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(CASE REPORT)

Giant adrenal ganglioneuroma: Case report and literature review

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Abstract

Adrenal ganglioneuroma is a benign tumor of the sympathetic nervous system, composed of gangliocytes and mature neural stroma. The tumor is asymptomatic in the majority of cases and mostly accidentally detected in diagnostic imaging due to health check. When the tumor is large, it causes the symptom such as abdominal pain or discomfort. We report a case of adrenal ganglioneuroma incidentally detected in a 25-year-old male patient. The physical examination and laboratory tests were in normal ranges. However, abdominal magnetic resonance imaging showed a large heterogeneous right adrenal mass measuring 16.8 x 14.1 cm. Histological examination of biopies confirmed an adrenal ganglioneuroma. A right adrenalectomy by laparotomy was carried out. The right renal artery was injured during the dissection of tumor and repaired with an end-to-end anastomosis. During postoperative period, the patient experienced a pleural effusion requiring a needle aspiration. No recurrence occurred during the 6-month follow-up.

Keywords: Ganglioneuroma; Adrenal ganglioneuroma; Magnetic resonance imaging; Renal artery injury

1. Introduction

Ganglioneuroma (GN) is a well-differentiated tumor deriving from the primordial neural crest cells that develop into the adrenal medulla and sympathetic nervous system during specification and differentiation [1,2]. According to Lonergan GJ et al. [3], it is composed entirely of mature ganglion cells and Schwannian stroma, thus considered benign, contrary to other sympathetic neuroectodermal tumors: neuroblastoma (NB) and ganglioneuroblastoma (GNB) with malignant or potentially malignant behavior. This tumor emerge along the anatomic distribution of sympathetic ganglia, and most of the GNs are located in the retroperitoneum (30-50%), posterior mediastinum (40%), and rarely in the adrenal gland (20-25%). GN may arise either from NB and ganglioneuroblastoma GNB, or *de novo* [4]

In report of Mylonas KS (2017), adrenal ganlioneuroma is generally hormonally silent, clinically asymptomatic even when the size of tumor is large and detected incidentally in the majority of cases [5]. However some of them secrete sufficient quantities of catecholamines. Although the charactetistics of adrenal GN on diagnostic imaging procedures such as computerized tomography (CT) scan and magnetic resonance imaging (MRI) are well-defined, however, clinically adrenal GN is challenging for diagnosis because of its similarity to other solid adrenal tumors. Histological examination remains the golden standard for the definitive diagnosis for adrenal GN which is treated by surgical resection with an excellent prognosis [6-8].

In this report, we present a case of 25-year-old male patient with a giant tumor in the right upper-quadrant that was diagnosed an adrenal GN and treated surgically because there were no reports in Vietnam so far for this.

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2. Case Report

A 25-year-old male patient presented a non-specific abdominal discomfort and a palpable mass in the right upper-quadrant. He had no significant past medical or surgical history. A abdominal solid mass was palpable in the right subcostal area. The rest of physical examination revealed no significant findings; his blood pressure was 120/ 70 mmHg.

Routine laboratory studies, including hemogram, biochemistry test, urinalysis, were normal. Serological markers of hepatitis B and C virus were negative. Endocrine tests were withing normal range, including serum cortisol level at 8h (326 nmol/L; normal range: 133 – 357 nmol/L), serum adrenocorticotropin hormone (ACTH) level (16.6 pg/mL; normal range: 7.2 – 63.3 pg/mL), 24h urinary catecholamines (adrenaline, noradrenaline, dopamine) and serum catecholamines levels. Levels of tumor markers (Alpha-fetoprotein, CA 19.9) were within normal limits.

