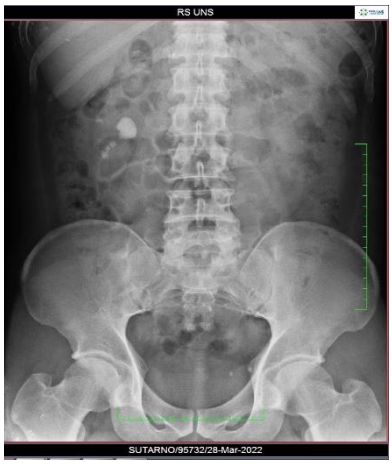

Figure 1. Plain photo of preoperative abdomen shows right kidney stone

Then the patient underwent percutaneous nephrolithotomy procedure and DJ stent placement. After the PCNL procedure and DJ stent placement, an evaluation of the DJ stent placement was carried out. Plain abdominal X-ray and C-Arm examination showed a good position of the DJ stent in the right hemiabdomen

Figure 2. Imaging with the C-Arm shows DJ stent in renal pelvic calyx system

Figure 3. Plain photo of the AP abdomen shows DJ stent in the right hemiabdomen

5 month later, the patient went to the polyclinic at the UNS Hospital with complaints of low back pain. On vital sign examination, normal hemodynamics were found. Physical examination of head, neck, thorax, heart, lungs, abdomen and extrimities were normal. Physical examination of the urogenital region consist of costovertebral region, suprapubic region and external genitalia (penis). Positive costo vertebra tapping pain in the right back were found. Physical examination of suprapubic region and external genitalia were normal. Laboratory examination consist of routine blood tests within normal limits, ureum 44 mg/dL, creatinine 1.79 mg/dL. The result of radiological examination AP Abdomen Plain Photo Examination 5 month ago were the position of the DJ stent on the right hemiabdomen is good, there tends to be a smaller right picture of multiple nephrolithiasis. The diagnosis is nephrolithiasis dextra with a surgery plan for realese right DJ stent. The prognosis is dubia ad bonam. The treatment are lithotripsy ureteroscopy and PCNL for release DJ Stent with general anesthesia.

After anamnesis, physical examination and supporting examinations the patient was planned to undergo the realese DJ stent procedure with URS and PCNL. After general anesthesia was performed and the patient was in the lithotomy position, the operating field was disinfected with 10% povidone iodine solution, then the operating field was narrowed with a sterile cloth.

Puncture by making an incision hole for the entry of a puncture needle 0.5 cm wide with needle no. 11, stick the puncture needle towards the calyx 1-2 cm below the desired costa 12 with fluoroscope guidance. Successful puncture is indicated by the discharge of urine through the puncture needle.

After a successful puncture, immediately insert a guide wire with the fine end in front (Figure 4). After that, dilation was started, with an 8 ch Teflon dilator, then attached a long stiff guide. With a telescopic dilatator set, widen the nephrostomy opening gradually, until the dilatator is 30 ch in size. Finally insert the protective tube (sheath amptatz) outside the 30 ch dilatator. Pull out all the dilators along with the long rigid guides, leaving the amplatz and the guide wires behind.

The next procedure is inserting the nephroscope into the amplatz tube (Figure. 5), through the exploratory nephroscope into the pyelum and calyx.

The DJ stent is visible and encrusted and there are stones around it (Figure 6). Then the collecting system was cleaned of blood clots with flat forceps and small stones were taken with stone forceps while large stones were broken up first through a lithotripsy procedure. The DJ stent which was encrusted and bound to the surrounding tissue was then removed uninterruptedly by twist the proximal portion of DJ stent through the puncture hole (Figure 7).

