



Case Series

Giant bladder uric acid stone with a history of prolonged sun exposure and high protein diet in North Moluccas: Case series

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ABSTRACT

INTRODUCTION: Giant bladder uric acid stone cases that have more than 4 cm in diameters and weighing more than 100 g are considered rare.

PRESENTATION OF CASES: At the end of 2019, two men presented with chronic lower abdominal pain since five years ago. Abdominal radiography found a giant opaque mass inside the bladder. Open suprapubic cystolithotomy was performed by a general surgeon. Both giant bladder stones were extracted and measured approximately 11 × 7 × 6 cm and 500 g in weight. More than 80 % of stone composition was uric acid. Neither of the patients developed severe complications after the procedure.

DISCUSSION: Our patients had a history of prolonged sun exposure related to occupation and high protein intake. Benign prostatic hyperplasia as a major underlying cause for stone formation was not found in the digital rectal examination. Prostatectomy was not performed. Uric acid stone is common in Southeast Asia, with a multifactorial pathogenesis.

CONCLUSIONS: Open suprapubic cystolithotomy is the best method to extract giant bladder stones in limited settings in the rural areas of Indonesia. It was likely that the most important factors associated with the stone formation were the climate and dietary habits. The findings showed that pathogenesis of bladder stone formation and particularly, uric acid bladder stone is still not clearly understood.

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1. Introduction

Urolithiasis is the most common urinary tract disease in Asia. Over the last decade, the incidence of bladder stones was declining sharply [1]. The combination of improved nutrition and antibiotic treatment [2], patient awareness, accessibility to medical services, and earlier management of bladder stones [3], has led to a significant decrease in the disease. In modern practice, a case with a giant bladder stone weighing more than 100 g is rare [4].

We reported two cases of giant bladder uric acid stones in the main hospital of North Moluccas Province, a rural area of Indonesia. Both of them were male, presented between September and December 2019, with a history of prolonged sun exposure attributed to occupation and high protein diet. Neither of them

exhibited any signs of benign prostatic hyperplasia (BPH). The report has been in line with the PROCESS Criteria [5].

2. Presentation of cases

2.1. Case 1

Male, 59 years old, presented with chronic lower abdominal pain and scant hematuria. He had a history of chronic dysuria since 2013. He tried to relieve the symptoms with alternative medicine. He was construction labor and his urine was often colored dark brown. His regular diet consisted of a large amount of rice with fish, eggs, and meat.

He had severe symptoms, measured by the International Prostate Symptom Score (I-PSS) with 27 points. He had hypertension (150/80 mmHg), suprapubic tenderness, and costovertebral angle pain. A solid mass inside the bladder was palpable during the digital rectal examination, and the prostate was not enlarged. His laboratory workup showed leukocytosis. He had high blood urea nitrogen level as 84.2 mg/dL (reference range 13.0–43.0), creatinine level as 2.52 mg/dL (0.60–1.10), and hyperuricemia with 8.30 mg/dL

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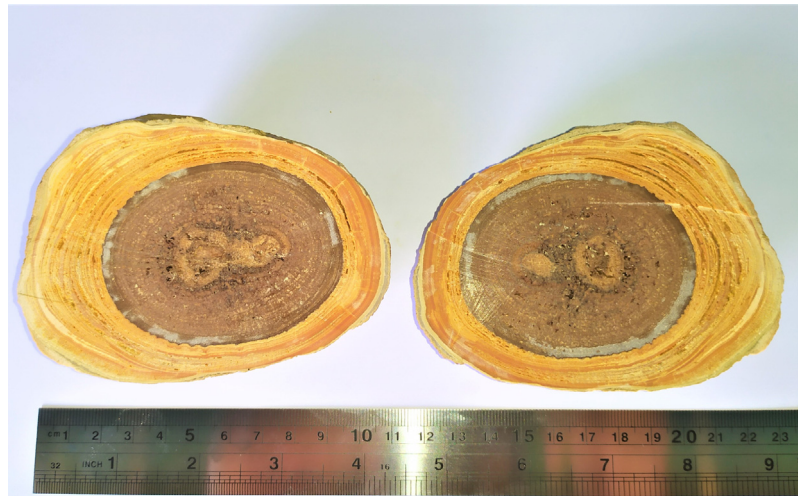


Fig. 1. Sagittal plane of Case 1 giant bladder stone. The stone was measured $11 \times 7 \times 6$ cm in dimension and weight approximately 500 g. It had a coarse outer surface with light yellow color. A couple of nuclei in the center of the stone with smooth laminated cortexes were depicted.