Abdominal CT scan showed a relatively heterogeneous right adrenal tumor measuring 16 x 12 cm with enhanced edge. MRI showed a large solid formation measuring 16.8 x 14.1 cm, composed of solid and fat components, with well-defined edge, located in the topography of the right adrenal. On the T1-weighted MRI, the tumor was visualized as a heterogeneous mass with signal intensity (hypointense signal) lower than that of the liver. T2-weighted MRI revealed a heterogeneous mass with high signal intensity (hyperintense signal) greater than that of the liver. Out-of-phase MRI did not show significant signal loss in the tumor comparing with in-phase MRI. After administration of gadolinium, there was enhancement of the solid components of the mass without wash-out sign. The tumor pushed the right kidney inferiorly, the liver to the left without well-defined cleavage plane and compressed the inferior vena cava (IVC). Initially, it was taken for a hepatic tumor, but its retroperitoneal localization refuted this supposition. However, it was not possible to conclude whether the adrenal tumor was benign or malignant. Therefore, an ultrasound-guided biopsy of the mass was conducted. Histological examination confirmed an adrenal ganglioneuroma.

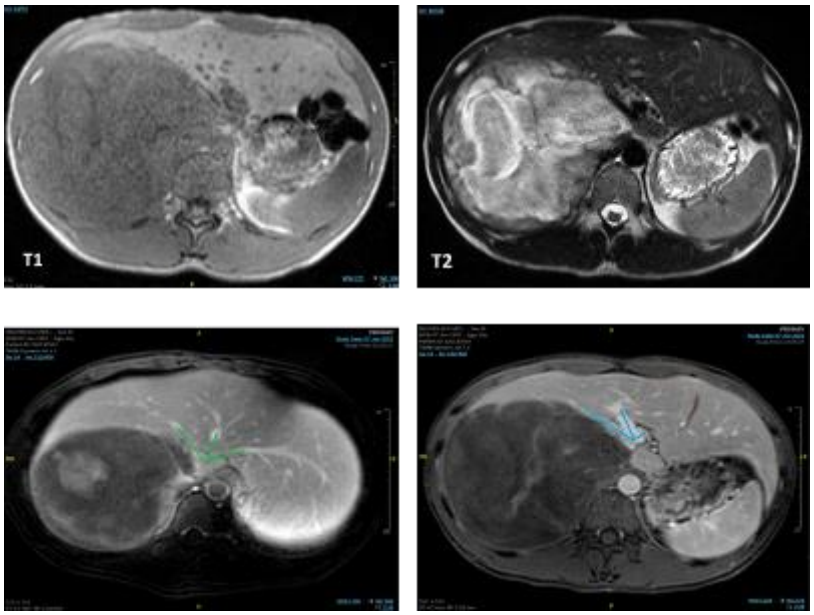

Figure 1 Abdominal MRI show a voluminous heterogenous formation

The laparotomy with a J-shaped incision was performed. At exploration, a tumor measuring 25 x 20 cm occupied most of the space in the right hemi-abdomen, pushed the liver to the left and the right kidney inferiorly. A right adrenalectomy was performed. Firstly, the tumor was dissected along the capsule and detached from the IVC. The vessels of tumor was ligated and cut carefully. As the tumor was attached partially to right renal vessels. However, the right renal artery was injured during the dissection despite the extreme caution. We reconstructed the artery with an end-to-end anastomosis; the warm ischemia time was 5 minutes. Upon removal of the vascular clamp, the right kidney was rapidly recolored. The mass was completely excised without significant hemorrhage nor other complications.

The surgical specimen showed mature ganglion cells and petite, regular, bland Schwann cells. The microscopic appearance was straightforward as an adrenal ganglioneuroma. The early postoperative course was uneventful. The postoperative renal function was normal and the examination of the right renal artery by color Doppler ultrasound study did not notice any stenosis of the anastomosis (peak systolic veloctity 120 cm/s). The patient was discharged at

postoperative day 7. At the 1-month follow-up visit, a right pleural effusion was recorded and required a needle aspiration, when the patient complained of right chest pain and slight dyspnea. No recurrence occurred at the 6 month follow-up visit.

