PRIMITIVE NEUROECTODERMAL TUMOR OF KIDNEY: A CASE STUDY

Mainali N[1], Sinha A[1], Homagai N[2], Bhattarai M[3], Nathania S[4]

[1]Department of Pathology, [2]Department of Obstetrics and Gynecology, [3]Department of Radiology and Imaging, [4]Department of Urosurgery, Nobel Medical College Teaching Hospital, Kanchanbari-4, Biratnagar-5, Morang, Nepal

ABSTRACT

Primitive neuroectodermal tumor present mostly as bone or soft tissue masses in the trunk or axial skeleton in children and young adults. Because of the similar morphology and the same genetic aberrations with Ewing's sarcoma, PNET is now considered virtually the same entity as Ewing's sarcoma. Primary primitive neuroectodermal tumors (PNETs) of the kidney are very rare and have been primarily documented as case reports. Diffuse immunohistochemical expression of CD99 is a characteristic feature of PNET/Ewing sarcoma and used as a part of a diagnostic immunohistochemical panel. PNET of the kidney has a poor prognosis due to their higher rate of local recurrence and early metastases.

KEYWORDS

Ewing sarcoma, primitive neuroectodermal tumor, CD99

CORRESPONDING AUTHOR

Dr. Nirajan Mainali, Assistant Professor,
Department of Pathology,
Nobel Medical College Teaching Hospital,
Kanchanbari-4, Biratnagar-5, Morang, Nepal
Email: mainali_nirajan@hotmail.com

INTRODUCTION

The Ewing's sarcoma (ES) family of tumors, including peripheral neuroectodermal tumor (PNET), is defined on the basis of genetic by specific chromosomal translocations resulting in fusion of the *EWS* gene with a member of the ETS family of transcription factors, either *FLI1*(90–95%) or *ERG* (5–10%)[1,2]

PNET is presumed to be derived from neural crest, that present mostly as bone or soft tissue masses in the trunk or axial skeleton in children and young adults. Because of the similar morphology and the same genetic aberrations with Ewing's sarcoma, PNET is now considered virtually the same entity as Ewing's sarcoma. Primary primitive neuroectodermal tumors (PNETs) of the kidney are very rare and have been primarily documented as case reports.[3-6]

In kidney, most cases are found in the medullary/pelvic region. Palpable mass, hematuria, and pain are the most common clinical presentation, and most patients are symptomatic at presentation.[7] Most of the patients were seen in second and third decade.

Grossly, PNETs are tan-white to gray and contain solid and cystic areas hemorrhage and necrosis. Microscopically, they look like PNET found elsewhere and consist of sheets of monotonous cells with scant cytoplasm traversed by thin fibrous bands. Perivascular pseudo rosettes are sometimes seen but true rosettes are uncommon.

Diffuse immunohistochemical expression of CD99 is a characteristic feature of PNET/Ewing sarcoma and used as a part of a diagnostic immunohistochemical panel.[4] Electron microscopy shows primitive cells with interdigitating cell processes and containing occasional dense-core granules and microtubules. Demonstration of the characteristic t (11; 22), and less frequently t (21; 22), by a variety of techniques may help to confirm the diagnosis of renal PNET.[4-6]

PNET of the kidney has a poor prognosis due to their higher rate of local recurrence and early metastases.[8]

CASE DESCRIPTION

A 29-years-old female with primigravida at 24 weeks of gestation came to Outpatient department with complain of abdominal distension and progressive weight loss. MRI scan of the lumbosacral spine revealed a large well defined heterogeneous predominantly hypo intense mass lesion in T1W images with hyper intense areas in T2W images involving upper and mid pole of right kidney.

Mild heterogeneous enhancement of the mass lesion was seen in post contrast images with lesion abutting inferior surface of liver and compressing and inferiorly displacing right pelvicalyceal system, however its interface with liver was maintained. Right renal vein and inferior venacava were normal. Radical nephrectomy was done and biopsy was sent for histopathological examination in the department of histopathology. 7cm friable mass involving the pelvicalyceal system and medulla and showing occasional areas of hemorrhage was identified; however the capsule was intact grossly.

Histopathological report revealed features compatible with small round cell tumor, possibly intrarenal neuroblastoma. Tumor cells consisting of small round cells were arranged in diffuse pattern with occasional fibrocollagenous strands separating them loosely. Individual cells showed ill defined cell borders, fine chromatin and inconspicuous nucleoli and occasional fibrillary cytoplasm. Large areas of necrosis along with frequent pseudo-rosettes formation were also noted. Slides and block was sent outside for immunohistochemistry. Result was CD10 (non reactive), CD99 (4 +), Pan CK (non reactive), NSE (3+), S-100 (non reactive) and WT-1 (non reactive).

