

## Case Report

# Ganglioneuroma coexisted with renal dysplasia, hydronephrosis and cryptorchidism

Zhi-Bin Niu, Jing Tong

Department of Pediatric Surgery, Shengjing Hospital Affiliated to China Medical University, Shenyang 110004, China

Received October 14, 2016; Accepted December 23, 2015; Epub June 15, 2016; Published June 30, 2016

**Abstract:** We report an unusual case with synchronous occurrence of ganglioneuroma (GN) and multiple urogenital malformations (including ipsilateral renal dysplasia, cryptorchidism and contralateral congenital hydronephrosis). The lesions may be a syndrome associated with embryogenetic disorders. Imaging examinations are helpful for preoperative diagnosis and choose of surgical approach. Staging surgical interventions which taking emphasis on the resection of the tumor was recommended for this case and postoperative histological confirmation, anticipation of malignant transformation of the tumor is also important to ensure a final cure. GN coexisting with multiple urogenital malformations is extremely rare and there is no previous similar reported case.

**Keywords:** Ganglioneuroma, hydronephrosis, renal dysplasia, cryptorchidism, image, urogenital malformation

### Introduction

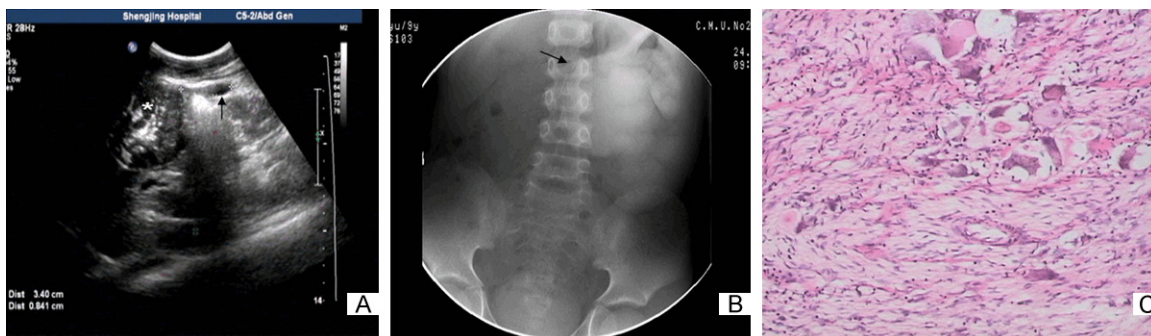
Ganglioneuromas (GNs) are neural crest cell-derived tumors and seldom occur in the adrenal gland [1]. GNs are usually asymptomatic and may be found incidentally. We report an unusual presentation in an 8-year-old boy with GN in the adrenal gland coexisted with ipsilateral renal dysplasia, cryptorchidism and contralateral congenital hydronephrosis. There are no previous reported cases of a patient with a GN and multiple urogenital malformations. We treated this case with resection of the GN and dysplastic kidney together with orchiopexy and pyeloplasty.

### Case report

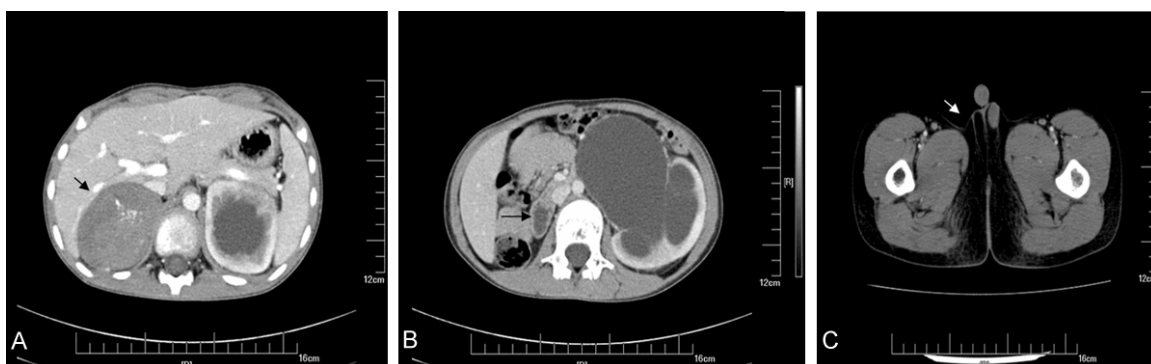
An 8-year-old boy suffered from intermitted left flank pain and had the symptom of a palpable mass on left upper abdomen. He was with normal intelligence and physical development. Physical examination revealed a mass of the left flank abdomen and nonpalpable right testis. Blood pressure was within normal limits. Hematology, serum biochemistry and urine analysis were unremarkable. Ultrasonography (US) revealed large hydronephrosis of left kid-