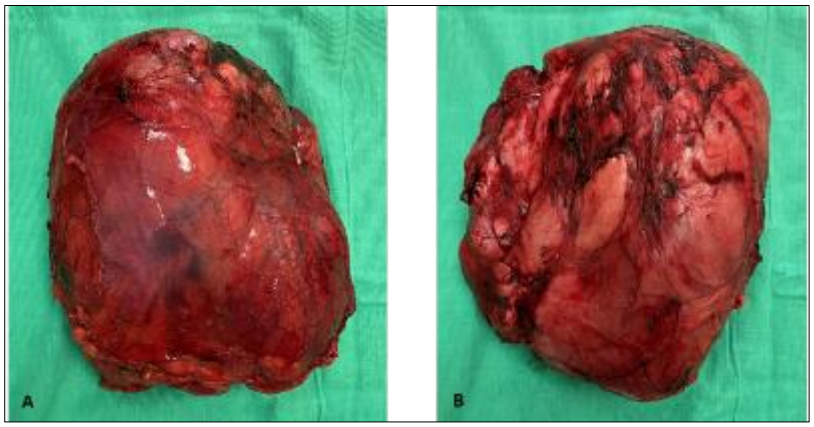

Figure 2 Right adrenal tumor measuring 25 x 20 cm, anterior view (A) and posterior view (B)

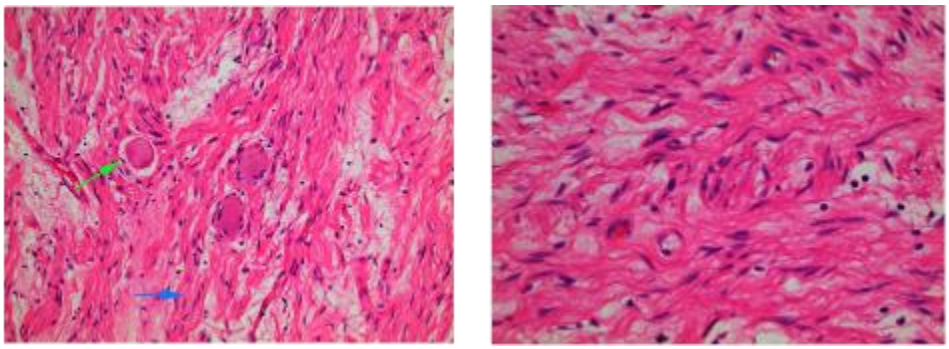

Figure 3 Histopathology of adrenal tumor tissue stained by hematoxylin and eosin (H&E, x400). Microscopic view shows ganglion cells (green arrow) and mature Schwann cells (blue arrow)

3. Discussion

Neuroblastoma, ganglioneuroblastoma and ganglioneuroma are tumors varying maturity devived from the primordial neural crest cells that form the sympathetic nervous system, ranging from the undifferentiated (NB) to the mature (GN). GN is a rare and benign tumor composed completely undifferentiated cells, while NB and GNB contain immature elements and are considered malignant and potentially malignant, respectively. The median age at diagnosis is approximately 7 years [3,4,7]

Adrenal GNs usually have silent hormonal function. They are detected incidentally in the majority of cases. In other cases, physical examination find abdominal pain, palpable mass or specific signs of organ compression. Most of GNs do not secrete catecholamine or steroid hormones. Endocrine tests are normal in general. Occasionally, some of adrenal GNs secrete catecholamines as a result of a mixed tumor with pheochromocytoma (PC), and can manifest the sympathetic hyperactivity (hypertension, diarrhea, flushing, etc); but they secrete exceptionally cortisol and androgen [8-10] Composite adrenal tumors PC/GN contain pheochromocytoma together with ganglioneuroma, and are functional in the most of cases with increased levels of catecholamines or even corticotropin-releasing hormone. GN sometimes can also produce vasoactive intestinal peptide by ganglion cells, responsible of diarrhea [10] Therefore, all patients with adrenal GN should be evaluated with hormonal screening tests.

