Original Article

Different managements of horseshoe kidney stones, any difference in the outcome?

Abdulhakim Al Otay[1], Osama Sarhan[1,2], Hossam S. El-Tholoth[1,2], Ahmed Alhelaly[1], Hamad Al Akrash[1], Mustafa Al Ghanbar[1], Khaled Al Bedaiwi[1], Ziad Nakshabandi[1], Ali Obeid[1]

[1]Division of Pediatric Urology, Department of Urology, Prince Sultan Military Medical City, Riyadh, Saudi Arabia, [2]Urology and Nephrology Center, Faculty of Medicine, Mansoura University, Mansoura, Egypt

Abstract

Purpose: The aim is to assess the outcomes of different approaches for the management of renal stones associated with horseshoe kidneys (HSKs) in our institution over a 12-year period.

Methods: A retrospective review of 144 patients with HSKs who presented from 2000 to 2012 was performed. Twenty-eight patients (19.4%) were found to have renal stones. Demographic data were collected; the method of treatment and the outcomes of stone management were reviewed. We excluded patients with non-functioning moieties and associated genitourinary anomalies, and those with incomplete data.

Results: We included 25 patients, of which 16 males (64%) and 9 females (36%), with a mean age of 37 years. Mean serum creatinine level was 66 mmol/L. Eleven patients with a stone size <8 mm were treated expectantly with medical treatment, with only one patient requiring endoscopic intervention. Six patients (24%) with a stone size between 1 cm and ≤2 cm were treated with extracorporeal shock wave lithotripsy (ESWL) with the placement of double J stents, and seven patients (28%) with a stone size of >2 cm were treated with percutaneous nephrolithotomy. One patient with a 10 mm stone was treated using flexible ureteroscopy. No significant perioperative complications were encountered.

Conclusions: Indications, methods of treatment, and outcomes of management of stones associated with HSKs were comparable to those for stones associated with normal kidneys. Tailored approach based on stone size is highly recommended. ESWL accompanied with ureteric stenting is a promising strategy for the management of stones associated with HSKs in selected patients requiring intervention.

Keywords: Horseshoe kidney, outcome, percutaneous nephrolithotomy, shock wave lithotripsy, stones

Address for correspondence: Dr. Abdulhakim Al. Alotay, Department of Urology, Division of Pediatric Urology, Prince Sultan Military Medical City, Riyadh 11159, Saudi Arabia.
E-mail: alotay99@hotmail.com
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INTRODUCTION

Horseshoe kidney (HSK) is the most common renal fusion anomaly, affecting about 0.25% of the newborn.[1] In most cases, fusion occurs in the lower pole of the kidney, leading to failure of ascent, and malrotation of the kidneys. Ureter insertion is usually superior and lateral, leading to impaired drainage of the collecting system, as well as urinary stasis, and concomitant stone formation.[2] Other investigators have attributed metabolic abnormality as a cause.[3,4]

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Urolithiasis is the most common complication of HSK, affecting 20%–60% of cases and the successful management of these stones is considered by many to be a conundrum.[5]

However, various methods are indicated for the management of stones associated with HSK, including percutaneous nephrolithotomy (PCNL) and extracorporeal shock wave lithotripsy (ESWL), which are the most commonly used methods.[1,5-8] More recently, flexible ureteroscopy (URS), laparoscopic pyelolithotomy, and robotic pyelolithotomy have also been shown to be effective.[9,10]

The majority of the published papers that concern the treatment of HSK stones emphasize on one modality of management, discussing its safety and efficacy. Therefore, we present our single tertiary center experience of >10 years involving different management modalities for HSK stones, as a means to demonstrate and emphasize the outcomes of treatment with these modalities.

METHODS

A retrospective review of 144 patients with HSK over a 12-year period (from January 2000 to January 2012) was performed through an imaging dictation keyword search. Twenty-eight patients (19.4%) were found to have renal stones. Demographic data for these patients were collected. In addition, the laterality, the method of treatment, patient serum creatinine levels, and the outcomes of stone management were also reviewed. We excluded patients with nonfunctioning moieties, those with associated genitourinary anomalies, and those with incomplete data.

All selected patients were reviewed for clinical presentation, previous history of stone management, and preoperative radiology stone size. The maximum dimension of the stone was selected as the guide for the method of intervention. In the case of multiple stones, the sum of the maximum dimensions of the largest two stones was measured. The mode of management was selected according to the stone size; largest diameter; stone location; the anatomy of the pelvicalyceal system (delineated on ultrasound, intravenous pyelography, and computed tomography [CT] scan); and the presence of symptoms.

Operative details, postoperative course, complications, stone-free rate, and recurrence during follow-up were noted. A postoperative CT scan was completed in the cases of all patients to assess stone-free rate status. Stone-free rate was defined as the appearance of no residual stones left behind on CT scan. All data were analyzed using the SPSS 14 program (IBM Co., Armonk, NY, USA).

RESULTS

Twenty-five patients with HSK (29 renal units), 16 males (64%) and 9 females (36%), with a mean age of 37 years (2–78 years), were included. Mean serum creatinine was 66 mmol/L. Fourteen patients (56%) had stones in the left compartment, whereas seven patients (28%) had it in the right one, and four patients (16%) had bilateral renal stones. Six patients (24%) had recurrent stones at presentation; of them, five had a previous history of ESWL, and one had a history of pyelolithotomy.

