Clinics in Surgery

Case Report
Published: 31 Jul, 2020

Successful Endoscopic Management for the Adult Patient with Non-Functioning Atrophic Kidney Caused by Obstructed Ureteral Stone: Two-Step Treatment Strategy

Takaaki Inoue[1,2], Fukashi Yamamichi[1], Masaichiro Fujita[1], Hideto Ueki[1] and Masato Fujisawa[2]*

[1]Department of Urology, Hara Genitourinary Hospital, Japan

[2]Department of Urology, Kobe University, Japan

Abstract

Background: Most patients with non-functioning atrophic kidney caused by obstructed ureteral stone often are performed simple nephrectomy to prevent infectious status. However, kidney function might still remain even if there is non-function kidney in pre-operative imaging study. We experienced a successful endoscopic management for non-functioning atrophic kidney caused by obstructed kidney-ureteral stone.

Case Report: We had an experience with multiple large kidney-impacted ureteral stones in non-functioning atrophic left kidney examined by pre-operative ^{99m}Tc-MAG3 renography. In first step, we determined to place the percutaneous nephrostomy in left kidney to find real remained kidney function. Urine through nephrostomy was produced around 750ml a day. In second step, we performed minimally invasive endoscopic combined with intrarenal surgery to remove all large stones under the Bart's modified Valdivia position. The procedures for kidney-impacted ureteral stones succeeded. Finally, serum eGFR had improved in comparison to pre-operative level.

Conclusion: We believe there is still remained kidney function even if being diagnosed non-functioning kidney in pre-operative ^{99m}Tc-MAG3 renography. Endourological procedures might be quite available to preserve the kidney function.

Keywords: Minimally invasive endoscopic combined with intrarenal surgery; Atrophic kidney; Obstructed ureteral stone

OPEN ACCESS

Correspondence:
Takaaki Inoue, Department of Urology and Stone Center, Hara Genitourinary Hospital, Hyogo, Tyuou-ku, Kitanagasa-tori 5-7-17, Kobe, Hyogo 650-0012, Japan, Tel: +81-078-371-1203; Fax: +81-078-371-1203; E-mail: inouetak@harahospital.jp

Received Date: *23 Jun 2020*
Accepted Date: *25 Jul 2020*
Published Date: *31 Jul 2020*

Citation:
Inoue T, Yamamichi F, Fujita M, Ueki H, Fujisawa M. Successful Endoscopic Management for the Adult Patient with Non-Functioning Atrophic Kidney Caused by Obstructed Ureteral Stone: Two-Step Treatment Strategy. Clin Surg. 2020; 5: 2893.

Abbreviations

Mini ECIRS: Minimally Invasive Endoscopic Combined with Intrarenal Surgery; ^{99m}Tc-DMSA: Tecnetium-99m Dimercaptosuccinic Acid; ^{99m}Tc-MAG3: Tecnetium-99m Benzoylmercaptoacetyltriglycine; sCre: Serum Creatinine; eGFR: Estimate Glomerular Filtration Rate; CVD: Cardiovascular Disease; CKD: Chronic Kidney Disease

Introduction

Most patients with non-functioning atrophic kidney caused by obstructed ureteral stone usually are performed simple nephrectomy to prevent infectious status. Generally, renal renography including Tecnetium-99m dimercaptosuccinic acid (^{99m}Tc-DMSA) orTecnetium-99m Benzoylmercaptoacetyltriglycine (^{99m}Tc-MAG3) was underwent to evaluate the split kidney function to determine the treatment plan in atrophic kidney cases. Simple nephrectomy is mostly considered if having a split renal function of less than 10% in diseased side [1]. However, kidney function might still remain even if there is non-function kidney in pre-operative imaging study. Therefore, we assessed kidney function by placing nephrostomy tube and the necessity of nephrectomy in a patient who had been already evaluated to have non-functioning atrophic kidney in ^{99m}Tc-MAG3 renography pre-operatively.

Case Presentation

We experienced a patient with multiple large kidney-impacted ureteral stone in non-functioning atrophic left kidney. The patient is 56 years old man (height 177 cm, weight 76.4 kg, body mass index 24.4 kg/m^2) who had a medical history of treatment for right kidney stone 8 months ago whose composition analysis was revealed calcium oxalate, multiple large kidney stones with severe

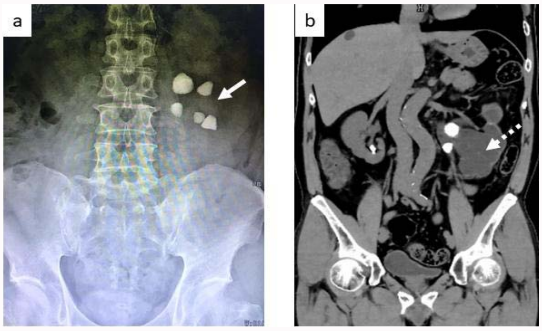

Figure 1: Preoperative image of KUB and CT. a) Arrow indicates large kidney stones including ureteral stone. b) Dot arrow indicates left atrophic kidney with hydronephrosis.

