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CASE REPORT

Colonic Perforation during Percutaneous Nephrolithotomy Treated Conservatively

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ABSTRACT

Colonic perforation is a rare complication occurring during percutaneous nephrostomy. This report describes a patient with this complication, which was clinically silent. The patient was treated by conversion of the nephrostomy to a colostomy, followed by removal of the nephrostomy catheter. Similar cases reported in the literature have been treated conservatively. As colonic perforation is often contained in the retroperitoneum, the condition has a mild clinical presentation. This report discusses the anatomical variants and risk factors that contribute to colonic perforation, and outlines the principles of treatment without the need for surgical intervention.

Key Words: *Colon; Intraoperative complications; Nephrostomy, percutaneous; Risk factors*

中文摘要

經皮腎鏡取石術誘發結腸穿孔的保守治療

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結腸穿孔是經皮腎鏡取石術的少見手術併發症之一。本文報導一例存在該併發症但臨床表現隱匿的患者情況。術中首先將患者腎臟造瘺轉換為結腸造瘺，隨後拔除腎造瘺管。文獻報導中類似病例採取保守治療。由於結腸穿孔通常局限於腹膜外腔，因此患者臨床症狀較輕。本文將討論誘發結腸穿孔的解剖變異和危險因素，並歸納非手術治療的原則。

INTRODUCTION

The complication rate for percutaneous nephrostomy is 83%. Mild complications of extravasation and fever are common, while major complications of septicaemia and colonic or pleural injury are rare. Major complications of perforation or laceration to the organs adjacent to the kidneys have been reported in less than 1% of procedures.[1] Bowel transgression in percutaneous nephrostomy is an even rarer complication, occurring in approximately 0.3% of procedures.[2] This report describes a patient with colonic perforation, which was clinically silent.

CASE REPORT

A 46-year-old, otherwise healthy, Chinese woman presented to the emergency department in 2009 with left flank pain associated with dysuria for 10 days. The clinical impression was that of urinary tract infection. She underwent intravenous urogram, which showed marked left-sided hydronephrosis secondary to pelviureteric junction obstruction (Figure 1). Computed tomography (CT) confirmed the finding of left pelviureteric junction obstruction with no obstructing urinary tract calculi (Figure 2). There were no anatomical variants, namely

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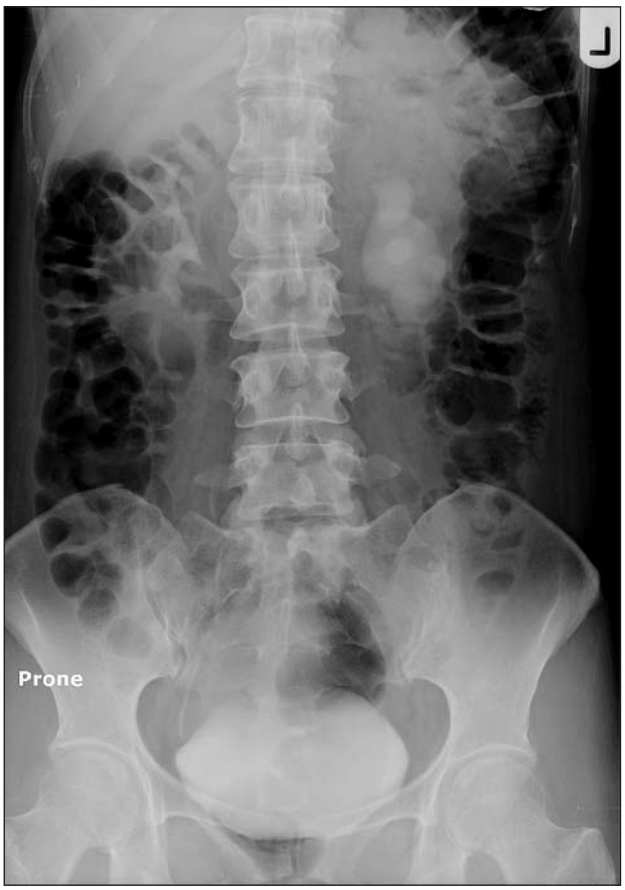

Figure 1. Delayed image of the intravenous urogram showing marked left-sided hydronephrosis with obstruction at the level of the pelviureteric junction. The large bowel shadow was prominent and filled with gas.

