

A Case Report of Anatomic Nephrolithotomy for Treatment of Medullary Sponge Kidney with Complex Stones

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ABSTRACT

Medullary Sponge Kidney (MSK) is a kind of congenital renal medullary cystic disease. The etiology is unknown, often associated with stones, infections, etc. There are various treatment methods, but the current treatment methods, the overall effect is not very satisfactory. and not an atrophic nephrolithotomy has been used. Specific reports of surgical treatment, here, we report a case of an atrophic nephrolithotomy + renal pelvic calyx fusion angioplasty for the treatment of unilateral sponge kidney with multiple complex kidney stones. The operation cost is low, there is no residual stone after the operation, and no serious complications, postoperative follow-up, renal function is slightly decreased, but it is not life-threatening. Therefore, we believe that an atrophic nephrolithotomy + renal pelvic calyx fusion plasty can be used as the first choice for MSK complicated with multiple complex calculi methods.

Abbreviations: MSK: Medullary Sponge Kidney; ANL: An Atrophic Nephrolithotomy; CT: Computed Tomography; CTU: Computed Tomography Urography; Scr: Serum Creatinine; KUB: Plain Film of Kidney-Ureter-Bladder; IVU: Intravenous Urography; GFR: Glomerular Filtration Rate; ESWL: Extracorporeal Shock Wave Lithotripsy; URL: Ureteroscopic lithotripsy; FURL: Flexible Ureteroscopy Lithotripsy; PCNL: Percutaneous Nephrolithotomy

Introduction

Medullary Sponge Kidney (MSK) is a kind of congenital renal medullary cystic disease. The etiology is unknown, often complicated by stones, infection, etc. However, in current therapies, the overall effect was less than ideal, and no specific reports using an Atrophic Nephrolithotomy (ANL) treatment. The author used ANL + renal pelvic calyx fusion plasty in the treatment of 1 case of unilateral MSK with multiple complex kidney stones. The results are satisfactory, the report is as follows.

Case Report

A 69-year-old woman was admitted to the hospital, because of "right side waist pain for more than 1 year, worsened for 1 week". physical examination showed that he was obese, had no masses in the waist and abdomen, had positive percussion pain in the right kidney area, and had negative Murphy's sign. KUB and IVU revealed multiple stones in the right kidney (Figures 1A & 1B). Computed Tomography (CT) and Computed Tomography Urography (CTU)

reported (Figures 1D & 1E): multiple stones and calcifications in the right kidney, atrophy of the left kidney, and mild hydrups in the left kidney. Serum creatinine (Scr) $160\mu\text{mol/L}$, the left kidney GFR was 20.03ml/min , and the right kidney GFR was 25.33ml/min . According to KUB, there are multiple high-density shadows in the right kidney area, such as grape clusters. IVU shows that the right kidney is developed like grape clusters and overlaps with the high-density shadows of the KUB film, And the left kidney is well developed. We diagnosed:

1. Right side MSK with multiple complex stones
2. Urinary tract infection.

After weighing the pros and cons, we believed that ANL for stone removal is more reasonable. After active preoperative preparation, under general anesthesia, ANL + renal pelvic calyx fusion plasty was performed. During the operation, the right kidney was exposed, showing normal size, full appearance, and felt like a spongy and grit on palpation. Block the right renal artery before incision and stone removal, fast infusion of 20% mannitol 250ml in the anterior vein of the right renal artery, immediately cool the

temperature with ice saltwater after blocking the right renal artery and block the renal artery from the back of the right kidney edge. The kidney parenchyma is cut longitudinally to reach the renal pelvis, and dozens of stones in the renal pelvis are removed. From the renal parenchyma incision, many cystic dilated lesions were cut radially. It was found that the lesions were filled with stones, more than a hundred stones were taken out. we palpate the right kidney by hand. After no obvious stones are found, use 4/0 absorbable sutures to suture the suspicious bleeding site in the kidney incision to stop bleeding, open the radially incised cystic lesions, and fuse the renal pelvis and calyces, an F7 double J tube was inserted for internal drainage, and then a nephrostomy was performed. The renal parenchymal incision was sutured with the 2/0 absorbable suture. During the operation, the renal artery blood supply was blocked for 54 minutes, and the operation time was 180 minutes. During the operation, there was no blood transfusion. KUB was examined one week after surgery (Figure 1C). The stones were completely removed. One month after the operation, the double J tube was removed, the GFR was 20.14 ml/min for the left kidney, 18.82 ml/min for the right kidney, and SCR was $89\mu\text{mol/L}$.

