Subcapsular hematoma in a solitary kidney: successful conservative management

John M. Myrga, MD,[1] Christopher J. Staniorski, MD,[1] Robert M. Turner III, MD,[1] Michelle J. Semins, MD[2]

[1]Department of Urology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA
[2]Department of Urology, West Virginia University, Wheeling, West Virginia, USA

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Subcapsular renal hematoma (SRH) is an infrequent complication of urologic interventions but can lead to serious consequences in patients with a solitary kidney. We present our experience with conservative management of a patient with a solitary kidney and multiple medical comorbidities who developed a SRH and subsequent renal failure after nephroureteral catheter placement. Literature on the management of this unique clinical scenario is limited. Herein, we share our experience with supportive care and temporary dialysis in a medically complex patient whose outcome is complete renal recovery.

Key Words: subcapsular hematoma, solitary kidney, endourology

Introduction

Subcapsular renal hematoma (SRH), a collection of blood beneath the renal capsule, is a rare clinical entity associated most frequently with trauma and renal masses but is also seen following common urologic procedures.[1] In some patients, this extrinsic compression on the renal parenchyma can lead to the phenomenon of Page Kidney associated with flank pain, hypertension, and ultimately renal ischemia which may require medical or surgical intervention. SRH has been reported in up to 4.1% of shockwave lithotripsy (SWL) patients as well as 0.4% of ureteroscopy with laser lithotripsy cases.[2-4] In these populations, management is typically conservative, as most have normal contralateral kidney function and the consequences of SRH are fairly minimal. However,

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Address correspondence to Dr. Michelle J. Semins, 20 Medical Park, Suite 201, Tower 2, Wheeling, WV 26003 USA

rarely, surgical decompression or drain placement may be considered.[2,4] While the care of patients with two kidneys and one-sided SRH is well established, currently, there is limited literature on how to manage patients with a solitary kidney and SRH, particularly in the setting of acute renal failure.

One body of literature that exists on this topic is in the renal transplant domain. SRH are sometimes seen following transplant biopsies and trauma. The content is limited to case series and reviews but provides insight into a treatment approach of SRH in a functionally solitary kidney. Similar to those with a solitary kidney, the pressure from the SRH on the allograft can lead to ischemia and eventual tissue death, which can manifest with anuria and renal failure.[5] In serious cases, allograft SRH can lead to overt renal rupture associated with hemodynamic instability. While there is no consensus in the transplant literature on optimal management strategy, a recent review of 40 SRH in allograft kidneys demonstrated that operative management was used more commonly in this population. Ninety-three percent (37/40) underwent surgical intervention or percutaneous drainage and only three patients were managed non-surgically.[6] While conservative management is not specifically defined, the strategy in the literature is supportive care, with inpatient monitoring, daily bloodwork, transfusions and dialysis if indicated until renal function has recovered and the patient has stabilized.

Outside of the transplant literature, only two case reports were identified that addressed the management of SRH in a solitary kidney, both of which were managed operatively.[1,7] While operative intervention of a SRH in a solitary kidney is technically feasible, it can be a high-risk procedure. Additionally, there may be instances where patients are poor surgical candidates or instances where patients do not want surgery. Published experience of non-surgical treatment of a SRH in a solitary kidney is limited. We share our experience with conservative management of a SRH in a solitary kidney in a patient who was a poor surgical candidate.

Case report

A 62-year-old male with a past medical history of incomplete quadriplegia secondary to a traumatic spinal cord injury in his 20s, atrial fibrillation, and cardiac pacemaker presented to the emergency department (ED) from his skilled nursing facility with chills and fatigue following interventional radiology (IR) guided right nephroureteral catheter placement. The catheter was placed in preparation for an upcoming right percutaneous nephrolithotomy (PCNL). The patient had a long history of kidney stones managed with retrograde ureteroscopy and laser lithotripsy, in addition to neurogenic bladder managed with a suprapubic tube. He was recently diagnosed with bilateral staghorn calculus and underwent a left-sided nephrectomy for xanthogranulomatous pyelonephritis (XGP). Preoperatively, his baseline creatinine (Cr) was 0.4, and, 1 month following his nephrectomy it stabilized at 0.9.

