Singapore Med J 2007; 48(11) : e289

Urinothorax: an unusual cause of pleural effusion

Handa A, Agarwal R, Aggarwal A N

ABSTRACT

Urinothorax refers to the presence of urine in the pleural space secondary to obstructive uropathy, and is an unusual cause of pleural effusion. The importance of recognising this entity lies in the fact that the condition is completely reversible following relief of urinary tract obstruction. We describe a 35-year-old man who developed urinothorax following a percutaneous nephrolithotomy for renal calculi. We also reviewed the literature for reported cases between 1968 and 2006.

Keywords: hydrothorax, obstructive uropathy, pleural effusion, urinothorax

Singapore Med J 2007; 48(11):e289–e292

INTRODUCTION

Urinothorax refers to the presence of urine in the pleural space secondary to obstructive uropathy,[1] and is a rare cause of pleural effusion. The urine moves into the pleural space from the retroperitoneal space via the diaphragmatic lymphatics or through an anatomical defect in the diaphragm. The fluid is a transudate and often smells like urine. Several biochemical tests aid in the diagnosis, and these include low pleural fluid glucose, acidic pH and a pleural fluid-to-serum creatinine ratio that is greater than one. The importance of recognising urinothorax lies in the fact that the condition is completely reversible following relief of urinary tract obstruction. We report a 35-year-old man who developed urinothorax following a percutaneous nephrolithotomy for renal calculi.

CASE REPORT

A 35-year-old man, a known case of renal stone disease, presented to our centre with complaints of high grade fever, progressive shortness of breath and right-sided pleuritic chest pain of two weeks duration. The patient had undergone right-sided percutaneous nephrolithotomy for renal calculi two weeks earlier at a different centre. There was no history of cough, expectoration, dysuria, pyuria, haematuria or abdominal pain. There was no past history of pulmonary tuberculosis, pleural effusion or any other surgical procedure. On clinical examination, the patient was febrile (38.3°C) with a pulse rate of 112 beats/minute, blood pressure of 110/72 mmHg, and a respiratory rate of 33 breaths/minute. There was pallor, but no jaundice, pedal oedema, lymphadenopathy, icterus or clubbing. Examination of the respiratory system showed decreased movements, dull percussion note and absent breath sounds in the entire right hemithorax, consistent with massive pleural effusion. There were no adventitious sounds. Examination of the other systems, including the abdomen, cardiovascular system and nervous system, was normal.

Chest radiograph showed massive pleural effusion on the right side, and serial radiographs showed development of a loculated effusion. The biochemical profile, including serum electrolytes, renal and liver function, was normal. Complete blood count revealed haemoglobin of 8.5 g/dL, total leucocyte count 36,800/μL with predominant neutrophils, and a platelet count of 4.9×10^5/μL. Urinalysis showed 20–30 pus cells/high power field. Analysis of the pleural fluid showed a haematocrit of 2.1%, cell count 1,780/μL with predominant polymorphs, pleural fluid protein of 500 mg/dL, lactate dehydrogenase (LDH) of 100 U/L and glucose of 66 mg/dL (corresponding serum values: protein 7.2 gm/dL, LDH 100 U/L, glucose 89 mg/dL). Pleural fluid adenosine deaminase was 27 U/L. Gram stain and Ziehl-Neelsen stain were negative. Pleural fluid creatinine was 58 mg/dL against a serum creatinine of 1.3 mg/dL (ratio 44.6:1). Blood cultures, urine cultures and pleural fluid cultures were sterile.

Ultrasonography of the abdomen showed normal-sized kidneys with an intact pelvicalyceal system and no calculi. Computed tomography of the chest revealed right pleural effusion with thin septa and passive collapse of underlying lung. Technetium (Tc-99m) scintigraphy demonstrated a right-sided reno-pleural communication with rapid collection of radiotracer in the pleural cavity. A diagnosis of right-sided urinothorax following percutaneous nephrolithotomy and urinary tract infection was made. The patient was started on broad spectrum antibiotics (intravenous [IV] piperacillin-tazobactam 4.5 g six-hourly and IV amikacin 750 mg once daily). A 28 F intercostal tube drain was inserted in the right fifth intercostal space to

Department of Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Sector 12, Chandigarh 160012, India

Handa A, MBBS, MD, DM
Senior Resident

Agarwal R, MBBS, MD, DM
Assistant Professor

Aggarwal AN, MBBS, MD, DM
Associate Professor

Correspondence to:
Dr Ritesh Agarwal
Tel: (91) 172 278 4976
Fax: (91) 172 274 8215
Email: riteshpgi@gmail.com

Table 1. Clinical characteristics of patients with urinothorax described in literature (n = 47).

