CASE REPORT

Primary primitive neuroectodermal tumour of the kidney in adults

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SUMMARY

Primitive neuroectodermal tumour (PNET) is a neural crest tumour derived from neuroectoderm. Renal PNET is a very rare tumour occurring during childhood or adolescence. We report two cases of PNET involving kidney in adults. Presenting signs and symptoms include abdominal/flank pain and/or haematuria. Microscopy reveals the tumour consisted of small round cells with round nuclei and scant cytoplasm. Diagnosis was confirmed by immunohistochemistry with diffuse membranous positivity of tumour cells with CD99. As these tumours have an aggressive clinical course with rapid death in many reported cases, it is important to differentiate them from other small round-cell tumours.

BACKGROUND

Primitive neuroectodermal tumour (PNET) is derived from neuroectoderm of the central or peripheral origin. Peripheral PNET commonly arises from the chest wall or paraspinal region. PNET may rarely arise from bones, limbs and genitourinary tract and very rarely from kidneys.^{1 2} PNET arising from kidneys metastasise to regional lymph nodes, lungs, liver and bones at an early stage unlike PNET arising from other organs and hence portends a poor prognosis.³ We describe two cases of renal PNET in adults with one patient having tumour thrombus in the inferior vena cava (IVC).

CASE PRESENTATION

Case 1

A 48-year-old man presented with pain/fullness over the left flank and loss of appetite and weight for 1 month. There was no haematuria, dysuria or lower urinary tract symptoms. Upon examination, a firm 13×11 cm mass was palpated in the left hypochondrium.

Case 2

A 23-year-old man presented with right flank pain, haematuria (passage of blood clots) and low-grade fever for 2 months. He had a large swelling measuring 25×25 cm in the right hypochondrium/lumbar region with extension in the right epigastric region.

INVESTIGATIONS

Case 1

Abdominal ultrasonography revealed heterogeneously enhancing left renal mass (17×14 cm) with pressure effect on adjacent structures. Abdominal CT showed a mass with hypodense non-enhancing centre suggestive of necrosis and focal

calcifications. The left renal vein or local regional lymph nodes were not involved.

Case 2

CT of the abdomen showed a mass (20×15×15 cm) in the right kidney. A thrombus in the renal vein and in the IVC was also seen. The patient underwent a CT-guided fine needle aspiration cytology report of a low-grade renal cell carcinoma (RCC).

DIFFERENTIAL DIAGNOSIS

Clinically, both patients were diagnosed with RCC.

TREATMENT

Case 1

The patient underwent left open radical nephrectomy.

Case 2

The patient underwent right open radical nephrectomy with IVC thrombectomy and IVC wall excision.

OUTCOME AND FOLLOW-UP

Case 1

Grossly, the left renal mass (17×14 cm) showed a stretched capsule with gross involvement of fat/fascia by the tumour. The cut surface showed friable growth replacing the entire kidney (figure 1). Histologically, the tumour consisted of small round cells arranged in diffuse sheets with uniform, large, round nuclei and scant cytoplasm (figure 2A). Large areas of necrosis and lymphovascular invasion were also present. Immunohistochemically, tumour cells were positive for CD99 (figure 2B) and vimentin.

Figure 1 Grossly a heterogeneous tumour replacing the entire renal parenchyma.

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Figure 2 Diffuse sheets of tumour cells (A) (haematoxylin and eosin, $\times 200$), positive membranous staining of CD99 (B) ($\times 400$), rosette formation of tumour cells (C) (haematoxylin and eosin, $\times 400$) and negative staining of synaptophysin (D) ($\times 400$).

The patient received adjuvant chemotherapy with vincristine, doxorubicin, ifosfamide and etoposide and he recuperated after 12 months of follow-up.

