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Case report

Successful retrograde intrarenal surgery (RIRS) for a 2-centimeter stone in a chronic renal failure (CRF) patient

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ABSTRACT

Introduction and importance: Retrograde intrarenal surgery (RIRS) is the best complementary method to Flexible Ureterorenoscopy (URF). In the case of renal insufficiency in patients with urolithiasis, the stone treatment strategy can be different because it should have the least injury to the kidney and be minimally invasive. There was no previous evidence of RIRS in stone-breaking in a chronic renal failure (CRF) patient. For the first time, we presented a successful RIRS in the monokidney CRF case with >2 cm stone.

Case presentation: We have done the RIRS over a 55-year-old monokidney woman. She already has lymphoma, chemotherapy, lithotripsy, right renal nephrostomy, and a left kidney stone removal. She had hydronephrosis with a >2 cm stone in her left kidney. The patient underwent RIRS surgery and Holmium lithotripsy (strength 8 and impact strength 13,000) on pinking layers of stone.

Clinical discussion: During the RIRS surgery, we put a ureteric stent (the patient already had a double J before), and we fixed the ureteral catheter with the Foley catheter and removed the ureteral catheter 4 days after the surgery. The result of the surgery was satisfying and after three days the patient goes into a stable condition.

Conclusion: Regarding the least injury to the kidney during RIRS surgery, it can be the best treatment option for urolithiasis in CRF patients.

1. Introduction

The prevalence of kidney stone disease, also known as urolithiasis, has increased mostly in developed countries over the last years. It seems that urolithiasis is related to several factors such as socioeconomic conditions, lifestyle changes, obesity, diabetes, sedentary jobs, and metabolic syndrome. Treatment strategies are minimally invasive like extracorporeal shockwave lithotripsy (SWL), ureteroscopy (URS), and percutaneous nephrolithotomy (PNL), and Retrograde intrarenal surgery (RIRS) [1]. Retrograde intrarenal surgery (RIRS) is the least invasive procedure for doing surgery within the kidney using a viewing tube called a fiberoptic endoscope. In RIRS the scope is placed through the urethra (the urinary opening) into the bladder and then through the ureter into the urine-collecting part of the kidney. The scope thus is moved retrograde (up the urinary tract system) to within the kidney (intrarenal). The stone can be seen through the scope and manipulated or crushed by an ultrasound probe or evaporated by a laser probe or grabbed by small forceps. RIRS should be performed by a specialist, a urologist (endourologist) with special expertise in RIRS and under general or spinal anesthesia.

Chronic renal failure (CRF) or kidney failure is the progressive loss of kidney function which is defined as decrease glomerular filtration rate and increased urinary albumin excretion [2]. Management of CRF patients with stones is completely different from the patients with stones and normal renal function. Renal insufficiency in patients with urolithiasis can be either due to calculus nephropathy or nephropathy of medical renal disease. The precise prevalence of calculus nephropathy is not known but the prevalence of renal failure with urolithiasis is about 1.7–18%. Several reports indicated successful RIRS in urolithiasis but not in CRF patients.

In the current study, we reported the first successful RIRS in a CRF patient with stone >2 cm. Moreover, we considered the treatment strategy of RIRC in CRF patients and the best candidate antibiotic medication with the required efficacy in this patient.