Stone location was variable:four presented in the upper calyceal, five in the middle calyceal, seven in the lower calyceal, and three at the ureteropelvic junction. Four cases presented as having a multicalyceal stone location, one was classified as staghorn stone, and one as a ureteric stone.

In our series, the mean follow-up period was 31.6 ± 24.1 months (12–76 months). Eleven patients (44%) with stone size <8 mm in diameter were treated expectantly with hydration and medical treatment. Only one of these patients developed severe renal colic and obstructed kidney; this individual underwent left semi-rigid URS without preoperative complications. Six patients (24%) with a stone size between 1 cm and <2 cm were treated successfully with ESWL and the placement of double J (DJ) stents. The mean number of sessions was 1.29.

Seven patients (28%) with a stone size of >2 cm were treated successfully with PCNL; of them, four were stone-free after one session of PCNL. On the other hand, three cases needed additional auxiliary procedures to be stone-free; one case needed a second instance of PCNL, one needed flexible URS, and another patient with residual stone post-PCNL needed one session of ESWL. DJ stent implantation was utilized in five of these cases.

One patient (4%) with a 10 mm stone at the ureteropelvic junction was treated by flexible URS.

DISCUSSION

HSK is the most common renal fusion anomaly, and is characterized by male predominance. In our series, male patients represented 64% of the total number of patients. Renal stones are one of the complications of HSK, and the successful management of these stones can be challenging. We found that indications, methods of treatment and the outcomes of management of stones associated with HSK

are comparable to those completed in patients with normal kidney morphology.

Patients with a stone size of >20 mm in the largest diameter were primarily offered PCNL while patients with a stone size below 20 mm were offered ESWL as a primary option. However, all patients who underwent ESWL were managed by the placement of a DJ stent before ESWL. All patients with small nonobstructing stones with a size of <8 mm were treated expectantly with hydration and medical treatment, including alkalization in radiolucent, uric acid, and cystine stones.

We reported expectant management as an option for handling small-sized asymptomatic stone in 44% of cases, with only one patient (9%) requiring active intervention by URS for an obstructed kidney during follow-up. To the best of our knowledge, this mode of treatment of HSK stones is the first to be reported as a valid option of management of HSK stones, much like in normal renal anatomy stones.

The efficacy of ESWL the presentation of stones in patients with HSK has been studied since 1989, and variable success rates have been reported.[6-8,11-13] Stone-free rates up to 100% have been reported in some of the studies, and ESWL has safely been performed for stones smaller than 20 mm, and in patients with a lighter stone burden whose urinary drainage was not blocked.[7] Differences in success rates depend on the definition of success, the number of SWL sessions and the duration of follow-up intervals.[6-8,11-13]

Sheir *et al*. reported a 71.4% stone-free rate in their series of 49 patients.[8] while Lampel *et al*., in a series of 50 patients, determined a 76% stone-free rate.[13] In our series, the stone-free rate was (100%) after ESWL accompanied by the preoperative placement of DJ stent in all patients. Although routine DJ stent fixation before ESWL was not recommended in many series, in our cases, it showed a high success rate, which may be due to an improvement of drainage from the HSK. We opted for this option to avoid known post-ESWL complications, such as pain and obstruction.

PCNL is also effective in managing urolithiasis in HSK.[1,14-20] The orientation of the collecting system in HSK offers surprisingly good access to PCNL.[19] Meanwhile, due to the concern regarding the abnormal relationship between the HSK and abdominal viscera, particularly the bowel, others have recommended a CT scan be performed in every case before surgery.[18] We also advise doing CT scan for all cases of HSK harboring stones before PCNL. Several authors considered PCNL as the treatment of choice for all patients who have a very significant high stone bulk with a reported stone-free rate of 75%–87.5%.[1,15-19] Etemadian *et al*. reviewed previous studies related to the use of PCNL in HSK stones and found an average stone-free rate between 66.7% and 87.5%, with a nearly 20% complication rate.[20] In our series, we support the use of PCNL in HSK patients with bulky stones of >20 mm, despite the fact that three patients (42%) from our PCNL group needed auxiliary procedures to be stone-free without any significant complications. The relatively low PCNL success rate in our patients may be attributed to a lack of available flexible instruments during that period.

The use of flexible URS in HSK has been reported in a few recent studies, with proven efficacy.[21-24] Some authors have shown that retrograde stone treatment using URS and laser lithotripsy in cases of HSK stones can be performed with a high success rate and low complication rate.[24] Nevertheless, this procedure should be done in a high volume stone center with an experienced endourological surgical team. In this study, we showed flexible URS to be an effective treatment option in the management of primary and residual stones post-PCNL for HSK, allowing for the fragmentation and removal of stones simultaneously without significant complications.

The limitations of our study include its retrospective design involving a fairly small number of patients with highly selective inclusion criteria.

Finally, the management of HSK stones is possible with high success and low complication rates. It depends mainly on the stone size, and the approach to the management of these stones varies according to the surgeon's preference. We agree with previous investigators who reported that stones in HSK can be cleared successfully in almost all patients, providing that all necessary techniques are available to the operating surgeon.[25,26]

CONCLUSIONS

Indications, methods of treatment, and outcomes of management of stones associated with HSKs were comparable to those for stones associated with normal kidneys. The management needs to be individually tailored according to stone size and burden, with the possibility of conservative management. In our study, if an intervention was required, ESWL showed a good stone-free rate when accompanied by ureteric stent placement. PCNL and/or URS are both highly effective in achieving a high stone-free rate with minimal morbidities.

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Conflicts of interest
There are no conflicts of interest.

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