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Case Report

Urinothorax, a rare complication of rupture renal calyx ☆

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ABSTRACT

Urinothorax is one of the rare causes of pleural effusion of extra-vascular origin, commonly presents with a transudative pleural effusion due to obstruction, injury or trauma to the genitourinary tract. It is not a common cause which increases the likelihood of underdiagnosis or misdiagnosis. Herein, we are presenting a 65-year-old gentleman who presented with urinary symptoms found to have urinothorax secondary to urinary tract obstruction by benign prostatic hypertrophy. This case was further complicated by urinoma and pyelonephritis. We are reporting this case to highlight the importance of including this entity in the differential diagnosis in patients who have pleural effusion especially if they presented with obstructive urinary symptoms.

Introduction

Urinothorax is defined by the presence of urine in the pleural space. Urinothorax causes transudative pleural effusion and may be under-recognized due to its rare presentation. Making the diagnosis is complicated when patients with coexisting conditions that also contribute to pleural fluid formation present with new or worsening pleural effusion [1]. The accumulation of urine in the pleural space is often caused by obstructive uropathy or injury to the genitourinary tract [1]. Multiple cases of urinothorax have been described in the literature. These cases have helped increase the awareness of the condition and improved diagnostic testing and availability of advanced imaging studies and scintigraphic techniques [2]. Herein, we describe a case of urinothorax in a patient with

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urinary tract obstruction caused by benign prostatic hyperplasia. This case was further complicated by urinoma and pyelonephritis.

Case presentation

A 65-year-old gentleman with a past medical history of benign prostatic hyperplasia, erectile dysfunction and recurrent UTI presented with complaints of nocturia, weak urinary stream and erectile dysfunction. He was examined by a urologist 3 months prior to admission. Digital rectal examination revealed an enlarged prostate with subtle left induration, tadalafil 5 mg daily was given but he was noncompliant with his medications. One week prior to his admission, he was complaining of dysuria, urgency and increased frequency of urination. He was diagnosed with a urinary tract infection and started on cephalexin 500 mg twice daily for 5 days.

On the day of presentation to the emergency department, he presented with complaints of difficulty in urination and decreasing urine output for 1 week duration. This was associated with nausea, vomiting and lower abdominal pain. He also reported shortness of breath on exertion and generalized weakness without chest pain. On initial evaluation, the patient was alert and oriented but tachypneic with a respiratory rate of 22 breaths per minute. He was afebrile, blood pressure of 165/86 was mm Hg and a heart rate of 110 beats per minute. On physical examination, auscultation of the lungs showed decreased air entry on the right lung with dullness to percussion and decreased transmission of vocal sounds in the right hemithorax. On exam, he also had a distended abdomen with mild tenderness in the lower abdomen and right costovertebral angle tenderness.

Laboratory test results revealed a total white cells count of 21,500/uL (normal range: 4400-11,000/uL), urea level 114 mg/dL (normal range: 6.0-24.0 mg/dL) and creatinine level 12.3 mg/dL (normal range: 0.6-1.2 mg/dL). Inflammatory markers revealed a C-reactive protein of 10.6 mg/dL (normal range: 0.0-0.8 mg/dL). Urinalysis revealed leukocytes 6-15 cells/high power field, red blood cells 3-15 cells/high power field, leukocyte esterase +2 mg/dL, nitrate negative. Computerized tomography (CT) of the chest, abdomen and pelvis showed a moderate to large right pleural effusion (Fig. 1), there is also increased infiltration of fat as well as a moderate amount of ill-defined fluid seen around the right kidney representing a ruptured calyx with resultant extravasation of infected urine around the right kidney in the setting of right pyelonephritis. The CT scan also showed fluid tracking into the extra peritoneal space of the lower abdomen (Fig. 2).

