

# Urine in the Pleural Space – Urinothorax Causing Massive Pleural Effusion as a Rare Complication of Percutaneous Nephrolithotomy

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## Abstract

Urinothorax is a rare condition which is defined as collection of urine in the pleural space due to retroperitoneal leakage of urine into the pleural space. It is a rare cause of transudative pleural effusion. It is usually obstructive or traumatic in etiology. It is a rare complication associated with percutaneous nephrolithotomy (PCNL). We report the case of a 29-year-old female who presented with massive pleural effusion that developed in the patient who had undergone PCNL for renal stones. Thoracocentesis was done, and creatinine levels in pleural fluids were measured for diagnosis of urinothorax. For diagnosis, awareness of condition and high degree of clinical suspicion is required. Imaging modality such as computed tomography of the abdomen is useful for allocation of anatomical defect causing retroperitoneal leakage of urine or urinoma. We highlight the importance of early diagnosis of urinothorax for prompt treatment of the underlying condition.

**Keywords:** Double-J stenting, percutaneous nephrolithotomy, pleural effusion, thoracocentesis, urinothorax

## INTRODUCTION

Urinothorax is defined as accumulation of urine in the pleural space, and is a rare cause of pleural effusion. It is considered a transudative cause of pleural effusion. Urinothorax was first described in 1968 by Corriere *et al.* in two patients, which was then described during experiments in mongrel dogs after obstruction of bilateral ureters.<sup>[1]</sup> It is generally secondary to trauma or obstructive causes such as renal stones.<sup>[1,2]</sup> It can also be caused by iatrogenic procedures such as percutaneous nephrolithotomy (PCNL), ureterorenoscopic lithotripsy, or shock wave lithotripsy. With the increasing awareness and better understanding of this entity, this condition is being recognized. Better availability of advanced imaging such as computed tomography (CT) or scintigraphy and further investigations such as biochemical examination of the pleural fluid helped in the earlier diagnosis of this entity.<sup>[3]</sup> Pleural fluid-to-serum creatinine ratio > 1 is the diagnostic criterion for urinothorax. In this report, we present the case of a 29-year-old woman who developed urinothorax as a complication of the procedure PCNL.

## CASE REPORT

A 29-year-old woman presented to the emergency room with complaints of progressive worsening of dyspnea and left-sided flank pain with decreased urine output for the past 4 days. She gave a history of undergoing left-sided PCNL 15 days prior for renal stone complicated with obstructive hydronephrosis. The procedure was uneventful with no associated complications. The patient was nondiabetic and nonhypertensive. On physical examination, she was tachypneic without the use of accessory muscles, with an oxygen saturation of 88% on room air. Other vital signs were normal. On auscultation, there were absent breath sounds and dullness to percussion over the left interscapular and infrascapular regions. On abdominal examination, the abdomen was slightly distended and tenderness was present over the left lumbar region with no signs of ascites.

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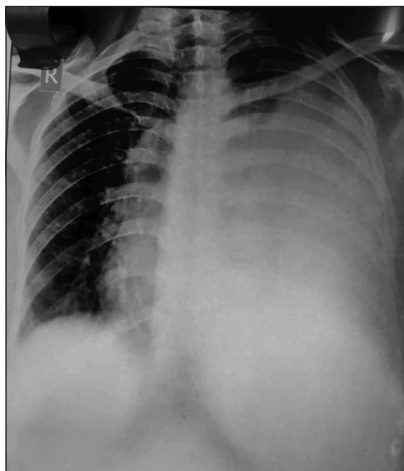
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Routine investigations were done which revealed hemoglobin of 10 g/dl, white blood count – 13,500 cells/mm<sup>3</sup>, blood urea nitrogen (BUN) – 32 mg/dl, serum creatinine – 1.9 mg/dl, serum glutamic-oxaloacetic transaminase – 22 IU/L, serum glutamic-pyruvic transaminase – 31 IU/L, serum bilirubin – 0.6 mg/dl, serum proteins – 6 g/dl, and serum lactate dehydrogenase (LDH) – 422 U/L. Electrocardiogram of the patient was normal.

The chest X-ray [Figure 1] showed left-sided massive pleural effusion and chest ultrasonogram confirmed left-sided massive pleural effusion with underlying atelectasis. Thoracocentesis was done which revealed light red-colored pleural fluid with a smell characteristic of urine. Pleural fluid analysis was done which revealed total protein of 0.6 g/dL which is transudative in nature, with pH 7.1, glucose 75 mg/dl, LDH 248 U/L, and creatinine 18.8 mg/dl. As per Light's criteria, pleural fluid LDH-to-serum LDH ratio <0.6 is hallmark for transudative pleural effusion. In this case, it was 0.58. Pleural fluid creatinine-to-serum creatinine ratio in our case was 9.8 (>1) confirming urinothorax. Bacteriological examination of the pleural fluid by Gram's stain showed no growth of any organism and no acid-fast bacilli by Ziehl-Neelsen stain. Nasopharyngeal swab was sent for COVID-19 reverse transcription-polymerase chain reaction which was negative. Intercostal tube was inserted for drainage of pleural fluid and the symptoms improved after tube thoracotomy.

