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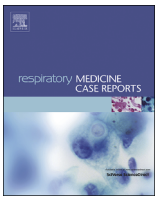

Case Report

Malpositioned nephrostomy tube with associated hemorrhagic pleural effusion

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ABSTRACT

Pleural effusion of extra-vascular origin has a large differential diagnosis. Ultrasonography can be utilized alongside pleural fluid analysis to determine a pleural effusion's complexity and size, thus helping aid in both diagnostic and therapeutic management.

We describe the case of a 38-year-old male with a prior medical history of neurogenic bladder and nephrolithiasis with percutaneous nephrostomy tube placed one week prior to presentation. Using ultrasonography, the nephrostomy tube was determined to be positioned within the pleural cavity with a resultant hemorrhagic pleural effusion.

1. Introduction

Pleural effusion of extra-vascular origin (PEEVO) is an entity with a large differential diagnosis. Its origin is typically defined as the movement of extrapleural fluid into the pleural space. As with other effusions, it may be either transudative or exudative, simple or complex. In almost all cases, treatment of the underlying condition leading to the effusion is the mainstay of therapy. Pleural fluid sampling and analysis can greatly assist the underlying diagnosis, however a proportion of patients have recurring effusions that require multiple drainage procedures prior to a diagnosis. Ultrasonography is an essential tool in both diagnosis and management of pleural effusion. In addition to evaluating the pleura, lung parenchyma, and fluid itself, it is also essential in assisting with invasive procedures in the chest cavity to sample fluid or definitively manage it.

We describe a case of a patient with abrupt development of pleural effusion after nephrostomy tube replacement, with ultrasonography being uniquely essential to determining the cause of the effusion.

2. Case presentation

A 38-year-old male with a prior medical history of cerebral palsy, neurogenic bladder with suprapubic catheter, and nephrolithiasis with a left percutaneous nephrostomy tube presented to the hospital with severe chest pain. Approximately one week prior to this presentation he was hospitalized for a left sided cystolithoalopexy, suprapubic catheter exchange, and L percutaneous nephrostomy tube replacement with access tract dilation. The patient on presentation described chest pain with pleurisy, burning in nature. He had no known sick exposures, cardiac, or pulmonary disease history. Initial evaluation included an electrocardiogram without ischemic changes, and negative trended cardiac markers. A chest x-ray was obtained showing a new left sided pleural effusion with left lower

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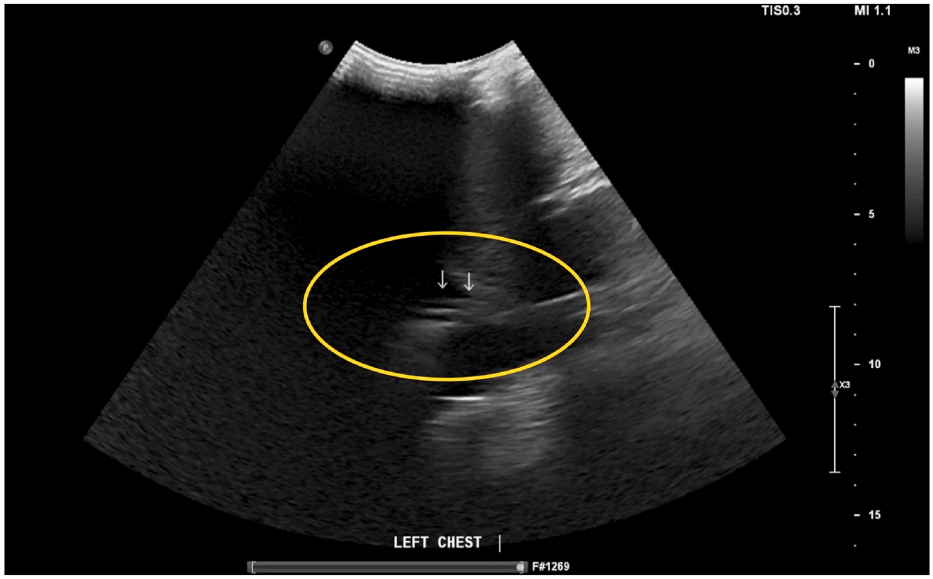

Fig. 1. Ultrasound of the patient's left diaphragm and pleural space showing a thin linear translucency with concern for foreign body (yellow circle with white arrows). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

