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# Ceftriaxone-Induced Bilateral Nephrolithiasis in a Pediatric Patient: A Rare Complication of Antibiotic Therapy- Case report

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## ABSTRACT

Nephrolithiasis is a condition characterized by the formation of crystallized material in the urinary system . it's not common in pediatric population but prevalence has risen in recent decades. Ceftriaxone, a widely used third-generation cephalosporin for treatment of various infections in children. It is mainly excreted through the kidneys, with a portion eliminated via the biliary system. We report a case of 5-year-old boy who received ceftriaxone treatment for acute lymphadenitis and developed bilateral nephrolithiasis, anuria , and acute postrenal kidney failure.

## INTRODUCTION

Nephrolithiasis is a condition characterized by the formation of crystallized material in the urinary system. While this condition is not common among pediatric patients, its prevalence has dramatically increased over the past two decades for reasons that are not yet fully understood [1-3]. Ceftriaxone is a widely used third-generation semisynthetic cephalosporin prescribed for the treatment of various bacterial infections in children. The drug is primarily eliminated through the kidneys, with the remainder excreted via the biliary system. Ceftriaxone binds with calcium ions, leading to reversible precipitations that can form biliary lithiasis, also known as pseudolithiasis, in both children and adults [1-4]. Several studies have reported nephrolithiasis as an additional complication associated with ceftriaxone therapy [1-4].

## CASE REPORT

Treatment with ceftriaxone at 100 mg/kg/day was initiated, leading to an improvement in the general condition of the patient. However, on the 5th day of the antibiotic course, the patient developed abdominal pain, multiple episodes of vomiting, diminished diuresis, and soon developed anuria. The serum creatinine level increased to 5.7 mg/dl. Ultrasound of the urinary system revealed the right kidney dimensions as 90X40, parenchyma thickness at 22 mm, and a dilated pelvis measuring up to 23 mm, with a 7 mm diameter calculus identified within the ureteropelvic junction. The left kidney dimensions of 89X45 mm, parenchymal thickness of 30 mm, fixed calculi, and a dilated pelvis extending up to 20 mm. A CT scan of the urinary tract was performed; however, due to a high creatinine level, contrast was not used. Bilateral renal stones up to 5 mm in size were visualized. The right renal pelvis was dilated approximately up to 15 mm, and the left renal pelvis up to 11 mm. Masses of increased density were found in the lumen of the distal ureter of both ureters and the ureterovesical junction of the right ureter. Sizes were reported as 14mm/5mm on the left, approximately 10mm/4mm in the distal section of the right ureter, and 7mm/3mm. in the ureterovesical junction section. Urinalysis showed the presence of erythrocytes. Bilateral urinary tract obstruction secondary to stones in the ureteropelvic junction was confirmed. Ceftriaxone therapy was immediately stopped, and an urgent nephrostomy was placed in the left kidney by the urologist. Rehydration along with spasmolytics was initiated, achieving diuresis. The patient reported less abdominal pain, and the general condition improved. Chemical analysis of the calculus could not be performed due to the rapid elimination of the stones. After one week of the initial diagnosis, full elimination occurred, and no calculi were found on the follow-up ultrasound. The patient was subsequently discharged from the clinic.

| | | Reference Range |
|---|---|---|
| Hemoglobin | 13.5 | 12.4-16.4 g/L |
| Hematocrit% | 47 | 40-51 % |
| MCV | 82 | 80-96 fL |
| Red Cell Count | 4.6 | 4.00-5.50 10^12/L |
| White cell count | 7.5 | 5.0-10.0 10^9/L |
| Platelet count | 295 | 150-400 10^9/L |
| CRP | 5.6 | <6 mg/dl |
| ESR | 18 | <20 mm/hr |
| Creatinine | 5.72 | 1.0-1.72 mmol/l |
| BUN | 51.2 | 15 – 36 mg/dL |
| Urea | 110 | 7.01 – 16.8 mg/dL |

**TABLE 1: TABLE SHOWING THE PATIENT'S LABORATORY RESULTS**

CRP- c reactive protein, ESR- Erythrocyte sedimentation rate, BUN-Blood Urea Nitrogen