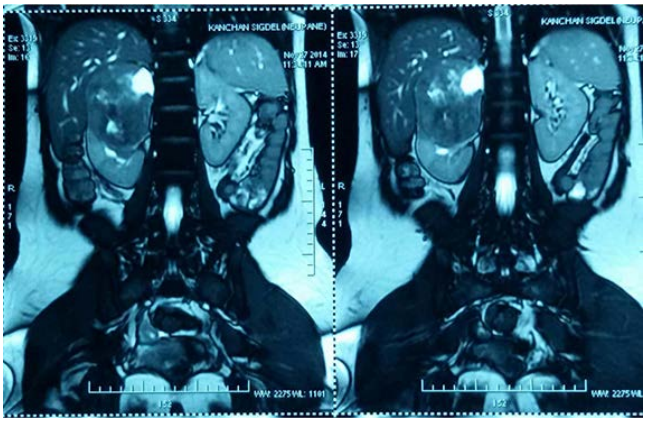

Fig. 1(a): CT scan of the tumor

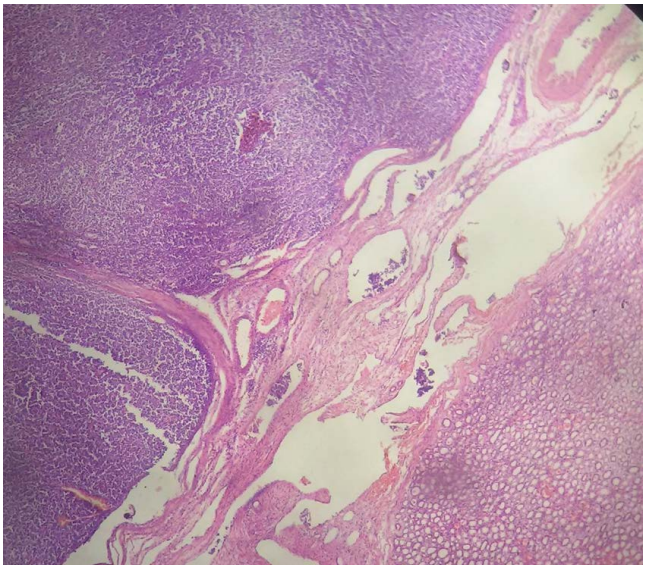

Fig. 2(a): H&E stain microscopic picture showing normal kidney structure and small round cell tumor.