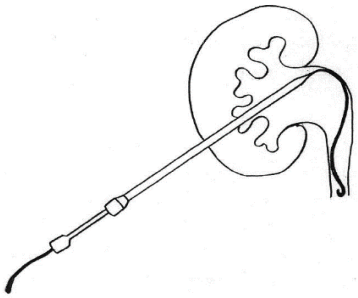

Figure 4. Inserting the guide wire into pelvic calyx system of renal

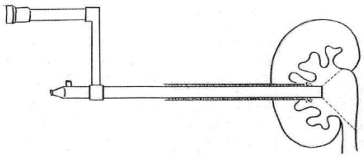

Figure 5. Inserting the (rigid) nephroscope into the amplatz into pelvic calyx system of renal

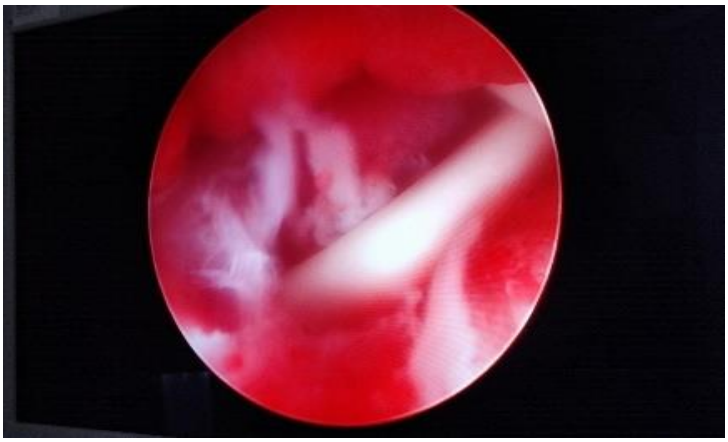

Figure 6. Encrusted DJ Stent in pelvic calyx system of renal

After the procedure is complete, attach the nephrostomy catheter using a 20 Foley catheter (Figure 8). The tip of this catheter is cut so that a straight channel is obtained which the guidewire can enter when changing the nephrostomy catheter. The balloon is filled with 2-3 cc of normal saline and the catheter is fixed to the skin with silk thread sutures. The catheter is connected to the urine bag.

The patient underwent treatment for 3 days with daily follow-up to find out the patient's complaints. During the 3 days of treatment the patient complained of pain at the surgical site with diminishing intensity and evaluation of the surgical wound showed that the wound was clean and had no signs of infection. The patient went home on the 3rd day after surgery with alpha 1 blocker drugs, painkillers, and antibiotics.

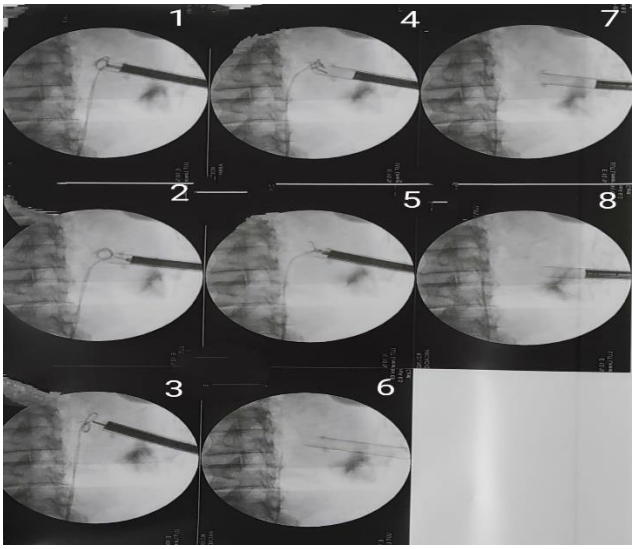

Figure 7. DJ Stent Removed Through Tube Amplatz in pelvic calyx system of renal

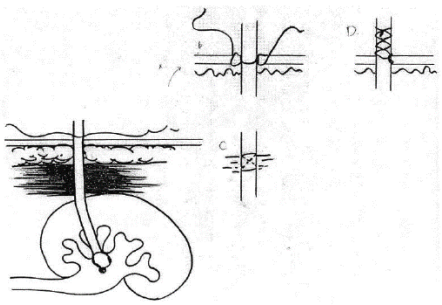

Figure 8. Insert a Nephrostomy Catheter with a 20 Foley Catheter

DISCUSSION

DJ stent encrustation and stone formation begins with bacterial adhesion, colonization and biofilm formation. The biofilm layer protects bacteria from the immune system and antibiotics. Encrustation can occur in sterile or infected urine depending on the urine pH, bacterial enzymes and stent material used. The study by El-Faqih et al reported that the increase in the occurrence of encrustation was directly proportional to the length of time the stent was in the urinary tract, in that study 76.3% of stent encrustation occurred after the 12th week. In addition, another study by Kawahara et al found that 75.9% of stent encrustations occurred after 3 months[4].

