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CASE REPORT

Giant renal calculus in a horseshoe kidney presenting as an abdominal lump

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Abstract We report a case of giant renal calculus of 14 × 10.5 × 9 cm in size and weighing 790 g, in a horseshoe kidney, along with two large calculi on the opposite side. Patient presented with unusual complaint of an abdominal lump only. Physical examination revealed a stony hard mass on the left side of the abdomen, extending from the subcostal region to just above the iliac crest. A giant renal calculus on the left and two large calculi on the right side of a horseshoe kidney were diagnosed on computed tomography (CT) scan. Percutaneous nephrolithotomy, followed after 5 days by open pyelolithotomy was done for the stones on the right and left side, respectively. Analysis revealed a calcium phosphate stone. This case is worth reporting as it was not only the 8th heaviest renal stone reported in the English literature, but also the first giant stone to be reported in a horseshoe kidney.

Keywords Giant renal calculus · Horseshoe kidney

Introduction

Giant renal calculus (GRC) has been infrequently described. Only 8 cases are on record in the English literature. All of the described cases so far are those of giant calculi in kidneys without any structural abnormality [1, 2]. No case of GRC in a horseshoe kidney (HSK) has been described till now. Giant renal calculus may present with any of the symptoms of urinary stone disease. Because of large size, it usually compromises the renal function of the affected unit. However, rarely it may progress slowly to attain enormous size, without causing any symptoms and loss of renal function [3]. It may also predispose to the development of urothelial neoplasms [4, 5]. Traditionally, GRC have been managed by nephrectomy whenever associated with non-functioning kidney or urothelial neoplasms. However, in case the function of the affected kidney is good, or the GRC happens to be in a solitary functioning kidney, pyelolithotomy has been usually preferred [1, 2, 6]. For calculi in abnormal kidneys like HSK, although, percutaneous nephrolithotomy (PCNL) has been shown to be safe and effective treatment modality even for large stones, its use seems to be limited in cases of GRC (in abnormal as well as normal kidney) [1, 2, 6]. This mainly is due to multiple PCNL's needed to attain full stone clearance, with resulting increased morbidity and obviously the total cost of the treatment [6]. Thus, in selected patients as with GRC in HSK, open surgical stone removal is the best option. Herein, a case of GRC of exceptional size, with two large calculi on opposite side in a patient with HSK is described because of its extreme rarity, and management of this situation is discussed and references to the important relevant literature are made.

Case summary

A 32-year-old male presented with a lump in the left side of the abdomen, and the left flank. It had been there for last

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5 months. He did not complain of pain in the abdomen, hematuria or any other symptoms. On examination, he had a palpable hard right kidney. Complete blood counts, blood urea, serum creatinine, liver function tests, serum parathyroid hormone, and calcium levels were all within normal limits. Routine urine analysis showed 12–15 erythrocytes and 10–15 leukocytes per high power field. Urine culture did not show any growth. Plain radiograph of KUB region showed two large right renal calculi, and a left GRC. Computed tomography (CT) scan with urography revealed that the patient had a HSK that was filled with two large stones ($7 \times 6 \times 6$, $6 \times 6 \times 5$ cm) on the right side, and a GRC ($14 \times 11 \times 9$ cm) on left side (Fig. 1). Both the sides were functioning well. Pelvicalyceal system was moderately dilated on the right side and undilated on the left side (Fig. 2). Treatment was planned in two steps; PCNL for right side stones, followed after few days by open pyelolithotomy for the left giant calculus. Right PCNL was performed in prone position, using posterior middle calyceal puncture. After the procedure, we kept a double-J stent and left nephrostomy tube in situ (Fig. 3). Nephrostomy tube was removed on third post-op day after a short period of clamping. Left pyelolithotomy (Fig. 4) was performed on fifth post-op day. A double-J stent was placed and a closed suction drain was left in the operative area. There was no complication during and after the procedure. More details of the procedures have been tabulated in Table 1. The GRC measuring $14 \times 10.5 \times 9$ cm (removed from left side only) weighed 790 g and had almost the complete imprint of the pelvicalyceal system (Fig. 4). Perurethral catheter and the drain were removed subsequently. He was discharged on sixth day after the second procedure. Chemical analysis of the stone revealed a calcium phosphate stone. Follow-up urography at 3 months, showed complete stone clearance and moderately dilated right renal pelvis (Fig. 5). During follow-up, when the patient was on usual diet and physical activity, we considered to perform metabolic evaluation consisting of different serum and urine tests. Serum uric acid, calcium, sodium and phosphate levels were found to be within normal range. Urinary pH and levels of uric acid, calcium, sodium, phosphate and potassium were also within normal range.