Most of adrenal GNs are detected incidentally on diagnostic imaging studies [11]. Ultrasonography is not well specific, shows a well-defined, homogeneous and hypoechogenic mass. On CT scan , adrenal GN have a variable appearance and is described as a well circumscribed homogeneous or slightly heterogeneous mass, hypodense signal and slightly

enhanced in the delayed phase. According to Adas M [8], intratumoral calcifications are present in 0% to 29% of GNs. Guo YK et al [12] reported that both CT scan and MRI are valuable technique for diagnosis of CNs. CT scan allows for an accurate evaluation of relationship with vascular structures. On MRI, the tumor shows a homogenous mass with low- or intermediate signal intensity in T1-weighted, heterogeneous with slightly high signal intensity on T2-weighted, and progressively enhanced after gadolinium administration. The heterogeneous high signal intensity on T2-weighted images depends on the amount of myxoid matrix, collagen fibers and ganglion cells present in the tumors. Although the imaging characteristics of adrenal GN have been well described, the preoperative precise diagnosis remains difficult because of lack of specific findings. Some characteristics of adrenal GN are similar to other adrenal tumors, such as adrenocortical carcinoma or PC; and the non-diagnosis rate in GN before surgery is 64.7%. Thus, diagnostic imaging studies cannot differentiate GN from other adrenal tumors arising from sympathetic nervous system or from adrenal gland itself. Only biopsy for histopathological examination can confirm the diagnosis [13-15].

The treatment of choice for adrenal GN is surgical resection [16,17]. Deflorenne E et al [17] had a retrospective multicentric study of 104 cases from the COMETE network. Open surgery is imperative in the present case because of the size of the mass. However, laparoscopic surgery may be a great alternative for small tumors. The incidence of postoperative complications are transient. The risk of surgery-related complications can assessed by image-defined risk factors described by the International Neuroblastoma Risk Group Staging System [18]. Tumoral tissue related to vascular structures or adjacent organs are risk factors for complications. It is necessary to prepare a further visceral or vascular resection and reconstruction for resection of a tumor that involves multiple structures, which was unfortunately occurred in our situation. GNs are classified within a favorable histology group [19].The prognosis of adrenal GN after surgical resection is good without any further requirement for treatment with no recurrence [17]. In this our case, the patient had no tumor recurrence at 1 years after the operation.

4. Conclusion

In conclusion, adrenal GN is a rare benign and non-secretor tumor arising from the sympathetic nervous system. Diagnostic imaging studies as Ultrasound, CT scan and MRI are not specific therefore it cannot differentiate a GN from other adrenal tumors. Biospy is required to confirm the diagnosis. Surgical resection is currently the first-line treatment with a good prognosis.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Geoerger B, Hero B, Harms D, et al. Metabolic activity and clinical features of primary ganglioneuromas. Cancer. 2001;91(10):1905-13. Epub 2001/05/11. doi: 10.1002/1097-0142(20010515)91:10<1905::aid-cncr1213>3.0.co;2-4. PubMed PMID: 11346873.

[2] Kouriefs C, Leris AC, Mokbel K, et al. Abdominal ganglioneuromas in adults. Urol Int. 2003;71(1):110-3. Epub 2003/07/08. doi: 10.1159/000071107. PubMed PMID: 12845274.

[3] Lonergan GJ, Schwab CM, Suarez ES, et al. Neuroblastoma, ganglioneuroblastoma, and ganglioneuroma: radiologic-pathologic correlation. Radiographics. 2002;22(4):911-34. Epub 2002/07/12. doi: 10.1148/radiographics.22.4.g02jl15911. PubMed PMID: 12110723.

[4] Brouwers FM, Eisenhofer G, Lenders JW, et al. Emergencies caused by pheochromocytoma, neuroblastoma, or ganglioneuroma. Endocrinol Metab Clin North Am. 2006;35(4):699-724, viii. Epub 2006/11/28. doi: 10.1016/j.ecl.2006.09.014. PubMed PMID: 17127142.

[5] Mylonas KS, Schizas D, Economopoulos KP. Adrenal ganglioneuroma: What you need to know. World J Clin Cases. 2017;5(10):373-7. Epub 2017/11/01. doi: 10.12998/wjcc.v5.i10.373. PubMed PMID: 29085827; PMCID: PMC5648998.

[6] Koch CA, Brouwers FM, Rosenblatt K, et al. Adrenal ganglioneuroma in a patient presenting with severe hypertension and diarrhea. Endocr Relat Cancer. 2003;10(1):99-107. Epub 2003/03/26. doi: 10.1677/erc.0.0100099. PubMed PMID: 12653673.