The CT of the abdomen [Figure 2] revealed a communicating tract or anatomical defect between the left renal system and the left pleural cavity. Along with this, a calculus was present in the left ureter causing its dilatation. After consultation with a nephrologist, the patient was planned for double-J (DJ) stenting, thus the patient was referred to the nephrology department. On follow-up visit, after 5 days, the chest tube was removed. The hydroureter was resolved after the DJ stent was implanted and the renal profile was normal with BUN – 14 mg/dl and serum creatinine – 0.8 mg/dl. On subsequent follow-up visits, no evidence of recurrent pleural effusion was found.



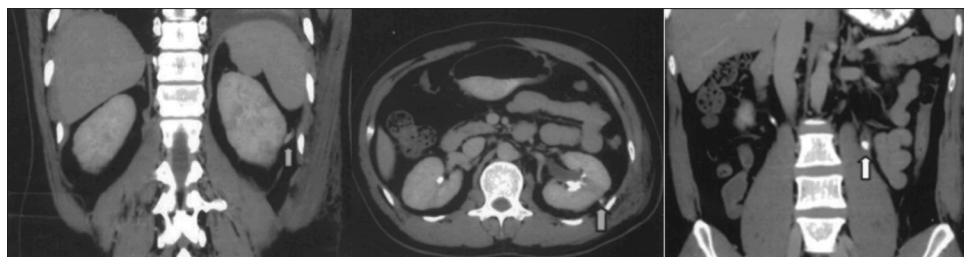
**Figure 1:** Chest X-ray showed left-sided massive pleural effusion

## DISCUSSION

Urinothorax is defined as accumulation of urine into the pleural space, and is an unusual cause of pleural effusion.<sup>[4]</sup> The most common etiology responsible for urinothorax is extravasation of urine from the reno-ureteric system causing the formation of urinoma. The etiologies can be classified as (i) obstructive urinothorax due to obstructive uropathy, (ii) traumatic urinothorax due to trauma to the genitourinary tract,<sup>[5]</sup> and (iii) iatrogenic urinothorax due to injury caused by iatrogenic procedures such as PCNL, ureterorenoscopic lithotripsy, or shock wave lithotripsy. From all the possible etiologies proposed, obstructive uropathy with hydronephrosis and associated injury of diaphragm with blunt abdominal trauma are the most common etiologies.<sup>[6]</sup> There are several obstructive or traumatic causes to the urinary tract reported for urinothorax such as benign prostatic hypertrophy, prostatic malignancy, urethral valves, renal and ureteric calculi, renal cysts, and renal transplantation.<sup>[7,8]</sup> It has been seen that pleural effusion is generally present on the same side of the obstructive uropathy, however, the presence of it on the contralateral side is not rare.<sup>[4]</sup> There are two theories proposed and debated regarding the mechanisms responsible for the transdiaphragmatic evasion of urine. Urine accumulation into the pleural space, can be either due to (1) the lymphatic drainage into the pleural space or (2) retroperitoneal fluid first entering into peritoneal space than through direct transdiaphragmatic passage into the pleural cavity.<sup>[9]</sup> As in our case, urinothorax was a complication of PCNL as an iatrogenic cause.

Urinothorax can present at any age, the median age being at 45 years. It generally has an acute presentation in the form of dyspnea, abdominal pain, and decrease in urine output. Furthermore, in the case of obstructive uropathy, it is often associated with fever and flank pain.<sup>[10]</sup> On examination, there are generally decreased respiratory movements on the affected side with dullness on percussion and absent breath sounds on auscultation. For the diagnosis of urinothorax, awareness and understanding about this entity is important for early diagnosis and treatment. As in our case, the patient's clinical presentation with massive pleural effusion and on thoracocentesis the distinctive ammoniacal smell like urine led to high clinical suspicion of urinothorax. In general, pleural fluid creatinine levels are not done, as urinothorax is a very unusual cause of pleural effusion. Common causes include infections, malignancies, and congestive heart failure. Mostly, the fluid is transudative according to Light's criteria, with biochemical features of low glucose, low protein, and low pH, but elevated LDH level.<sup>[11]</sup> The hallmark feature of urinothorax is the pleural fluid creatinine-to-serum creatinine ratio which is >1 and mostly >10.<sup>[3]</sup>