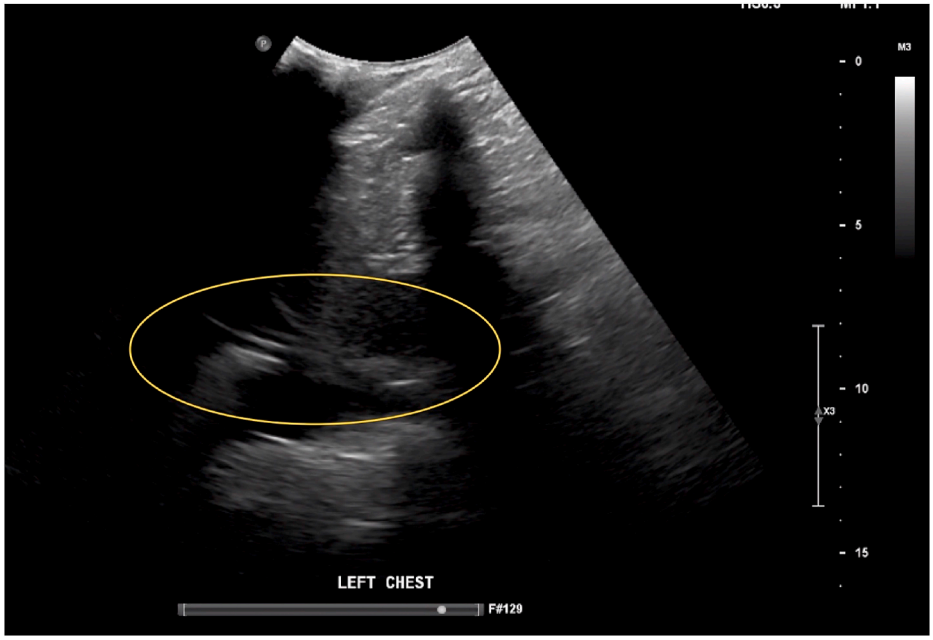

Fig. 2. Ultrasound of the patient's left diaphragm and pleural space showing a thin linear lucency traversing the course of the patient's diaphragm (yellow circle). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

lobe consolidation, new when compared to an unremarkable chest x-ray just six days prior on his last discharge from the hospital. A thoracentesis was performed using ultrasound guidance. The effusion appeared moderate in size on ultrasound, with some heterogeneity. The procedure ended with 800mL of bloody appearing pleural fluid. Pleural fluid analysis revealed 5800 white blood cells (WBC) per cubic millimeter, 44% of those polymorphonuclear leukocytes and 33% lymphocytes, and 290,000 red blood cells (RBC) per cubic millimeter. Lactate dehydrogenase (LDH) was 515 IU/L (serum 139 IU/L), protein 5.4 g/dL (serum 8.0 g/dL), pleural creatinine 0.30 mg/dL (serum 0.39 mg/dL), and pH 7.39 – all consistent with an exudative effusion without complication. Approximately 24–48 hours after thoracentesis, the fluid reaccumulated in the left costophrenic angle when examined by chest x-ray. The decision was made to proceed with ultrasound guided pigtail thoracostomy placement. Prior to thoracostomy placement, both bedside and official ultrasonography revealed a thin linear echodensity in the pleural space (Figs. 1 and 2) – concerning for the nephrostomy tube which was placed just one week earlier. Pleural fluid analysis after thoracostomy placement was similar to that from the thoracente-

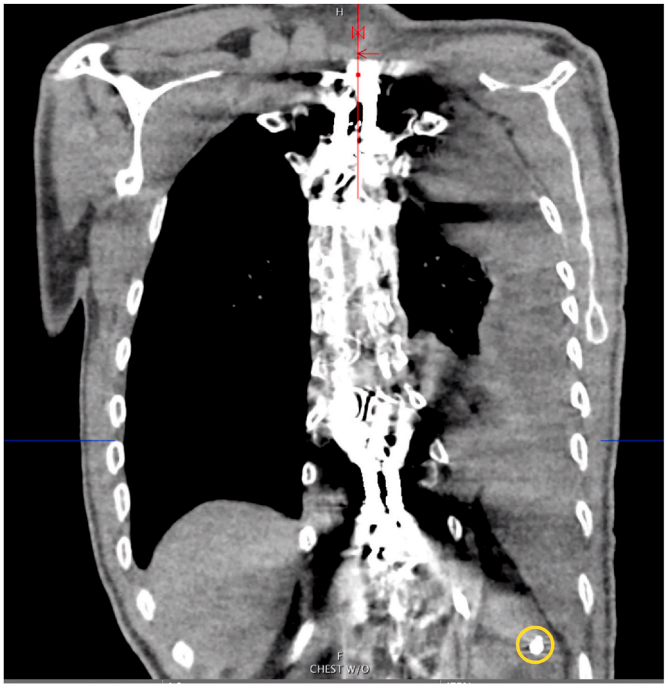

Fig. 3. Coronal view of computerized tomography of the chest without intravenous contrast demonstrating a foreign body at the level of the patient's left diaphragm (yellow circle). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Fig. 4. Transverse view of computerized tomography of the chest without intravenous contrast demonstrating a linear foreign body at the level of the left diaphragm (yellow circle). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

sis. A computed tomography scan of the chest without intravenous contrast was performed, confirming the nephrostomy placement in the posterior aspect of the costophrenic sulcus (Figs. 3 and 4). Given the makeup of the pleural fluid, as well as the imaging findings, a diagnosis of a hemorrhagic exudative pleural effusion was made. Given the patient's significantly diminished muscle mass, it was unclear if he met the criteria for true urinothorax, or if he simply had a traumatic effusion. Both the interventional radiology and urology teams were consulted, and a multidisciplinary plan was created to surgically remove the obstructing stones in order to expedite removal of the malpositioned nephrostomy tube.