Two months later, in preparation for treatment of the right staghorn calculus, a right-sided nephroureteral catheter was placed via upper pole access uneventfully and he was discharged home the same day. He was not on any anticoagulation and coagulation studies were normal. The patient presented to the ED 1-day post-procedure with chills and a subjective fever at home in addition to bloody output from his nephroureteral and suprapubic catheters. He is insensate throughout his torso and noted increased pressure but no flank pain. At that time, he was also noted to have an acute kidney injury (AKI) with a Cr of 3.1. Blood and urine cultures were obtained and a computed tomography (CT) scan of his abdomen and pelvis revealed a moderately sized subcapsular hematoma measuring approximately 9 cm in maximum dimension with renal compression, Figure 1a. His vital signs were normal and he was admitted for further management. Urgent surgical intervention was considered, but due to the patient's medical comorbidities, and the risk of conversion to nephrectomy, observation with supportive care was chosen. He was informed of management options and agreed with close observation with the understanding that he may need delayed operative intervention if he failed to demonstrate renal recovery.

The patient's Cr continued to rise and was 6.0 on hospital day 4 with significant oliguria. A temporary dialysis catheter was placed, and hemodialysis was initiated on day 4 and repeated on day 5, Figure 2. At this time, surgical intervention was again considered for urgent decompression. On hospital day 6, after discussion with nephrology and the patient, a shared decision was made to continue to monitor the patient for another 24 hours for signs of renal recovery with plans for surgical decompression the following day. The patient remained normotensive throughout his stay and noted only mild right-sided discomfort.

Repeat imaging showed stability in the size of the SRH, Figure 1b, and he underwent another round of dialysis. On hospital day 7, his Cr increase was minimal, Figure 2b, and his urine output, Figure 2a, suddenly improved. His Cr plateaued at 3.9 and 1 additional session of dialysis was pursued on hospital

day 12. During his hospital stay, he was transfused 2 units of packed red blood cells for a hemoglobin of 6.7 with an appropriate response. His Cr continued to trend down, and his urine output markedly increased for the remainder of his hospitalization. He was discharged on hospital day 17 with a Cr of 1.98 and plans for close outpatient monitoring.

At a 6-week outpatient follow up visit, his Cr was back to his baseline post-nephrectomy at 0.7. Imaging obtained 3 months later showed a significant decrease in his SRH with almost complete resolution, Figure 1c. The decision was made to proceed with his PCNL utilizing the same tract. At the time of surgery, balloon dilation of the tract to 30 atmospheres (Bard Care, Covington, GA, USA) failed with a band of resistance appearing to be in the location of the renal capsule. Renal amplatz dilators were needed to sequentially dilate the tract from 14 French to 26 French and a 26 French access sheath was able to be successfully placed. The remainder of the surgery was unremarkable. An indwelling double J stent and 16 french nephrostomy tube were placed at the end of the case. Upon removal of the sheath, pressure was applied, and hemostasis was excellent. The patient's Cr postoperatively was stable at 0.72 and his hemoglobin was stable without the need for transfusion. CT scan completed postoperative day 1 demonstrated he was radiographically stone-free, Figure 1d. His nephrostomy tube was removed and he was discharged home postoperative day 1. His stent was removed in the office 8 days following surgery.

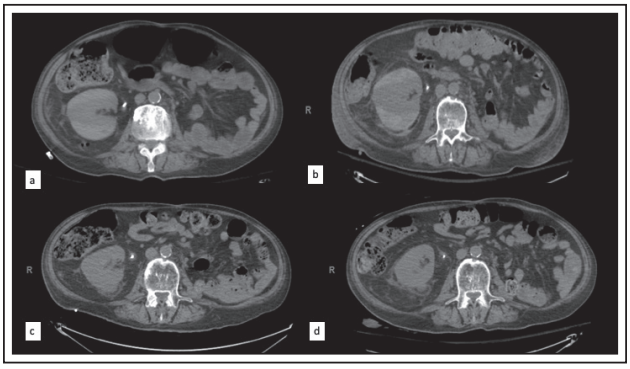

Figure 1. a) Image from patient's admission imaging showing a 9 cm SRH with an appropriately placed nephroureteral catheter with evidence of renal parenchyma compression. **b)** Repeat imaging on hospital day 7 shows the persistence of a stable SRH. **c)** Repeat CT 3 months later shows almost complete resolution of the SRH. d) Post-PCNL image with small residual SRH and stone-free.

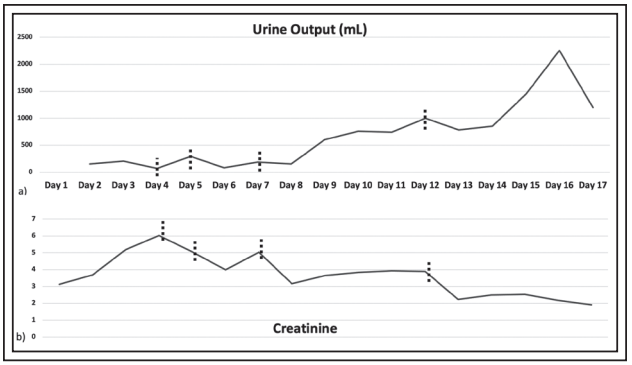

Figure 2. a) Patient's total urine output tracked over his 17-day hospital course in milliliters. A vertical dashed line indicates when the patient had a dialysis session. **b)** Patient's creatinine tracked over his 17-day hospital course. Vertical dashed lines indicate when the patient had a dialysis session.