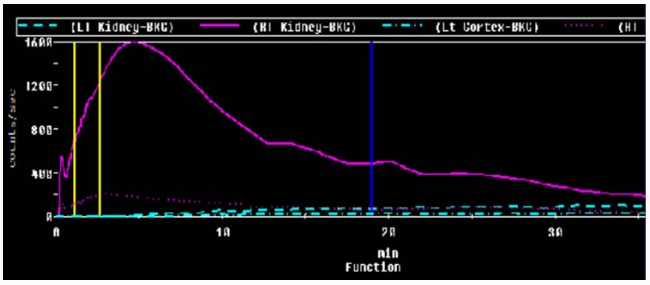

Figure 2: Image of ^{99m}Tc-MAG3 renography. Image shows no uptake in left kidney which means non-function and normal change in right kidney.

hydronephrosis in left kidney and mild hypertension. In this time, he had left dull flank pain and visited to our hospital to access the condition in left kidney. Imaging study including KUB, US, and CT was revealed that two large ureteral stones measuring 2.3 cm × 2.2 cm and 1.9 cm × 1.6 cm, (1502 and 1454 Hounsfield units; HU, respectively), three large kidney stones measuring 2 cm × 1.5 cm, 1.8 cm × 1.7 cm, and 1.4 cm × 1.2 cm in left kidney (1446, 1460, and 1332 HU, respectively) with severe hydronephrosis involving atrophic parenchyma (Figure 1). His serum Creatinine (sCre) and Estimate Glomerular Filtration Rate (eGFR) value in pre-operative examination were 1.33 mg/dl and 44.7 ml/min/l. And then, we underwent ^{99m}Tc-MAG3 renography to investigate the split kidney function pre-operatively. As a result, ^{99m}Tc-MAG3 renography revealed no uptake in left kidney which means non-functioning kidney (Figure 2). On the other hand, right kidney indicated 100% uptake in ^{99m}Tc-MAG3 renography. Therefore, we explained some clinical events such as infections like pyelonephritis to be possible to occur in future and suggested a few treatment options including simple nephrectomy, endourological stone surgery, and observation to the patient and family. Finally, he decided to treat by endourological stone management to expect the kidney preservation. In first step, we planned to carry out the placement of nephrostomy (10Fr) in middle pole of left kidney to make sure of remained kidney function in outpatient clinic. Total urine volume through the nephrostomy tube was 700 ml to 800 ml per day. Therefore, we judged left kidney function leaves and still produces the urine even if no uptake in ^{99m}Tc-MAG3 renography pre-operatively. In second step, we planned to perform the minimally invasive Endoscopic Combined Intrarenal Surgery (mini-ECIRS) using miniature nephroscope (16 Fr) after one month. He was oriented in Bart's modified Valdivia position under general anesthesia which is characterized by lateral position elevated at the angle of 45 degree in upper body and lithotomy position in

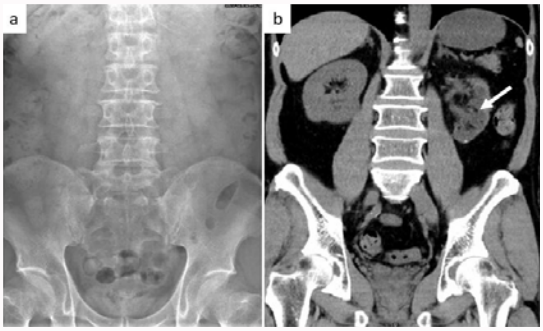

Figure 3: Postoperative image of KUB and CT. a) KUB shows stone free status. b) Arrow indicates to disappear hydronephrosis and remove all stone fragments in left kidney.

lower body. And then, he was intravenously administrated antibiotics (0.5 g Meropenem) 30 min prior to the start of operation because of positive *Pseudomonas aeruginosa* in preoperative his urine. At first, we inserted the semi-rigid ureteroscope to left ureter over the guide wire with retrograde access and observed intra-ureteral lumen. One of the stones was impacted with plenty polyp and severe edema in Pelvic-Ureteral Junction (PUJ). Contrast injection and guide wire couldn't retrogradely pass through the stone bed. Therefore, we dilated the percutaneous tract from 10 Fr to 16 Fr by using nephrostomy tube which was already placed. And then, we inserted 12 Fr miniature nephroscope through the percutaneous tract and accessed to the stone bed antegradely. However, it is not so easy to reach to the impacted stone place because the space of left renal pelvis is much wide. We finally could reach to the impacted stone place and rolled around the guidewire on the stone place to trace when nephroscope goes back and forth. After this, we intermittently disintegrated the impacted stone using holmium laser fiber of 365 micro fiber (Pulse ^{TM}120H ; Lumenis, Israel) with long pulse, 0.6-1.0 J × 6-10 Hz setting. We delicately manipulated the nephroscope antegradely and the ureteroscope retrogradely not to injury ureteral mucosa in stone bed. And then, we definitely confirmed there are not any residual stones in impacted stone bed. After removal of ureteral impacted stone, we percutaneously disintegrated and removed the other large stones in the kidney. Finally, we placed 6 Fr ureteral stent and 14 Fr nephrostomy tube. The operative time was 170 min; stone components were 95% calcium oxalate. He didn't have any complications such as fever, transfusion and injury of viscera. And then, he was removed nephrostomy tube on post-operatively day 1 and discharged on post-operatively day 3 with ureteral stenting. At 2 weeks later, ureteral stent was removed in outpatient clinic due to no residual fragments on US and KUB. At additional 2 weeks later, we examined the degree of hydronephrosis in left kidney by CT. The image-finding revealed no hydronephrosis and no ureteral stricture. Additionally, total kidney function in his blood test had improved to 1.16 mg/dl in sCre and 52.0 ml/min/l in eGFR. And then, his urine had been quite clear with no pyuria and no bacteria.