3. Discussion

Pleural effusions of extra-vascular origin (PEEVO) are defined by migration of extrapleural fluid to the pleural space. They can be classified as either exudative or transudative. Etiologies of transudative PEEVO include atelectasis, heart failure, hepatic hydrothorax,

hypoalbuminemia, nephrotic syndrome, peritoneal dialysis, urinothorax, or malpositioned venous catheters. Exudative PEEVO can be caused by chylothorax, bilothorax, malpositioned feeding tubes, esophageal or gastric perforation, hypothyroidism, malignancy, pulmonary embolism, sarcoidosis, nonexpendable lung, and superior vena caval obstruction.

This patient presented with a pleural effusion of unclear etiology. Given recent genitourinary (GU) tract manipulation, nephrostomy tube shown above the diaphragm, and serum creatinine approaching the pleural creatinine close to a ratio of 1.0, and RBC count of 290,000, the diagnosis of hemorrhagic exudative pleural effusion was made. There was question of whether or not this patient met criteria for urinothorax. Given this patient's nephrostomy tube tract dilation into the pleural space through the diaphragm, it is difficult to determine if the patient truly had urine leakage into the pleural space with associated inflammation, rather than simply traumatic effusion, or even fistulization secondary to diaphragmatic rupture from the tube [1,2]. Given the potential for genitourinary tract contamination of the pleural space, given the unknown final position of the nephrostomy tube, it was decided not to manipulate the tube. The usage of agitated saline or a bubble study in these situations has not been published before, but in theory could have been performed to assist in visual identification.

Urinothorax is typically due to a result of obstruction or injury to the GU tract leading to transfer of fluid to the pleural space. The diagnosis is typically transudative with a pleural fluid to serum creatinine ratio greater than 1.0 [1]. In this patient, the ratio was 0.77. The utility of this ratio is unclear given this individual patient's history of cerebral palsy and a baseline low creatinine due to low body muscle mass putting into question whether or not this was true urinothorax. Pleural fluid studies in patients of extremely low muscle mass or cachexia has not been well studied. Very few cases of urinothorax have been reported due to attempted nephrostomy tube placement. One case series reports less than 10% of urinothorax cases being secondary to a malpositioned nephrostomy tube [2].

In the workup of any pleural effusion, including urinothorax, computerized tomography (CT) and ultrasonography play an important role in diagnosis. Typically, a nuclear radiotracer scan (Tc99m) is utilized to confirm radiolabeled translocation of albumin into the pleural space, however this has an unknown positive and negative predictive value [1]. Ultrasonography, however, has been shown repeatedly to serve as essential in the diagnosis and evaluation of both pleural effusions and renal disease [3,4]. It has been found to have superior sensitivity, specificity, and accuracy compared to chest x-ray, and has been found to be quite similar to that of computed tomography as the gold standard. In this case, ultrasonography was crucial [4]. A small linear density was seen traversing the pleural space and likely across the diaphragm, which was corroborated by CT scanning of the chest. Some studies describe how important the visualization of linear densities by ultrasonography is when planning for percutaneous foreign body removal. One study describes the usefulness of associated percutaneous ultrasonography leading to foreign body removal success in nearly 100% of all cases [5].

Declaration of competing interest

On behalf of all authors, the corresponding author declares that there are no conflicts of interest002E.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rmcr.2022.101798.

References

[1] A. Austin, S.N. Jogani, P.B. Brasher, R.G. Argula, J.T. Huggins, A. Chopra, The urinothorax: a comprehensive review with case series, Am. J. Med. Sci. 354 (2017) 44–53, https://doi.org/10.1016/j.amjms.2017.03.034.

[2] M.E. Toubes, A. Lama, L. Ferreiro, A. Golpe, J.M. Álvarez-Dobaño, F.J. González-Barcala, E.S. José, N. Rodríguez-Núñez, C. Rábade, T. Lourido, L. Valdés, Urinothorax: a systematic review, J. Thorac. Dis. 9 (2017), https://doi.org/10.21037/jtd.2017.04.22.

[3] P.Z. Svigals, A. Chopra, J.G. Ravenel, P.J. Nietert, J.T. Huggins, The accuracy of pleural ultrasonography in diagnosing complicated parapneumonic pleural effusions, Thorax 72 (2017) 94–95, https://doi.org/10.1136/thoraxjnl-2016-208904.

[4] B. Shkolnik, M.A. Judson, A. Austin, K. Hu, M. D'Souza, A. Zumbrunn, J.T. Huggins, R. Yucel, A. Chopra, Diagnostic accuracy of thoracic ultrasonography to differentiate transudative from exudative pleural effusion, Chest 158 (2020) 692–697, https://doi.org/10.1016/j.chest.2020.02.051.

[5] J.L. del Cura, I. Aza, R.M. Zabala, M. Sarabia, I. Korta, US-Guided localization and removal of soft-tissue foreign bodies, Radiographics 40 (2020) 1188–1195, https://doi.org/10.1148/rg.2020200001.