Discussion

The management of SRH in a solitary kidney is not well-defined in the literature. Patients with significant clinical comorbidities may be at higher operative risk. However, observation is also a risky management strategy that may leave a patient ultimately dialysis-dependent and missing an opportunity for possible intervention. Conservative management for SRH in a solitary kidney may be an appropriate management strategy for select patients with acute renal failure. Here, we show that close monitoring and dialysis to help the patient overcome initial renal failure was followed by complete renal recovery. This experience shows close observation and supportive measures may be a reasonable option in challenging patients or patients unwilling to undergo surgery.

The transplant literature provides a source of patients with functionally solitary kidneys. A recent case series examined the transplant literature and found 40 reported cases of clinically identified SRH with renal failure.[6] Thirty-five patients were managed with an upfront intervention: 30 with open surgical decompression and 5 with percutaneous drainage. In this group, 29 (83%) had complete recovery, 5 (14%) had partial recovery, and 1 (3%) had ultimate graft loss. Out of the 5 conservatively managed cases, 2 ultimately required operative intervention and both had subsequent graft failure, 1 had reported improved renal recovery (no specific details reported), and 2 had complete renal recovery after multiple hemodialysis sessions and an extended hospital stay. It is important to note that while these two cases

were managed conservatively, they continued to have urine output (minimum 800 cc daily) and were noted to have smaller SRH (3-4 cm) compared to the 9 cm renal hematoma we encountered. Currently, there is not enough evidence to suggest whether the size of hematoma, timing or any clinical factor can be used to determine when conservative management is appropriate. These authors conclude that while there are no guidelines, their experience suggests prompt surgical decompression is indicated to best ensure the long term survival of the transplanted kidney.

Renal allografts are fundamentally different in many ways, having already had insults that may decrease their ability for renal recovery and may push surgeons toward operative intervention. Additionally, their location in the iliac fossa is a different surgical approach than accessing native kidneys. Nonetheless, the transplant kidney experience is important to consider given a paucity of data (two reported cases) guiding the management of SRH in solitary native kidneys. In these two reported cases, both patients underwent surgical intervention.[1,7]

In the first reported case, the patient had a prior nephrectomy and multiple biopsies of a mass in the remaining kidney resulted in a SRH of approximately 13 cm.[1] This patient had progressively worsening flank pain, volume overload, and a rising serum Cr to over 6 and ultimately required two sessions of hemodialysis. On day 4 of their admission, they underwent a flank capsulotomy and decompression with resolution of symptoms and improvement of renal function. Six months following the procedure, the patient was noted to have a serum Cr of 2.7, increased from their baseline of 2.2. Another case report was described in a patient with a solitary kidney who developed SRH following SWL.[7] The patient presented the evening following surgery with flank pain and was noted to be anuric and anemic requiring blood transfusion. On post-procedure day 3, the patient continued to be anuric and required hemodialysis. At that time, the decision was made to pursue decompressive capsulotomy and had subsequent return of renal function. No complications were reported following surgery. At a 3-month follow up appointment, the patient's Cr was noted to return to a baseline of 1.4. Due to the rarity of these situations, no formal guidelines exist, but authors of both reports argue for prompt surgical decompression to preserve renal function.

While the case we present provides an alternate management option, further discussion is still needed. The ultimate length to which we should consider observation is unknown. Our patient's renal recovery began around 1 week; however, the trajectory of hematoma reabsorption and ultimate lessening of parenchymal compression is not known. Furthermore, renal doppler data was not obtained during his stay which would be helpful to determine the extent of renal blood flow. It's also unclear if there is an optimal time window for decompression and if a delay may eliminate surgical intervention as an option for renal recovery if observation fails. Further data on clinical factors (e.g. hematuria, flank pain, size of hematoma, hemodynamics, etc.) that could serve as indicators of chance for renal recovery, may be helpful to guide management. Larger studies examining these factors and their association with outcomes would be beneficial to know which patients may require the most aggressive treatments. The long term outcomes are also unclear, and despite a complete renal recovery in the case of our patient, it is unknown how this period of parenchymal compression will eventually affect his future renal function.

While questions still exist in the management of this difficult scenario, for patients with moderately sized subcapsular hematomas, this non-operative approach, with close observation and supportive care, can be considered to avoid excessive morbidity. □

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