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Retroperitoneal paraganglioma—Is pre operative embolization useful?



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ABSTRACT

INTRODUCTION: Paragangliomas (PG) are rare tumors derived from chromaffin cells that are located outside the adrenal gland and are capable of producing catecholamines. The treatment is based on a surgical resection, and there is controversy regarding the usefulness of previously carrying out an embolization and what is the most adequate surgical approach.

CLINICAL CASE: We will present a 17-year-old woman with a retroperitoneal tumour in contact with the aorta and the inferior vena cava, treated with embolization prior to the surgical resection via laparotomy.

DISCUSSION: The PG tumors are very infrequent and originate in the extra-adrenal chromaffin cells that exist in the vicinity of the components of the autonomic nervous system. Most of them (86%) produce catecholamines, are unique, sporadic, benign and more frequent in middle-aged women. Since they are radioresistant tumors, the only possibility for a cure is by a complete surgical excision. The preoperative embolization has been described mainly as the treatment of cervical PG, although its use in abdominal PG is more controversial and is not done in a systematic manner.

CONCLUSION: We can conclude that the embolization of abdominal PG is not free of risks and that it has not been demonstrated that it significantly reduces the peri-operative bleeding or the surgical time. Probably, the embolization should be reserved for intensively hypervascularized and larger PGs.

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1. Introduction

Paragangliomas (PG) are rare tumors derived from chromaffin cells that are located outside the adrenal gland and are capable of producing catecholamines. The treatment is based on a surgical resection, and there is controversy regarding the usefulness of previously carrying out an embolization and what is the most adequate surgical approach. We will present a case treated with embolization before the surgical resection via laparotomy and a review of the existing literature. The present work is reported in line with the SCARE criteria [1].

2. Clinical case

A 17-year-old woman, without any interesting notes, that was assessed due to brief palpitations, hydorrhea and cephalalgia, without suffering from high blood pressure, which has evolved over

one year. The physical exam, the electrocardiogram monitoring, the blood pressure and the treadmill test were normal. The laboratory exams show an increase of the plasma normetanephrine (566 pg/ml), urinary noradrenaline (592 mcg/24 h) and urinary dopamine (632 mcg/24 h). The rest of the test were normal, including the oncogene markers and the chromogranin-A. In a computerised tomographic scan (CT) there can be seen a 3 × 5 cm retroperitoneal tumour in contact with the aorta and the inferior vena cava, with a homogenous uptake of the contrast medium (Fig. 1). The magnetic resonance imaging (MRI) of the abdomen shows a 49 × 30 × 25 mm right retroperitoneal nodular lesion at the level of the inferior vena cava, which it compresses, with an increase in signal in the potentiated sequences in T2 and restriction to the diffusion and enhancement with contrast medium (Fig. 2). The study was completed with a scintigraphy with somatostatin receptors (OctreoScan) SPECT CT in which the retroperitoneal mass shows a pathological uptake.

Based on the suspicion raised from the retroperitoneal paraganglioma, the decision to operate on the patient was made, after a two-week of alpha-adrenergic blockade, and beginning the beta-adrenergic blockade 48 h before the operation; while the patient remained hospitalized to carry out a safe embolization of the lesion.

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Fig. 1. CT scan showing a 3 × 5 cm retroperitoneal tumour in contact with the aorta and the inferior vena cava, with a homogenous uptake of contrast.

Accessing it through the right femoral artery, a selective angiography of the right lumbar arteries was carried out, being able to complete the vascularization of the tumour by direct branches from the distal third of the aorta (Fig. 3). The arteriography from the upper mesenteric artery shows small arterioles that rise from a branch of the ileocolic artery and irrigate the tumour (Fig. 4). Embolization of the lumbar branches is carried out without subsequent highlighting of the tumour. They did not embolize the arterioles from the ileocolic to prevent a possible ischaemia of the bowel loops. The patient was stable during the procedure and the following hours.