Imaging modalities are useful for diagnosis of urinothorax. A chest radiograph is helpful to diagnose massive pleural effusion on the ipsilateral side and sometimes on the contralateral side as well. Mediastinal shift can also be appreciated on chest X-ray. CT and ultrasound help in aiding



**Figure 2:** Contrast-enhanced computed tomography abdomen revealed a communicating tract or anatomical defect between the left renal system and the left pleural cavity (reno-pleural fistula). Along with this, a calculus was present in the left ureter causing its dilation (hydroneureter)

in the diagnosis of urinothorax by determining the underlying genitourinary or abdominal pathology causing retroperitoneal urinoma formation.<sup>[12]</sup> Contrast-enhanced CT helps in demonstrating the reno-pleural fistula or any other anatomical defect. On contrast-enhanced CT, during the excretory phase, contrast extravasation from the urinary tract helps to confirm the urinary leakage and urinoma formation which reveal attenuation equivalent to water.<sup>[4]</sup> Intravenous pyelogram and renal scintigraphy are the other modalities that help to reveal contrast extravasation from the urinary tract to the pleural space and thus help in the diagnosis of urinothorax. Technetium-99m renal scan also helps to confirm the diagnosis of urinothorax by revealing the presence of technetium-99m-labeled albumin from the genitourinary tract in the pleural space.<sup>[5]</sup>

Management of urinothorax requires a multidisciplinary approach with involvement of multiple specialists. It involves treatment of underlying etiology causing urinothorax. Thoracocentesis is done both diagnostically and therapeutically, but recurrence can be present until the main genitourinary pathology has been corrected. For the obstructed uropathy, DJ stenting is done to prevent the urinary leak and formation of retroperitoneal urinoma and reno-pleural fistula. It helps in the resolution of urinothorax and also prevents the recurrence.

## CONCLUSION

Urinothorax is a rare and unusual cause of pleural effusion. High degree of clinical suspicion is required when patients present with acute onset of dyspnea with urological symptoms, especially in obstructive uropathies and patients who underwent any urological or abdominal surgical procedures such as PCNL, ureterorenoscopic lithotripsy, or shock wave lithotripsy. Early diagnosis and management of the underlying urinary leak help in the favorable outcome of the condition.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Corriere JN Jr, Miller WT, Murphy JJ. Hydronephrosis as a cause of pleural effusion. *Radiology* 1968;90:79-84.
2. Garcia-Pachon E, Padilla-Navas I. Urinothorax: Case report and review of the literature with emphasis on biochemical diagnosis. *Respiration* 2004;71:533-6.
3. Handa A, Agarwal R, Aggarwal AN. Urinothorax: An unusual cause of pleural effusion. *Singapore Med J* 2007;48:e289-92.
4. Laskaridis L, Kampantais S, Toutziaris C, Chachopoulos B, Perdakis I, Tahmatzopoulos A, *et al.* Urinothorax-an underdiagnosed cause of acute dyspnea: Report of a bilateral and of an ipsilateral urinothorax case. *Case Rep Emerg Med* 2012;2012:395653.
5. Garcia-Pachon E, Romero S. Urinothorax: A new approach. *Curr Opin Pulm Med* 2006;12:259-63.
6. Leung FW, Williams AJ, Oill PA. Pleural effusion associated with urinary tract obstruction: Support for a hypothesis. *Thorax* 1981;36:632-3.
7. Laforet EG, Kornitzer GD. Nephrogenic pleural effusion. *J Urol* 1977;117:118-9.
8. Belis JA, Milam DF. Pleural effusion secondary to ureteral obstruction. *Urology* 1979;14:27-9.
9. Bhattacharya A, Sunil VH, Santosh K, Mittal BR. Urinothorax demonstrated on 99 m TC ethylene dicysteine renal scintigraphy. *Nephrol Dial Transplant.* 2007;22:1782-3.
10. Toubes ME, Lama A, Ferreiro L, Golpe A, Alvarez-Dobano JM, Gonzalez-Barcala FJ, *et al.* Urinothorax: A systematic review. *J Thorac Dis* 2017;9:1209-18.
11. Light RW, Macgregor MI, Luchsinger PC, Ball WC Jr. Pleural effusions: The diagnostic separation of transudates and exudates. *Ann Intern Med* 1972;77:507-13.
12. Chandra A, Pathak A, Kapur A, Russia N, Bhasin N. Urinothorax: A rare cause of severe respiratory distress. *Indian J Crit Care Med* 2014;18:320-2.