



# Giant Bladder Stone and Renal Failure: A Case Report, Literature Review and Future Perspectives

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## Abstract

We present a male patient, 52 years old, with acute renal failure due to giant bladder stone. In first presentation with acute renal failure, tomography has shown a bladder stone with 10 cm in its largest diameter associated with bilateral ureterohydronephrosis. It was initially treated by bladder catheterization and indicated emergency dialysis and subsequently submitted to surgical treatment through open cistolitotomy. During the procedure it was possible to observe the giant calculus, adhered to the trigone of the bladder, occluding his neck. After the vesical catheter was deployed, the patient had clinical and laboratory improvement during hospitalization. The association between giant bladder stones and urologic kidney failure is a rare condition and once removed the causative factor, we expect the return to normal limits. Studies with higher levels of evidence are needed to increase knowledge about the subject.

## Subject Areas

Urology

## Keywords

Giant Bladder Stone, Renal Failure, Open Cystolithotomy

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## 1. Introduction

In times of technological advances in urology, the entity described in this article goes back to the beginnings of our specialty. Bladder stones represent 5% of urinary tract lithiasis and the so called Giant is described as stones heavier than 100

grams (g) or measuring more than 4 centimeters (cm) in its largest diameter [1] [2] [3]. The biggest vesical calculus described weighted 6294 g [1]. It is a rare condition and reports in literature are limited to cases and description of its various complications. In this context, our objective is to report a case of giant bladder calculi associated with renal insufficiency and conduct a comprehensive literature review.

## 2. Scenario and Case Presentation

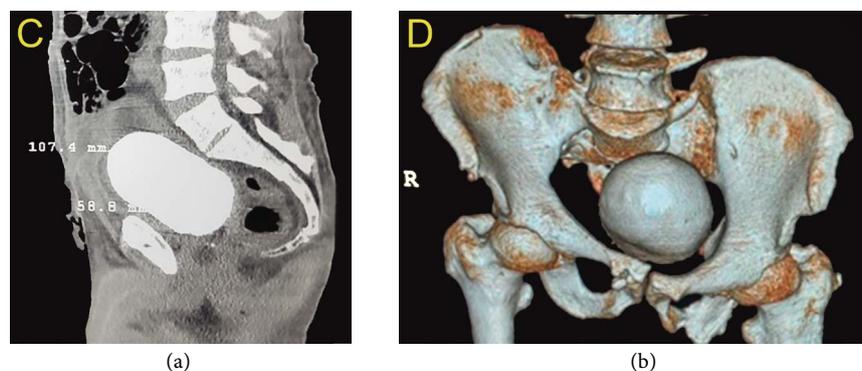
This study was carried out in accordance with the ethical standards of the hospital's institutional committee on human experimentation and the Informed consent was obtained from the patient.

A man with previous history of trauma at age 18, suffered pelvis fracture and needed cystostomy; had a good recovery, catheter was removed, but developed voiding dysfunction. At age 52, he needed health care for acute urinary retention associated with renal failure. Transurethral bladder catheterization was performed successfully but high levels of serum creatinine (6.3 mg/dL—reference values: 0.7 - 1.3 mg/dL) led him to dialysis.

Tomography (CT) identified a giant bladder stone, 1222 UH (units Hounsfield), measuring  $10.74 \times 7.77 \times 5.88$  cm, bilateral ureterohydronephrosis and a hypodense image in upper right lateral bladder wall with subcutaneous extension, suggesting cutaneous fistula (Figure 1).

We performed cystolithotomy by transverse incision above the pubic bone, with a longitudinal opening of the bladder. Considering the location that the calculus was encrusted, we performed 623 g stone extraction after careful dissection of the bladder neck and ureteral ostia identification. Bladder cystostomy with a 22F catheter was performed under direct vision; synthesis of bladder in two planes was done after hemostasis review. The stone is shown in Figure 2.

On the second postoperative day the use of antibiotics was suspended according to the guidance of the Center for Control of Nosocomial Infection. Three days later, an operative wound infection, treated with oxacillin for 10 days, was identified. After gradual improvement of renal function (creatinine levels—2.8 mg/dL to 2.1 mg/dL in one week, to 1.98 mg/dl in five weeks), he was discharged



**Figure 1.** The figure shows the patient's CT. (a) Stone perspective on sagittal plane; (b) Stone perspective on 3D reconstruction.