Forty-eight hours later the patient is operated on through a median infra-umbilical laparotomy. There are no peritoneal implants, regional pathologic adenopathies nor ectopic locations of chromaffin tissue. After mobilising the right colon medially a 6 cm retroperitoneal tumour is identified. It had a nodular appearance and a brownish colour and was closely adhered to the distal

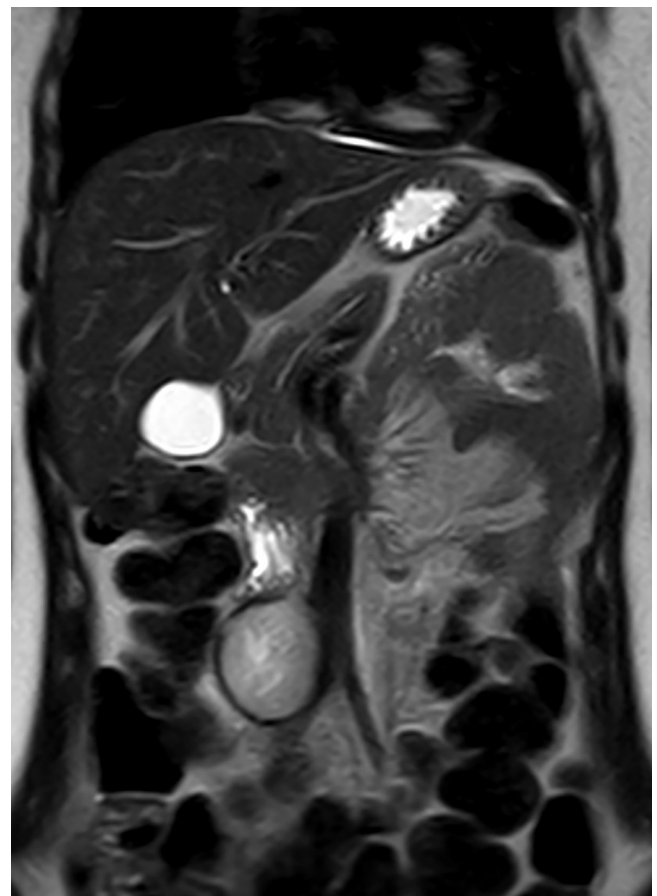


Fig. 2. MRI showing a retroperitoneal node, with an increase in signal in the potentiated sequences in T2 and restriction to the diffusion and enhancement with contrast.



Fig. 3. angiography of the right lumbar arteries.