ney, simultaneously, a 6-cm heterogeneous mass in the right adrenal region accompanied by the absence of the normal right kidney in renal region and right testis in scrotum. A 3.4×0.8 cm irregular with low level and liquid echo in right renal region and testis-like mass in the right inguinal region were detected by US (**Figure 1A**). Furthermore, he was investigated with intravenous pyelography (IVP) and computed tomography (CT) scan of the abdomen. A large hydronephrotic, extrarenal pelvis probably owing to ureteropelvic junction obstruction and absence of right kidney was showed in IVP (**Figure 1B**). CT revealed a 6.5×5.5×4.9 cm solid tumor in the right adrenal region which was hypodense with speckled calcification on unenhanced CT and showed moderate enhancement with administration of contrast medium. Left hydronephrosis with ureteropelvic junction (UPJ) obstruction, right renal dysplasia and cryptorchidism were also illustrated in CT scan (**Figure 2**). Renal scintigraphy detected no function of the right kidney and almost normal GFR (glomerular filtration rate) of the left kidney. Serum-ferritin, 24-hour urine vanillylmandelic acid, and homovanillic acid were measured then, and all values obtained were within normal limits. A skeletal survey showed no evi-

## Case report



**Figure 1.** A: US reveals a 6 heterogeneous mass with calcification in the right adrenal region (\*: tumor) and a 3.4×0.8 cm irregular with low level and liquid echo in right renal region with absence of normal right kidney (arrow-head); B: IVP shows a large hydronephrotic, extrarenal pelvis probably owing to UPJ obstruction and nonvisualization of right kidney (.arrowhead); C: Microscopic finding shows that the tumor cell components are immature and mature ganglion fibers and neuronal cells (hematoxylin and eosin stain ×200).



**Figure 2.** Contrast-enhanced CT scan shows (A) a 6.5×5.5×4.9 cm solid tumor in the right adrenal region which is moderate enhancement with speckled calcification, (B) left hydronephrosis with extrarenal pelvis and thinning of renal cortex, right renal dysplasia (arrowhead) and (C) cryptorchidism (arrowhead).

dence of osseous metastases and bone marrow puncture didn't reveal any rosettes or anaplastic cells. He was taken up for laparotomy. Intraoperative findings revealed a 6.5×5.5×4.9 cm solid tumor with definite margins located in right adrenal region, and the adrenal gland almost disappeared for compression by the tumor. A 3.0×2.0×0.8 cm irregular vesicle-like mass located in right renal region and right ureter was absent. The solid tumor didn't adhere to the surround tissues and was carefully and completely dissected out together with the right adrenal gland, the vesicle-like mass was removed simultaneously. The postoperative histologic examination revealed a mixture of immature and mature ganglion fibers and neuronal cells in the solid tumor (**Figure 1C**) and little amount of dysplastic nephron in vesicle-like mass. Ganglioneuroma (GN) and renal dysplasia was diagnosed. The patient underwent

the second operation one month later with full recovery from the first surgery. Aderson-Hynes procedure and orchiopexy were carried out simultaneously. Postoperative recovery was unremarkable and there was no evidence of recurrence of the tumor or abnormalities of right kidney and testis at 3 years of close follow-up.

