Iatrogenic parapelvic urinoma post-proximal uretero-calyx anastomosis: The role of dynamic renal scintigraphy

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SUMMARY

A woman in her mid 30s presented with recurrent right-sided abdominal swelling, which was initially diagnosed as a right parapelvic renal cyst. She had undergone laparoscopic deroofing with proximal uretero-calyx anastomosis. Post-operatively, as the swelling had recurred, a 4-phase contrast-enhanced renal CT scan was performed and revealed gross right hydronephrosis, proximal hydroureter and a large cyst-like lesion at the anastomotic site. The patient was then referred to our nuclear medicine department for further assessment of urinary outflow obstruction and characterisation of the cystic lesion because the differential diagnosis was suspected urinoma. On 99mTechnetium-Mercaptoacetyltriglycine (^{99m}Tc- MAG3) dynamic renal scintigraphy, there was progressive tracer accumulation in the right kidney with tracer hold-up noted at the inferior part of the cystic lesion located adjacent to the inferior pole of the right kidney. This confirmed the communication between the pelvic-calyceal system of the right kidney with the collection. Thus, the diagnosis of urinoma was confirmed with the ^{99m}Tc-MAG3 renal scintigraphy. Renal scintigraphy can aid in the assessment of renal function as well as confirm the presence of a urinoma, which may at times be difficult to be determined on conventional radiological imaging.

INTRODUCTION

Urinomas occur as a result of leakage of urine into a contained collection in the retroperitoneal cavity as a result of blunt or penetrating abdominal injury leading to rupture anywhere along the urinary system. The aetiology of urinomas includes tumours or calculi causing urinary obstruction and damage to the urinary outflow tract, or rarely caused by iatrogenic injury to the pelvicalyceal system (PCS).[1] Usually, a urinoma starts as a small collection and does not require any intervention. In cases of significant injury or trauma, however, urinomas can increase in size and lead to other complications. Failure to decompress a urinoma can lead to compression of other organs, the development of abscess, hydronephrosis, electrolyte imbalance and even urosepsis.[2] Radiological imaging such as contrast-enhanced computed tomography (CECT) with delayed imaging or CT urography (CTU) and retrograde urethrography are the diagnostic imaging modalities of choice to help make the diagnosis.[3] In some cases, urinomas can be missed or mistaken for exophytic renal cysts. Thus, in certain instances, dynamic renal scintigraphy may be useful to aid in the diagnosis of a urinoma masquerading as a parapelvic cyst.[4]

CASE PRESENTATION

A woman in her 30s with no known medical illness presented with a non-tender right abdominal swelling, which increased in size over a period of 1 year. Ultrasound abdomen was performed at our hospital and detected a large right renal cyst. Subsequently, she underwent a four-phase contrast-enhanced renal CT scan, which revealed a large right parapelvic renal cyst with no complex features.

Hence, our urology team decided to perform aspiration of the cyst and proceeded with laparoscopic deroofing operation with proximal uretero-calyx anastomosis. At 2-week post-operative period, the patient again presented with a recurrence of the swelling at the right lumbar region.

A post-operative CT scan was performed to investigate the recurrent mass, which revealed right hydronephrosis and proximal hydroureter as well as a large cystic lesion anterior to the anastomotic site, measuring 3.6cm × 4.1 cm × 5.1cm. There was no communication between the mass and the dilated proximal ureter. Therefore, the patient was managed conservatively as a recurrence of right parapelvic cyst. However, due to persistent abdominal swelling and discomfort after 6 months post-surgery, the patient was arranged for a follow-up CT scan.The scan revealed worsening right hydronephrosis whereas the cyst was essentially unchanged in size, measuring 3.5cm x 3.9cm and 5.0cm (APxWxCC). Subsequently, the urology team referred the patient to our nuclear imaging department for a dynamic renal scintigraphy to rule out urinary outflow obstruction and characterisation of the cyst in view of worsening hydronephrosis.

Thus, we performed dynamic renal scintigraphy with F+20 protocol using ^{99m}Tc-Mercaptoacetyltriglycine (^{99m}Tc-MAG3). Whereby F+20 is a protocol for administration of IV Lasix at 20 minutes post-radiotracer injection for achieving diuretic renal stress. After post-processing, the differential renal function was calculated by creating a region of interest around each kidney. Subsequently, the renogram curve was generated.

