



Case report

Urine in the lung: An uncommon cause of transudative pleural effusion

Abigayle Sullivan^{a,*}, Theresa Lanham^a, Nidrit Bohra^a, Brigid Ellis^b, Daron Kahn^c^a Department of Internal Medicine, Reading Hospital – Tower Health System, PA, USA^b Department of Nephrology, Reading Hospital – Tower Health System, PA, USA^c Department of Pulmonary and Critical Care, Reading Hospital – Tower Health System, PA, USA

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ABSTRACT

Urinothorax [UT], the accumulation of urine in the pleural space, is an uncommon cause of pleural effusions resulting from trauma, obstruction, or iatrogenic causes. Thoracentesis with pleural fluid analysis and evaluation of biochemical characteristics, such as pleural fluid creatinine (PCr) to serum creatinine ratio (SCr), is necessary to establish this diagnosis. This case illustrates a 93 year old man with a complicated past medical history including chronic kidney disease stage 4, adenocarcinoma of the prostate status post brachytherapy complicated by proctitis, high grade transitional cell carcinoma of the right kidney with right hydronephrosis, and recurrent hematuria who was hospitalized for worsening hematuria and suprapubic pain. The patients CXR showed a large right pleural effusion. A repeat thoracentesis was performed removing 1.85L clear yellow fluid. PCr and SCr were 4.1 mg/dl and 3.94 mg/dL respectively. This confirmed the diagnosis of UT with a PCr to SCr ratio of 1.04. Again, diagnosis requires pleural fluid analysis and is associated with a paucicellular, transudative effusion with an ammonia-like odor, acidotic pH less than 7.4, and a PCr to SCr ratio greater than 1.0. Management is dependent on correcting the underlying pathology, such as repairing traumatic GU injury or obstruction.

Financial disclosures

None.

Conflicts of interest

None.

Ethics approval

Our institution does not require ethics approval for reporting individual cases or case series.

Informed consent

Written and verbal informed consent were obtained from the patient for their anonymized information to be published in this article.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were

generated or analysed during the current study.

1. Introduction

Urinothorax [UT], the accumulation of urine in the pleural space, is an uncommon etiology of pleural effusions resulting from trauma, obstruction, or iatrogenic issues [1–3]. This was first documented in 1968 and requires a high clinical index of suspicion [2]. Thoracentesis with pleural fluid analysis and evaluation of biochemical characteristics, such as pleural fluid creatinine to serum creatinine ratio, is necessary to establish the diagnosis [1–4]. UT is a rare but important diagnosis to keep in mind when evaluating pleural effusions, especially in the setting of trauma or recent urologic procedures.

1.1. Case details

A 93-year-old man with past medical history significant for chronic kidney disease stage 4, sick sinus syndrome status post permanent pacemaker placement, type 2 diabetes mellitus, adenocarcinoma of the prostate status post brachytherapy complicated by proctitis, high grade transitional cell carcinoma of the right kidney with right

* Corresponding author. Department of Internal Medicine Reading Hospital - Tower Health System, PA, USA.

E-mail address: abigayle.sullivan@towerhealth.org (A. Sullivan).



Fig. 1. CXR demonstrating moderate to large right pleural effusion with adjacent atelectatic changes of the right mid and lower lung fields.

hydronephrosis, and recurrent hematuria was hospitalized for worsening hematuria and suprapubic pain. Home medications at the time of presentation included furosemide 40 mg daily.

The patient was afebrile and hemodynamically stable. Blood pressure was 150/58 mmHg, and he was maintaining an oxygen saturation of 97% on room air. Clinical exam revealed gross hematuria requiring continuous bladder irrigation and he had decreased breath sounds on the right. Chest radiograph (CXR) showed a moderate to large right pleural effusion [Fig. 1]. Computed tomography (CT) of the abdomen and pelvis illustrated moderate to severe right-sided hydronephrosis and hydroureter with a heterogeneous density within the right renal pelvis and diffuse mural thickening in the posterior and right lateral urinary bladder walls [Fig. 2].

An ultrasound guided thoracentesis was performed the following day with the removal of 2 L of clear yellow fluid. The analysis demonstrated a pH 7.423 (ref: 7.6–7.660), LDH 48 (ref: <50% plasma LDH) IU/L, glucose 164 (ref: normal glucose plasma range) mg/dL, protein <3.0 (ref: <3.0) g/dL, and pleural fluid creatinine 2.5 mg/dL. Cytology was negative for malignancy. Serum creatinine was 2.59 (ref: 0.6–1.30) mg/dL resulting in a pleural fluid to serum creatinine ratio of 0.96. Of note, the serum creatinine was 2.34 mg/dL the following morning, which would result in a ratio greater than one.