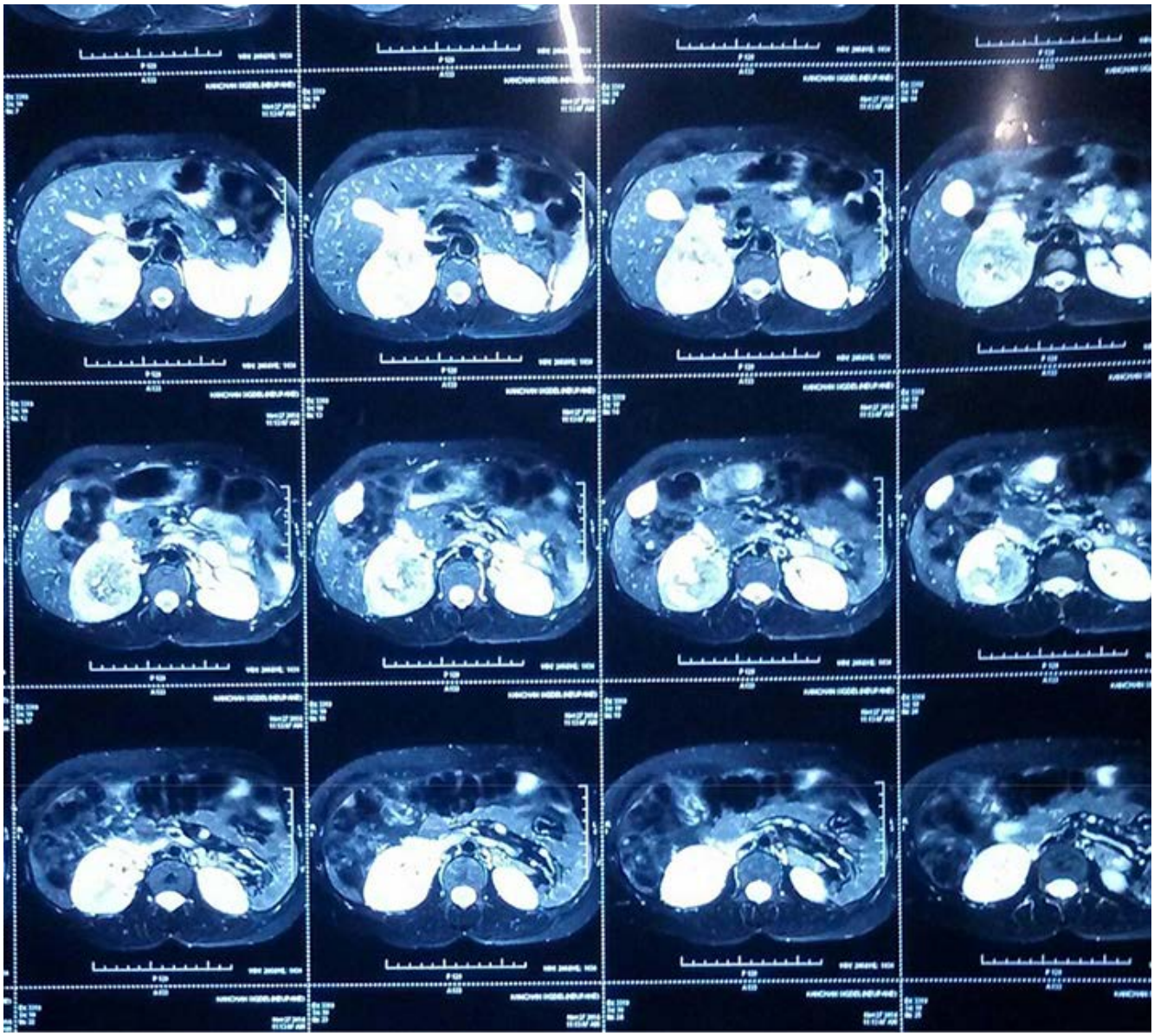

Fig. 1(b): CT scan of the tumor

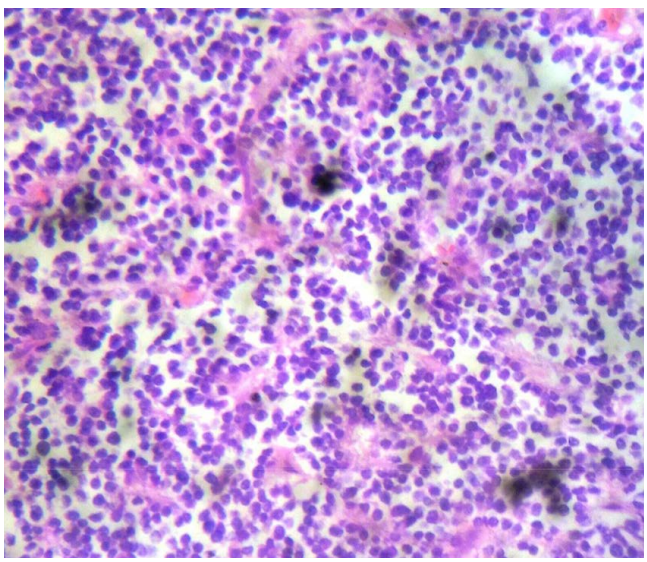

Fig. 2(b): H&E stain of microscopic picture showing pseudorosette

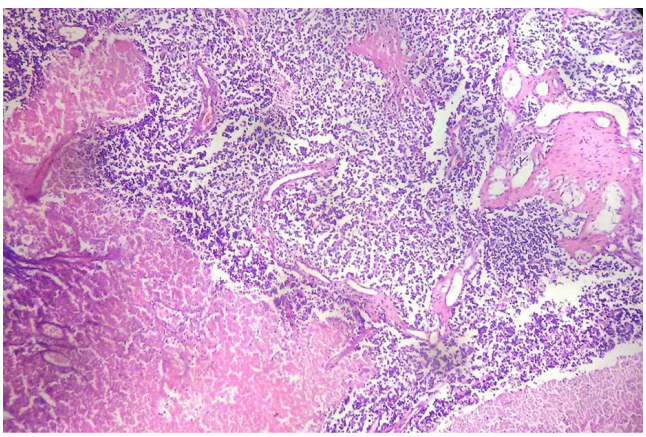

Fig. 2(c): H&E stain showing large areas of necrosis along with small round cells.

DISCUSSION

Renal Ewing sarcoma/ Primitive neuroectodermal tumor was first reported by Mor *et al*.[9] The recognition of PNET at this site has greatly enhanced by recent development in molecular techniques. Similar to the PNET/Ewing sarcomas at other sites, most renal PNETs show the translocation t(11;22) resulting from the fusion of the EWS gene on chromosome 22 to the FLI-1 gene on chromosome 11. Characteristic feature of PNET/ Ewing sarcoma is the diffuse immunohistochemical expression of CD99 which is a useful diagnostic immunohistochemical character. About 2/3 of the tumors show FLI-1 nuclear positivity. Most of PNETs show positive reaction with antibodies to vimentin and NSE, whereas the minority show positive reaction with S-100 protein and cytokeratin. Electron microscopy shows primitive cells with interdigitating cell processes containing occasional dense core granules and microtubules.[10]