Discussion

Giant renal calculus (GRC) i.e. kidney stones weighing more than 500 g is rarely seen in today's urological practice. This is emphasised by the fact that only less than 10 cases of GRC have been documented in the English literature [1, 2]. The largest renal calculus reported so far weighed 1,350 g [2]. Although in the English literature, such calculi have been reported in one kidney, and very rarely in both the kidneys, but a GRC in a HSK has never been reported. Horseshoe kidney is the most common fusion abnormality of the kidney that occurs in 1 per 400

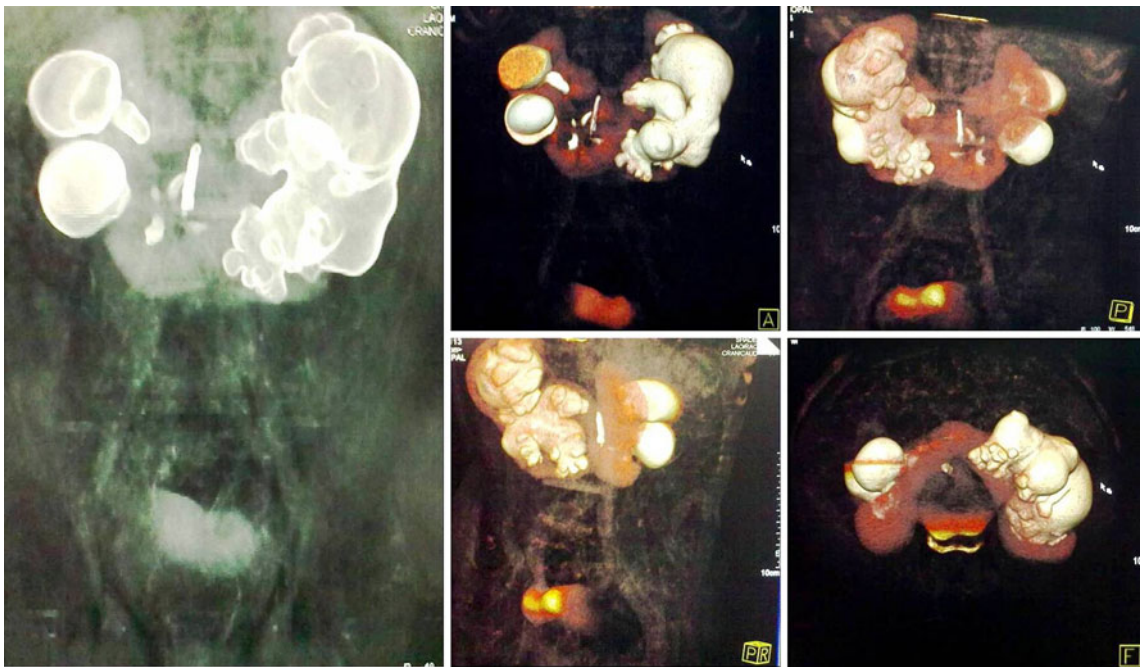

Fig. 1 CT scan with urography of a 32-year-old man who presented with abdominal lump, showing a HSK with two large stones on the *right*, and a giant renal stone on the *left side*. Constructed 3-D images (*right hand side* of the figure) using raw data from the CT scan with urography of the same patient