(0.00–7.00). Urinalysis showed a pH of 5.5 (4.5–8.0), +1 protein (0), 6 red blood cells (0–5 per high-power field), and 4 white blood cells (0–3 per high-power field). Urine culture and 24-h urine collection was not done because limited facilities and experts. Ultrasonography (USG) examination showed a giant bladder stone with severe bilateral hydronephrosis.

Open suprapubic cystolithotomy was done by a general surgeon with 2 years of experience in conducting the procedure. A stone, $11 \times 7 \times 6$ cm in size, and approximately 500 g in weight was removed easily (Fig. 1). Based on the stone composition analysis through Fourier transform infrared spectrophotometry (FTIR), 82% of the stone composition was uric acid (uricite), and the rest was ammonium urate.

The patient received ceftriaxone as prophylaxis antibiotic 60 min before procedure to prevent surgical site infection. After the procedure, the patient remained four days in the ward and received intravenous ceftriaxone only for 24-h post-procedure. He also received ketorolac, urine catheter placement, and bladder spooling with normal saline fluid. He had an infection at the site of incision two weeks after being discharged. Accordingly, he was readmitted for seven days until the infection resolved, and discharged without the urine catheter. There were no other complications that followed.

2.2. Case 2

Male, 46 years old, presented with chronic lower abdominal pain since 2015. He felt dysuria and scant hematuria. He was a farmer and a frequent smoker. His urine was usually a dark brown color. He consumed a large amount of rice with fish, eggs, and meat as a regular diet.

The patient had severe 31 I-PSS points. His vital signs were normal with lower abdominal tenderness. A solid mass inside the bladder was identified during the digital rectal examination, while the prostate was not enlarged. His complete blood count was normal. However, he had high blood urea nitrogen level as 86.4 mg/dL, high creatinine level as 3.43 mg/dL, and hyperuricemia with 8.54 mg/dL (0.00–7.00). Urinalysis showed a pH of 5.45 (4.5–8.0), 0 protein, 3 RBC/HPF, and 2 WBC/HPF. Urine culture and 24-h urine collection were not done. Kidney-ureter-bladder (KUB) film revealed a giant opaque mass inside the bladder with 11 cm in length and 7 cm in width (Fig. 2). USG examination confirmed the stone and found moderate bilateral hydronephrosis.



Fig. 2. Case 2 KUB film. The film showed opaque round mass approximately 11 cm in length and 7 cm in width inside the bladder. The mass had more opaque density in the center. No other abnormality was depicted.

Open suprapubic cystolithotomy was performed by the same surgeon. A stone, $11 \times 7.5 \times 6$ cm in size and 400 g in weight, was removed easily (Fig. 3). The stone chemical composition was 86% uric acid (uricite), 13% calcium oxalate monohydrate, and 1% other matrices.

The patient stayed in the ward for six days after the procedure and received the same treatment before and after the procedure as Case 1. Post-procedure complications were absent in the four weeks after discharge.



Fig. 3. Case 2 bladder stone. The stone was 11 × 7.5 × 6 cm in size and approximately 400 g in weight. The stone had a smooth outer surface with dark brown color, stratified lamella layers developed from the stone nucleus.

3. Discussion

Indonesia is a developing country with hot tropical temperatures. The majority of Indonesians have occupations that are associated with rough working conditions and long hours of sun exposure such as farmer, fisherman, and construction worker. Our patients' occupations are a construction worker and farmer with prolonged standing hours under the tropical sun, high energy work, and inadequate hydration.

Climate and dietary habits are the most important factors that determine the prevalence and incidence of urolithiasis. Countries located in tropical areas have a higher prevalence of the disease compared to those in frigid zones [1]. The hot dry climate accelerates the evaporation of body fluid from the skin, subsequently resulting in concentrated urine, and contributing to crystals precipitation and stone formation [6].

Another kind of climate-related effect involves occupational conditions. The risk of acquiring urolithiasis in people working outdoors or exposed to high temperatures, such as farmers, miners, or quarrymen, is double than people working at ambient room temperature [7]. They also have less access to drinking water, leading to dehydration [8]. Thailand's manual workers, especially farmers, were found to have a higher incidence of urolithiasis compared to sedentary workers [9].