### Discussion

GN is the benign counterpart in the spectrum of peripheral neuroblastic tumors of ganglion cell origin, which include neuroblastoma (NB), ganglioneuroblastoma (GNB) and GN, often originate in the paravertebral sympathetic plexus or in the adrenal gland. NBs and GNBs are malignant in nature, whereas GNs are benign and may arise *de novo* or from a NB either spontaneously or after chemotherapy. A GN arising *de*

## Case report

**Table 1.** Summary of related studies of GN coexisting with urogenital malformation

Study	Year	Age/Sex	Tumor/Location	Urogenital malformations	Other malformations	Prognosis
Bansal N et al [4]	1978	21 days/F	NB/adrenal gland	Ipsilateral UPJO	none	Good
Morales L et al [5]	1981	2 years/F	NB/adrenal and pelvic	Solitary pelvic kidney, bifid uterus	Microcephaly, hypertelorism, aortic coarctation	Dead
Diamond DA et al [6]	1986	11 weeks/F	GNB/near renal hilum	Ipsilateral duplex kidney and ureterocele	None	Good
Jeong HJ [7]	2009	19 months/M	GNB/between the left kidney and psoas muscle	Crossed testicular ectopia	None	Not mentioned
Current case		7 years/M	GN/ adrenal gland	Ipsilateral renal dysplasia and cryptorchidism, contralateral UPJO	None	Good

NB: neuroblastoma; GNB: ganglioneuroblastoma; GN: ganglioneuroma; UPJO: ureteropelvic junction obstruction.

*novo* usually affects adolescents and young adults [1]. The occurrence of this tumor has no sex predilection (male/female ratio 1:1) [2]. The histologic diagnosis of GN is now based on the introduction of the International Neuroblastoma Pathology Committee criteria in which GN is defined as a tumor predominantly composed of ganglioneuromatous stroma with a minor component of mature ganglion cells [3]. The etiology of the GNs is still unknown. In this case, the GN coexisted with urogenital malformations and the tumor, renal dysplasia and cryptorchidism occurred in the same side, so the embryogenetic disorders may be the accepted theory. GN complicating with urogenital deformations is seldom reported. A Medline search of the English literature from 1950 to 2010 revealed four related reported cases which were listed in **Table 1**. There is no similar previous report concerning GN coexisted with multiple urogenital malformations. The clinical presentation of most patients with GN is asymptomatic and the tumor is detected incidentally by abdominal imaging studies for unrelated reasons. Sometimes the symptoms may relate to secretion of vasoactive peptides, compression effects, rupture, or hemorrhage into the tumor [8]. The tumor was found incidentally by imaging examination in this case. Detection of the retroperitoneal GNs usually depends on imaging examinations because of the deep tumor location. Ultrasound (US) is regarded as the preferred initial diagnostic modality for children with peritoneal tumors because its safeness, but US can't provide details of the tumor and surrounding tissues. Additional diagnostic tools include CT and MR imaging, which can provide more excellent visualization of tumors, and reveal helpful information for surgical approach. On CT and MR images, GNs usually present an oval, well-defined mass in the adrenal gland or

in extra-adrenal peritoneum. On MR, GNs usually present inhomogeneous hyperintensity on T2WI and inhomogeneous moderate to marked enhancement on delayed post-contrast images. On unenhanced CT, GNs often have a low attenuation, whereas NBs and GNBs have a relatively inhomogeneous high attenuation. Furthermore, GNs usually present a light or no enhancement in early phase, and moderate or marked enhancement in late phase. However, NBs and GNBs often have an inhomogeneous marked enhancement in early phase after injection of contrast media [9]. The pattern of calcification on CT has been previously reported as a main differential point for the tumors of ganglion cell origin, other than a feature special for ganglioneuroma [10]. These morphological characteristics of GN are consistent with those of our patient. A solid tumor coexisted with urogenital malformations were detected initially by US and CT was used as the main imaging modality, the tumor was disclosed distinctly and its nonmalignant nature and neurogenic origin were suspected. The ipsilateral renal dysplasia and cryptorchidism together with contralateral UPJ obstruction were also demonstrated well. These findings were helpful to guide the treatment of the case.