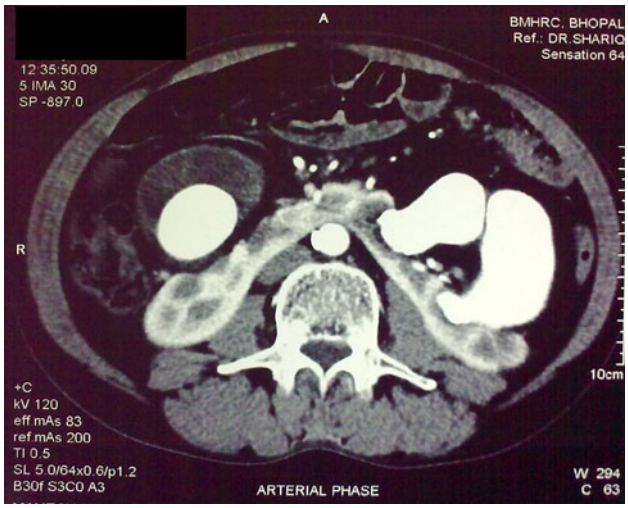

Fig. 2 CT scan of the same patient, showing the stones in HSK with moderately dilated pelvicalyceal system on the *right side*

Fig. 3 Plain X-ray KUB region of the same patient after *right side* PCNL

people with the male–female ratio of 2:1 [7]. The most common complication associated with HSK is renal calculus [8], with a reported incidence of 21–60% [9]. The impaired drainage because of abnormal supero-lateral displacement of the renal pelvis and the ureter, associated with stasis and infection, is thought to predispose to stone formation in HSK [9]. However, the metabolic abnormalities also play an important role in most of these patients, that are treatable [10].

A GRC may develop bilaterally or in a solitary kidney, and present with any of the known symptoms of renal stone disease. Long standing lithiasis may also lead to renal functional loss, but slow progression to larger size, without any symptoms or impairment of renal functions, is also known [3]. Very infrequently, GRC may not cause the symptoms associated with urinary lithiasis. As for instance, Kapoor et al. [11] described a case of GRC that presented as an abdominal lump, as in our case. Alster et al. [12] reported an unusual presentation with sigmoid impaction and subsequent perforation by a GRC that passed into the colon through a nephrocolic fistula. Long duration of stone disease in cases of GRC may also act as a predisposing factor for the development of urothelial neoplasms [5].

The management of GRC depends on the residual renal function of the affected kidney and the contra-lateral renal unit, and associated urothelial tumor. Giant renal calculus with non-functioning kidney or urothelial tumor needs nephrectomy that, although, can be performed laparoscopically but may require open conversion in case severe adhesions are present due to recurrent infections [4]. When the residual function of affected kidney is good or in case of solitary functioning kidney stone removal is to be considered [1, 2]. This has been traditionally done by standard open pyelolithotomy [1, 2]. But with the development of endourological and minimal invasive surgical techniques including percutaneous nephrolithotomy (PCNL), ureterorenoscopy (URS), and laparoscopy, along with extracorporeal shock wave lithotripsy (SWL) the stone treatment has been revolutionised. This has led to marked reduction in the open stone surgery. Nowadays, most of large renal stones are treated with PCNL or PCNL plus SWL [13]. However, in cases of giant renal stones it is very difficult to attain a stone-free status with PCNL [6]. Thus, an open nephro- or pyelo-lithotomy is preferred for a giant calculus (only to avoid multiple percutaneous procedures needed for its complete removal) when additional surgical procedure for example pyeloplasty is needed or after failure of PCNL [6]. Also, open surgical approach is still required for patients with complex calculus disease associated with anatomic abnormalities like HSK [14].