2. Case presentation

A 55-year-old monokidney woman was referred to the Urology

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Research Center at Sina Hospital. Written informed consent was obtained from the patient for publication of this case report and accompanying images and her case is presented through this article and is adhere to SCARE guidelines [3]. The patient had a history of medication with Tacrolimus and Mycophenolate Mofetil. We have already known that RIRS is safe and tolerable for patients. She had a previous medical history of lymphoma which had been undergone chemotherapy and completed her treatment. She had been visited in another surgery department and underwent lithotripsy treatment from 2005 to 2007 there. She agreed to report her case after signing the informed consent and the case report is based on SCARE guidelines. General patient status was not good because she had bilateral stones with blood creatinine 11 mg/dl and she was made to have another visit in another central emergency room. The ultrasound and CT scan tests there revealed left severe kidney hydronephrosis with a 2 cm stone. The patient underwent right renal nephrostomy with no decreased creatinine, and after dialysis underwent nephrolithotomy. After that, scan tests indicated just 5% kidney function but the patient did not accept nephrectomy. Subsequently, after left kidney stone removal, the patient developed pneumonia and was transferred to CCU. Later than 48 h, she was discharged from ICU with creatinine 5 mg/dl. After three months with stable creatinine 5 mg/dl, she was referred to the Sina hospital. The place of nephrostomy was seen in the right flank and the medical patient's history indicated the fact that a double j was placed there before the disease and the nephrostomy was removed but still urine exits from nephrostomy place.

The patient became the candidate for kidney transplantation. Regarding the scan result which indicating to just 9% function of the right kidney, the patient was advised for nephrectomy but she did not agree. There was no choice except RIRS. Patients became more adept at advocating for their health care and that of their families.

3. Method

Our RIRS candidate patient was tested for creatinine-potassium and sodium. Patient creatinine was reported as 6.2 mg/dl, potassium 4.7 mmol/L, and sodium 143 mmol/L, and hemoglobin 11.3 g/dL. The patient underwent dialysis 24 h before RIRS surgery and 500 mg of Meropeneme was injected. After dialysis, the patient's creatinine was reported 5.1 mg/dl and potassium 42 mmol/L, and sodium to 132 mmol/L. The patient underwent RIRS surgery and Holmium lithotripsy (strength 8 and impact strength 13,000) on pinking layers of stone (Fig. 1).

The surgery lasting for 58 min and a relatively sturdy stone and misty atmosphere brought some difficulties to the RIRS process but finally, the stone was broken. During the first 2 h after RIRS, the patient developed a fever (39.5 °C) in the ICU, and we were made to prescribe vancomycin (state 1.5 g) based on nephrologist recommendations. The patient's pulse was increased to 147 (114–120) for the first 24 h, and the patient's pressure was 95 mg/Hg before and after the RIRS surgery. During the RIRS surgery, we put a ureteric stent (the patient already had a double J before), and we fixed the ureteral catheter with the Foley catheter and