A foley catheter was inserted into the urethra with a urine output of 12,600 mL during the first 24 hours. On the next day creatinine decreased to 1.6 mg/dL (normal range: 0.6-1.2 mg/dL) and urea to 30.0 mg/dL (normal range: 6.0-24.0mg/dL). A diagnostic and therapeutic thoracentesis was performed with removal of clear light-yellow fluid with a urine-like smell. Pleural fluid analysis demonstrated pH 8.0, glucose 114 mg/dL, creatinine 1.7 mg/dL (serum level 1.6 mg/dL, pleural fluid/serum ratio: 1.06), lactate dehydrogenase 125 U/L (serum level 227 U/L, pleural fluid/serum ratio: 0.55), protein 0.8 g/dL (serum level 6.7 g/dL, pleural fluid/serum ratio: 0.12), amylase 41 U/L; pleural erythrocytes and leukocytes were 1683/mm^3 and 351/mm^3. Pleural fluid cultures were sterile and cytology was negative for malignant cells. Urinalysis of pleural fluid was consistent with the urinalysis of urine removed from the foley catheter. Urine cultures showed growth of <10,000 CFU/mL gram negative bacilli, blood cultures were sterile (the patient was under antibiotics treatment when he presented to the emergency room).

His symptoms were significantly improved after the relief of urinary obstruction by insertion of foley catheter and thoracocentesis. He was treated with Piperacillin/Tazobactam and Tamsulosin. Cystoscopy with TURP was done before discharge, showing significant lateral lobe prostate enlargement

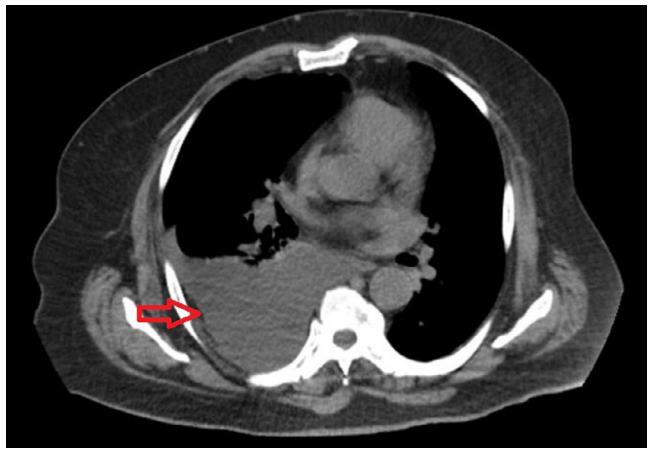

Fig. 1 – CT chest without contrast reveals large right-sided pulmonary effusion (red arrow).

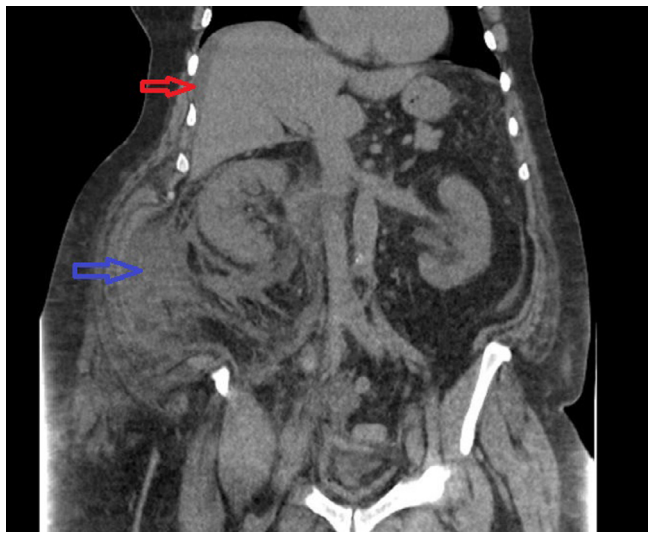

Fig. 2 – CT abdomen without contrast reveals increased infiltration of fat as well as a moderate amount of ill-defined fluid seen around the right kidney representing a ruptured calyx (blue arrow) with fluid tracking around the liver up to the diaphragm (red arrow).

and obstruction. The prostatic fossa was open following resection with overall improvement of symptoms.

Discussion

Pleural effusion of extra-vascular origin (PEEVO) refers to a pleural effusion that does not originate from the pleural vasculature. These effusions can either be transudative or exudative and urinothorax is 1 of the 5 causes of transudative PEEVO [3]. The other 4causes include: peritoneal dialysis; duropleural fistula; glycinothorax; and extravascular migration of a central venous catheter with saline or glucose infusion [4].