Regarding treatment of stones in HSK; PCNL, although technically demanding, has also been found to be safe and effective, especially for large and SWL-refectory stones [15, 16]. Symons et al. [17] with the largest single-center experience of managing urolithiasis within HSK, concluded that for smaller stone burdens in a HSK, ESWL and flexible ureteroscopy are viable treatment options that provide acceptable stone clearance rates. For larger stones in HSK, PCNL is a safe and effective treatment with excellent stone clearance rates [17]. However, the appropriate option for stone in HSK depends not only on stone burden, but also its location and the presence of further anomalies such as

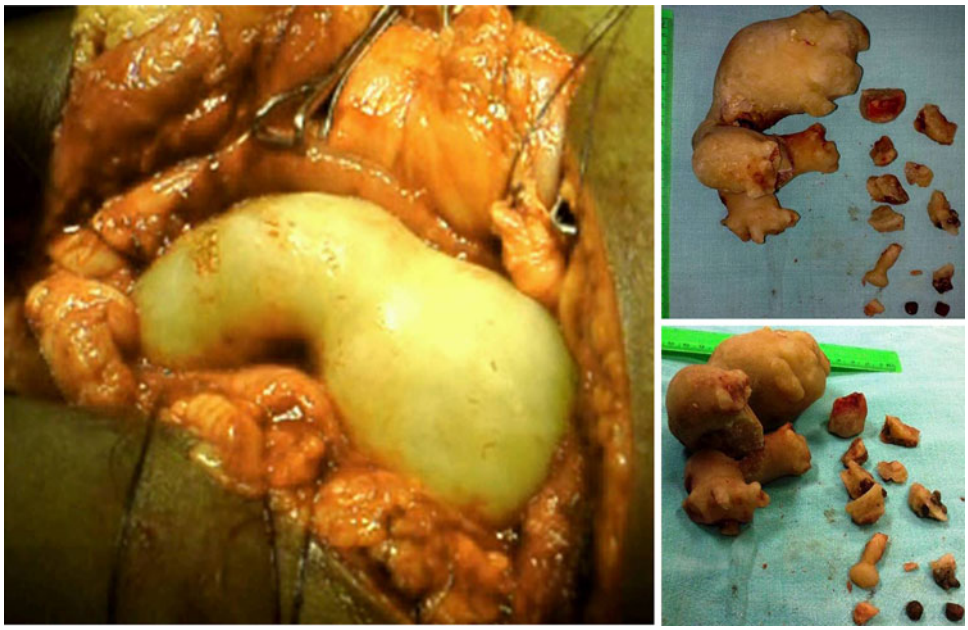

Fig. 4 Intraoperative photograph of open pyelolithotomy. Giant renal calculus is completely filling the renal pelvis which is kept opened with the help of stay-sutures. Specimen of the giant calculus removed from the *left side* of HSK is also shown

Table 1 Summary of the operative details of the present case

Patient's age/sex	Procedure	Anaesthesia	Position	Approach to the procedure	Operative time (min)	Approximated blood loss (ml)	Weight of the removed stone (g)
32 Years/male	Step-I: right percutaneous nephrolithotomy	General anaesthesia	Prone	Posterior middle calyceal puncture	180	90	135 (approx.)
	Step-II: left open pyelolithotomy	General anaesthesia	Right lateral (left kidney position)	Left flank oblique incision, and extraperitoneal approach	300	110	790

malrotation [17]. In cases where the stone is located in the lower calyx or isthmus, the nephroscope might not reach the stone. Moreover, PCNL becomes almost impossible in severely malrotated kidneys where all calyces face anteriomedially. Also, in special cases of GRC in a HSK like the present case, several sittings of PCNL would be needed that would increase the morbidity as well as the total cost of the treatment. Under such instances, pyelolithotomy either laparoscopic or open provides best results [14, 17].