Clinical characteristics	No. (%)	95% confidence interval
Mean age (years)	45.95	37.57–54.33
Gender		
Male	30 (63.83)	49.54–76.03
Female	14 (29.79)	18.65–43.98
Not available	3 (6.38)	2.19–17.16
Aetiology		
Non-malignant obstruction	16 (34.04)	22.17–48.33
Malignant obstruction	11 (23.4)	13.6–37.22
Instrumentation	12 (25.53)	15.25–39.51
Trauma	5 (10.64)	4.63–22.59
Others	3 (6.38)	2.19–17.16
Site of urinothorax		
Ipsilateral to obstruction	35 (74.47)	60.49–84.75
Contralateral to obstruction	1 (2.13)	0.37–11.11
Bilateral with unilateral obstruction	3 (6.38)	2.19–17.16
Details not available	8 (17.02)	8.89–30.14
Urinoma or reno-pleural fistula (RPF)		
Urinoma	17 (36.17)	23.97–50.46
RPF	4 (8.51)	3.36–19.93
Both	4 (8.51)	3.36–19.93
None	7 (14.89)	7.41–27.69
Details not available	15 (31.91)	20.4–46.17
Treatment of urinothorax		
Relief of obstruction	31 (65.96)	51.67–77.83
Spontaneous resolution	4 (8.51)	3.36–19.93
Details not available	12 (25.53)	15.25–39.57

drain the massive pleural effusion. Intravenous urography did not reveal any obstruction at the side of the urinothorax. The trauma was thought to be caused by percutaneous nephrolithotomy that had spontaneously healed, and the patient did not require any further intervention. He improved with the above management and was discharged. At four weeks follow-up, the patient was asymptomatic, and clinical examination and chest radiograph was normal.

DISCUSSION

Urinothorax is a rare cause of pleural effusion that is due to the presence of urine in the pleural space in the setting of obstructive uropathy.[1,2] There is increasing awareness of this entity because of the availability of sophisticated imaging and scintigraphic techniques. This has led to a greater number of cases being diagnosed than in the past. Urinothorax occurs as a result of leakage of urine into the retroperitoneal space and formation of urinoma.[1] The urine then reaches the pleural space by diaphragmatic lymphatics or by passing through defects in the diaphragm.[3] The effusion is usually ipsilateral to the obstructed kidney. Contralateral or bilateral cases are rare.[2] The pleural fluid fulfils Light's criteria for a transudate, except for occasionally elevated LDH levels which may lead to misclassification as exudative effusion.[4] The fluid may also have low glucose and pH in most but not all cases. The only other causes of a transudative pleural fluid with low glucose and pH, are patients with hypoglycaemia and systemic acidosis, respectively. The diagnosis can be confirmed by finding pleural fluid-to-serum creatinine ratio that is greater than one, and in most cases, greater than ten.[5] Our patient had a transudative effusion with low sugar and a pleural fluid-to-serum creatinine ratio of 44.6:1.

Our MEDLINE search and review of the literature revealed 58 reported cases of urinothorax in the last four decades, excluding the present case. The references,[6-38] whose full text and/or abstract were available, were scrutinised and the salient features of 47 cases are presented in Table I. There were 11 cases (all non-English literature), whose articles or abstracts were not accessible for review.[39-45] Urinothorax was found to be associated with renal cysts,[6] nephrolithiasis,[13] blunt trauma to kidney,[33] bladder laceration,[8,27] retroperitoneal inflammatory fibrosis

and malignant process.[19] More recently, cases have been reported in the setting of interventions, including percutaneous nephrolithotomy,[37] nephrostomy,[32] extracorporeal shock wave lithotripsy,[31,34] renal transplantation,[19] ileal conduit surgery[15] and renal biopsy.[19] Most cases are unilateral and ipsilateral (n = 35) to the site of obstructive uropathy but has also been reported contralaterally[15] (Table I). Three cases had bilateral urinothorax following unilateral urinary tract obstruction/intervention.[18,27,31]

