

Nephroblastic elements in a retroperitoneal immature teratoma with elevated serum alpha-fetoprotein

Chiu-Hsuan Cheng, Shang-Hsien Yang, Borcherng Su

ABSTRACT

Introduction: Teratoma and Wilms' tumor are among the most frequent tumors of childhood. The occurrence of nephroblastic elements in a teratoma is extremely rare. Only eight cases that occurred in the retroperitoneum have been reported in English literature. Such occurrence complicates the differential diagnosis because of the overlapping histopathological findings between teratoma with nephroblastic elements and teratoid Wilms' tumor. Alpha-fetoprotein (AFP) is a recognized marker of immature teratomas. The source of AFP is believed to be from gastrointestinal epithelium and neuroepithelium. To our knowledge, this is the first case of elevated serum AFP level observed in a retroperitoneal immature teratoma with nephroblastic elements. **Case Report:** A three and a half-month-old Taiwanese female infant presented with an abdominal distension. A retroperitoneal neoplasm was detected by the abdominal computed tomography scans.

Histologically, nephroblastic elements in lobular contour were noted comprising about 15% per slide along with mixed elements of grade 3 teratoma in organoid arrangement. Her preoperative serum AFP level (1182 ng/ml) was above the physiologic level for her age. It decreased to 312.5 ng/ml at one week after tumor excision. She was well with no evidence of tumor recurrence at the age of one and a half years with unremarkable AFP blood level. **Conclusion:** We made the diagnosis of retroperitoneal immature teratoma with nephroblastic elements due to their preservation of lobular shape and organoid arrangement of mixed elements from different germ layers. A significant AFP level elevation may be noted in immature teratomas regardless of the presence of nephroblastic elements.

Keywords: Alpha-fetoprotein, Nephroblastoma, Retroperitoneal neoplasm, Teratoma, Wilms' tumor

How to cite this article

Cheng CH, Yang SH, Su B. Nephroblastic elements in a retroperitoneal immature teratoma with elevated serum alpha-fetoprotein. *J Case Rep Images Pathol* 2016;2:15–19.

Article ID: 100008Z11CC2016

doi:10.5348/Z11-2016-8-CR-4

Chiu-Hsuan Cheng¹, Shang-Hsien Yang², Borcherng Su³
Affiliations: ¹MBBS, Resident pathologist, Department of Pathology, Buddhist Tzu Chi General Hospital, Hualien city, Hualien county, Taiwan; ²MD, Attending pediatrician and pediatric hemato-oncologist, Department of Pediatric Hematology and Oncology, Buddhist Tzu Chi General Hospital, Hualien city, Hualien county, Taiwan, School of Medicine, Tzu Chi University, Hualien city, Hualien county, Taiwan; ³DDS, PhD, Attending pathologist, Department of Pathology, Buddhist Tzu Chi General Hospital, Hualien city, Hualien county, Taiwan, School of Medicine, Tzu Chi University, Hualien city, Hualien county, Taiwan.

Corresponding Author: Borcherng Su, Complete Mailing Address - No. 701, Section 3, Zhongyang road Hualien City, Hualien County, Taiwan, 970; Email: pathology@email.com

Received: 09 May 2016
Accepted: 07 June 2016
Published: 05 July 2016

INTRODUCTION

Teratomas are neoplasms consisting of mixed elements derived from all three germ cell layers.

Extragenital teratomas tend to occur in the midline structures such as the mediastinum, retroperitoneum, sacrococcygeal region, and pineal gland. Retroperitoneal teratomas are rare in terms of the primary site for extragenital teratomas and represent only 1–11% of primary retroperitoneal tumors [1–2]. They are the third most common retroperitoneal tumors in the pediatric population after neuroblastoma and Wilms' tumors [2]. In very rare conditions, nephroblastic elements are found in retroperitoneal teratomas. Their occurrence may represent a diagnostic challenge for pathologists because they may be confused with teratoid Wilms' tumors (nephroblastomas).

Alpha-fetoprotein (AFP) is a typical oncofetal antigen of hepatic and germ cell tumors particularly those containing yolk sac elements. In retroperitoneal teratomas, its level correlates with tumor grade [3].