Present case demanded reporting because of three important features; first, it is the 8th heaviest renal stone ever reported in the English literature. Second, it is the first giant stone reported in a HSK, and the patient presented with an abdominal lump. Third, this case provides rare and valuable experience of PCNL and open pyeloithotomy in the same patient. We performed open pyelolithotomy for giant calculus, as the affected kidney was functioning well, and the stone was removed without any complications. Although the preoperative CT scan had not revealed any other additional abnormality, and no suspicious finding suggestive of urothelial tumor was noted during surgery, we took biopsy from a ferocious looking area of renal pelvis. It finally came out to be just squamous metaplasia. We did not go for PCNL on left side as the stone was too large and it might have required multiple procedures to achieve stone-free status. The patient had already undergone right PCNL for large calculus. Multiple percutaneous procedures on left side could have increased the morbidity markedly. Finally, we did not go for isthmectomy because during both the procedures we found the ureters on the dependant parts. Also, that much HDN could be because of very large stone itself and not because of the actual obstruction. This was supported by the findings that both pelvicalyceal systems were almost of the size of the stones, and excretion and clearance of contrast in follow-up urography (3 months) was adequate.

Conclusion

A case of giant renal calculus that weighed 790 g in a HSK has been described. To the best of our knowledge this is the 8th heaviest renal stone, and the first giant stone in a HSK ever reported in the English literature. Our experience with

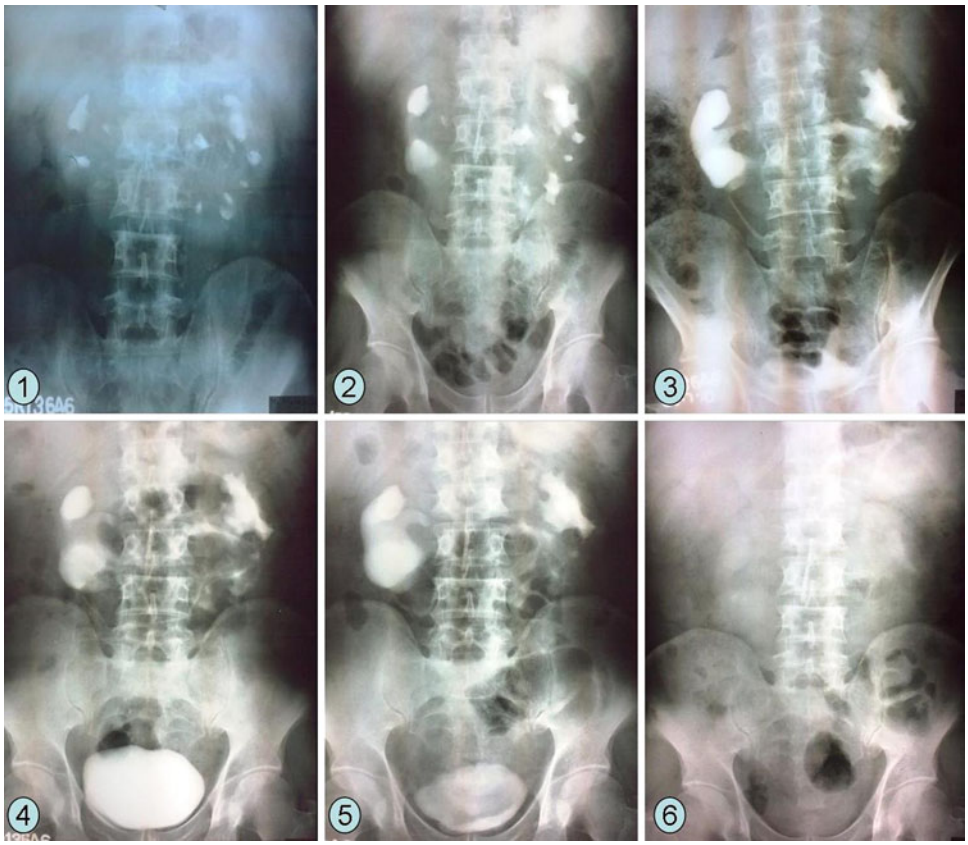

Fig. 5 Post operative IVU at 3 months follow-up showing films at 5, 15, 30, 45, 90 and 120 min

this case proves that although, PCNL is safe and effective for larger stones in HSK and provides excellent stone clearance, some special cases like giant stones (>500 g) may still require open pyelolithotomy.

Conflict of interest None.

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