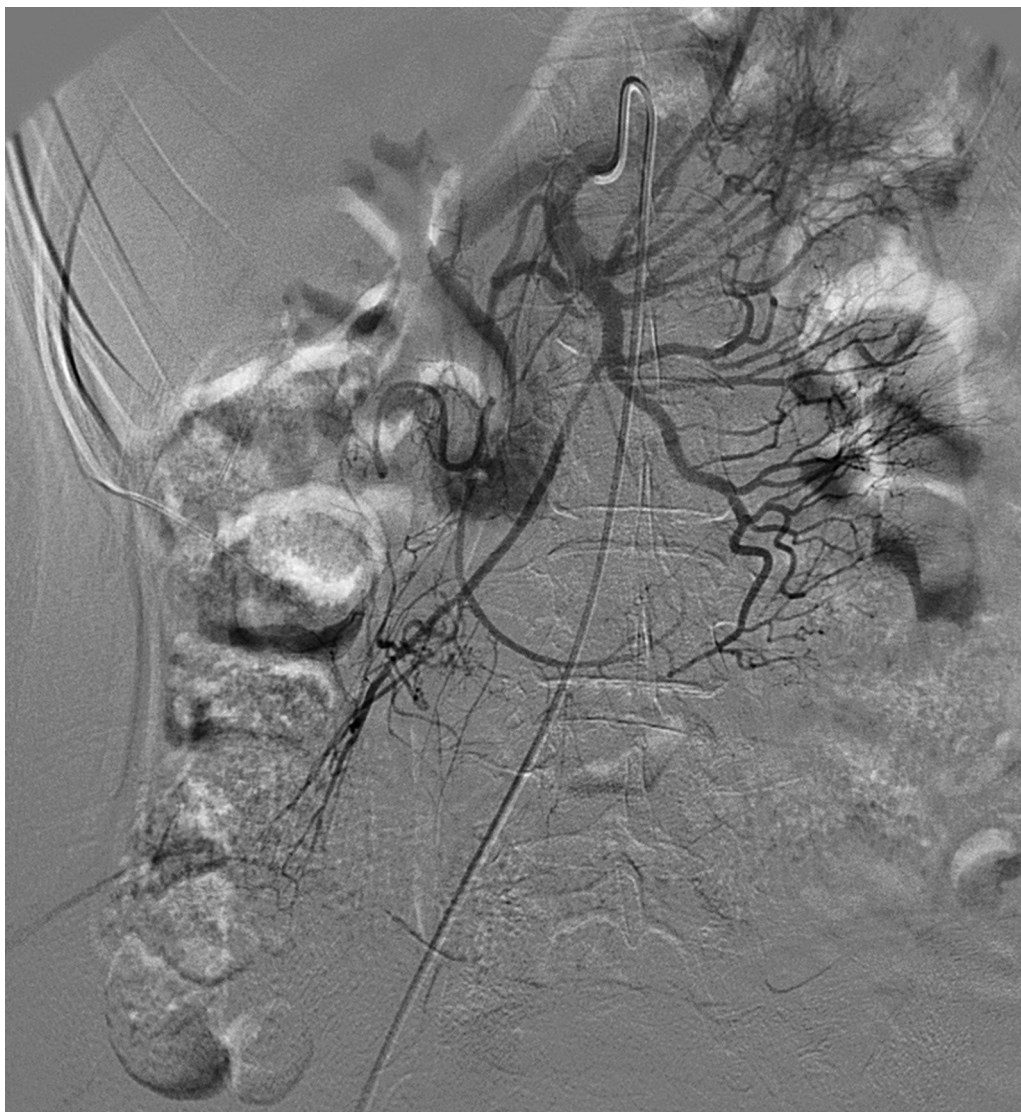


Fig. 4. arteriography from the upper mesenteric artery showing small arterioles that rise from the ileocolic artery and irrigate the tumour.

aorta, the right iliac artery and the inferior vena cava at the level of the confluence of the iliac veins, but without infiltrating it (Fig. 5). A complete excision of the lesion is carried out with a total bleeding of less than 50 cc and a surgical time of 160 min. The patient remained haemodynamically stable without striking variations in her blood pressure. The post-operative evolution was favourable. The patient was discharged 6 days after the surgery.

The pathological anatomy of the lesion describes a $5.5 \times 5.3 \times 3.5$ cm well defined, encapsulated, microscopically conformed to have principal and sustentacular cells distributed in an alveolar pattern. There are a synaptophysin and chromogranin expressions in the principal cells and an immunohistochemical expression of S-100 protein in the sustentacular cells, Ki-67 (proliferation index) $< 2\%$, which confirms the diagnosis of paraganglioma. The genetic study confirms the existence of a genetic mutation in the SDHB gene of the succinate dehydrogenase, which is also present in her mother and a brother.

After 24 months of follow-up, the patient remains asymptomatic. The serial determinations of catecholamines and metanephrines in plasma and urine are normal, and the control MRI does not show significant changes.

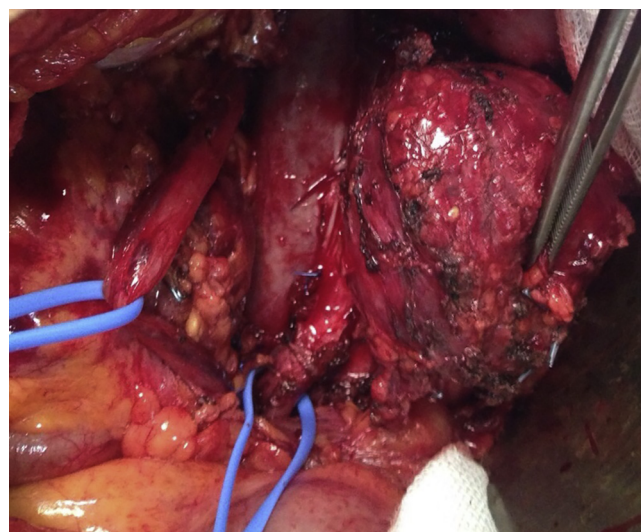


Fig. 5. surgical site showing the presence of the tumour and the absence of vessel infiltration.