We present a rare case of retroperitoneal immature teratoma that contained approximately 15% of nephroblastic elements in a three and a half-month-old Taiwanese female infant who had preoperative serum AFP elevation. This is the first report of elevated serum AFP level noted in a retroperitoneal immature teratoma with nephroblastic elements.

CASE REPORT

Clinical history and outcome

A three and a half-month-old Taiwanese baby girl, who was born by uneventful normal vaginal delivery at full term, was admitted to our hospital because of abdominal distension for 1 week. Apart from that, she became irritable, cried easily and reduced feeding volume for two weeks. On admission, she was alert and active with normal vital signs. Physical examination was remarkable for abdominal distension with reduced bowel sound and percussion dullness over the left lower quadrant.

A plain X-ray for kidneys, ureters, and bladder showed a huge soft tissue shadow at the left side of the abdomen that displaced the bowel loops to the right side. Under ultrasonography, it was a lobulated mass with a fluid component in the outer part and some hyper-echoic shadows in the inner part. Her serum AFP level was 1182 ng/ml. An abdominal computed tomography revealed an oval-shaped soft tissue mass measuring 13.3×12.6 cm in size at the left retroperitoneum. Cystic components and focal calcifications were noted within the mass. A tumor excision was performed. Intraoperatively, a left retroperitoneal mass with a size of 14×8×7 cm was found and easily removed.

The baby suffered an episode of urinary tract infection postoperatively and was treated with systemic antibiotics. She was discharged from hospital on the eighth postoperative day. Her AFP level decreased to

312.5 ng/ml on discharge. She was well with no evidence of tumor recurrence at the age of 1 and a half years with unremarkable AFP blood level.

Pathology

Grossly, the resected specimen was a well-encapsulated lobulated mass. The cut surface showed a variegated appearance with yellowish solid areas and hemorrhagic or cystic areas (Figure 1). The cysts contained serous, mucous, sebaceous and cartilaginous contents.

Histologically, yellowish solid areas revealed teratoma consisting of primitive mesenchymal tissue, neuroepithelium, mature adipose tissue, cartilage, bone, skeletal and smooth muscle, and glandular and cystic structures lined by gastrointestinal type epithelium (Figure 2A–B). Scattered among them were foci of blastemal tissue consisting of closely packed small, blue cells with tubule formation and glomeruloid structures (Figure 2C). Such foci of nephroblastic tissue comprised approximately 15% per slide. Immature neuroepithelium occupied more than 4 low-power fields of a slide. The final diagnosis was a retroperitoneal grade 3 immature teratoma with nephroblastic elements. The tumor was excised with a clear margin. Immunohistochemically, focal Wilms' tumor 1 gene (WT-1) protein nuclear positivity was observed in the blastemal cells, and immature glomeruli (Figure 3 A), and AFP positivity in the cytoplasm of columnar epithelium and neuroepithelium (Figure 3B).

DISCUSSION

Primary retroperitoneal teratomas account for only 1–11% of retroperitoneal neoplasms [1, 2]. They

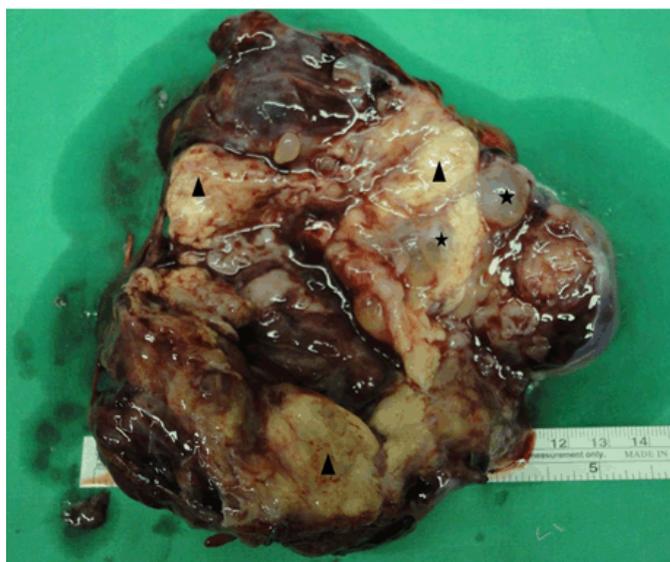


Figure 1: The cut surface of the resected tumor showing yellowish solid areas (triangles), translucent cysts (stars) and hemorrhagic areas.