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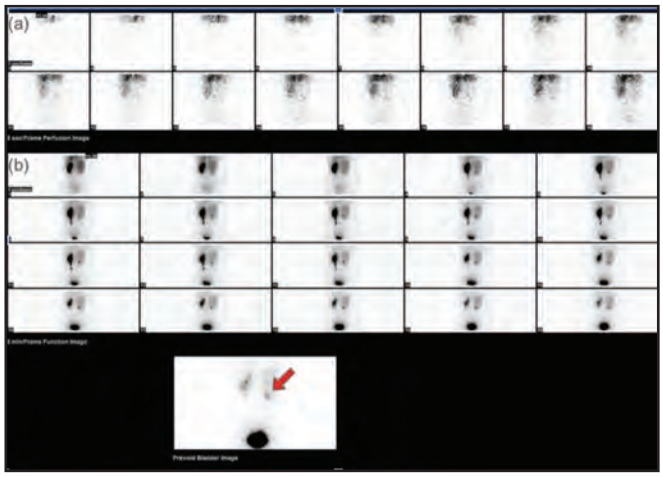

Fig. 1: Dynamic renal scintigraphy image. (a) Perfusion images. (b) Functional images. In image (a) demonstrating good and prompt tracer perfusion in the left kidney but poor and delayed perfusion in the right kidney. The red arrow highlights one of the images in the functional scan demonstrating faint uptake in the enlarged right kidney with tracer hold-up noted in the collection at the lower pole of the right kidney.

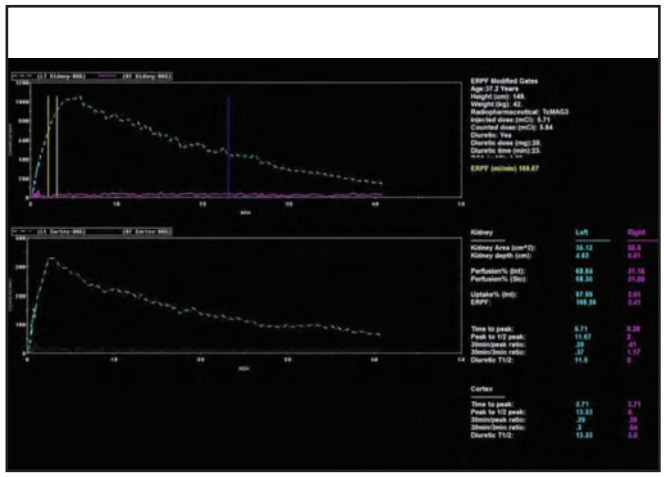

Fig. 2: Summary of renal scintigraphy with renogram showed a non-functioning of the right kidney with severely reduced perfusion and function.

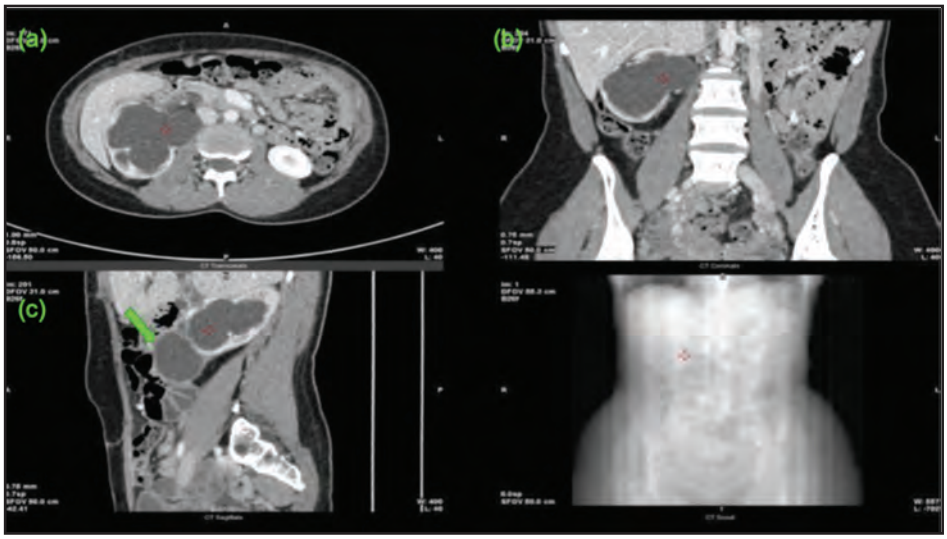

Fig. 3: A four-phase renal contrast enhanced CT scan in (a) axial, (b) coronal and (c) sagittal views during the nephrographic phase, which revealed a large cystic lesion (green arrow) arising from the right parapelvic region.

^{99m}Tc-MAG3 dynamic renal scintigraphy revealed markedly reduced perfusion of the right kidney, which was compressed and displaced superiorly by a large cystic mass located at the right parapelvic region and extending to the right lumbar region. Hence, the urodynamic status of the right kidney was indiscernible due to severely impaired function. As the study progressed, there was an apparent large area of mild tracer accumulation seen at the right renal fossa, which corresponded to a huge hypodense cystic mass seen on a previous CT. We also observed a hold up of tracers at the inferior pole of this large mass (red arrow) (Figure 1). The renogram illustrated a clinically non-functioning right kidney, with a solitary good-functioning left kidney having no scan evidence of urinary outflow obstruction (Figure 2). On further evaluation of the previous CT imaging, the cystic lesion measured 12.2 x 9.2 x 11.8 cm (AP x W x CC) and a communication between this mass and the ruptured renal calyx at the mid-segment of the right kidney was identified (Figure 3). Moreover, we concluded that the hydronephrosis and severely impaired right renal function were due to the right ureteric compression caused by the large urinoma in the parapelvic region.