The main pathogens for encrustation are Escherichia coli, Streptococcus and Pseudomonas. However, clinically, bacterial colonization and biofilm formation on ureteral stents are not fully understood because there is no consensus on the specific pathogen causing the encrustation. It is also not clear how biofilm formation on the stent surface promotes mineral deposition and stent encrustation[4].

Conditions that increase susceptibility to bacteriuria and urinary tract stones predispose to stent encrustation. Recurrent urinary tract infections, diabetes mellitus, and chronic renal failure are conditions that can increase urinary bacterial colonization and can increase the risk of stent encrustation. Pregnant patients are equally at high risk of absorptive hypercalciuria and hyperuricosuria and are advised to change stents every 4 to 6 weeks to avoid stent encrustation. Other risk factors including

history of urolithiasis, diet, malabsorption disorders and cancer can cause stent encrustation by increasing the concentration of calcium, oxalate and uric acid in the urine[4].

Stent encrustation is also affected by the physical characteristics of the stent material. Kawahara et al evaluated 330 stents in one institution and found that stent length and patency did not correlate with the risk of encrustation, whereas a stent diameter smaller than 6Fr indicated a higher rate of encrustation whereas a stent diameter greater than 7Fr indicated a much lower rate of encrustation. The composition of the stent material can significantly affect the risk of stent encrustation, with different compounds and polymer blends inhibiting stone formation on the stent surface[4].

The mechanism of stent encrustation is complex and multifactorial. After the stent is inserted, it is immediately coated with a film made of patient tissue glycoproterin and urine composition, which can cause 3 things: 1) the stent can remain unchanged, the stent can be further coated with a bacterial biofilm (predisposing to urosepsis) or 3) the stent can experiencing encrustation[5].

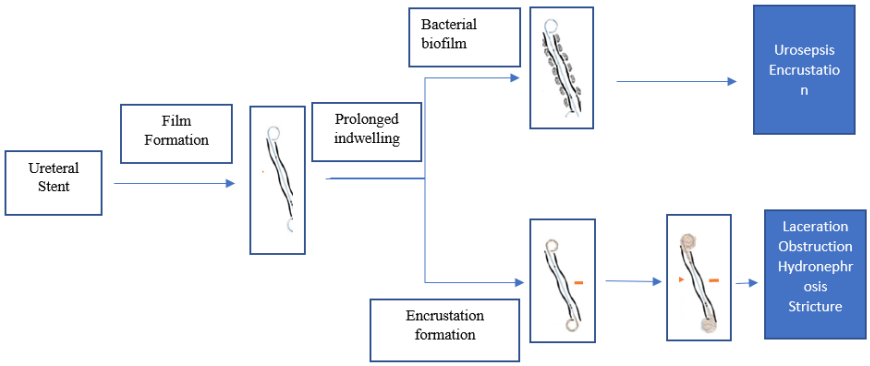

Figure 9. Encrusted Stent Mechanism begins with the formation of a biofilm, a long installation then forms a bacterial biofilm and the formation of encrustation which eventually causes urosepsis, laceration, obstruction, hydronephrosis and stricture[5]

The indications for percutaneous nephrolithotomy are as follows[6]:

1. Pielum or calix stones

Pielum stones that are larger than 1.5 or 2 cm that are suspected to be too hard or large to be cleared by ESWL, PCNL should be performed as primary therapy. The goal of kidney stone therapy is to remove stones without the rest, not the most non-invasive or up-to-date therapy, but the chances of success are smaller

2. Debulking of staghorn stones as a combination therapy for ESWL.

PCNL combination therapy with ESWL is currently one of the non-invasive treatment options that provides good results. PCNL is usually done first to remove stones in the inferior calyx, medius and pielum. After this PCNL usually left only a few small stones or which can't be reached with a nephroscope. The remains of this rock are then broken down by ESWL. How this combination can prevent the occurrence of steinstrasse.