typically occur in infancy and early adulthood. They are the third most common retroperitoneal tumors in the pediatric population after neuroblastoma and Wilms' tumors [2]. As elsewhere, retroperitoneal teratomas are classified as mature or immature based on the histological composition and degree of maturation or differentiation. Immature elements usually contain neuroepithelium, cartilage, and primitive mesenchymal tissue [4]. Nephroblastic tissue is found very rarely in an immature teratoma. Its actual occurrence is unclear. Ma et al. [4] reported 33 cases of teratomas with nephroblastic elements while Coli et al. [5] collected 31 cases of immature renal tissue associated with teratomas. Most of them occurred in the lumbosacral region. Only 6 out of 31 cases occurred in the retroperitoneum [5]. There are several possible explanations for the occurrence of nephrogenic tissue in teratoma including a collision between neuroblastoma and teratoma. However, the

more plausible explanation would be an embryonic origin of nephrogenic components in teratoma [6] (Table 1).

We collected eight previously reported cases of retroperitoneal teratomas with nephroblastic elements [6–9]. Their clinicopathologic data are summarized in Table 1. The most common presentation was an abdominal mass. The tumor size ranged from 2.5–20 cm. Different proportions of nephroblastic elements ranging from 15–70% were blended with the teratomatous components in those tumors. Most of the patients who underwent excision were free from tumor for three months. AFP levels were not known, except for in the Ishida case, whose level was within physiologic elevation [6].

Whenever nephrogenic tissue is found in a retroperitoneal tumor, it is mandatory to differentiate between benign immature renal elements observed as part of an immature teratoma and a teratoid Wilms' tumor. Both tumors can occur in the retroperitoneum. In the latter, the heterogeneous teratoid elements comprises > 50% of the nephroblastoma [10]. In teratomas, the different elements of three germ layers occur in an organoid arrangement [6]. Instead, heterogeneous elements are positioned in a haphazard fashion in teratoid Wilms' tumors [6]. The presence of an organoid arrangement in our case favored the diagnosis of teratoma. Furthermore, it is necessary to determine the benign or malignant nature of the nephrogenic tissue. Nephroblastoma tends to form expanding, spherical nodules surrounded by a fibrous pseudocapsule, while the nephrogenic rests have a tendency to preserve lobular shape [5]. WT1 immunostaining is not helpful in determining their nature. In our patient, the nephrogenic tissue maintained a lobular contour without a fibrous capsule. In addition, the frank cytologic atypia, atypical mitoses and pleomorphism were not found. Thus, benign primitive nephroblastic tissue is favored.

Another differential diagnosis is the presence of a yolk sac tumor. The immature glomeruli found in nephroblastic elements are similar to the Schiller Duval bodies of a yolk sac tumor, especially at low-power magnification. However, our case lacked the classic microcystic pattern, intracytoplasmic hyaline bodies and extracellular basement membrane deposits, features suggestive of a yolk sac tumor [11].

AFP is a principle marker of hepatic and germ cell tumor particularly those containing yolk sac components. In Wilms tumors, it is rarely elevated, either with teratoid or classic variant [12]. Despite not diagnostic, its serum level is useful in assessing response to treatment and surveillance of tumor recurrence if it is elevated pretreatment. That of our patient was 1182 ng/ml. According to Blohm et al. [13], the mean AFP level for 91 to 120 day-old infants is 98 ng/mL and the 95.5% interval ranges from 3–417 ng/ml. Therefore, this patient's AFP was higher than the physiologic level. Then, it returned to the normal range after tumor excision. The AFP level has been reported to be correlated with the pathologic grade of retroperitoneal teratomas. A significant elevation is