Recently, urinothorax has been classified as obstructive (urinothorax associated with a bilateral or a common distal obstructive disease) and traumatic (associated with an evident traumatic, usually iatrogenic, event).[5] In our patient, ipsilateral traumatic urinothorax followed percutaneous nephrolithotomy for nephrolithiasis, and was complicated by postoperative urinary tract infection. The presence of reno-pleural fistula can be demonstrated by use of various techniques (intravenous indigo carmine, intravenous pyelography, retrograde pyelography) including Tc-99m labelled DTPA renal perfusion scan.[18,37] Our patient showed a large right-sided reno-pleural communication with rapid collection of urine in right pleural space on scintigraphic imaging with Tc-99m labelled DTPA. Another interesting feature was the presence of loculated collections. In the setting of urinothoraces, loculations usually do not occur, but has been reported earlier by Parvathy et al,[33] in a case with blunt trauma abdomen with renal laceration leading to urinothorax. Our case also developed loculated effusion, possibly due to repeated thoracocentesis or infected urine collecting in pleural space, and was managed by intercostal tube drainage along with broad spectrum antibiotics.

In conclusion, the diagnosis of urinothorax requires a high index of suspicion and should be considered whenever pleural effusion occurs in the setting of urinary tract obstruction or a urological intervention. Most cases are ipsilateral and all reported cases are transudates by Light's criteria. Confirmation is by a pleural fluid-to-serum creatinine ratio greater than one. Relief of obstruction is therapeutic in most cases.

REFERENCES

1. Light RW. Update: management of the difficult to diagnose pleural effusion. Clin Pulm Med 2003; 10:39-46.
2. Sahn SA. Pleural effusions of extravascular origin. Clin Chest Med 2006; 27:285-308.
3. Light RW. The undiagnosed pleural effusion. Clin Chest Med 2006; 27:309-19.
4. Garcia-Pachon E, Padilla-Navas I, Dosda MD, Miralles-Llopis A. Elevated level of carcinoembryonic antigen in nonmalignant pleural effusions. Chest 1997; 111:643-7.
5. Garcia-Pachon E, Romero S. Urinothorax: a new approach. Curr Opin Pulm Med 2006; 12:259-63.
6. Corriere JN, Miller WT, Murphy JJ. Hydronephrosis as a cause of pleural effusion. Radiology 1968; 90:79-84.
7. Friedland GW, Axman MM, Love T. Neonatal "urinothorax" associated with posterior urethral valves. Br J Radiol 1971; 44:471-4.
8. Barek LB, Cigtay OS. Urinothorax--an unusual pleural effusion. Br J Radiol 1975; 48:685-6.
9. Laforet EG, Kornitzer GD. Nephrogenic pleural effusion. J Urol 1977; 117:118-9.
10. Lahiry SK, Alkhafaji AH, Brown AL. Urinothorax following blunt trauma to the kidney. J Trauma 1978; 18:608-10.
11. Belis JA, Milam DF. Pleural effusion secondary to ureteral obstruction. Urology 1979; 14:27-9.
12. Frantz P, Riquet M, Richard R, Chatelain C, Kuss R. [Urothorax]. J Urol Nephrol (Paris) 1978; 84:807-13. French.
13. Baron RL, Stark DD, McClennan BL, et al. Intrathoracic extension of retroperitoneal urine collections. AJR Am J Roentgenol 1981; 137:37-41.
14. Leung FW, Williams AJ, Oill PA. Pleural effusion associated with urinary tract obstruction: Support for a hypothesis. Thorax 1981; 36:632- 3.
15. Stark DD, Shanes JG, Baron RL, Koch DD. Biochemical features of urinothorax. Arch Intern Med 1982; 142:1509-11.
16. Redman JF, Arnold WC, Smith PL, Seibert JJ. Hypertension and urino-thorax following an attempted percutaneous nephrostomy. J Urol 1982; 128:1307-8.
17. Carcillo J Jr, Salcedo JR. Urinothorax as a manifestation of nondilated obstructive uropathy following renal transplantation. Am J Kidney Dis 1985; 5:211-3.
18. Ralston MD, Wilkinson RH Jr. Bilateral urinothorax identified by technetium-99m DPTA renal imaging. J Nucl Med 1986; 27:56-9.
19. Salcedo JR. Urinothorax: report of 4 cases and review of the literature. J Urol 1986; 135:805-8.
20. Nusser RA, Culhane RH. Recurrent transudative effusion with an abdominal mass. Urinothorax. Chest 1986; 90:263-4.
21. Miller KS, Wooten S, Sahn SA. Urinothorax: a cause of low pH transudative pleural effusions. Am J Med 1988; 85:448-9.
22. Capellier G, Gaussorgues P, Boyer F, Claud B, Robert D. [Diagnosis of post-traumatic pleural effusion]. Ann Fr Anesth Reanim 1989; 8:131-2. French.
23. Fokaefs E, Melekos MD. Pleural effusion associated with urinary extravasation due to renal colic. Br J Urol 1991; 68:435.
24. Liang DY, Tsai JS, Hsu SL. [Spontaneous rupture of the ureter with urinothorax: a case report]. Zhonghua Yi Xue Za Zhi (Taipei) 1992; 49:128-30. Chinese.
25. Gurtner B. [Urine in the wrong place: urothorax]. Schweiz Rundsch Med Prax 1994; 83:30-5. German.
26. Geraldía Lama M, León Jiménez A, Soler Regal C, Clavo Sánchez A. [Urinothorax: an infrequent cause of pleural effusion]. Med Clin (Barc) 1994; 103:439. Spanish.
27. Chanatry BJ, Gettinger A. Progressive respiratory insufficiency after cesarean section. Crit Care Med 1995; 23:204-7.
28. Hase T, Kodama M, Domasu S, et al. A case of urothorax that manifested as posttraumatic pleural effusion after a motorcycle crash. J Trauma 1999; 46:967-9.
29. Kamble RT, Bhat SP, Joshi JM. Urinothorax: a case report. Indian J Chest Dis Allied Sci 2000; 42:189-90.
30. Hendriks J, Michielsen D, Van Schil P, Wyndaele JJ. Urinothorax: a rare pleural effusion. Acta Chir Belg 2002; 102:274-5.
31. Oguzulgen IK, Oguzulgen AI, Sinik Z, et al. An unusual cause of urinothorax. Respiration 2002; 69:273-4.
32. Ray K, Rattan S, Yohannes T. Urinothorax: unexpected cause of a pleural effusion. Mayo Clin Proc 2003; 78:1433-4.
33. Parvathy U, Saldanha R, Balakrishnan KR. Blunt abdominal trauma resulting in urinothorax from a missed uretero-pelvic junction avulsion: case report. J Trauma 2003; 54:187-9.
34. Garcia-Pachon E, Padilla-Navas I. Urinothorax: case report and review of the literature with emphasis on biochemical diagnosis. Respiration 2004; 71:533-6.
35. Buyukcelik M, Satar N, Celik U, et al. An unusual cause of pleural effusion, urinothorax in a child with urinary stone disease. Pediatr Nephrol 2005; 20:1487-9.