Discussion

In the present case, we succeeded the minimally invasive endoscopic combined with intrarenal surgery for multiple large kidney stones and impacted ureteral stone in non-functioning atrophic kidney diagnosed by pre-operative ^{99m}Tc-MAG3 renography. We planned two-step strategy to initially assess the remained kidney function and secondary undergo the removal of all large stones including impacted ureteral stone by endourological surgery.

Generally, standard treatment for non-functioning atrophic kidney of less than 10% in split renal function is open or laparoscopic simple nephrectomy [1,2]. However, some current articles have showed a high incidence of Cardiovascular Disease (CVD) among Chronic Kidney Disease (CKD) patients. The mortality rate of end-stage renal disease was above 20% per year in spite of the use of dialysis, and more than half death was related to CVD. Lower eGFR has been a strongly independent risk factor for CVD [3]. Thereby, preserving the kidney function is one of most important concerns for urologists. Current trend in urological field has been a nephron sparing surgery ever if larger malignant tumor presented in the kidney as well as stone disease [4]. However, considering the kidney preservation in atrophic kidney is not sure to be correct way yet. Demirtas reported that of 18 patients who had a split renal function of less than 10% in DMSA scan, 44.4% patients after placing nephrostomy had recovered a kidney functioning above 10% of its capacity on DMSA scan. According to current trend, we tried to preserve the non-functioning atrophic kidney cause by impacted ureteral stone which was evaluated no uptake in pre-operative ^{99m}Tc-MAG3 renography in this time. Consequently, eGFR in total kidney function after stone removal and disappearance of hydronephrosis in endourological treatment had improved than before operation. We planned two-step model to undergo this treatment. First step is placing nephrostomy and second step is performing stone removal. In first step, we confirmed the remaining kidney function by measuring urine volume produced through the nephrostomy tube. We guess that the discharge of water liquid through nephrostomy is also quite significant even if not being useful to keep mineral balance and excrete the waste products in diseased kidney. In our present case, the left atrophic kidney produced 700 ml to 800 ml urine a day. In second step, we performed mini-ECIRS to remove all stones. Most careful issue in this operation is post-operative ureteral stricture. We should gently manipulate the nephroscope and use laser setting to avoid this complication. Anyway, we experienced the novel treatment strategy for atrophic kidney to preserve kidney function as much as possible.

Conclusion

We succeeded the minimally invasive endoscopic combined with intrarenal surgery for multiple large kidney stones in non-functioning atrophic kidney examined by pre-operative ^{99m}Tc-MAG3 renography. We believe there might be still remained kidney function even if being diagnosed non-functioning kidney in pre-operative functioning study. Endourological procedures are one of beneficial management to preserve the kidney function.

References

1. Demirtas A, Guleser AS, Sonmez G, Demirtas T, Tombul ST. Two-step treatment model for the adult patients with an obstructed kidney functioning below 10% of its capacity: A pilot study. Clin Exp Nephrol. 2020;24:185-9.

2. Gulpinar MT, Akcay M, Sancak EB, Akbas A, Tepeler A, Resorlu B, et al. Comparison of transperitoneal laparoscopic nephrectomy outcomes in atrophic and hydronephrotic kidneys. Turk J Urol. 2015;41:181-4.

3. Yuan J, Zou XR, Han SP, Cheng H, Wang L, Wang JW, et al. Prevalence and risk factors for cardiovascular disease among chronic kidney disease patients: Results from the Chinese cohort study of chronic kidney disease (C-STRIDE). BMC Nephol. 2017;18:23.

4. Janssen MWW, Linxweiler J, Terwey S, Rugge S, Ohlmaa C-H, Becker F, et al. Survival outcomes in patients with large (>7 cm) clear cell renal cell carcinomas treated with nephron-sparing surgery versus radical nephrectomy: Results of a multicenter cohort with long-term follow-up. PLoS One. 2018;13:e0196427.