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## CASE REPORT

# Pyeloduodenal fistula diagnosed with technetium-99m scintigraphy and managed with a conservative strategy

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**SUMMARY**

We present a case of pyeloduodenal fistula in an 89-year-old woman with history of nephrolithiasis and recurrent urinary tract infection (UTI) who presented to the emergency department with back pain. CT revealed a malrotated right kidney with a large renal stone and possible fistulous connection between the second portion of the duodenum and the right renal collecting system. Technetium-99m scintigraphy confirmed presence of the fistula. The patient declined intervention and was discharged from the hospital with oral antibiotic suppressive therapy. The patient remained clinically stable at time of follow-up 3 months later. Spontaneous pyeloduodenal fistula is an aetiology of recurrent upper or lower UTIs or persistent bacteriuria though uncommonly recognised. Diagnosis may be achieved using several modalities, including technetium-99m scintigraphy. Nephrectomy and primary fistula closure has traditionally been the treatment of choice for this condition; however, conservative management is an option for patients with intact renal function.

**BACKGROUND**

Pyeloduodenal fistula is an uncommonly diagnosed aetiology of recurrent urinary tract infections (UTIs), pyelonephritis and persistent bacteriuria. The clinical presentation of pyeloduodenal fistula includes upper and lower urinary tract symptoms and asymptomatic bacteriuria. The optimal modality for diagnosis of pyeloduodenal fistula is unclear and presents an opportunity for

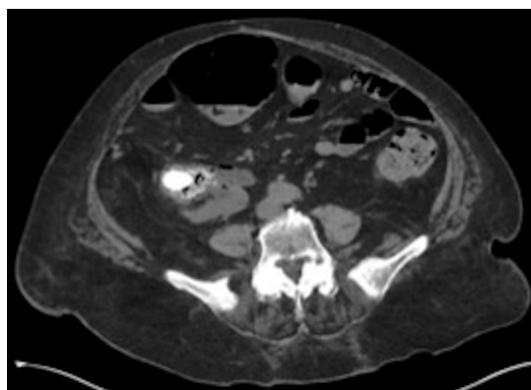
investigation. Early literature reported the retrograde pyelogram to be the diagnostic test of choice, though more recent studies have reported antegrade pyelogram, oesophagoduodenoscopy and contrast enhanced CT or upper gastrointestinal series as diagnostic options.<sup>1-4</sup> Our patient's pyeloduodenal fistula was confirmed using technetium-99m mercaptoacetyltriglycine (Tc-99m MAG3) scintigraphy, a modality which has been little studied for diagnosis of this condition. Treatment of pyeloduodenal fistula is similarly controversial. Early literature identified nephrectomy with primary fistula closure as the treatment strategy of choice. Recent literature has reported successful treatment through conservative management—a strategy which offers the benefit of kidney preservation. Tc-99m MAG3 scintigraphy offers a functional assessment of the affected kidney, information which may guide clinicians in the choice between invasive or conservative management<sup>5</sup>

**CASE PRESENTATION**

An 89-year-old woman with a history of nephrolithiasis and right kidney malrotation presented to the emergency department with low back pain radiating to her legs, progressively worsening over 1 week. The patient reported paroxysms of pain involving her lumbar region, with spasmodic cramping of bilateral buttocks and thighs. Her symptoms did not improve with ibuprofen and oxycodone, prompting her hospital visit. The patient was diagnosed with UTI by her primary care physician twice within the preceding 2 months. Urine cultures obtained at the time of each infection revealed identical strains of pansensitive *Escherichia coli* and *Enterococcus faecalis*; she was treated with oral amoxicillin on both occasions. She denied fever, chills, abdominal or suprapubic pain, dysuria, haematuria or pneumaturia. Her medical history included chronic kidney disease, asthma and ventral hernia complicated by incarceration and perforation requiring urgent right hemicolectomy 5 years ago.