Urinothorax can be further classified into 2 types: obstructive uropathy or traumatic. Obstructive uropathy is often due to calculi, renal cysts, malignancy, retroperitoneal fibrosis or congenital malformations and traumatic often follows blunt renal trauma, renal transplantation, renal biopsy, ureteral instrumentation, ureteral surgery, percutaneous nephrolithotomy, extracorporeal shockwave lithotripsy or bladder laceration [5].

There are 2 theories regarding the mechanisms involved in the translocation of urine into the pleural space. Urine can either pass directly through diaphragmatic pores due to increased retroperitoneal or intraperitoneal pressure or indirectly by the communication between retroperitoneal and pleural lymphatics. A pleural effusion usually develops when the rate of accumulation of fluid in the pleural space exceeds the rate of pleural fluid removal by the parietal pleural lymphatics [4]. In this case, the urine most likely passed from the urinoma around the right kidney to the pleural space by the lymphatic connections.

Urinothorax is most commonly unilateral and ipsilateral to the affected kidney, with rapid accumulation of fluid in the pleural space [3]. Contralateral and bilateral urinothorax are rare but have been reported in the literature [5,6].

To establish the diagnosis of urinothorax, it is important to perform thoracentesis to evaluate the biochemical characteristics of the pleural fluid. The fluid is usually straw colored with the distinctive smell of urine [7]. Conventionally, urinothorax is considered to be transudative and has a low glucose level or low pH and a pleural fluid to serum creatinine ratio higher than 1 [8]. However, high LDH levels have been reported in multiple urinothorax cases. The effusion in these cases may be misclassified as exudative [1]. Urinothorax is the only transudate associated with low pH (less than 7.40). However, only half of cases have low pH; and the pleural fluid is rarely alkaline because of concomitant urinary tract infections caused by a urea-splitting organism such as *proteus* or *klebsiella* [4]. This can also be seen in this case where the presence of pyelonephritis likely caused the fluid to have an alkaline pH.

The pleural fluid to serum creatinine ratio in all patients with urinothorax had values higher than 1 when measured. In most cases the values were higher than 10. A pleural fluid to serum creatinine ratio higher than 1 is the hallmark of this condition and is highly sensitive (97.9%) but is not specific to urinothorax [1,7].

The diagnosis or urinothorax can be supported by imaging studies, such as abdominal ultrasonography and contrast enhanced computed tomography CT of the abdomen. These imaging modalities detect the presence of genitourinary tract pathology and underlying urinoma [4]. If the pleural fluid analysis and the radiographic studies are inconsistent with the diagnosis but clinical suspicion remains high, renal scintigraphy can detect the migration of urine from the genitourinary tract into the pleural space. There are multiple cases in the literature that report the detection of urine translocation by using technetium-99m DTPA, technetium-99m ethylene dicysteine (EC) and technetium-99m-mercaptoacetyltriglycine-3 renal scintigraphy [6,9,10].

Management of urinothorax requires multidisciplinary cooperation between urology, pulmonology and sometimes interventional radiology. Initial thoracocentesis may be helpful in relief of symptomatic dyspnea and prevention of infection, but the definitive treatment is to treat the cause. When the cause is treated, rapid resolution of the urinothorax occurs [4,10].

Conclusion

Although urinothorax is a rare condition, physicians should be aware of the potential for pleural effusion to occur in the setting of urinary tract obstruction, genitourinary tract injury or renal trauma. Understanding the characteristics of pleural fluid analysis in patients with urinothorax can aid in prompt diagnosis and treatment. Analysis will often show pleural fluid to serum creatinine ratio greater than 1, transudative effusion, and a pH less than 7.40. Although these are the most commonly seen fluid analysis results, cases have been reported of exudative effusion or an alkaline pH. When presented with a difficult case to diagnose, imaging studies are recommended to establish the etiology of genitourinary tract pathology. If suspicion is high, but pleural fluid lacks the typical characteristics or imaging studies lack the evidence of genitourinary tract pathology, renal scintigraphy can be used to confirm the diagnosis. Once a diagnosis has been made, treatment of the underlying pathology is usually sufficient for spontaneous resolution of urinothorax with or without pleural fluid evacuation.

Patient consent

Informed consent for publication of their case was obtained from the patient(s).

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