The "round cell" tumors of the kidney include different pathologic entities, including blastema predominant Wilms' tumors (WT), lymphoma, clear cell sarcoma, small cell carcinoma, monophasic synovial sarcoma, neuroblastoma, desmoplastic round cell tumor, and extra skeletal Ewing's sarcoma/primitive neuroectodermal tumor (ES/PNET). It is important to identify each of these entities, because each carries unique therapeutic and prognostic implications. However, accurate diagnosis is difficult due to their significant morphologic overlap and complicated by their rarity. Immunohistochemistry has proven to be valuable in the differential diagnosis of renal round cell tumors,

although some of these round cell tumors lack a characteristic immunophenotype (for example, clear cell sarcoma) and immunophenotypic overlap exists in some (for example, WT, ES/PNET, small cell carcinoma) with respect to such widely used markers as cytokeratin, desmin, and CD99. Similar immunophenotype in our renal ES/PNET was found as previously reported in non renal ES/PNET. All ES/PNET in study done by Rafael *et al* showed strong, uniform expression of CD99 and which was similar to our case.[11] A large number of previous studies showed that CD99 expression is ubiquitous in ES/PNET.[12] In a study done by Gu *et al*. and Collini *et al*, cytokeratin expression was also present in approximately 25% of bone and soft tissue ES/PNET.[13,14] In our case cytokeratin report was negative.

REFERENCES

1. Delattre O, Zucman J, Melot T *et al*. The Ewing family of tumors: a subgroup of small-round-cell tumors defined by specific chimeric transcripts. *New Engl J Med* 1994; 331: 294–299.
2. Kovar H: Progress in the molecular biology of Ewing tumors. Sarcoma 1998, 2: 3-171: 294–299
3. Furman J, Murphy WM, Jelsma PF, *et al*. Primary primitive neuroectodermal tumor of the kidney. Case report and review of the literature. *Am J Clin Pathol* 1996; 106: 339-344.
4. Marley EF, Liapis H, Humphrey PA *et al*. Primitive neuroectodermal tumor of the kidney—another enigma: a pathologic, immunohistochemical, and molecular diagnostic study. *Am J Surg Pathol* 1997; 21: 354–359.
5. Quezado M, Benjamin DR, Tsokos M. EWS/FLI-1 fusion transcripts in three peripheral primitive neuroectodermal tumors of the kidney. *Hum Pathol* 1997; 28: 767–
6. Sheaff M, McManus A, Scheimberg I *et al*. Primitive neuroectodermal tumor of the kidney confirmed by fluorescence in situ hybridization. *Am J Surg Pathol* 1997; 21: 461–8.
7. Risi E, Iacovelli R, Altavilla A, *et al*. Clinical and pathological features of primary neuroectodermal tumor/Ewing sarcoma of the kidney. *Urology* 2013; 82: 382–6.
8. Romero FR, Rais-Bahrami S, Muntener M, Permpongkosol S, Fine SW, Paidas CN, *et al*. Metastatic primitive neuroectodermal tumor to the kidney. *Urol Int* 2007; 78: 286-8.
9. Mor Y, Nass D, Raviv G *et al*. Malignant peripheral primitive neuroectodermal tumor (PNET) of the kidney. *Med Pediatr Oncol* 1994; 23: 437–40.
10. Reuter VE, Tickoo SK. Adult Renal Tumors.In Stacey E M editor. Sternberg's Diagnostic Surgical Pathology (5th Ed) Lippincott Williams & Wilkins 2010: 1786-7.
11. M.D. REJ,M.D. ALF, M.D. RLL *et al*. Primary Ewing's Sarcoma/Primitive Neuroectodermal Tumor of the Kidney: A Clinicopathologic and Immunohistochemical Analysis of 11 Cases. *Am J Surg Pathol* 2002; 26: 320–7.
12. Stevenson A, Chatten J, Bertoni F *et al*. CD99 (p30/32MIC2) neuroectodermal/Ewing's sarcoma antigen as an immunohistochemical marker. Review of more than 600 tumors and the literature experience. *Appl Immunohistochemistry* 1994; 2: 231–40. 1994; 23: 437–40.
13. Gu M, Antonescu CR, Guiter G, *et al*. Cytokeratin immunoreactivity in Ewing's sarcoma: prevalence in 50 cases confirmed by molecular diagnostic studies. *Am J Surg Pathol* 2000; 24: 410–6.
14. Collini P, Sampietro G, Bertulli R *et al*. Cytokeratin immunoreactivity in 41 cases of ES/PNET confirmed by molecular diagnostic studies. *Am J Surg Pathol* 2001; 25: 273–4.