**INVESTIGATIONS**

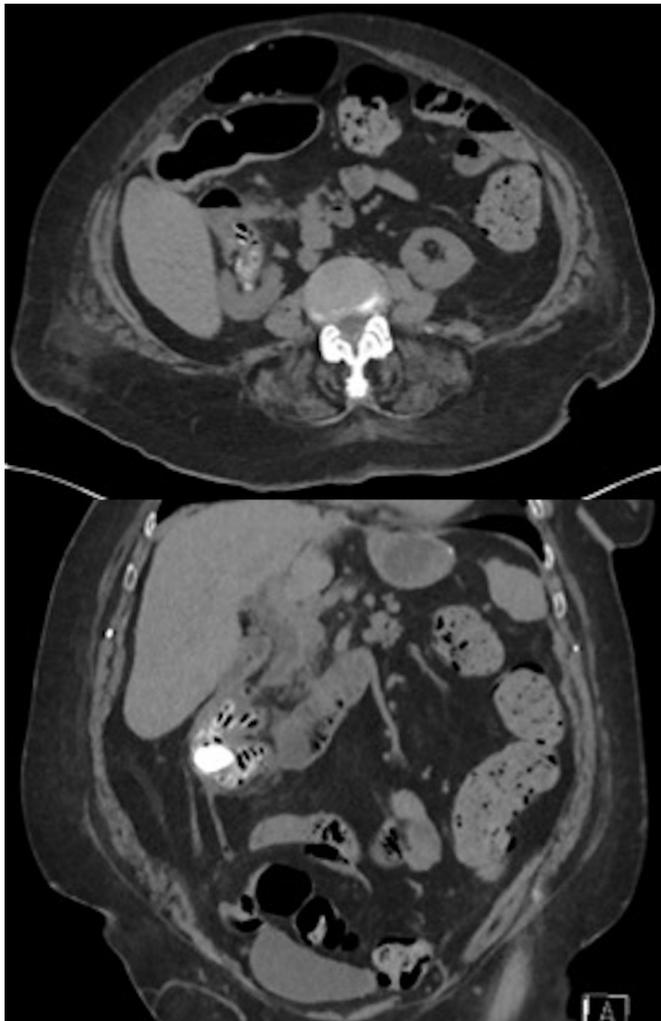
Physical examination revealed a well-appearing elderly patient in no acute distress. Her heart rate was 100 bpm, but vital signs were otherwise normal. The results of the physical examination were unremarkable except for myofascial tenderness involving the lumbar paraspinal region and



**Figure 1** CT scan of abdomen and pelvis reveals malrotated right kidney with a stone measuring 2.1×1.3 cm.

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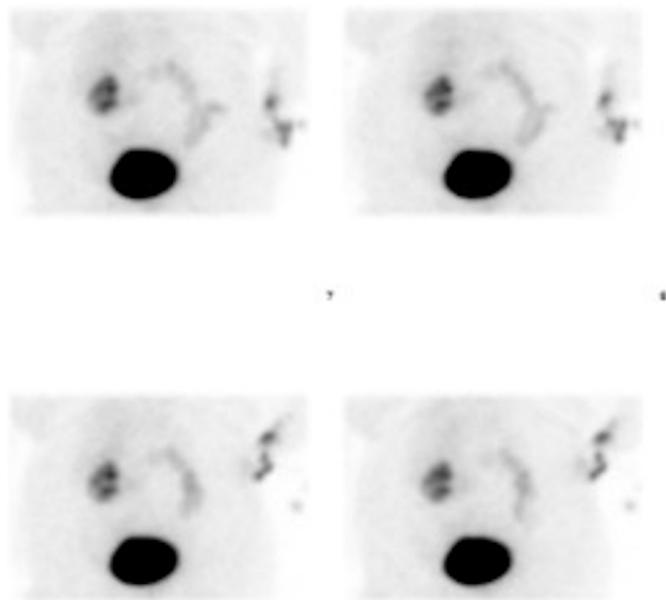
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**Figure 2** (A) Axial view (above). CT scan of the abdomen and pelvis shows fistulisation between the second portion of the duodenum and the malrotated right renal collecting system. Gas and dense material are present within the dependent portion of the duodenum extending into the renal pelvis and the calyces. (B) Coronal view (below).

glutei and hamstrings bilaterally. Laboratory findings included white cell count  $15 \times 10^9/L$ , blood urea nitrogen 37 mg/dL and creatinine 2.09 mg/dL (baseline creatinine was 1.7 mg/dL). Urinalysis showed white cells  $>182$ /high-power field (HPF), red blood cells  $>182$ /HPF, large nitrites and large leucocyte esterase. X-ray of the spine showed multilevel degenerative changes and stable mild anterolisthesis of L4 over L5 without acute fracture. CT without contrast revealed a malrotated right kidney with a large stone measuring  $2.1 \times 1.3$  cm (figure 1) and a possible fistula between the second portion of the duodenum and the right renal collecting system, with gas and dense material within the dependent portion of the duodenum extending into the renal pelvis and calyces (figure 2A and B).

The patient's myofascial pain immediately improved with trigger point injections. Empiric intravenous antibiotics were initiated. Intravenous Tc-99m MAG3 scintigraphy was used to establish conclusive evidence of a fistulous connection and to approximate the function of the affected kidney. Tracer was seen within the small bowel on 30 min delayed imaging, confirming the presence of pyeloduodenal fistula (figure 3). The right kidney demonstrated delayed intrarenal transit and excretion of the tracer, as well as retention of the tracer following administration



**Figure 3** Technetium-99m scintigraphy reveals the tracer within the small bowel on delayed imaging, confirming the presence of pyeloduodenal fistula.

of furosemide 40 mg intravenous, suggestive of right kidney dysfunction.