**Figure 2.** The figure shows the Giant vesical stone after the surgery.

from dialysis. On the 12th postoperative day, the patient developed a vesico-cutaneous fistula with conservative treatment through bladder catheterization. In the late postoperative period, an urethrocytography revealed urethral stenosis, a cone-trabeculated bladder shape during voiding attempt. After identification of the stenosis, he underwent termino-terminal urethroplasty. At the moment it has no voiding complaints with a good urinary flow ( $Q_{max}$  43 ml/s), and good bladder capacity (Vol 600 ml).

Due to the rarity of this condition, we investigated similar cases on the following search platform: Pubmed, Research Gate, Virtual Health Library and tried to document its epidemiology, diagnosis, complications and management. By our observation through the indexed platforms, we confirmed the scarcity of this subject.

### 3. Discussion and Future Perspectives

Bladder stones account for about 5% of urinary tract stones, men are more affected than women [2]. It occurs more commonly in patients of low socioeconomic condition of underdeveloped countries [3].

Children with nutritional disorders are at high risk of developing the called endemic bladder stones. Deficiency of magnesium, phosphate, Vitamin A and B6, combined with low protein content and high volume of carbohydrates are associated to this condition [2].

Boys are more commonly affected than in girls at a ratio of 8:1 [4], common age of occurrence is 2 - 5 years. Our review concerning about giant bladder stones leading to renal insufficiency showed only three cases in children; all them were boys, mean age 9.66 years old, corresponding to 9.67% of the subjects reported.

Anatomical disorders could lead to bladder stone formation among children. A report by Cuban researches described an 11 year old boy with multiples episodes of urinary tract infection (UTI). Excretory urography was performed: a big radiopaque imaging in pelvis, delay in contrast elimination, bilateral ureterohydronephrosis, an important dilation of the bladder neck above the striated

sphincter (typical in posterior urethral valve type III by Young's Classification). Open cystolithotomy and debridation of the valve by passing catheters in both ways was performed. Stone weighted 230 g. Patient had a good evaluation and was discharged with good urinary flow and normal renal function [5].

Descriptions of giant calculus in women are rare. We found two cases of women with giant bladder stones causing renal failure, representing 6.45% of the cases. It is often related with foreign body, sutures, catheters or other objects introduced in the bladder, but also neurological disorders, dystopias and other unusual situations reported in literature. Kidney stones if dropped in bladder may remain as foreign body and attains larger size due to deposition of phosphates around it [6].

Men are commonly affected as 95% by vesical calculus if compared to women [2]; in our review, 93.54% of the cases had male patients with giant bladder stones leading to renal impairment. Median age among adult men was 57.88 years, one report didn't show patient's age; our patient was 52 years old. Many causes could lead to bladder stone formation among men, such as prostate enlargement, urethral strictures, neurological disorders, presence of foreign body inside the bladder or even a descendent kidney stone. Our review showed 4 cases related to neurological disorders including neurogenic bladder, multiple sclerosis, spinal cord injury, Parkinson's disease and stroke. In 6 reports we identify low urinary tract symptoms (LUTS) and 7 cases had UTI associated. Some papers related foreign bodies in men and one case showed even recurrence of giant bladder stone. Our patient had voiding disfunctions after pelvic fracture.

The chemical composition of the stones is varied. Colonization status of the urinary tract plays a role on stone formation. Urease-positive organisms predisposes the composition of struvite stones (magnesium ammonium phosphate) and carbonate apatite. *Escherichia coli* is associated with formation of calcium oxalate stones and urate [7]. In the present case mineralogical study was not done. In the review, 11 cases did not informed about stone's mineralogy. As usual, some of them had more than one mineral in the same stone, 7 papers reported multi-mineral composition; 3 cases showed struvite stones, 4 cases described uric acid, 7 cases listed calcium oxalate, 6 cases exposed calcium phosphate; 1 case reported carbon apatite [8].

The initial suspicion departs from urinary complaints related to the urothelial tract injury associated with history of urinary disorders or manipulation of the urinary tract and pelvis. Diagnostic tools should be employed, starting with the plain radiograph of the abdomen, ultrasound of the urinary tract and cystoscopy [7]. In our case, CT was the method of choice, due to patient's presentation and the presence of a palpable mass in the hypogastrium.