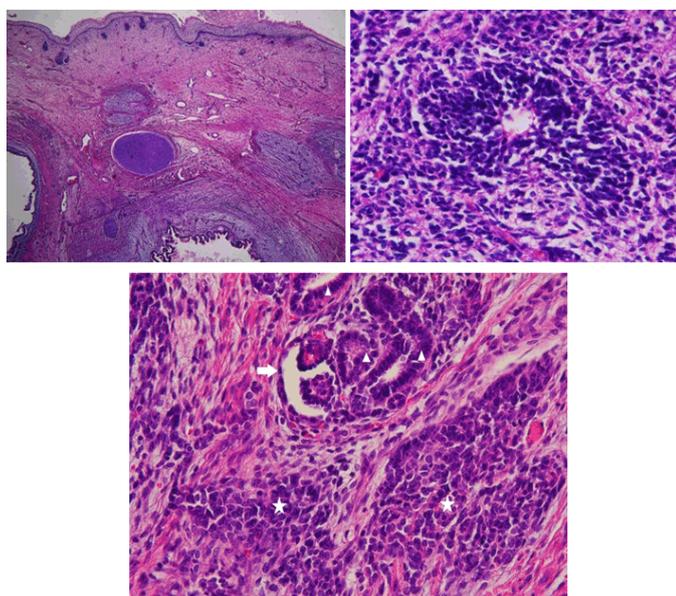


Figure 2: (A) Mixed elements from three germ layers were arranged in organoid pattern (H&E stain, x40), (B) Neuroepithelium in a rosette (H&E stain, x400), (C) Blastemal cells (stars), tubules (triangles) and glomeruli (arrow) represented the nephroblastic elements (H&E stain, x400).

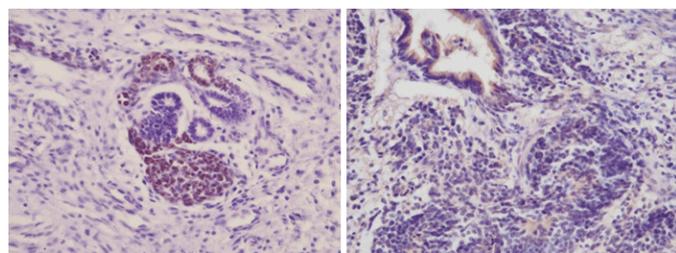


Figure 3: (A) WT-1 nuclear positivity was observed in the blastemal cells while more differentiated tubules remained negative (H&E stain, x400), (B) The source of AFP was demonstrated in the cytoplasm of columnar and neuroepithelium (H&E stain, x400).

Table 1: Previously reported cases of retroperitoneal teratomas with nephroblastic elements

Authors	Publication year	Age	Sex	Tumor location	Tumor size	Treatment	Outcome
Willis [†]	1935	2 m	F	Abdominal mass	Unknown	Surgical removal	Unknown
Malik et al.*	1967	6 y	F	Left retroperitoneum	12x8x12 cm	Surgical removal	Unknown
Carney*	1975	41 y	M	Left retroperitoneum	Huge	RT	Died 4 months later
Kim et al. [7]	1990	10 m	F	Left retroperitoneum	3x3x2.5 cm	CT	Free of tumor 4 months later
Park et al.[8]	1991	4 y	F	Left retroperitoneum	20x15x12 cm	Surgical removal	Recurrent 3 months later
Governder et al. [9]	1999	2 y	M	Left renal bed	4xx4x4 cm	Surgical removal	No residual tumor 3 months later
Fan et al. [†]	2006	2 y	M	Retroperitoneum	7cm	CT+ surgical removal+RT	Free of tumor 2 months later
Ishida et al. [†]	2012	2 m	F	Right retroperitoneum	13x10 cm	Surgical removal	Free of tumor 3 months later
Present case	2016	3 m 15 d	F	Left retroperitoneum	14x8x7 cm	Surgical removal	Free of tumor one year later

[†]Reference from Ishida et al. [6], *Refrence from Kim et al. [7].

Abbreviations: m months, F female, y years, M male, RT radiotherapy, CT chemotherapy, d days.

noted in grade 3 retroperitoneal teratomas compared with mature ones [3]. Ma et al.[4] reported a case similar to our patient that occurred in the sacrococcygeal region.

