CASE REPORT

Inguinal hernia containing a native orthotopic kidney

Douglas J Cassidy,¹ Hemang Kotecha,² Vicki Sein¹¹Surgery, Massachusetts General Hospital, Boston, Massachusetts, USA²Radiology, Massachusetts General Hospital, Boston, Massachusetts, USA**Correspondence to**
Dr Douglas J Cassidy,
dcassidy3@partners.org

Accepted 10 December 2018

SUMMARY

We report a rare case of an inguinal hernia containing part of a native kidney and present a review of the literature with regard to urological findings in patients with inguinal hernias. This case involves an elderly man with known bilateral inguinal hernias with an incidental radiographic finding of a large right inguinal hernia containing the inferior pole of the right kidney. The patient was not symptomatic from the hernia and given his overall frailty, no surgical intervention was offered.

BACKGROUND

Inguinal hernias are one of the most common surgical complaints worldwide. It is estimated that more than 20 million hernias are repaired worldwide and about 500 000 per year in the USA.¹ Involvement of a solid abdominal organ in a primary abdominal hernia is a rare event, with documented genitourinary organs including bladder, ureter and renal transplants including the transplant ureter.^{2,3} Here, we present a case of an incidentally identified right inguinal hernia containing an orthotopic right kidney.

CASE PRESENTATION

An 85-year-old man with a history of stage IV prostate adenocarcinoma with metastases to pelvic lymph nodes and to bone as well as recurrent urinary tract infections, most notable with *Pseudomonas* and *Enterococcus*, was brought to the emergency room of our institution after a fall from sitting with brief loss of consciousness. The emergency department clinical investigation was significant for a patient with poor mental status who was only intermittently oriented to self but able to maintain his airway. A physical examination demonstrated a

superficial left-frontal scalp haematoma and associated ecchymosis but no other external signs of trauma. The remainder of the examination was notable for bilateral reducible inguinal hernias; however, the right-sided hernia was felt to be more firm compared with the left. The patient was unable to provide further information, therefore, most of his medical history was obtained from his wife, as well as the medical record.

INVESTIGATIONS

The initial trauma imaging was notable for scattered subarachnoid haemorrhages and trace interventricular haemorrhage. Because of the patient's mental status and inability to provide a reliable examination, he underwent complete trauma imaging in addition to his head CT, including a CT of the cervical spine, chest, abdomen and pelvis. The CT demonstrated a normal appearing left kidney in the renal fossa. The right kidney was noted to be abnormally located in the right lower pelvis, with a portion of the kidney extending into an indirect inguinal hernia (figure 1). The arterial supply of the kidney originates from the normal anatomic location, with the right renal artery arising from the right lateral aorta between L1 and L2 (figure 2). The right renal vein drains into the inferior vena cava between L3 and L4. There was no hydronephrosis. A fat-containing left inguinal hernia was also identified (figure 3). The left kidney was normally positioned in the left renal fossa. Of note, the patient has no history of chronic renal impairment and his initial laboratory findings were notable for a creatinine of 1.06 mg/dL, blood urea nitrogen (BUN) of 22 mg/dL and estimated GFR >60 mL/min/1.73 m². His urinalysis on admission was both nitrite and leucocyte esterase positive with 20–50 WBC/hpf.

DIFFERENTIAL DIAGNOSIS

The aetiology of the patient's altered mental status was thought to be attributed to the traumatic brain injury, recurrent urinary tract infection, possible incarcerated hernia or multifactorial in nature. The right-sided hernia, while firm, was reducible and there was no overlying erythema, cellulitis or skin changes.

On review of the patient's chart and outside medical records, a CT scan from 12 years prior noted a ptotic right kidney and perinephric fat extending into bilateral inguinal hernias. The kidney was not within the right inguinal hernia at that time. The patient was symptomatic from his left-sided hernia and underwent a left inguinal herniorrhaphy with pathology notable for a large

Figure 1 Incidental bilateral inguinal hernias. Axial contrast-enhanced CT image shows the inferior pole of the right kidney within the right inguinal hernia sac (arrow) and a fat-containing left inguinal hernia (*).

© BMJ Publishing Group Limited 2019. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Cassidy DJ, Kotecha H, Sein V. *BMJ Case Rep* 2019;**12**:e227645. doi:10.1136/bcr-2018-227645

Figure 2 Orthotopic right kidney. Coronal oblique maximum intensity projection reformatted image from contrast-enhanced CT shows the right renal artery (black arrow) arising from the abdominal aorta (black *) at the same level as the left renal artery (arrowhead). The right renal vein (white arrow) drains into the inferior vena cava (white *).

fragment of omental tissue (15×10×3 cm). The right side was not repaired at that time.