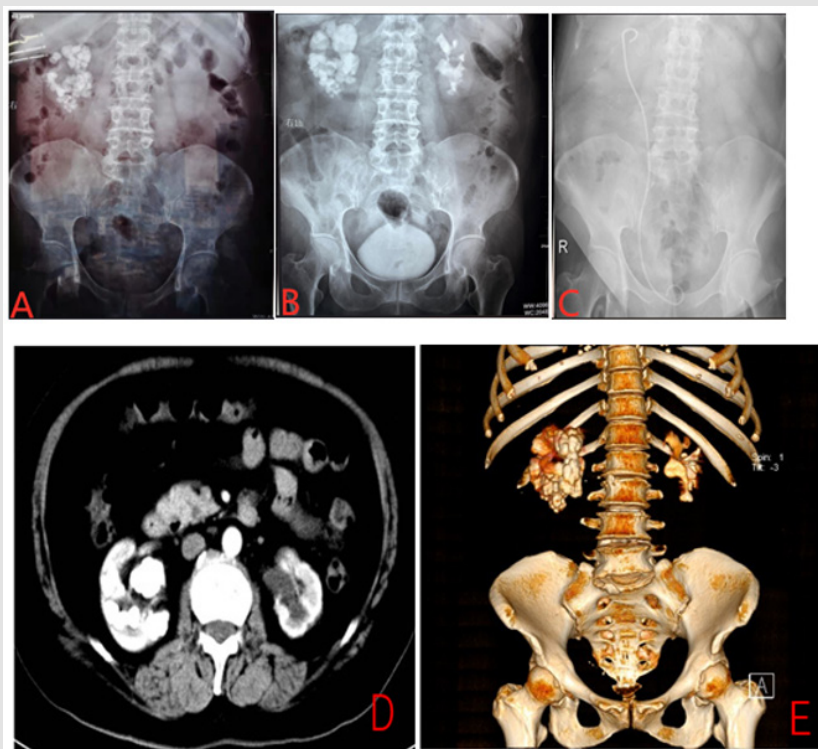


Figure 1:

- A, B: Multiple stones and calcification foci of the right kidney, multiple stones of the left kidney, and hydronephrosis of the left kidney.
- C: Two weeks after surgery, there was no residual stone, and the double J tubes were in a good position.
- D, E: The filling cystic cavity of the right kidney was the grape cluster, the renal tubules were flower-like, multiple stones and calcification foci of the right kidney, hydronephrosis of the left kidney.

Discussion

MSK is characterized by the expansion of the collecting ducts of one or several papillae of the kidney, forming small sacs and cyst-like cavities. The connection between the expanded collecting duct and the proximal normal collecting duct is smooth, and the diameter of the connection with the distal renal calyx is normal or relatively narrow [1]. The nipple ducts and collecting ducts of the renal pyramid are expanded in a fusiform or small sac shape. The expanded cyst cavity can be filled with calcium salts to form small sand-grained stones. The kidney looks like a sponge [2]. The treatment of sponge kidney stones is mainly implemented for its secondary diseases, such as stone obstruction and repeated infections. But to prevent its occurrence, the current treatment has been extended to eliminate the pathological basis of stones and infections, that is, to remove free stones in the kidney and submucosal stones of the renal papilla that are about to fall into the collecting system. to reduce the occurrence of urinary tract obstruction after the stones are free [3]. After the renal papillary obstruction is relieved and the dilated collecting duct has smooth urine excretion, the incidence of infection will also decrease. There are different treatment methods and effects for MSK patients with multiple kidney stones. Current minimally invasive techniques for treating urinary calculi include ESWL, URL, fURL. And PCNL and other techniques. Due to the particularity of MSK anatomy, the effects of the above various treatment methods are not ideal.

The overall performance is that the postoperative residual stone rate is high, the risk of infection still exists, multiple treatments are required, and the cost is expensive. In the end, it cannot effectively avoid renal damage or even renal failure [4-6]. Through our literature review, there is no specific report on the treatment of the MSK with multiple complex stones by ANL. ANL is a traditional procedure for treating kidney stones, especially for staghorn stones and complex kidney stones. ANL is based on the peripheral branch of the blood vessel at the junction of the anterior and posterior branches of the renal artery called the relatively avascular area, that is, the anterior and posterior branches at the renal hilum or the renal sinus branches into the renal parenchyma. in this way, the renal parenchyma is cut with a sharp knife, with less renal vascular damage, which can prevent large-scale renal infarction, reduce postoperative renal damage and atrophy, and protect renal function [7,8]. Considering the patient's physical condition and economic situation, as well as the anatomical characteristics of MSK, if the commonly used minimally invasive technique is selected, the stone removal effect cannot achieve satisfactory results, and the cost is high. However, ANL can not only remove all stones at one time but also has a relatively low cost. During the operation, the renal artery blood supply was blocked for 54 minutes.

By using mannitol intravenous infusion and ice saltwater soaking the kidney before blocking the renal artery, the osmotic pressure in the glomerular tubules was increased, to prevent acute tubular necrosis, and renal function was protected, Besides, hypertonic glucose and ginkgo- dipyridamole were given intravenous drip support for renal ischemia-reperfusion for 7 days after the operation, which effectively prevented the renal ischemia-reperfusion injury. Besides, after removing the stones, we also performed the fusion of the renal pelvis and calyces, which may anatomically achieve the purpose of preventing stone recurrence. The postoperative follow-up time of this patient was 3 months, which was relatively short. Close follow-up is needed to understand the renal function and the recurrence of stones. According to the analysis of the results of GFR before and after the operation, Renal ischemia-reperfusion injury cannot be avoided, but it is not life-threatening, and the SCR has decreased, which proves that the anti-renal ischemia-reperfusion therapy is effective However, this surgical method still has a certain degree of renal damage and still needs to be taken seriously. In addition, although there were no serious complications during and after the operation, in this case, it is a high-risk operation that requires strict training and needs to be carried out in a large hospital with conditions. Based on the above analysis, combined with the good treatment results achieved in this patient, we believe that ANL + renal pelvic calyx fusion plasty can be used as the first choice for treatment of MSK complicated with multiple complex stones.

Acknowledgments

Not applicable.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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