CONCLUSION

In summary, we describe a rare finding of nephroblastic elements in a retroperitoneal immature teratoma. This is the first case with alpha-fetoprotein elevation. The exact prognosis of such tumors has not been established due to their rarity. We feel that a “wait and see” policy with a closer follow up is optimal for our patient in the absence of obvious atypia and features of malignancy.

Author Contributions

Chiu-Hsuan Cheng – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Shang-Hsien Yang – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Borcherng Su – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

Copyright

© 2016 Chiu-Hsuan Cheng et al. This article is distributed under the terms of Creative Commons Attribution License which permits unrestricted use, distribution and reproduction in any medium provided the original author(s) and original publisher are properly credited. Please see the copyright policy on the journal website for more information.

REFERENCES

1. Patil PS, Kothari P, Gupta A, et al. Retroperitoneal Mature Cystic Teratoma in a Neonate: A Case Report. *J Neonatal Surg* 2016 Apr 10;5(2):15.
2. Gatcombe HG, Assikis V, Kooby D, Johnstone PA. Primary retroperitoneal teratomas: a review of the literature. *J Surg Oncol* 2004 May 1;86(2):107–13.

3. Hunter CJ, Ford HR, Estrada JJ, Stein JE. Alpha-fetoprotein levels correlate with the pathologic grade and surgical outcomes of pediatric retroperitoneal teratomas. *Pediatr Surg Int* 2009 Apr;25(4):331–6.
4. Ma Y, Zheng J, Zhu H, Shen C, Zheng S, Xiao X, Chen L. Sacrococcygeal teratoma with nephroblastic elements: a case report and review of literature. *Int J Clin Exp Pathol* 2014 Oct 15;7(11):8211–6.
5. Coli A, Angrisani B, Chiarello G, Massimi L, Novello M, Lauriola L. Ectopic immature renal tissue: clues for diagnosis and management. *Int J Clin Exp Pathol* 2012;5(9):977–81.
6. Ishida M, Hotta M, Ohta M, Taga T, Ohta S, Takeuchi Y, Okabe H. A case of retroperitoneal immature teratoma with nephroblastic components. *J Pediatr Hematol Oncol* 2012 Jan;34(1):e22–5.
7. Kim YW, Park YK, Oh SM, Yang MH. Retroperitoneal teratoma with predominance of nephroblastic elements--a case report. *J Korean Med Sci* 1990 Dec;5(4):237–42.
8. Park HR, Park CY, Choi NK, Park YE. A case of retroperitoneal teratoma with nephroblastoma. *J Korean Med Sci* 1991 Mar;6(1):95–102.
9. Govender D, Hadley GP. Recurrent Wilms' tumour or retroperitoneal teratoma? A challenging case. *Virchows Arch* 1999 Jul;435(1):67–70.
10. Variend S, Spicer RD, Mackinnon AE. Teratoid Wilms' tumor. *Cancer* 1984 May 1;53(9):1936–42.
11. Ulbright TM. Germ cell tumors of the gonads: a selective review emphasizing problems in differential diagnosis, newly appreciated, and controversial issues. *Mod Pathol* 2005 Feb;18 Suppl 2:S61–79.
12. Dhungel S, Cheng LJ, Hai ZZ. Elevated serum alpha-fetoprotein in Wilms' tumor: a case report and review of literature. *J Ped Surg Case Reports* 2014;2(3):153–5.
13. Blohm ME, Vesterling-Hörner D, Calaminus G, Göbel U. Alpha 1-fetoprotein (AFP) reference values in infants up to 2 years of age. *Pediatr Hematol Oncol* 1998 Mar-Apr;15(2):135–42.

SUGGESTED READING

- John N. Eble, Guido Sauter, Jonathan I. Epstein and Isabell A. Sesterhenn. Pathology and genetics of tumors of the urinary system and male genital organs: World health organization classification of tumors. 1ed. Lyon: IARS press; 2004. p. 48–54.

Access full text article on
other devices



Access PDF of article on
other devices