Figure 2. Computed tomography of the kidneys, ureter, and bladder confirmed a left pelviureteric junction obstruction, with no obstructing calculi detected.

horseshoe kidney or abnormal lie of the kidneys. Renal isotope study confirmed a poorly functioning left kidney, with obstruction at the left pelviureteric junction. Differential renal function was 17% on the left and 83% on the right.

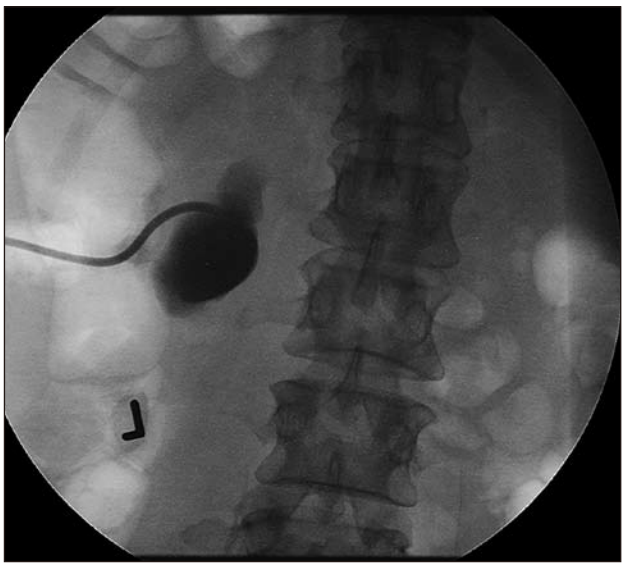

Figure 3. Uneventful left percutaneous nephrostomy.

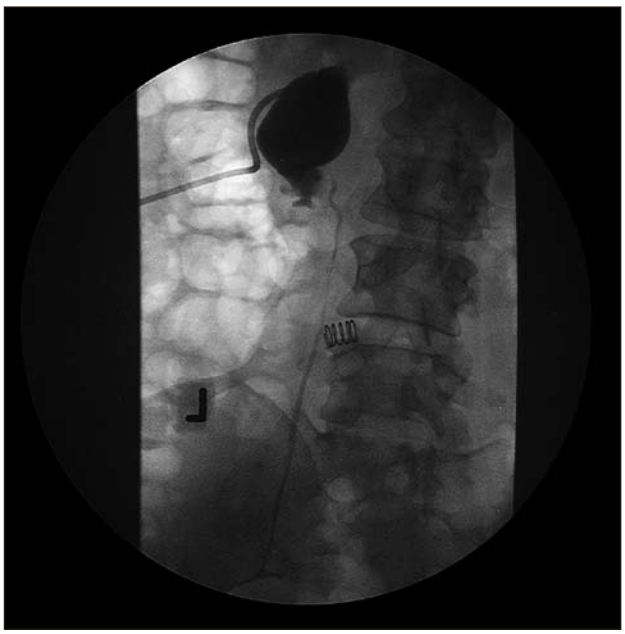

Figure 4. Antegrade pyelogram showing the percutaneous nephrostomy tube in a good position in the renal pelvis, with high-grade left pelviureteric junction obstruction. No extravasation of contrast was noted.

Percutaneous nephrostomy of the left kidney was performed under ultrasound guidance. A posterolateral approach was made with a 21-G needle directed into the lower pole calyx of the left kidney. Clear urine was aspirated. The tract was secured by AccuStick II set (Boston Scientific Corporation, Natick, USA). An 8-F locking pigtail Bard Navarre universal drainage catheter (Bard, Tempe, USA) was then deployed into the renal pelvis. The procedure was uneventful (Figure 3). An antegrade nephrostogram performed the following day showed high grade pelviureteric junction obstruction

with the percutaneous nephrostomy catheter in a good position in the renal pelvis (Figure 4). No extravasation of contrast was noted.

A left endopyelotomy was performed 3 weeks later through the left percutaneous nephrostomy tract, using the NephroMax High Pressure Nephrostomy Balloon Catheter system (Boston Scientific Corporation). The percutaneous nephrostomy tract was dilated up to 30-F, and a 30-F polytetrafluoroethylene sheath was inserted. The procedure was uneventful. The patient had an antegrade left Double J stent inserted 2 days later (Figure 5). An antegrade pyelogram was performed by injecting contrast through the indwelling Foley's nephrostomy catheter, with minimal contrast entering the ureter. A guidewire was negotiated across the pelviureteric junction into the ureter and bladder. The guidewire was exchanged for a Teflon wire, and an 8-F sheath was advanced over it into the renal pelvis. A 22-cm 7F DJ stent (Colopast, Humlebaek, DK, Denmark) was deployed. On completion of stent deployment, contrast was noted within the colon. A CT of the region of interest confirmed a transcolonic nephrostomy tract (Figure 6). The tract appeared to be mature, with no spillage of contrast into the retroperitoneum. The patient was asymptomatic during the entire procedure. It was concluded that there was inadvertent through and through puncture of the adjacent colon during the initial percutaneous nephrostomy.