3. A pinched UPJ (uretero-pelvic junction) stone

UPJ stones are usually pinched, resulting in hydronephrosis. Such stones can easily be removed percutaneously. With ESWL, trapped stones usually don't manage to clear properly. With PCNL, procedures can be performed quickly and with low morbidity

4. Proximal ureteral stones with severe dilation and other ureteral stones that are trapped

This situation is not much different from UPJ stones, ureteral stones wherever they are located, theoretically they can be taken using a flexible nephroscope or cystoscope. By itself this action should

be considered well in comparison with the URS in cases where there is already a nephrostomy flow, this action is very helpful.

5. Residual stones on ESWL

Sometimes stones can be broken with ESWL therapy, but can't get out of the kidney. This situation may be due to the infundibulum being too narrow or the stone located in the diverticula.

6. Stones in the diverticula of the calyces

The diverticula are connected to another collecting system (calyx or pielum) by a very narrow canal, often as large as a hair. This situation makes it difficult for crushed stones after ESWL to come out. Therefore, the indication of ESWL in diverticular stones must be made carefully after taking the stone, it must be dilated from the connecting canal to prevent stones from occurring again

7. Pielolysis, especially if there are stones

In UPJ stenosis, kidney stones are often found secondary. The pielum stone is taken first, then the UPJ is widened with a razor or electric knife, and a special catheter is left to keep the UPJ wide for about 3 weeks (can be a nephrostomy catheter with a widened section up to 24 Ch or a special DJ stent).

An encrusted stent is a challenge for the urologist and requires an endourology modality. While several studies have introduced algorithms for the management of indwelling ureteral stents, there is no consensus on the best method for efficiently managing encrusted stents. A thorough preoperative imaging evaluation determines the treatment strategy. The size of the stone and the location of the encrustation determine the specific enourology procedure. PCNL is used for the proximal end of a stent that is covered with stones. Although endourology can provide all the necessary solutions for the management of an encrusted stent, the best treatment is prevention. It has been reported that a timeframe of between 2 and 4 months can be considered optimal. However, patients with re-encrusted stents should be replaced early (every 6-8 weeks).[7]

Management of an encrusted stent is based on anamnesis, physical examination and supporting examinations (Figure 10). An encrusted stent in the bladder was performed by cystolithotripsy with a 30 watt laser and a 550 micron laser probe. The stent was encrusted in the ureter, a 7F semi-rigid ureteroscope was inserted into the ureter by placing a 0.35 inch guide wire and then lithotripsy was performed with a 365 laser probe until it reached the proximal ureter and released the DJ stent. If the proximal part of the stent is encrusted, lithotripsy is performed with a flexible URS through a guide wire and laser probe 272 then the DJ stent is removed by holding the forceps. In the case of proximal encrusted stents or the formation of large stones, PCNL is performed[8].

Removal of an encrusted ureteral stent bound to the surrounding tissue is a difficult clinical scenario. A ureteral stent that is encrusted and bound into a proximal ureteral stricture requires percutaneous endourologic removal using a novel loop-wire technique. The loop wire technique is an effective technique for removing encrusted and implanted stents without invasive surgery. By accessing the proximal stent band and repositioning it to a suitable position, this technique allows more reliable definitive removal of the stent. Use of a wire loop around the proximal stent bundle as an extraction device. The Bentson wire is placed through the ureteroscope with the distal end of the wire adjacent to the proximal stent bond. The distal end of the wire is then externalized via a percutaneous access. After both sides of the wire have been removed from the ureteroscope and assembled as a unit, gently pull the loop wire under the fluoroscope. This technique allows the proximal stent to be banded out of the stricture and into the renal pelvis. The rigid nephroscope is then used to remove the stent via percutaneous access[9].