Given the radiographic findings and reducibility of the hernia, it was felt that this was a chronic process and the firmness of the mass was attributed to the hernia sac containing the right kidney.

TREATMENT

The patient's overall trauma burden consisted of scattered subarachnoid haemorrhages and trace intraventricular

Figure 3 Perinephric fat herniation. Coronal oblique reformatted contrast-enhanced CT image shows the indirect left inguinal hernia containing perinephric fat. The lateral conal fascia (black arrowheads), inferior epigastric arteries (arrows) and perinephric fluid (white arrowheads) are labelled.

haemorrhage. An interval CT scan of the head showed no progression and he completed a 7-day course of seizure prophylaxis with levetiracetam. He was treated empirically with cefepime for his positive urinalysis based on prior culture data. Ultimately, his culture grew just rare mixed organisms.

Unfortunately, his neurological status did not improve during his hospitalisation, and the family ultimately decided that the primary goal was for the patient to be comfortable at home, and hospice was arranged. His hernias were asymptomatic and the kidney containing inguinal hernia was an incidental finding on his trauma work-up. His hernias were reducible, and it is unclear if his recurrent urinary tract infections are related to his hernia. Repair was discussed with the family, but not within the goals of care of the patient.

OUTCOME AND FOLLOW-UP

The patient was discharged to hospice and did not recover neurologically. He passed away shortly after discharge.

DISCUSSION

Inguinal hernias are among the most common problems encountered in general surgery. Solid organ involvement is uncommon and when present, commonly involves the gastrointestinal tract. Involvement of genitourinary organs within inguinal hernias is rare and most commonly seen with the bladder and ureter. Urological organ involvement must be suspected in patients presenting with lower urinary tract symptoms, haematuria, acute urinary obstruction and double-phase micturition in patients with a concomitant inguinal hernia.⁴ Oruç *et al* performed a review of the literature and found a total of 190 patients with inguinal hernias with additional urological pathologies.² These included 116 cases involving the bladder, 10 involving a diverticulum and 64 involving the ureter.² Ureteroinguinal hernias are defined as paraperitoneal, intraperitoneal or extraperitoneal. Paraperitoneal hernias are due to adherence of the ureter to the hernia sac posterior (80% of ureteroinguinal hernias), whereas extraperitoneal hernias do not involve the hernia sac and are due to descent of the ureter into the scrotum with the testicle.⁴ Ureteroinguinal hernias are also seen with transplant kidneys and are a rare cause of ureteral obstruction and acute kidney allograft dysfunction.^{3 5-7}

Kidney involvement in inguinal hernias is extremely rare and limited to a few case reports. Most of these cases involve an ectopic pelvic kidney.⁸⁻¹⁰ Kusuma *et al* described a rare case of an ectopic supernumerary kidney within an inguinal hernia.¹¹ To date, there are only two documented reports of inguinal hernias containing orthotopic kidneys as opposed to pelvic kidneys. Farrell *et al* described case of a duplicated kidney within the hernia sac, whereas Wendler *et al* found a massive inguinal hernia containing multiple loops of bowel as well as the right kidney.^{12 13} Both of these kidneys had vasculature that could be traced back to the inferior vena cava (IVC) and aorta in the normal anatomic position.

Kidneys are derived embryologically from the both an outgrowth of the caudal mesonephric (Wolffian) duct, or ureteric bud, and the metanephrogenic blastema, a renogenic region within the intermediate mesoderm in the tail of the embryo. The ureteric bud grows into the metanephrogenic blastema, leading to induction of the kidney. As the kidneys grow, they ascend from the pelvis into their final location in the lumbar region of the retroperitoneum. Initially, the vascular buds of the kidneys grow toward and invade the common iliac arteries. As the kidneys ascend, they develop new cranial arterial branches and induce

regression of more caudal branches. The kidney takes new arterial blood supply from the aorta and venous drainage into the inferior vena cava. In a pelvic kidney, the kidney does not ascend and is more likely to maintain its iliac arterial blood supply.

Given the rarity of these hernias, there is no clear explanation as to how a normally retroperitoneal kidney migrates into an inguinal hernia sac. Tardu *et al* described a case of large retroperitoneal sarcoma presenting with an inguinal hernia due to growth of the tumour towards the inguinal region.¹⁴ This was thought to follow the path of the gonadal vein into the internal inguinal canal, thus demonstrating a pathway for other retroperitoneal structures to end up within an inguinal hernia. The kidney is normally surrounded by anterior and posterior perinephric fascia that do not fuse caudally, allowing communication with the ipsilateral pelvis.¹⁵ CT-guided contrast injection studies have provided a potential avenue for an orthotopic kidney to communicate with the extraperitoneal pelvis.¹⁵ This was thought to be the mechanism of herniation in the case of an orthotopic kidney within an inguinal hernia presented by Farrell *et al*.¹²