Outcome/Follow-up

Definite management by the urology team was for right nephrectomy in view of non-functioning right kidney and increasing size of the urinoma. The patient, subsequently, underwent an open right nephrectomy and was well post-operatively. She was discharged with empirical antibiotics for a week. Follow-up physiotherapy was planned for the patient during the recovery period.

DISCUSSION

Post-traumatic urinomas are a rare complication, occurring in less than 1% of cases of abdominal injury. The differential diagnoses include parapelvic renal cysts and perirenal haematomas. Nevertheless, a history of preceding trauma or surgery may point to the correct diagnosis with the aid of radiological imaging. The delayed phase of a contrast-enhanced CTU is usually helpful in clinching the diagnosis. Three factors are required for the development of a urinoma, which includes a tear in PCS, the presence of a functional kidney and underlying distal urinary outflow obstruction.[3]

Four-phase contrast-enhanced renal CT scan is the modality of choice to diagnose a urinoma as extravasation of contrast from the renal PCS or ureter indicates urinary leakage. However, this radiological modality is unable to measure renal function or elucidate on the presence of urinary obstruction in the individual kidneys. Repeated exposure to radiation and intravenous iodinated contrast media that may cause adverse reactions are also factors to be considered.

Renal scintigraphy uses a lower dose of effective ionising radiation compared to contrast-enhanced CT. It can also be used in patients with compromised renal function. Severe allergic reaction to contrast media can also be prevented.[4] As in our patient, the decision to perform the renal scintigraphy to aid in the evaluation of renal function and renal outflow obstruction was made due to the initial diagnosis of a large parapelvic cyst compressing the right pelviureteric junction. Nevertheless, the scan revealed a free communication with the collection and PCS with radiotracer hold-up evident in the collection as the scan progressed. The right renal parenchyma was slightly functioning, albeit with reduced intensity. The Single Photon Emission Computed Tomography/Computer Tomography (SPECT/CT) imaging further helped to localise the ruptured PCS that communicated with the large urinoma. This multi-modal assessment in a single investigation allows clinicians to decide on a definitive management by appropriate evaluation of the size of the urinoma as well as the status of the kidney function. Early diagnosis of urinomas, the assessment of renal function and identification of urinary outflow obstruction can give a better prognosis by enabling the urologist to decide on definitive surgical intervention.

Dynamic renal scintigraphy is a simple, non-invasive, outpatient procedure that can be safely performed in paediatric as well as adult age groups and even in patients with poor renal function. It does not produce serious adverse effects and carries minimal radiation exposure to patients. In comparison with four-phase contrast-enhanced renal CT scan, which gives an effective radiation dose of approximately 10 mSv, dynamic renal scintigraphy gives only 2.7 mSv of effective radiation dose.[5] Thus, performing dynamic renal scintigraphy carries lower ionising radiation risk because its effective dose is 30% lower than conventional CT imaging. Furthermore, if SPECT/CT is performed, only a low dose CT is utilised, and it can help to delineate the site of leakage and estimate the rate of leakage. This will be helpful in assisting the decision-making towards formulating the optimal management strategy and is indispensable for the selection of a conservative versus a surgical approach.[6] First line of treatment is the drainage of the urinomas with empirical antibiotics. If the catheter fails to drain, a percutaneous nephrostomy tube is placed to facilitate drainage. Surgical reconstruction will be performed only if the other measures fail to resolve the collection.

CONCLUSION

Renal scintigraphy can aid in the assessment of renal function as well as confirm the presence of a urinoma, which may be missed on conventional radiological imaging.

LEARNING POINTS

- Urinomas can occur as a complication of blunt or penetrating abdominal injury, with iatrogenic causes being a rare aetiology.
- Radiological imaging such as contrast-enhanced CTU or retrograde urethrography is first-line modalities of choice that help make the diagnosis.
- The presence of a triad of factors predisposes to the formation of urinomas, which include a tear in PCS, the presence of a functional kidney and underlying distal urinary outflow obstruction.
- Radionuclide imaging such as dynamic renal scintigraphy may aid in the diagnosis of urinomas and exclude other differential diagnoses such as parapelvic renal cysts or perinephric haematomas, by demonstrating leakage and accumulation of the radiotracer within the urinoma collection.

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