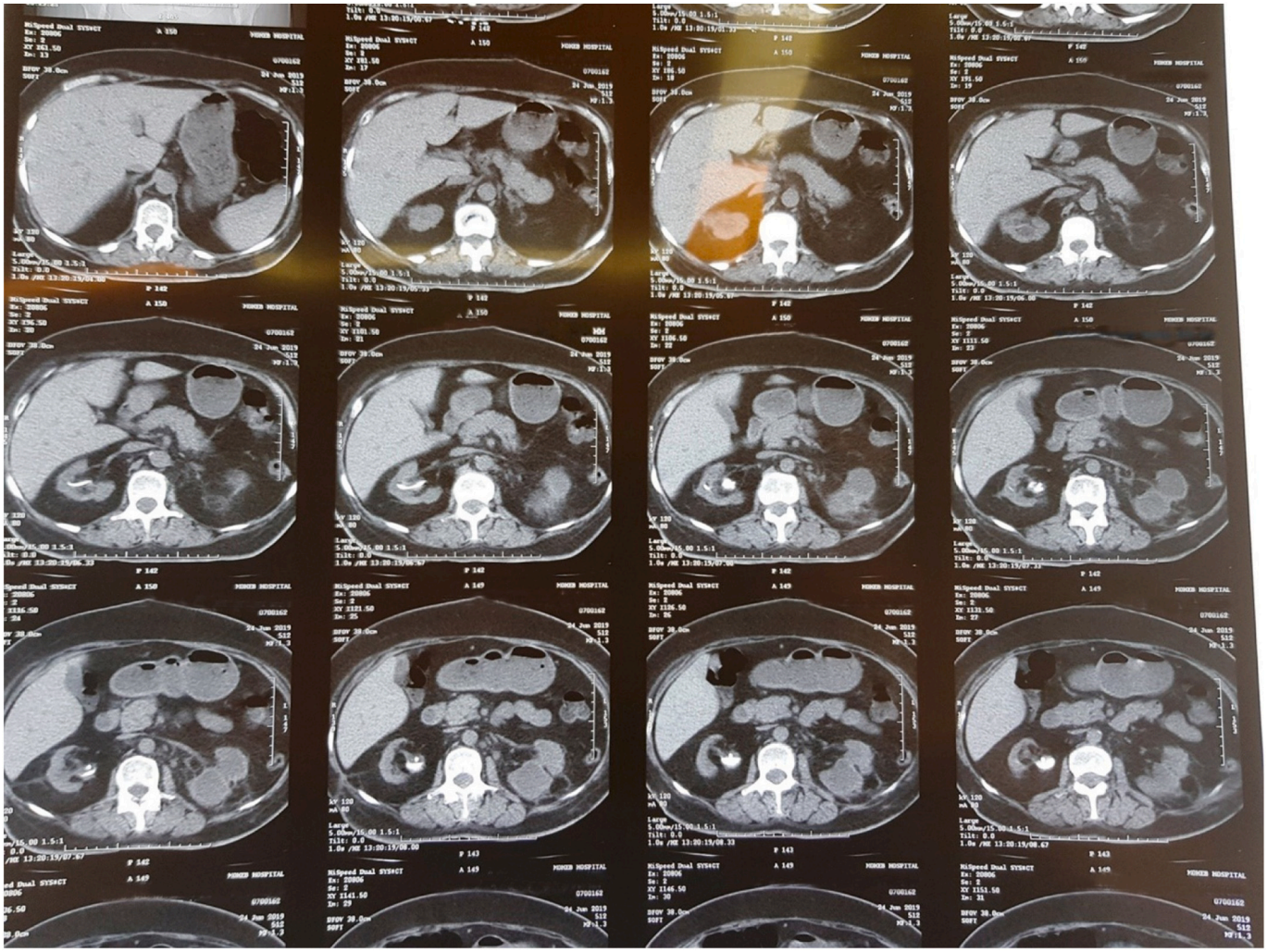

Fig. 1. The RIRS procedure in a 55-year-old monokidney woman.

removed the ureteral catheter 4 days after the surgery. During the first three days, the patient developed moderate to severe hematuria until day 3 resulting in the hemoglobin level decrease to 8.7 g/dL. Preoperative hemoglobin was 11.1 that reached 8.7 after 24 h from surgery due to hematuria. Although the patient's WR was unchanged before and after the surgery (1/1), a pack cell unit was prescribed by the nephrologist during dialysis, and the patient hemoglobin increased from 8.7 to 9.7. Patient creatinine decreased by 4.1 after surgery and patient sodium by 141 and potassium by 4.3. Hematuria was discontinued after 48 days and the patient was discharged on the third day after surgery. Four weeks' follow-up after surgery indicated the stable situation of the patient and no more complications.

4. Discussion

In this research, we are presenting the first and only report of successful RIRS in a case of CRF with a kidney stone $>$ 2 cm. Management of stones in chronic renal failure is very challenging. We should choose the best treatment strategy with minimizing renal injury. When a 'stone-free kidney' is achieved, steps should be taken to conserve renal function and address the issue of recurrence.

Most published studies for urolithiasis management in CRF patients were in a time when minimally invasive modalities in the management of urolithiasis were not fully developed [4]. By way of illustration, open stone surgery like pyelolithotomy, extended pyelolithotomy, atrophic nephrolithotomy, or ureter lithotomy, recovers renal function and delays or prevents progression to end-stage renal disease. However, based on American Urological Association (AUA) guideline open stone surgery is recommended just for patients with the complex stone burden and those with associated anatomic anomalies such as pelvic-ureteric junction obstruction or infundibular stenosis. Shockwave lithotripsy (SWL) in CRF patients can decrease fragmentation due to a deficient wet layer over the stone, but complete clearance of fragments is doubtful due to decreased urine output from the affected kidney, however, SWL is not suitable for large stone and kidney deficient patients. A meta-analysis by Donalson and his colleagues in 2015 indicated to the PNL and RIRS as the more considerable effective techniques than SWL for $>$10 mm stones [5,6]. Here in our study the RIRS was shown as the minimally invasive method of treatment of urolithiasis in a CRF monokidney patient. There is no need for anesthesia and open surgery procedures in RIRS.

Before our study, the main modality of management in patients with stones and CRF was percutaneous nephrolithotripsy (PNL). In a study of more than 4000 patients with urolithiasis underwent treatment and 84 (1.9%) had renal insufficiency defined as serum creatinine above 1.5 mg/dl; 87 rental units underwent PNL and required almost two stages per renal unit. A study in Pakistan by Hussain et al., indicated to the infection in 19 (6.8%) patients, ureteroscopy was directly performed, stones were fragmented, and DJ stents were passed without doing PCNL and hemodialysis. The initial mode of drainage of obstructed kidneys with CRF is complicated because it has advantages and disadvantages of PCNL.

Very recently a German prospective multicenter BUSTER project by Lebentrau and his colleagues has indicated to the hospital volume in ureterorenoscopy stone treatment that could increase the chance of a better outcome. In some intraoperative biopsies, interstitial papillary deposits were found in calcium oxalate stone formers and apatite crystal plugging the terminal collecting duct with obvious renal injury was revealed in brushite stone formers. Renal function concerning the type of stone can be considered. RIRS is safe and does not adversely affect renal function.

5. Conclusion

Taking everything into consideration RIRS can be the minimal invasive with the least injury to the kidney for urolithiasis (stone $\geq$ 2 cm) treatment in CRF patients.

Consent

The written informed consent was received to report the case anonymously.

Ethical approval

The care report is based on the SCARE guideline.

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CRediT authorship contribution statement

SMKA run the surgery and wrote the manuscript.

Declaration of competing interest

All authors claim that there is not any potential competing or conflict of interest.

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References

[1] C. Türk, A. Petřík, K. Sarica, C. Seitz, A. Skolarikos, M. Straub, et al., EAU guidelines on interventional treatment for urolithiasis, Eur. Urol. 69 (3) (2016) 475–482.
[2] V. Jha, G. Garcia-Garcia, K. Iseki, Z. Li, S. Naicker, B. Plattner, et al., Chronic kidney disease: global dimension and perspectives, Lancet 382 (9888) (2013) 260–272.
[3] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, et al., The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[4] R. Jain, R.S. Bali, J. Chander, S. Neogi, A. Gupta, Alteration in resistive index of renal vasculature following extracorporeal shock wave lithotripsy for renal stones, J. Adv. Med. Med. Res. (2016) 1–6.
[5] M.I. Gokce, Z. Tokatli, E. Suer, P. Hajiyev, A. Akinci, B. Esen, Comparison of shock wave lithotripsy (SWL) and retrograde intrarenal surgery (RIRS) for treatment of stone disease in horseshoe kidney patients, Int. Braz. J. Urol. 42 (1) (2016) 96–100.
[6] J.F. Donaldson, M. Lardas, D. Scrimgeour, F. Stewart, S. MacLennan, T.B. Lam, et al., Systematic review and meta-analysis of the clinical effectiveness of shock wave lithotripsy, retrograde intrarenal surgery, and percutaneous nephrolithotomy for lower-pole renal stones, Eur. Urol. 67 (4) (2015) 612–616.