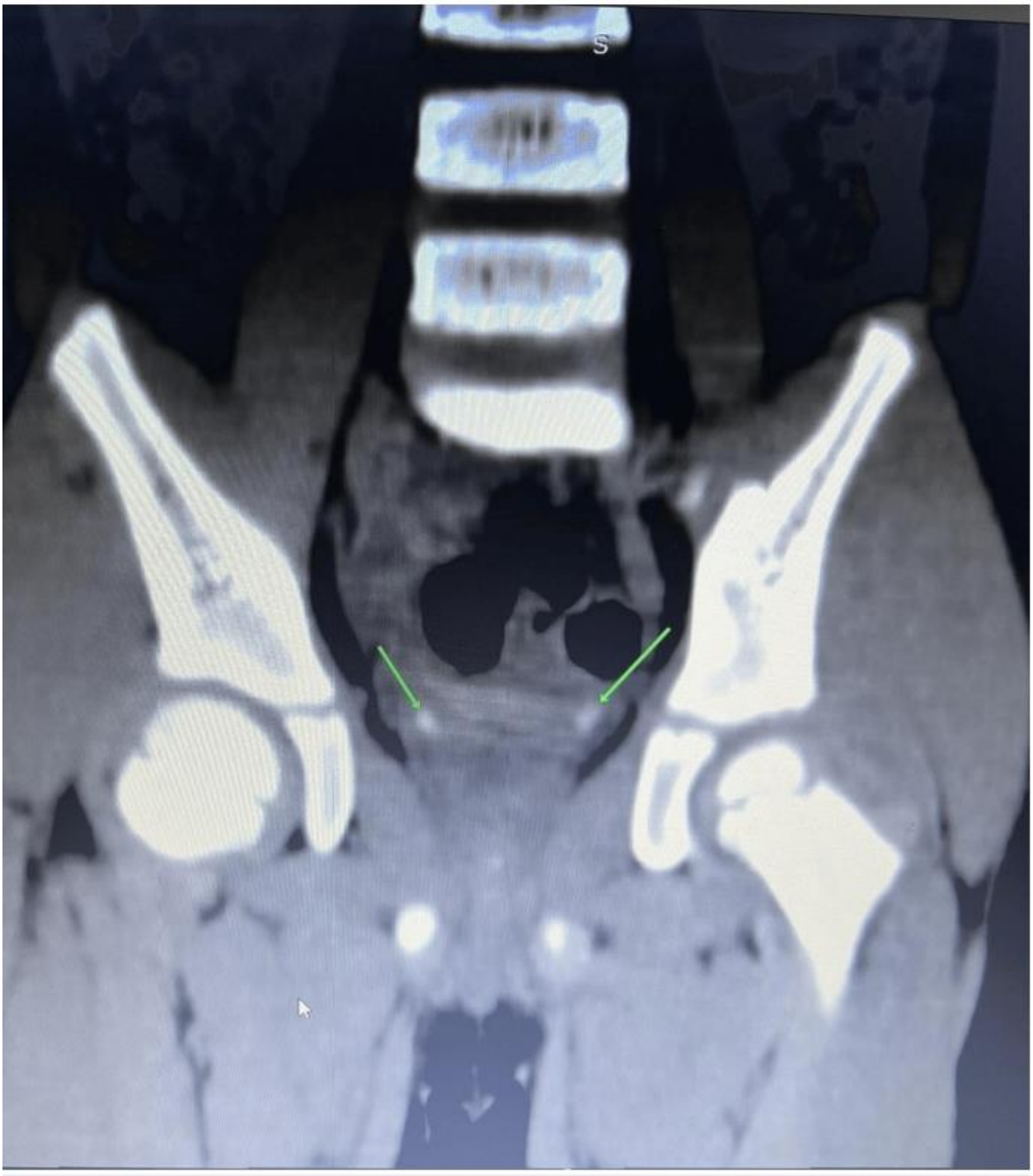


**FIGURE 1: CT scan of the patient.**

The green arrows indicate the presence of calculi.

## DISCUSSION

Nephrolithiasis occurs when crystallized material forms in the urinary system and affects approximately 11% of the United States population [3]. However, pediatric kidney stone disease is less common, with an estimated prevalence of about 1% [3]. The prevalence of urolithiasis is increasing globally in both pediatric and adult populations. Unfortunately, we were unable to find data regarding the prevalence of pediatric nephrolithiasis in Georgia. Causes of nephrolithiasis in children can be associated with metabolic disorders, urinary tract obstruction leading to urine stasis, and urinary tract infections [1-2]. Additionally, ceftriaxone-associated nephrolithiasis has been reported in the pediatric population. Ceftriaxone, a widely used third-generation cephalosporin for treating infections in children, is primarily excreted via urine, but a significant amount is secreted unmetabolized through the biliary system [5]. While biliary pseudolithiasis is a well-documented side effect of ceftriaxone therapy, an association between ceftriaxone and nephrolithiasis in children has also been reported [1-5]. Risk factors for ceftriaxone-associated nephrolithiasis include a positive family history, prolonged and high doses of ceftriaxone treatment, dehydration, and underlying conditions such as hypercalciuria and hypocitraturia. Manifesting generally 8-10 days after antibiotic initiation, ceftriaxone-associated nephrolithiasis is self-limited. Calculi elimination from the urinary system typically occurs within 5 days to 3 weeks after the cessation of treatment and does not usually result in long-term complications. These risk factors highlight the importance of monitoring and careful consideration when prescribing ceftriaxone in pediatric patients.

## CONCLUSION

Our case underscores that commonly used antibiotics such as ceftriaxone can lead to acute complications. Monitoring with ultrasound (US) may be a valuable solution in the pediatric population during ceftriaxone therapy. Increasing awareness among general practitioners is crucial, as any onset of abdominal pain or changes in urination after initiating ceftriaxone treatment could be indicative of a potential complication, particularly in children with heightened risk factors. Timely recognition and intervention are essential to guarantee the secure use of ceftriaxone, reducing the risk of adverse outcomes in pediatric patients.

Additional Information Disclosures Human subjects: Consent was obtained or waived by all participants in this study. I.tsitsishvili Children Clininc issued approval 101/12/NB. The local committee approval . Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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