In our case discussed above, we have the benefit of CT imaging from 12 years prior to presentation that demonstrates bilateral herniation of perinephric fat and the presence of a ptotic right kidney that had not yet migrated into the inguinal hernia. Given what we know from the aforementioned contrast injection studies and our interval imaging, it can be hypothesised that our patient has a patent infrarenal space that has allowed herniation of retroperitoneal fat and eventually, the kidney on the right side. Because the vascular anatomy in this case demonstrates a right renal artery originating from the abdominal aorta in the normal anatomical position between L1 and L2 and drainage of the right renal vein into the inferior vena cava, this is likely a

case of an orthotopic kidney rather than a pelvic kidney, in an inguinal hernia.

Contributors All authors included on this paper fulfill the criteria of authorship and no author was excluded. DJC was the resident who took care of the patient in the Emergency Department with the Trauma Team. He maintained communication with the family, obtained consent, performed the initial literature review, and drafted the case report. VS was the attending surgeon of record with the trauma team and supervised DJC. HK was the radiologist of record and is responsible for the formatting of the images and their descriptions.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Next of kin consent obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. *The Lancet* 2003;362:1561–71.
- 2 Oruç MT, Akbulut Z, Ozozan O, *et al*. Urological findings in inguinal hernias: a case report and review of the literature. *Hernia* 2004;8:76–9.
- 3 Bugeja A, Clark EG, Sood MM, *et al*. As in real estate, location is what matters: a case report of transplant ureteral obstruction due to an inguinal hernia. *Can J Kidney Health Dis* 2018;5:205435811775362.
- 4 McKay JP, Organ M, Bagnell S, *et al*. Inguinoscrotal hernias involving urologic organs: A case series. *Can Urol Assoc J* 2014;8:429.
- 5 Lobo N, McCaig F, Olsburgh J. Contralateral inguinal herniation of a transplant ureter causing obstructive uropathy in a renal transplant recipient. *BMJ Case Rep* 2017;2017:bcr2016218071.
- 6 Soleymanian T, Kalantarian T, Radmard A. Report of a kidney recipient with inguinal herniation of the transplant ureter. *Saudi J Kidney Dis Transpl* 2016;27:614.
- 7 Coelho H, Nunes P, Canhoto C, *et al*. Inguinal hernia containing bladder and ureteroneocystostomy: a rare cause for acute renal graft dysfunction. *BMJ Case Rep* 2016;2016:bcr2016214466.
- 8 Perone RW, Del Prado D, Katz DS. Pelvic kidney presenting as inguinal hernia and acute renal failure. *AJR Am J Roentgenol* 2007;188:W305.
- 9 Weitzenfeld MB, Brown BT, Morillo G, *et al*. Scrotal kidney and ureter: an unusual hernia. *J Urol* 1980;123:437–8.
- 10 Osmani HT, Boulton R, Wyatt H, *et al*. An unusual inguinoscrotal hernia with renal involvement. *BMJ Case Rep* 2015;2015:bcr2015211519.
- 11 Kusuma V, Hemalata M, Suguna BV. Ectopic supernumerary kidney presenting as inguinal hernia. *J Clin Pathol* 2005;58:446.
- 12 Farrell MR, Coogan C, Hibbeln J, *et al*. Inguinal hernia containing a kidney with a duplicated system: an exceptionally rare case. *Int J Urol* 2014;21:338–40.
- 13 Wendler JJ, Baumunk D, Liehr UB, *et al*. Kidney dislocation in a monstrous inguinal intestinal hernia with ureteropelvic junction obstruction and acute on chronic renal failure. *Urol Int* 2013;91:370–2.
- 14 Tardu A, Yagci MA, Karagul S, *et al*. Retroperitoneal mass presenting as recurrent inguinal hernia: A case report. *Int J Surg Case Rep* 2016;20:46–8.
- 15 Mindell HJ, Mastromatteo JF, Dickey KW, *et al*. Anatomic communications between the three retroperitoneal spaces: determination by CT-guided injections of contrast material in cadavers. *AJR Am J Roentgenol* 1995;164:1173–8.

Learning points

- Alterations in renal function, recurrent urinary tract infections or urinary obstruction in the presence of an inguinal hernia should prompt investigation into urological organ involvement within the hernia.
- Inguinal hernias containing urological organs can occur in both native or transplanted kidneys and ureters.
- Inguinal hernias containing native kidneys can be pelvic or orthotopic in origin as determined by the vasculature of the kidney.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <https://www.bmj.com/company/products-services/rights-and-licensing/permissions/>
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow