

The importance of gray scale and color Doppler ultrasonography in the diagnosis of spontaneous renal pelvis rupture: case report

Spontan renal pelvis yırtılması tanısında gri skala ve renkli Doppler ultrasonografinin önemi: olgu sunumu

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Abstract

Peripelvic extravasation associated with spontaneous rupture of renal pelvis is a rare occurrence, caused mostly by the obstruction due to calculus. However, the presence of renal anomalies increases the risk of rupture. Urinary extravasation leads to flank pain and may cause acute abdominal symptoms. Especially, the displacement of viscera by extravasated urine and the presence of gastrointestinal symptoms arising through intestinal reflex stimulation renders diagnosis more difficult. Ultrasonography, intravenous urography and computed tomography are the most efficient diagnostic tools in the diagnosis of pelvic renal rupture. In the present study, pre- and post-treatment radiological imaging findings of a case with renal pelvis rupture due to right ureter stone and the use of gray scale and color Doppler ultrasonography in the diagnosis has been discussed.

Key words: Pelvis; renal; rupture; spontaneous; ultrasonography.

Özet

Spontan renal pelvis yırtılması beraberliğinde peripelvik ekstrevasiyon nadir görülür ve genellikle taşa bağlı tıkanma sonucu gelişir. Ancak, renal anomalilerin varlığı yırtılma riskini artırmaktadır. Üriner ekstrevasiyon künt ağrı oluşturur ve akut karın semptomlarına neden olur. Özellikle, ekstrevasiyon idrar ile karın içi organların yer değiştirmesi ve intestinal refleks uyarılma ile gastrointestinal semptomların varlığı tanıyı zorlaştırır. Pelvik renal yırtık tanısında en etkili tanı araçları ultrasonografi, intravenöz ürografi ve bilgisayarlı tomografidir. Burada, sağ üreter taşına bağlı renal pelvis rüptürü olan hastanın tedavi öncesi ve sonrası radyolojik görüntü bulguları ve tanıda gri skala ve renkli Doppler ultrasonografinin kullanımı tartışılmıştır.

Anahtar sözcükler: Pelvis; renal; spontan; ultrasonografi; yırtık.

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Peripelvic extravasation associated with spontaneous rupture of renal pelvis occurs rarely and is frequently due to the obstruction caused by the stone.^[1-3] Trauma, iatrogenic causes and neoplasm may be considered other etiological factors.^[1,4] With the increase in pressure due to one of the above factors, spontaneous rupture may occur in a weak point of the collector system. Prognosis may vary depending on underlying pathology, renal damage, location of rupture, and the presence of infection.^[5-7] The aim of this report is to evaluate pre- and post-treatment radiological imaging findings of a case with renal pelvis rupture due to ureter stone and to evaluate the use of gray scale and color Doppler ultrasonography (USG) in the diagnosis.

Case report

A 38-year-old female patient was referred to radiology clinic for intravenous urography (IVU) and USG investigation with the complaint of right flank pain. The left psoas muscle was well-seen on the abdominal radiography, but the mid-portion and superior margin of the right psoas muscle was not visualized (Fig. 1a). Plain abdominal radiography and IVU showed opacities consistent with calculi at the diameter of approximately 5 mm, located in middle part calyx of right kidney and 1/3 section of right ureter. There were dilatations in proximal ureter secondary to right ureter stone, enlargement in right renal pelvis and grade 2-3 ectasia in caliceal

system. In addition, extravasated opaque substance collection was observed in peripelvic and perirenal area on the film obtained after 7 min (Fig. 1b-c). In USG examination, in addition to IVU findings, a defect (rupture) at the diameter of 4.5 mm and a urinoma at the size of 2x1 cm in peripelvic area were observed (Fig. 2a, b). In color Doppler examination, when a slight compression was made on the side of the urinoma, jet effect the site of rupture to renal pelvis was observed (Fig. 2c). One day later, double J catheter was inserted in to right collecting system with diagnosis of pelvic rupture and subsequently

abdominal computed tomography (CT) scanning was performed. Widespread free fluid areas in perirenal and retroperitoneal area were observed in CT examination (Fig. 3a). A few hours after the insertion of catheter, symptoms resolved markedly and in the control CT taken next day, it was observed that fluid was considerably resorbed with minimal fluid left around renal pelvis (Fig. 3b). General condition of the patient improved substantially and creatinine values and the amount of diuresis were normal. Patient was discharged in good clinical condition.

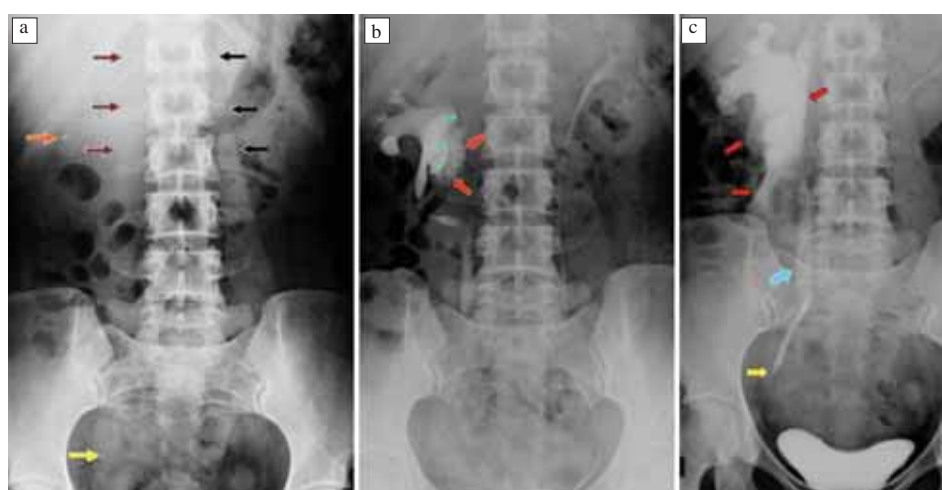


Figure 1

Radiographic images of spontaneous rupture of renal pelvis. (a) The left psoas muscle margin (black arrows) is normal and smooth; the right psoas muscle mid-portion and superior margin is not seen (red arrows). (b, c) In intravenous urography taken at 15th and 45th min, extravasation which increasingly grows larger in peripelvic and perirenal area is observed (orange arrow: renal stone, yellow arrow: ureteric stone, brown arrows: loss of the psoas muscle border, black arrows: left psoas muscle, green arrow: renal pelvis, red arrow: extravasated contrast material, blue arrow: dilated ureter).

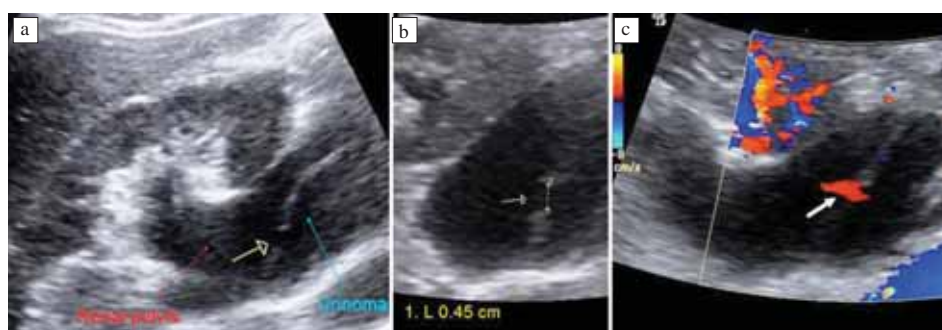


Figure 2

Spontaneous rupture of renal pelvis in USG. (a, b) A defect at the size of 4.5 mm (arrows) in renal pelvis is observed. (c) In color Doppler investigation, color flow to renal pelvis is observed associated with compression by urinoma (arrows: renal pelvis rupture).

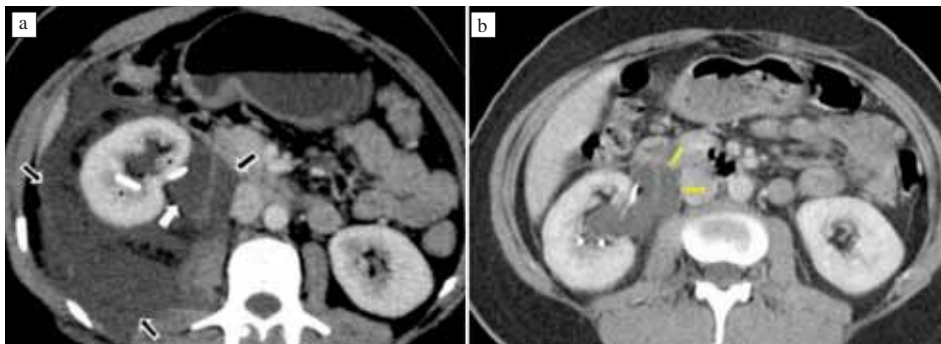


Figure 3

Computed tomography images of spontaneous rupture of renal pelvis. (a) In abdominal CT taken immediately after the insertion of double-J catheter, widespread free fluid areas are observed in perirenal area (black arrows: free fluid areas, white arrow: renal pelvis), (b) In abdominal CT taken one day after the insertion of Double-J catheter, minimal free fluid area is observed around pelvis (yellow arrows: minimal fluid around pelvis).

Discussion

Urine extravasation of kidney origin frequently occurs due to trauma. In addition, stones that cause urinary obstruction and increase intraluminal pressure, pelvic masses, pregnancy, retroperitoneal fibrosis, congenital anomalies, malignant diseases, and vesicoureteral reflux may also give rise to rupture.^[8-10] Its clinical presentation ranges from mild flank pain to acute abdominal symptoms.

Pain secondary to urine extravasation may be related to chemical peritonitis or infection. In some cases, the presence of gastrointestinal symptoms arising through the displacement of some visceral organs by extravasated urine and intestinal reflex stimulation may make diagnosis more difficult. Right-sided extravasation may particularly mimic cholecystitis, appendicitis and pyelonephritis. Spontaneous rupture of renal pelvis may rarely occur during pregnancy. Although this condition is usually associated with an underlying renal disease, it is also reported in the literature that rupture may develop without any renal pathology.^[11]

In the diagnosis of renal rupture, initially radiography and serial USG and subsequently IVU and CT are most beneficial tools. The plain abdominal radiography is readily available. Plain film of the abdomen may show a loss of retroperitoneal landmark (obliteration of the ipsilateral psoas shadow or renal outline), stone, and signs of paralytic ileus. However, most of these findings are nonspecific and bowel gas may obscure these findings.^[12] If a urine leak is sus-

pected, IVU may indicate the site and provide an estimate of the rate of leakage. Although IVU is simple and widely used, it exposes the patient to a relatively high dose of radiation, which is of special concern in children. In addition, it has to be used with caution in patients with compromised renal function; contrast medium-induced nephropathy and allergic reactions are also hazards.^[13] US can be used to confirm the diagnosis of kidney stones, hydronephrosis, the site of obstruction, and extravasated fluid; however ureteral stones may be missed due to the presence of obscuring bowel gas. US can be used in patients with an allergy to intravenous contrast, and is also useful in pregnancy, since there is no radiation to the patient or fetus. Unenhanced helical CT has been shown to be more sensitive in detecting and characterizing ureteral calculi and at least as sensitive in demonstrating the presence of obstructive uropathy.^[14] Additionally, CT may be performed rapidly, in approximately one-third the time of an IVU study, and does not require the use of intravenous contrast material. Contrast-enhanced CT with delayed images (obtained 5-20 min after contrast medium injection) shows contrast medium extravasation in the peripelvic, perinephric, or retroperitoneal spaces.^[3,15] An important consideration in choosing this modality is the significant radiation dose to the patient, compared to an IVU. This disadvantage restricts its use, especially in pregnant and pediatric patients. In this context, children and young adults will benefit most from the magnetic resonance urography advances. In obstetric patients, T2-weighted sequences might provide sufficient

information and thus eliminate the need for the use of contrast material and ionized radiation.^[16] In our case, above-mentioned findings of spontaneous renal pelvis rupture were present. However, it was remarkable in our case that USG demonstrated the location and size of rupture in renal pelvis and that in color Doppler examination, colored flow from the site of rupture was visible.