#### OUTCOME AND FOLLOW-UP

Our patient was initially treated with intravenous broad spectrum antibiotics, which were later narrowed to ceftriaxone 1 g daily based on urine culture results revealing *E. coli*. Urological intervention including nephrectomy and fistula closure was offered based on the findings of right renal dysfunction on Tc-99m MAG3 scintigraphy; however, the patient refused this intervention. Oesophagoendoscopy (OGD) demonstrated a cratered ulcer in the duodenal bulb, but no fistula tract was visualised, and primary closure was therefore unsuccessful. The patient was discharged with oral trimethoprim-sulfamethoxazole for long-term suppressive therapy. She was asymptomatic at the time of discharge and remained clinically stable at time of follow-up 3 months later.

#### DISCUSSION

Pyeloduodenal fistula, first described in 1841 by Rayer and Campaignac, is an uncommon clinical entity.<sup>6,7</sup> The anatomic proximity of the right kidney with the second portion of the duodenum enables fistula formation in the setting of renal inflammatory conditions, including nephrolithiasis or pyelonephritis. Malignant aetiologies of pyeloduodenal fistula include urothelial carcinoma, renal transitional cell carcinoma and nephrolithiasis-related squamous cell carcinoma and adenocarcinoma. Traumatic pyeloduodenal fistula may result from external trauma, foreign object ingestion or iatrogenic instrumentation.<sup>1,5,8</sup> In early literature, tuberculosis was a frequently reported cause of renal inflammation associated with fistula formation. Following development of effective antituberculosis treatment, few cases of pyeloduodenal fistula secondary to tuberculosis have been reported.<sup>5</sup>

Nephrolithiasis is the aetiology of spontaneous pyeloduodenal fistula in approximately 65% of cases.<sup>5</sup> Patients may experience urinary symptoms including flank pain, pneumaturia dysuria, urinary frequency or urgency and upper gastrointestinal tract

symptoms such as anorexia, nausea and vomiting. Physical findings may include fever, flank tenderness or palpable mass. Recurrent pyelonephritis and lower UTIs are common clinical presentations of this condition.<sup>1-5</sup> The large renal stone within our patient's malrotated right kidney is the most likely aetiology of this case of pyeloduodenal fistula; the patient manifested no clinical evidence to suggest an alternative aetiology such as malignancy, trauma, foreign object ingestion or tuberculosis.

Diagnosis of pyeloduodenal fistula requires confirmation of the connection between the renal and gastrointestinal systems. Early literature reports retrograde pyelogram to be the diagnostic study of choice; however, recent cases have been confirmed using antegrade pyelogram, OGD, contrast enhanced CT or upper gastrointestinal series.<sup>1-6</sup> This patient's fistula was confirmed using Tc-99m MAG3 scintigraphy. There is a paucity of literature describing use of Tc-99m MAG3 scintigraphy for diagnosis of pyeloduodenal fistula; however, this technique enables radiographic diagnosis of a fistulous connection between renal and enteric systems as well as functional assessment of the affected kidney.<sup>9</sup>

Ideal management of pyeloduodenal fistula remains controversial. Nephrectomy with primary closure of the fistula was recommended for the management of pyeloduodenal fistula in early literature.<sup>5-6</sup> Patients with severe functional impairment of the affected kidney warrant definitive surgical management. Patients with intact function of the affected kidney may benefit from non-operative management however. Recent reports

demonstrate success with conservative management, including withholding of oral intake, urinary diversion with percutaneous nephrostomy tube and ureteral stenting.<sup>1,3,10,11</sup> Tc-99m provides a qualitative assessment of renal function which may guide clinicians in the decision between nephrectomy with primary closure and kidney-sparing conservative management. Interpretation of qualitative data by clinicians is subject to variability; qualitative data must be paired with quantitative measures of renal function including serum creatinine, as well as consideration of the patient's suitability and amenability for surgical intervention.

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## Learning points

- ▶ Spontaneous pyeloduodenal fistula is an uncommon clinical entity, typically resulting from chronic inflammatory, infectious or malignant conditions of the right kidney.
- ▶ Urinary, gastrointestinal and constitutional symptoms are common, but patients may be asymptomatic.
- ▶ Urointestinal fistulae, including pyeloduodenal fistula, should be considered in patients with recurrent upper or lower urinary tract infections or persistent bacteriuria.
- ▶ Diagnosis may be achieved through antegrade and retrograde pyelography, CT, oesophagogastroduodenoscopy or Tc-99m MAG3 scintigraphy.
- ▶ Nephrectomy and primary fistula closure is indicated in the presence of functional impairment of the affected kidney; however, conservative management is an option for patients with intact renal function.

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