Case 2

Per-operatively, a renal mass (25 $\times$ 20 cm) displaced the aorta, IVC and colon to the opposite side. Upon exploration, tumour thrombus was seen extending from the right renal vein up to 3 cm below confluence of hepatic veins with IVC that was confirmed by the intraoperative transoesophageal ultrasound examination. Multiple lymph nodes in the right paracaval and interaortocaval areas were also enlarged. Grossly, the outer surface of the nephrectomy specimen was nodular with areas of haemorrhage. The cut surface showed a large tumour replacing the entire kidney. Histopathological examination revealed a tumour of small- to medium-sized cells with high nucleocytoplasmic ratio and scant cytoplasm disposed in the sheets with ill-defined nests. Foci of Homer-Wright rosette formation were also seen (figure 2C). Brisk mitosis was evident along with the areas of haemorrhage and necrosis. Lymphovascular invasion was evident near the renal sinus. Renal pelvis and sinus fat were encompassed by the tumour. Metastatic deposits were seen in the adrenal gland. IVC wall was infiltrated by the tumour. Paracaval and interaortocaval lymph node does not show encompassment by the tumour. Immunohistochemically, the tumour cells were positive for CD99 (MIC-2) and vimentin. Cells were negative for synaptophysin (figure 2D), chromogranin, epithelial membrane antigen and leucocyte common antigen.

The patient received adjuvant chemotherapy with vincristine, doxorubicin, ifosfamide and etoposide and he recuperated after 8 months of follow-up.

DISCUSSION

The term PNET was coined by Hart and Earle⁴ in 1973 for predominantly undifferentiated tumours of the cerebellum that did not match the diagnostic criteria for neuroblastoma, ependymoblastoma, medulloblastoma or pineal parenchymal tumours.

PNETs of the kidney usually affect adolescents and young adults. Their origin is unclear. They probably arise from cells

that migrate from the neural tube to the kidneys and have variable capability of ectodermal or neuronal differentiation.⁵ Renal PNETs are more aggressive than neuroectodermal tumours of other locations and primary renal tumours of other origins.

Upon ultrasound, CT and MRI, renal PNET appears as an ill-defined mass with variable areas of haemorrhage, necrosis, variable degree of contrast enhancement and internal septations and calcifications. These imaging techniques play an important role in determining local invasion of other organs like pancreas, spleen, stomach and psoas muscles by renal PNETs.

The definite diagnosis of PNET is based on pathological examination. As the size and colouration of these tumours overlap with other more common renal neoplasms, gross examination alone cannot confer a diagnosis of the renal PNET. The most important identifying histological feature to diagnose renal PNET is the presence of pseudorosette.⁶ Histopathologically, renal PNET resembles other round cell tumours of the kidney like Ewing's sarcoma, blastema-predominant Wilm's tumour, neuroblastoma, clear-cell sarcoma, rhabdomyosarcoma, lymphoma, desmoplastic round-cell tumour and metastasis.

Immunohistochemistry is essential to differentiate PNET from other round cell tumours. The renal PNET cells express features of neuronal differentiation such as neuron-specific enolase, synaptophysin, chromogranin and vimentin but these findings are not pathognomonic. More specifically, PNET cells express high amount of surface membrane protein MIC2 antigen (CD99) and exhibit chromosomal translocation between chromosomes 11 and 22 (t(11,22)(q24;q12)). High expression of CD99 in both the cases helped in the diagnosis.

There is no fix treatment protocol for PNET. Most reported cases underwent radical nephrectomy, adjuvant chemotherapy, radiotherapy or bone marrow transplant. The prognosis of PNET is poor despite these therapies as most patients present at an advanced stage with metastasis. The 5-year disease-free survival rate for patients presenting with well-confined extraskelatal PNET is around 45–55% and cases with advanced disease at presentation have a median relapse-free survival of only 2 years.⁷

Learning points

- ▶ Renal primitive neuroectodermal tumour (PNET) is a very rare tumour.
- ▶ Clinical/radiological features of renal PNET are usually non-specific and may resemble with renal cell carcinoma (RCC), which is the most common renal malignancy in adults.
- ▶ Histopathologically, these tumours show small round cells indistinguishable from other round cell tumours affecting kidney.
- ▶ Strong CD99 immunoreactivity may differentiate renal PNET from other renal tumours of neuroectodermal origin.
- ▶ The prognosis of renal PNET is poor despite surgery and chemotherapy as most patients with renal PNET present at an advanced stage with metastasis.

Competing interests None.

Patient consent Obtained.

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