Urinomas at small size can be spontaneously resorbed without any need for drainage. At present, conservative treatment of spontaneous renal pelvis rupture by ureteral stent is successfully carried out.^[3,5,17] Double J catheter or percutaneous nephrostomy are urinary diversion methods to be used especially in the presence of small rupture. Surgical treatment is performed especially in cases diagnosed late and/or with large urinomas or those with concurrent pathologies that should be corrected surgically.^[12]

In conclusion, spontaneous pelvis rupture is a rare cause of acute flank pain and imaging methods, primarily IVU and CT are diagnostic. However, grey scale and color Doppler USG examination may give useful information about the location and wideness of rupture, and extravasated fluid in the selected cases like pregnancy, pediatric patients, and patients with contrast medium allergy.

Conflict of interest

No conflict of interest was declared by the authors.

References

1. Paaanen H, Kettunen J, Tainio H, Jauhiainen K. Spontaneous peripelvic extravasation of urine as a cause of acute abdomen. *Scand J Urol Nephrol* 1993;27:333-6.
2. Koga S, Arakaki Y, Matsuoka M, Ohyama C. Spontaneous peripelvic extravasation of urine. *Int Urol Nephrol* 1992;24:465-9.
3. Koktner A, Unal D, Dilmen G, Koc A. Spontaneous rupture of the renal pelvis caused by calculus: a case report. *J Emerg Med* 2007;33:127-9.
4. Spurlock JW, Burke TW, Dunn NP, Heller PB, Collins HS, Park RC. Calyceal rupture with perirenal urinoma in a patient with cervical carcinoma. *Obstet Gynecol* 1987;70:511-3.
5. Kaplan M, Aktoz T, Atakan İH. A rare cause of acute flank pain: spontaneous rupture of the renal pelvis. *Turk J Urol* 2009;35:256-9.
6. Schmidlin FR, Iselin CE, Naimi A, Rohner S, Borst F, Farshad M, et al. The higher risk of abnormal kidneys in blunt renal trauma. *Scand J Urol Nephrol* 1998;32:388-92.
7. McAleer IM, Kaplan GW, LoSasso BE. Congenital urinary tract anomalies in pediatric renal trauma patients. *J Urol* 2002;168:1808-10.
8. Ashebu SD, Elshebiny YH, Dahniya MH. Spontaneous rupture of the renal pelvis. *Australas Radiol* 2000;44:125-7.
9. Ferri E, Casoni G, Morabito G, Alonzo LD, Magrini L, Somma SD, et al. Rupture of the renal pelvis complicating a renal colic: report of a case. *Am J Emerg Med* 2006;24:383-5.
10. Fujita K, Sugao H, Tsujikawa K. Perinephric urinoma secondary to neurogenic bladder with vesicourethral reflux: report of an adult case. *Int J Urol* 2004;11:53-5.
11. Van Winter JT, Ogburn PL, Engen DE, Webb MJ. Spontaneous renal rupture during pregnancy. *Mayo Clin Proc* 1991;66:179-82.
12. Huri E, Ayyildiz A, Nuhoglu B, Germiyanoglu C. Spontaneous rupture and emergency repairment of the renal pelvis. *Int Urol Nephrol* 2007;39:413-5.
13. Kumar R, Gupta R, Khullar S, Sharma S, Marwah A, Agarwal S. The management of urinoma: the role of renal scintigraphy. *BJU International* 2000;85:1154-6.
14. Mostafavi MR, Ernst RD, Saltzman B. Accurate determination of chemical composition of urinary calculi by spiral computerized tomography. *J Urol* 1998;159:673-5.
15. Titton RL, Gervais DA, Hahn PF, Harisinghani MG, Arellano RS, Mueller PR. Urine leaks and urinoma: diagnosis and imaging-guided intervention. *Radiographics* 2003;23:1133-47.
16. Sudah M, Vanninen R, Partanen K, Heino A, Vainio P, Ala-Opas M. MR urography in evaluation of acute flank pain. *AJR* 2001;176:105-12.
17. Li W, Liu C, Wu W, Chou Y, Huang C, Li C. Rupture of renal pelvis in an adult with congenital ureteropelvic junction obstruction after blunt abdominal trauma. *Kaohsiung J Med Sci* 2007;23:142-6.

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