3. Discussion

The PG tumors are very infrequent and originate in the extra-adrenal chromaffin cells that exist in the vicinity of the components of the autonomic nervous system (paraganglia) [2–4]. Most of PG are derived from the parasympathetic nervous system and are localised in the head, neck and along the branches of the vagus and glossopharyngeal nerves, and only 5% produce catecholamines [3]. On the contrary, 75% of the PG tumors located in the sympathetic system are localised in the abdomen, usually at the union with the inferior vena cava and the left renal vein or at the Zuckerkandl organ, between the origin of the inferior mesenteric artery and the aortic bifurcation [2,3]. Most of them (86%) produce catecholamines, are unique, sporadic, benign and more frequent in middle-aged women [5]. About 25% are hereditary or have a family relation, and are associated to the multiple endocrine neoplasia type 2 (MEN2), Hippel-Lindau syndrome, neurofibromatosis, Carney triad (gastrointestinal stromal tumors (GISTs), pulmonary chondroma and paraganglioma) or mutations in the oncogenes suppressors of the succinate dehydrogenase (SDHB, SDHC, SDHD) [3,5–8]. The mutation of the SDHB gene is mainly associated with abdominal PG, which are diagnosed at an earlier age than the sporadic ones, they have the capacity to produce dopamine, have a higher malignancy rate than other paraganglioma and a higher susceptibility to develop another type of tumors (gastrointestinal, thyroid or renal) [7,8]. It is recommended that the close family be tested because it is inherited in an autosomal dominant manner.

Although 18% of the patients with retroperitoneal PG are asymptomatic [5,6], they usually have a clinical condition related to high levels of catecholamines in blood: arterial hypertension, palpitations, cephalgia, hydorrhea and paleness [3,5]. When there is a clinical suspicion, the diagnosis is reached by the determination of high catecholamines and metanephrines in plasma and urine [4]. Locating the tumour is usually done through a CT scan or an MRI of the T2 where they manifest as hypervascular lesions [6]. The percutaneous puncture is contraindicated due to the high risk of a hypertensive crisis.

Histologically, the PG is characterised by a nested growth pattern composed of principal and sustentacular cells. The former are responsible for the output of catecholamines and are immunohistochemically positive for chromogranin A, synaptophysin and to neuron-specific enolase. The sustentacular cells are elongated and surround the principal cells and express the protein S-100 [6,9]. On the histological study, it is very hard to establish the malignancy potential of a PG. The local invasion by itself does not define malignancy since it has been observed in tumors that never develop a metastatic disease [9]. The diagnosis of malignant PG is fundamentally dependent on the evidence of distant metastasis [2,6].

Since they are radioresistant tumors, the only possibility for a cure is by a complete surgical excision [3]. The preoperative alpha-adrenergic blockade is necessary in all cases because even those silent PG tumors can trigger an alpha-adrenergic hypertensive crisis as a result of the surgical manipulation [4]. In a review of 22 retroperitoneal PG, the survival rate for five years was 19% in non-operated patients, and 75% after surgical excision [10]. In patients with locally advanced, recurrent and metastatic disease, the reduction of the tumoral mass has been associated with improvement of the symptoms and their survival. Laparoscopy is currently the elected access for the treatment of adrenal tumors, although the excision of abdominal PG tumors by laparoscopy is a matter of ongoing discussion due to the relatively high index of malignant tumors in comparison to the pheochromocytomas, as well as their intimate relation to major vascular structures (inferior vena cava and the aorta), that increase the technical difficulty [4,6]. The laparoscopic excision should be considered for small PG tumors, noninvasive and with a favourable surgical location [4]. Walz et al.,

have shared their experience with 27 PGs treated by endoscopy, they recommend a retroperitoneoscopic approach for tumors that are caudal to the renal vessels, and transabdominal laparoscopy for the PGs situated cranial to those vessels [11].

The preoperative embolization has been described mainly as the treatment of cervical PG as it reduces the surgical time and the intraoperative bleeding. Although its use in abdominal PG is more controversial and is not done in a systematic manner due to the risk of intestinal ischaemia and the liberation of catecholamines into the blood torrent which can induce a hypertensive crisis in the patient.

In our case, the open surgical approach was made to guarantee a complete excision with the least number of possible complications, since we were dealing with a very young patient suffering from PG adhered to major vascular structures. Although the embolization was partial, the surgical bleeding was minimal. Nevertheless, after a bibliographic revision, we can conclude that the embolization of abdominal PG is not free of risks and that it has not been demonstrated that it significantly reduces the *peri-operative* bleeding or the surgical time. Probably, the embolization should be reserved for intensively hypervascularized and larger PGs, that have had a previous alpha-adrenergic blockade and in tumors that cannot be excised to diminish the effects of excessive secretion of catecholamines.

Conflicts of interest

None.

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Ethical approval

Not needed.

Consent

- Not ID details on paper.
- Informed consent for publication on both cases.