[7] Rondeau G, Nolet S, Latour M, et al. Clinical and biochemical features of seven adult adrenal ganglioneuromas. J Clin Endocrinol Metab. 2010;95(7):3118-25. Epub 2010/04/30. doi: 10.1210/jc.2009-2775. PubMed PMID: 20427489.

[8] Adas M, Koc B, Adas G, et al. Ganglioneuroma presenting as an adrenal incidentaloma: a case report. J Med Case Rep. 2014;8:131. Epub 2014/05/02. doi: 10.1186/1752-1947-8-131. PubMed PMID: 24779851; PMCID: PMC4031973.

[9] Leavitt JR, Harold DL, Robinson RB. Adrenal ganglioneuroma: a familial case. Urology. 2000;56(3):508. Epub 2000/08/30. doi: 10.1016/s0090-4295(00)00695-6. PubMed PMID: 10962331.

[10] Erem C, Ucuncu O, Nuhoglu I, et al. Adrenal ganglioneuroma: report of a new case. Endocrine. 2009;35(3):293-6. Epub 2009/04/16. doi: 10.1007/s12020-009-9180-4. PubMed PMID: 19367379.

[11] Rha SE, Byun JY, Jung SE, et al. Neurogenic tumors in the abdomen: tumor types and imaging characteristics. Radiographics. 2003;23(1):29-43. Epub 2003/01/21. doi: 10.1148/rg.231025050. PubMed PMID: 12533638.

[12] Guo YK, Yang ZG, Li Y, et al. Uncommon adrenal masses: CT and MRI features with histopathologic correlation. Eur J Radiol. 2007;62(3):359-70. Epub 2007/05/29. doi: 10.1016/j.ejrad.2006.12.011. PubMed PMID: 17532488.

[13] Shi BB, Li HZ, Chen C, et al. Differential diagnosis and laparoscopic treatment of adrenal pheochromocytoma and ganglioneuroma. Chin Med J (Engl). 2009;122(15):1790-3. Epub 2009/09/29. PubMed PMID: 19781327.

[14] Linos D, Tsirlis T, Kapralou A, et al. Adrenal ganglioneuromas: incidentalomas with misleading clinical and imaging features. Surgery. 2011;149(1):99-105. Epub 2010/05/11. doi: 10.1016/j.surg.2010.03.016. PubMed PMID: 20452635.

[15] Dubois C, Jankowski A, Gay-Jeune C, et al. [Imaging of adrenal ganglioneuroma: a case report]. J Radiol. 2005;86(6 Pt 1):659-62. Epub 2005/09/06. doi: 10.1016/s0221-0363(05)81424-6. PubMed PMID: 16142032.

[16] Retrosi G, Bishay M, Kiely EM, et al. Morbidity after ganglioneuroma excision: is surgery necessary? Eur J Pediatr Surg. 2011;21(1):33-7. Epub 2010/10/19. doi: 10.1055/s-0030-1263195. PubMed PMID: 20954104.

[17] Deflorenne E, Peuchmaur M, Vezzosi D, et al. Adrenal ganglioneuromas: a retrospective multicentric study of 104 cases from the COMETE network. Eur J Endocrinol. 2021;185(4):463-74. Epub 2021/07/23. doi: 10.1530/eje-20-1049. PubMed PMID: 34291731.

[18] Brisse HJ, McCarville MB, Granata C, et al. Guidelines for imaging and staging of neuroblastic tumors: consensus report from the International Neuroblastoma Risk Group Project. Radiology. 2011;261(1):243-57. Epub 2011/05/19. doi: 10.1148/radiol.11101352. PubMed PMID: 21586679.

[19] Decarolis B, Simon T, Krug B, et al. Treatment and outcome of Ganglioneuroma and Ganglioneuroblastoma intermixed. BMC Cancer. 2016;16:542. Epub 2016/07/29. doi: 10.1186/s12885-016-2513-9. PubMed PMID: 27465021; PMCID: PMC4964292.