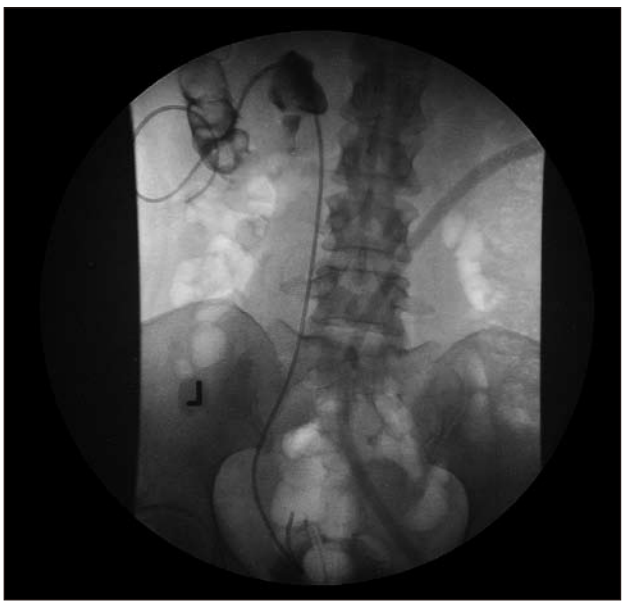

Figure 5. After antegrade Double J stent insertion, contrast had extravasated through the left percutanous nephrostomy tube into the ascending colon.

Figure 6. Computed tomography scan showing extravasation of contrast from the dilated left collecting system, through the left percutaneous nephrostomy tract, into the large bowel. The tract was mature, with no extravasation of contrast into the retroperitoneal space.

As the patient was asymptomatic, a decision was made for conservative management. Percutaneous nephrostogram on the following day showed good urinary drainage, with flow of contrast into the urinary bladder. The percutaneous nephrostomy was withdrawn into the colon, to be used as a percutaneous colostomy (Figure 7). A tube review was performed 4 days later, which confirmed closure of the colorenal fistula. The colon was opacified with air and contrast, and there was no further opacification of the pyelocolonic fistula (Figure 8). The drain was removed, and the patient was provided with broad-spectrum antibiotics of intravenous metronidazole, ceftriazone, and gentamicin. The patient was observed in the ward for another 2 days, before being discharged.

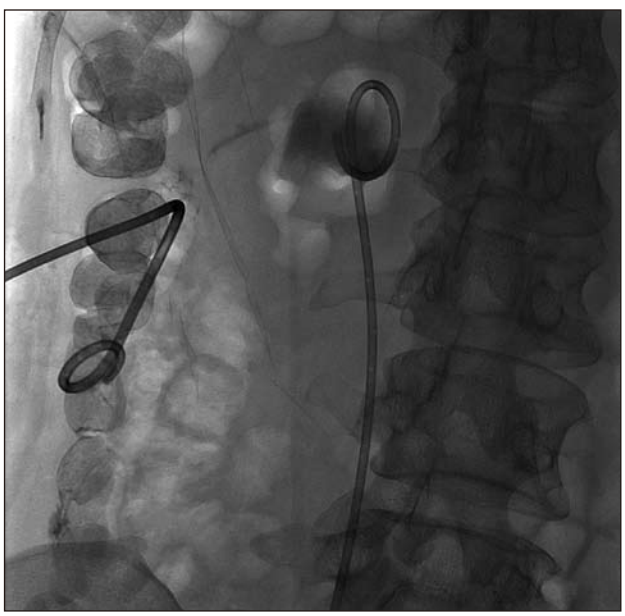

Figure 7. Antegrade nephrostogram showing good drainage of the urinary system.

Figure 8. Colostogram showing closure of the colorenal fistula.