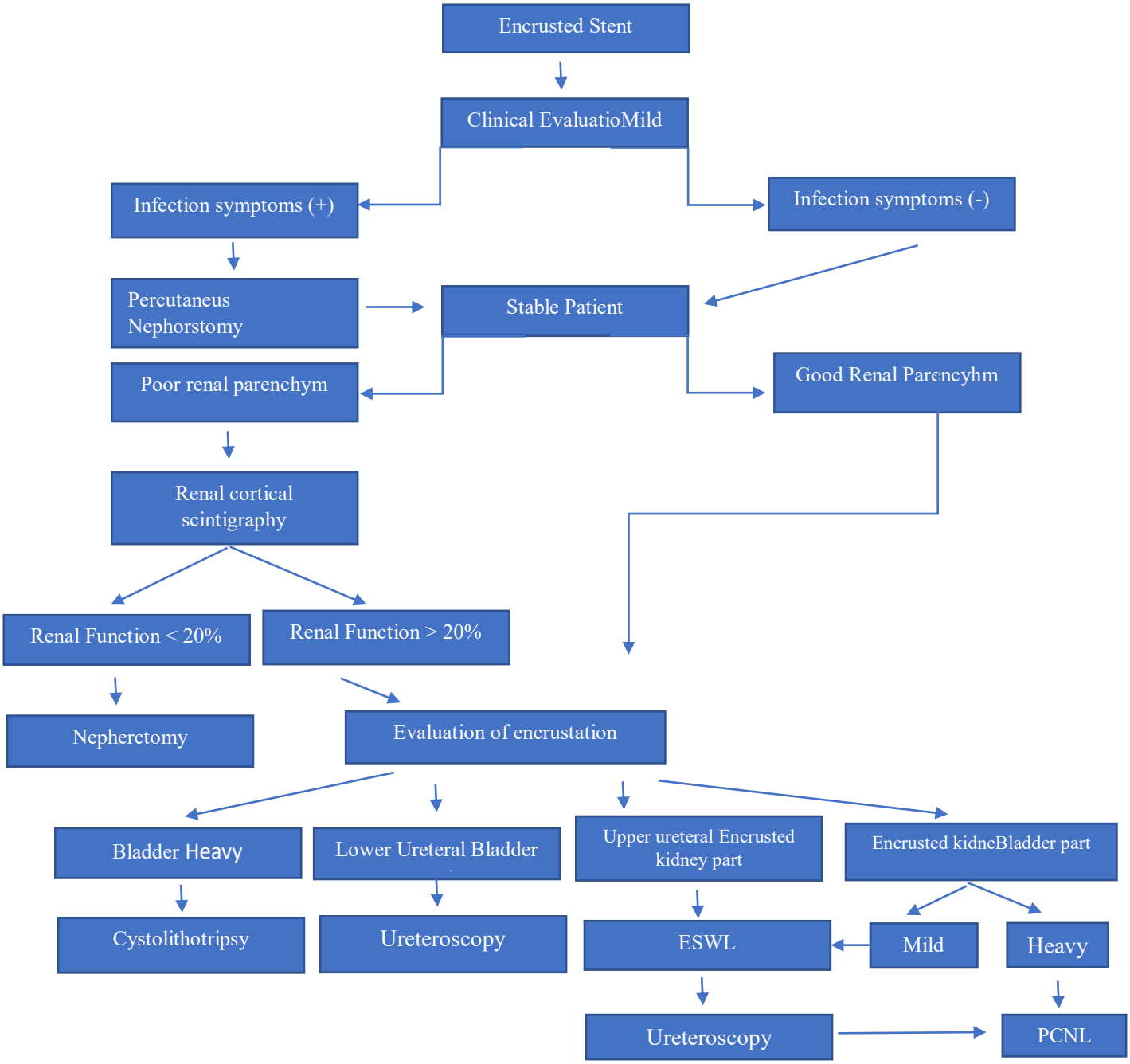

Figure 10. Treatment Algorithm of Encrusted DJ stent. Patients were divided into 2, with signs of infection and without signs of infection. Patients with signs of infection with stable condition and poor renal parenchyma underwent nephrectomy. Patients with sign of infection and renal function >20% either patient without signs of infection with stable condition and good kidney parenchyma were evaluated for DJ stent encrustation found in the baldder part, lower ureteral part, upper ureteral part and encrusted kidney part. Encrusted stent in bladder part performed cystolithotripsy, in the upper ureteral part performed ESWL, in the lower ureteral part performed ureteroscopy, and encrusted stent in the kidney parts with mild encrusted are done by ESWL or ureteroscopy and in the kidney parts with severe encrusted are done by PCNL.[8]

CONCLUSION

Eccrusted stents are still a challenge in urology where endourology remains the best choice of treatment. PCNL is a minimally invasive procedure that is effective and safe in the management of encrusted stents. The DJ stent which was encrusted and bound to the surrounding tissue was then removed uninterruptedly by twist the proximal portion of DJ stent through the PCNL puncture hole.

CONFLICT OF INTEREST

The authors reported no potential competing interests

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