Our patients consumed a large portion of rice as the main source of carbohydrates along with fish, eggs, and meat as their protein sources. In Southeast Asia, where rice is the main staple in the diet, the catabolized carbohydrates produce an acidic environment of urine, which contributes to stone formation [1]. Meanwhile, the regular consumption of meat and seafood also has a positive association with hyperuricemia, which is another risk factor for uric acid stone formation [10,11].

The two patients also had lower socioeconomic and educational levels. They often ignored their symptoms and only resorted to medical care when it became severe. Hammad et al. [3] described that their patients also tended to be very reluctant to undergo surgical procedures. The circumstances delayed the diagnosis and treatment along with the continuous deposition of stone in the bladder, which made the calculi large.

The ideal method for achieving stone clearance remains an issue of debate. The choice of surgical approach is based on the availability of equipment, surgical experience, patient characteristics, and stone parameters [2]. Considering our circumstances, open suprapubic cystolithotomy was chosen as the best method to extract the stone. The procedure maximizes stone clearance for giant calculi (>4 cm) but is associated with a prolonged hospital stay [2]. Prostatectomy was not performed because the patient did not exhibit

BPH, a major cause of bladder outlet obstruction (BOO). A recent study showed that bladder stone is not always associated with BOO. Thus, when treating bladder calculi, it is not necessary to automatically add treatment for prostatic enlargement [12].

Ceftriaxone was chosen as antimicrobial prophylaxis of the procedure because of its broad spectrum and longer half-life [13]. Additionally, both patients possess inherent risks such as advanced age and frequent smoker. The nature of the procedure as clean-contaminated, the size of the stone, and poor patient hygiene were also taken into consideration [14]. Ceftriaxone is also cheap, readily available, and approved by government regulation and national insurance.

Uric acid is a common component of urinary stones. The global prevalence of uric acid stone is estimated to be 10–15 % [11]. In Thailand, the uric acid stone is the most common stone found in the lower urinary tract [9]. The underlying mechanisms of uric acid stone formation are still not understood [15]. A high urinary uric acid excretion, acidic urinary pH, and low urine volume seemed to play a major role [11]. However, Li et al. [16] concluded that local factors played a more important role in bladder uric acid stone formation. The pathogenesis seemed to be multifactorial with local and systemic factors contributing to different manners of stone formation [17].

Our urine and radiology examination were not uniform and cannot objectively assess other underlying causes of BOO and uric acid stone because of limited facilities and experts. Therefore, we were limited in our ability to adequately estimate the underlying mechanisms of our cases. Further study is needed to address all of these issues.

4. Conclusion

Giant bladder uric acid stones that are more than 4 cm in diameter and 500 g in weight are a rare case. Our cases occurred in the rural area of Indonesia with a history of prolonged sun exposure and a high protein diet. Open suprapubic cystolithotomy was done as the best method of stone extraction without any severe complications. BPH as a major underlying cause of bladder stones was not found based on physical examination. It was most likely the stone developed because of climate and dietary habits. The pathogenesis of uric acid bladder stone is still not clearly understood.

Conflicts of interest

No potential conflict of interest relevant to this article was reported.

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Ethical approval

The informed consent form was declared that patient data or samples will be used for educational or research purposes. Our institutional review board also do not provide an ethical approval in the form of case series.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Abdul Muthalib Pattiiha: Designed the study, confirmed the diagnosis, performed surgical procedure, evaluation, and post-operative management of the case, revised and approved the final manuscript.

Hamzah Muhammad Hafiq: Collected patient data and images, drafted the manuscript, revised, and approved the final manuscript.

Abdul Hadi Fuad: Collected patient data and images, revised, and approved the final manuscript.

Sayyidati Rokhimah: Collected patient data and images, revised, and approved the final manuscript.

Registration of research studies

The manuscript is a case report, not considered a formal research involving participants.

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Abdul Muthalib Pattiiha: Conceptualization, Methodology, Validation, Investigation, Writing - review & editing, Supervision.

Abdul Fuad Hadi: Investigation, Writing - review & editing. **Sayyidati Rokhimah:** Investigation, Writing - review & editing. **Hamzah Muhammad Hafiq:** Conceptualization, Investigation, Writing - original draft, Project administration.

Abdul Muthalib Pattiiha: Conceptualization, Investigation, Writing - original draft, Project administration.

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