There are no clear guidelines that exist to direct the management of incidentally detected GNs [11]. Although some investigators have indicated that conservative management in cases not amenable to complete resection still results in a good prognosis [12, 13]. The popular management of GNs is surgical resection, which can be radical once or staged. There were researchers proposes the surgery should be performed for the following conditions: symptoms resulting from the tumor, encroachment on vertebral foramina, marked growth in size,

## Case report

and increased secretory activity of catecholamine [13]. For the GN in adrenal, the management should also follow the National Institutes of Health state-of-the-science statement which recommend that nonfunctioning adrenal incidentalomas larger than 60 mm or with suspicious features of malignancy on imaging studies should be treated using open adrenalectomy because of the increased prevalence of malignancy [14]. According the statements above, open resection of the tumor together with adrenalectomy is preferable for this case. The staging surgical operations were carried out in consideration of the existence of other urogenital malformations and physical condition of the patient. The tumor was resected at the first stage for its malignant potential. The possibility of slow progression and late recurrence of GNs has not been excluded; therefore, long-term follow-up postoperatively is necessary to assess the malignant potential of these tumors [2]. Our patient has a good prognosis, there were neither recurrence of the tumor nor the abnormal change of left kidney and right testis at 3 years closely follow-up.

### Disclosure of conflict of interest

None.

**Address correspondence to:** Dr. Zhi-Bin Niu, Department of Pediatric Surgery, Shengjing Hospital Affiliated to China Medical University, 36 Sanhao Street, Heping District, Shenyang 110004, China. Tel: 86-24-96615-57411; Fax: 86-24-23929903; E-mail: niuzb@sj-hospital.org

### References

- [1] Rha SE, Byun JY, Jung SE, Chun HJ, Lee HG, Lee JM. Neurogenic tumors in the abdomen: tumor types and imaging characteristics. *Radiographics* 2003; 23: 29-43.
- [2] Singh KJ, Suri A, Vijjan V, Singh P, Srivastava A. Retroperitoneal ganglioneuroma presenting as right renal mass. *Urology* 2006; 67: 1085, e7-8.
- [3] Shimada H, Ambros IM, Dehner LP, Hata J, Joshi VV, Roald B. Terminology and morphologic criteria of neuroblastic tumors: Recommendations by the international neuroblastoma pathology committee. *Cancer* 1999; 86: 349-363.
- [4] Bansal N, Wainstein M, Kropp KA. Congenital hydronephrosis with ipsilateral adrenal neuroblastoma: a case report. *J Urol* 1978; 120: 354-355.
- [5] Morales L, Rovira J, Mongard M, Baeta E, Querol FX. Solitary pelvic kidney and neuroblastoma in a child. *J Urol* 1981; 126: 249-250.
- [6] Diamond DA, Jeffs RD. Incidental ganglioneuroblastoma. *Urology* 1986; 27: 254-257.
- [7] Jeong HJ. Ganglioneuroblastoma in a patient with crossed testicular ectopia. *Urology* 2009; 74: 1126-1128.
- [8] Pratap A, Tiwari A, Pandey S, Yadav RP, Agrawal A, Sah BP, Bajracharya T, Ghimere A. Ganglioneuroma of small bowel mesentery presenting as acute abdomen. *J Pediatr Surg* 2007; 42: 573-575.
- [9] Cai J, Zeng Y, Zheng H, Qin Y, T K, Zhao J. Retroperitoneal ganglioneuroma in children: CT and MRI features with histologic correlation. *Eur J Radiol* 2010; 75: 315-320.
- [10] Ichikawa T, Ohtomo K, Araki T, Fujimoto H, Nemoto K, Nanbu A, Onoue M, Aoki K. Ganglioneuroma: computed tomography and magnetic resonance features. *Br J Radiol* 1996; 69: 114-121.
- [11] Masiakos PT, Gerstle JT, Cheang T, Viero S, Kim PC, Wales P. Is surgery necessary for incidentally discovered adrenal masses in children? *J Pediatr Surg* 2004; 39: 754-758.
- [12] Geoerger B, Hero B, Harms D, Grebe J, Scheidhauer K, Berthold F. Metabolic activity and clinical features of primary ganglioneuromas. *Cancer* 2001; 91: 1905-1913.
- [13] Hayes FA, Green AA, Rao BN. Clinical manifestations of ganglioneuroma. *Cancer* 1989; 63: 1211-1214.
- [14] Yamaguchi K, Hara I, Takeda M, Tanaka K, Yamada Y, Fujisawa M, Kawabata G. Two cases of ganglioneuroma. *Urology* 2006; 67: 622, e1-4.