He underwent cystoscopy with transurethral resection of bladder mucosal abnormality posteriorly, bilateral retrograde ureteropyelograms with right ureteral stent placement, and visual internal urethrotomy of bulbomembranous urethra in very close proximity to the external striated sphincter. Unfortunately, despite these interventions a renal ultrasound showed persistent dilation of the right renal collecting system with hypochoic material within the system concerning for

combination of solid mass and hemorrhage.

A repeat thoracentesis was performed ten days later, yielding 1.85 L of clear yellow fluid. Pleural fluid creatinine and serum creatinine were 4.1 mg/dl and 3.94 mg/dL respectively, supporting the diagnosis of urinothorax with a pleural to serum creatinine ratio of 1.04. The patient declined further urologic or oncologic interventions, opting for indwelling right pleural catheter placement and was transitioned to a skilled nursing facility.

2. Discussion

Urinothorax is a rare cause of pleural effusions first recognized in canines in 1968 by Corriere et al. [5]. True prevalence is unknown as only case reports are available in the literature. The development of urine in the pleural space is due to a mismatch of the rate of pleural fluid accumulation and the rate of reabsorption via pleural lymphatics [1]. This accumulation occurs by a direct or indirect mechanism. Direct mechanisms include migration of urine into the pleural space through diaphragmatic pores due to the difference in intraabdominal versus intrathoracic pressure gradient. In addition, urine can transfer directly into the mediastinum after rupture of a urinoma, a collection of urine in the retroperitoneal space. An indirect mechanism includes the passage of urine through the lymphatic system between the pleural space and the retroperitoneum [2,3,7].

The most common etiologies resulting in the development of a UT include trauma and obstructive uropathy. Other less common causes include lithotripsy complication, malignancy, gravid uterus, polycystic renal disease, and renal transplantation [7–9]. The etiology of UT in this case was regarded as either prostate obstruction versus high grade



Fig. 2. CT abdomen and pelvis showed moderate to severe right-sided hydronephrosis and hydroureter with a heterogeneous density within the right renal pelvis.

transitional cell carcinoma of the right kidney leading to obstruction. Despite placement of ureteral stent and normal post-void residual bladder volume, the patient's UT rapidly redeveloped suggesting that this patient's TU was due to transitional cell carcinoma of right kidney.

Primary presentation is often dyspnea associated with a new moderate to large pleural effusion. Toubes et al. reported that 64% of patients reporting dyspnea on admission presented with a UT occupying greater than two-thirds the hemithorax [2]. UT is most commonly ipsilateral to urologic pathology, however there are cases of bilateral or contralateral pleural effusions [1,2,10].

Diagnosis requires pleural fluid analysis and is typically associated with a paucicellular, transudative effusion, although cases of exudative effusions have been noted [1,8]. Fluid is often clear and yellow with ammonia-like odor, pH less than 7.4, a pleural fluid to serum creatinine ratio greater than 1.0, and a low LDH [1,3,4]. Although only half of reported cases has reported a low pH. Cases with atypical biochemical features have been reported as the fluid is dependent on the urine content and the possibility of concomitant pathologies producing a pleural effusion. In the event there is diagnostic uncertainty despite pleural fluid analysis, radioisotope renography utilizing Tc99m0-DTPA and Tc99m-MAG-3 is confirmatory [1,7].

Management is dependent on correcting the underlying pathology, such as repairing traumatic GU injury or obstruction. Diagnostic thoracentesis is therapeutic for those symptomatic but will redevelop until the causative process is corrected. In our case, the patient redeveloped a UT as the obstruction was not completely relieved. Notably, pleurodesis has not been found to be of benefit [8].

3. Conclusion

UT is an uncommon diagnosis important consider when evaluation a

new pleural effusion, especially in the setting of urologic pathology or procedures. It can be missed if there are several etiologies, as typical pleural fluid analysis can be skewed. Ultimately, a pleural fluid to serum creatinine ratio greater than 1.0 is highly specific for this diagnosis and is recommended for workup.

Declaration of competing interest

Neither financial nor non-financial competing interests.

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