DISCUSSION

There have been only a few reports of this rare complication.[2-5] A 10-year-old girl underwent percutaneous nephrostomy under sonographic guidance, and sustained iatrogenic colonic perforation, which was also treated conservatively.[3] Similarly, Juan et al reported a few patients with colonic perforation during percutaneous nephrolithotomy, who were also managed conservatively by stenting the urinary tract, using the percutaneous catheter as the colostomy tube, and giving broad spectrum antibiotics.[4] El-Nahas et al did a retrospective analysis of 5039 percutaneous nephrolithotomy procedures, and found that colonic perforation occurs in 0.3%.[2] Significant risk factors for this complication are advanced patient age and presence of a horseshoe kidney. These factors probably make visualisation of the kidneys difficult under ultrasound guidance, hence the increased complication rates. Goswani et al reported a patient with colonic injury during percutaneous nephrolithotomy in a horseshoe kidney, which was treated conservatively.[5] These authors concluded that CT imaging was necessary prior to percutaneous surgery for horseshoe kidney.[5] Maillet et al concluded that thin and young female patients, a markedly dilated pelvicalyceal system, and associated colonic obstruction are risk factors for colonic injury.[6] A significantly air-filled colon may prevent good visualization of the kidneys, and may also increase the chance of bowel interposition during percutaneous nephrostomy. Reported risk factors of comorbidities such as renal insufficiency, diabetes, gross obesity, and pulmonary disease increase the risk for complications,[7] all of which are likely to be attributable to poor visualization of the kidney under image guidance.

This patient was a thin middle-aged woman, who had relatively decreased perirenal fat, which would increase the chance of a posterior position of the colon. She also had a dilated pelvicalyceal system, which is a recognised risk factor for complications. These 2 factors could potentially displace the adjacent large bowel into a posterior position, and increase the chance of colonic transgression. This was evident on the CT scan, in which the dilated calyceal system displaced the bowel posterolaterally, due to the paucity of retroperitoneal fat. Awareness of these risk factors can potentially decrease the incidence of complications during the procedure.

The anatomical variant of a retrorenal colon can increase the risk of colonic perforation during percutaneous nephrostomy.[8] This variant, which lies along the path from the point between the punctures in the abdominal wall to the kidney, increases the risk of colonic injury. CT scan done before the procedure would be beneficial to evaluate this anatomical variant, which occurs in as many as 16% of patients;[1] ultrasound is not suitable for assessing the position of the colon.[8] Therefore, if a patient is assessed to have risk factors for a possible complicated percutaneous nephrostomy preoperatively, evaluation with CT is useful. One study has described percutaneous CT-guided nephrostomy as a reliable and safe procedure.[9]

Inadvertent colonic perforation during percutaneous nephrostomy is often clinically silent or presents with non-specific symptoms. Michel et al described a patient with colonic perforation after percutaneous nephrostomy, which was only apparent on removal of the nephrostomy.[7] The patient reported by Ohmori et al was similar to this patient, except for her age (10 years); the perforation was also clinically silent, and was discovered during a follow-up nephrostogram, which showed contrast in the bowel.[3] A patient with a perforation in a horseshoe kidney was also asymptomatic, and the perforation was discovered incidentally.[2] Most perforations were retroperitoneal and contained, which was also found in the case series of colonic perforation by El-Nahas et al.[2] This finding probably accounts for the mild clinical presentation.

This patient was treated conservatively, with relocation of the nephrostomy into the colon to become a colostomy tube, followed by removal of the colostomy tube at a later stage. The treatment principles involve establishing good distal drainage in the urinary and bowel systems. The Double J stent was placed in the left urinary drainage system, which ensured good

urinary flow. The contrast detected in the bowl on the antegrade nephrostogram showed no bowel obstruction. This would ensure no flow of urine or faecal material through the fistulous tract, thus facilitating healing and closure. This should be a step-wise conversion from a nephrostomy catheter to a colostomy catheter, before removal of the drain, to allow time for the fistulous tract to heal. Most of the patients with inadvertent colonic perforation were treated conservatively.[2,3,9] Surgical management with internal drainage was sometimes performed, but this approach entailed surgical risks. Hence, if inadvertent colonic perforation has occurred, a good outcome for conservative management can be achieved with early detection.

In summary, colonic perforation is a rare complication of percutaneous nephrostomy, occurring in less than 0.3% of patients. In patients with risk factors leading to poor visualization of the urinary system under ultrasound guidance, CT scan should be used to look for anatomical variants, such as a retrorenal colon or horseshoe kidney, to reduce the chance of inadvertent colonic puncture. This complication often has a mild clinical presentation as the perforation is often contained in the retroperitoneum. Early conservative management with the conversion of a nephrostomy to a colostomy, followed by removal of the catheter, can enable good healing of the fistulous tract with a good outcome.

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