36. Lee CC, Fang CC, Chou HC, Tsau YK. Urinothorax associated with VURD syndrome. Pediatr Nephrol 2005; 20:543-6.
37. Shleyfer E, Nevzorov R, Jotkowitz AB, et al. Urinothorax: An unexpected cause of pleural effusion. Eur J Intern Med 2006; 17:300-2.
38. Tortora A, Casciani E, Kharrub Z, Gualdi G. Urinothorax: an unexpected cause of severe dyspnea. Emerg Radiol 2006; 12:189-91.
39. Xue F. [Traumatic urothorax in childhood: report of 3 cases (author's transl)]. Zhonghua Wai Ke Za Zhi 1981; 19:561-2. Chinese.
40. Baldrati L, Zompatori M. [Hydronephrosis as a cause of pleural effusion]. G Clin Med 1981; 62:868-73. Italian.
41. Teyssier G, Chavrier Y, Allard D, et al. [Urothorax caused by traumatic rupture of the subpyelic ureter. Apropos of a case in a 5-year-old]. Pediatrie 1983; 38:37-41. French.
42. Leroy G, Dupuis F, Guy JP, et al. [Urothorax following total cystectomy]. Cah Anesthesiol 1984; 32:235. French.
43. Takase K, Ohya N, Kitagawa S, Maekawa Y, Matuda M. [A case of urinothorax]. Nihon Kyobu Shikkan Gakkai Zasshi 1985; 23:1059-64. Japanese.
44. Irisawa C, Yamaguchi U, Shiraiwa Y. A case of malignant lymphoma with urinothorax. Jpn J Clin Urol 1990; 4: 257-60.
45. Comiso EI, Roque CAM, Buxani NI, Agudera RT, Gatchalian ER. Urinothorax. Philipp J Urol 1999; 9: 98-101.