The choices for treatment depend on etiology and size of calculus; various techniques may be employed. Minimally invasive choices like extracorporeal lithotripsy are available but it does not appear to have a good result in calculi greater than 2 cm [9] [10]. Surgical techniques, endo-urological or open, approaches have a main role in giant bladder calculosis.

Percutaneous techniques have shown to be safe and feasible, especially in patients without clear urethral access and children. The procedure consists of approaching the bladder by a suprapubic puncture, creation of a path to insert an Amplatz sheath or a trocar, then the endoscopic lithotripsy is performed with lithotritor ultrasonic, pneumatic or even by laser energy [11].

Torricelli and colleagues from São Paulo performed a metanalysis regarding bladder stones treatment; they proposed some guidance and as seen in the chart bellow (Figure 3), the size of the stone influences the way it will be approached [10].

Mean weight among cases reviewed was 428.14 g, the heaviest were 1640 g; mean size in the longest diameter was 8.38 cm, the bigger one had 17 cm in the longest diameter. The stone in this case was 623 g.

Majority of the cases were managed by open cystolithotomy, it was the only intervention described in 10 cases reviewed, and it means that in 34.48% of the cases, only one procedure could solve patient's disease. Our patient underwent by urethral catheterization, haemodialysis, open cystolithotomy and cystostomy.

In cases like shown in this paper, the main outcome desired is patient's recovery of renal function. In our review some authors did not described the final serum creatinine values; 7 described as "normal". In one case a patient did not recovered the renal function even six months after surgery [12]-[15]. Our patient recovered renal function and was discharged from dialysis after reach creatinine level of 1,98 ng/d. In our review, considering those who described serum creatinine after treatment, the mean was 2.58 mg/dL.

We clarify that readers could learn that giant bladder stones can lead to complications and renal impairment is a major one. Despite the diagnostic method, treatment should be immediate to avoid complications in short term. Preoperative care such as antibiotic therapy, dialysis and urinary diversion seems to be a good way recovery; but such measures should not delay the cystolithotomy.

#### 4. Conclusions

As take-home message we concluded that few studies have reported the relationship between bladder giant stone and kidney failure. Studies with higher

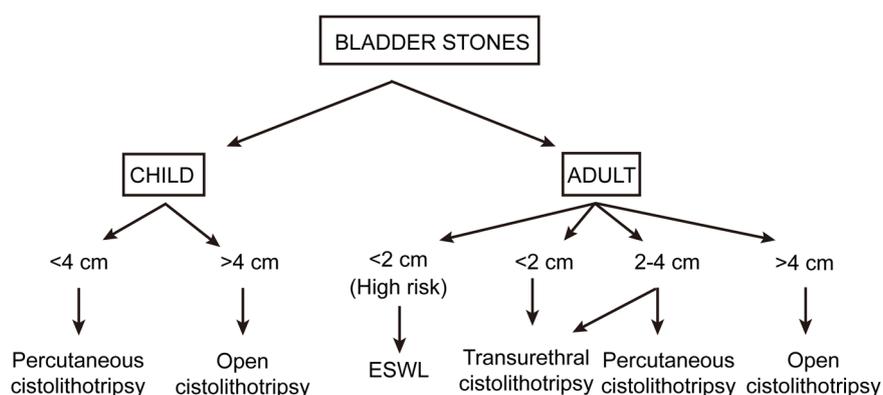


Figure 3. Treatment options according to stone size.

levels of evidence are needed to increase knowledge about the subject.

Bladder stones are movable, so rarely obstruct urethral or ureteral orifices, but over time, the mineral deposit determines the increase of stone volume, shaping bladder anatomy which can then block the normal urine output, causing renal failure. More studies on imaging should be done in order to understand these obstructions mechanisms. By our observation we conclude that considering the mean bladder volume, calculus greater than 400 g may be associated with renal failure.

The main parameter used to suppose renal insufficiency is the serum creatinine and urea levels; but, if possible, renal cintilography should be performed and would give us more data about renal impairment. It also would be an important tool to follow the renal function.

Despite the diagnostic method, treatment should be immediate to avoid complications in short term. Preoperative care such as antibiotic therapy, dialysis and urinary diversion seems to be a good way recovery; but such measures should not delay the cystolithotomy.

As final regard, imaging follow up and urodynamics study would be useful to predict recurrence and understand the reasons of bladder stone formation.

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