Author contribution

- Natalia Apentchenko: writing the article.
- Camilo Castellon: patient care, writing and editing the paper.
- Carlos Garcia: patient care, writing, translating and editing the article.
- Irene Gonzalo: diagnosis and patient care.
- Santos Jimenez: patient care (surgeon), editing the article.
- Pedro Pacheco: patient care (surgeon), editing the article.
- Juan Gomez: patient care (embolization).

Guarantor

- Carlos García Vásquez.
- Camilo Castellón Pavón.

References

- [1] R.A. Agha, A.J. Fowler, A. Saetta, I. Barai, S. Rajmohan, D.P. Orgill, for the SCARE Group, The SCARE statement: consensus-based surgical case report guidelines, *Int. J. Surg.* (2016).
- [2] Pathology and Genetics of tumours of the endocrine organs. WHO classification of tumours. DeLellis RA, Lloyd RV, Heitz PU, Eng C (Eds), IARC press, Lyon, France 2004.

- [3] H. Chen, R.S. Sippel, K. Pacak, The NANETS consensus guideline for the diagnosis and management of neuroendocrine tumors: pheochromocytoma, paraganglioma and medullary thyroid cancer, *Pancreas* 39 (6) (2010) 775–783.
- [4] J.W. Lenders, Q.Y. Duh, G. Eisenhofer, A.P. Gimenez-Roqueplo, S.K.G. Grebe, M.H. Murad, M. Naruse, K. Pacak, W.F. Young Jr., Pheochromocytoma and paraganglioma: and endocrine society clinical practice guideline, *J. Clin. Endocrinol. Metab.* 99 (6) (2014) 1915–1942.
- [5] D. Erickson, Y.C. Kudva, M.J. Ebersold, G.B. Thompson, C.S. Grant, J.A. van Heerden, W.F. Young Jr., Benign paragangliomas: clinical presentation and treatment outcomes in 236 patients, *J. Clin. Endocrinol. Metab.* 86 (2001) 5210–5216.
- [6] J. Wen, H.Z. Li, Z.G. Ji, Q.Z. Mao, B.B. Shi, W.G. Yan, A decade of clinical experience with extra-adrenal paragangliomas of retroperitoneum: report of 67 cases and a literature review, *Urol. Ann.* 2 (1) (2010) 12–16.
- [7] H.P.H. Neuman, C. Pawlu, M. Peczkowska, B. Bausch, S.R. McWhinney, M. Muresan, M. Buchta, G. Franke, J. Klisch, T.A. Bley, S. Hoegerle, C.C. Boedeker, G. Opocher, J. Schipper, A. Januszewicz, C. Eng, Distinct clinical features of paraganglioma syndromes associated with SDHB and SDHD gene mutations, *JAMA* 292 (8) (2004) 943–951.
- [8] C.J. Ricketts, J.R. Forman, E. Rattenberry, N. Bradshaw, F. Lallo, L. Izatt, T.R. Cole, R. Armstrong, V.K. Kumar, P.J. Morrison, A.B. Atkinson, F. Douglas, S.G. Ball, J. Cook, U. Srirangalingam, P. Killick, G. Kirby, S. Aylwin, E.R. Woodward, D.G. Evans, S.V. Hodgson, V. Murday, S.L. Chew, J.M. Connell, T.L. Blundell, F. Macdonald, E.R. Maher, Tumor risks and genotype-phenotype-proteotype analysis in 358 patients with germline mutations in SDHB and SDHD, *Hum. Mutat.* 31 (1) (2010) 41–51.
- [9] E. Cobos, J.A. Aragón, D.R. Soria, M.A. De la Rosa, A. Martínez de la Vega, M. Granados, E. Bargalló, Paraganglioma maligno (múltiple, multicéntrico y metastásico) en una paciente con historia familiar de paraganglioma, *Cir. Esp.* 93 (9) (2015) e127–e132.
- [10] E.E. Lac, Tumors of the Adrenal Gland and Extra-adrenal Paraganglia In: *Atlas of Tumor Pathology, Third Series, Fascicle 19*, Armed Forces Institute of Pathology, Washington, DC, 1997.
- [11] M.K. Walz, P.F. Alesina, F.A. Wenger, J.A. Koch, H.P.H. Neumann, S. Petersenn, K.W. Schmid, K. Mann, Laparoscopic and retroperitoneoscopic treatment of pheochromocytomas and retroperitoneal paragangliomas: results of 161 tumors in 126 patients, *World J. Surg.* 30 (2006) 899–908.

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