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A Massive Hepatic Infarction After Radiofrequency Ablation

Infarto hepático masivo tras ablación por radiofrecuencia[☆]

Radiofrequency ablation (RFA) is a safe and effective treatment option for patients with unresectable hepatic tumors, which are destroyed by coagulative necrosis. Nonetheless, complications may appear due to mechanical or thermal damage^{1,2} although these are not usually life-threatening. This article describes a severe complication of this treatment.

A 43-year-old male patient was sent to our department for treatment of hepatic metastases. The patient's prior medical history included allergy to penicillin, GIST of the small intestine that was surgically removed twice and treatment with imatinib 400 mg/day since the initial surgery (three years before). At that time, blood test results (biochemistry, coagulation, hemogram, tumor markers) were normal and computed tomography (CT) showed a total of eight hepatic metastases in both lobes. The patient underwent surgery, and eight atypical hepatic resections and cholecystectomy were performed.

Two years later, and despite continuing with chemotherapy with imatinib 800 mg/day, the patient presented with a new hepatic metastasis seen on CT, although on this occasion it was very badly situated between the cava, hepatic hilum and suprahepatic veins (Fig. 1). Given the lack of response to treatment and the stability of the lesion, the patient underwent surgery. After liver mobilization, it was observed that the lesion was in contact with the portal vein and its branches, cava and suprahepatic veins. With manual, visual and ultrasound confirmation, we therefore decided to treat it with RFA and clamping of the pedicle for 12 min, reaching a temperature above 70 °C. On the second post-op day, the patient presented tachypnea, dyspnea and oliguria, metabolic acidosis with respiratory compensation and blood tests showing severe hepatic and renal damage (GOT 9900, GPT 4224, INR 3, creatinine 2.3, platelets 108,000). The patient was admitted to the ICU for intensive monitoring and treatment of coagulopathies and renal failure, while receiving support for liver failure. After abrupt desaturation that required intubation, pulmonary thromboembolism (TEP) was ruled out with transesophageal echocardiogram. The abdomen was distended and defended. Abdominal Doppler ultrasound

demonstrated an area of liver infarction and portal vein thrombosis. The patient required antibiotic therapy, hemofiltration and massive transfusion due to the worsening coagulopathy and thrombopenia. The patient's condition progressed to multiple organ failure, requiring intensive inotropic support, and the electroencephalogram was suggestive of hepatic encephalopathy. On the fourteenth post-op day, the patient died.

The aim of RFA is to produce an area of necrosis that is large enough to encompass the hepatic tumor with a safety margin (at least 0.5 cm in order to impede the persistence or progression of the tumor). The size of the necrosis is determined by several factors, including the size of the electrode and thickness, temperature and duration.^{3,4}

The effectiveness of RFA decreases when the lesion is in the proximity of large blood vessels (larger than 3 mm in diameter) due to the refrigerating effect of the blood flow. In these cases, it has been observed that the suppression of the flow (not only by surgical clamping using the Pringle maneuver, but also with occlusion by means of a catheter) to the area of the lesion increases the size of the ablation by concentrating the temperature, which improves tumor-free margins.^{5,6}

RFA complications may range from 0 to 12.7% (according to different reports), and are generally due to infection or bleeding. Complications are classified into two categories: major and minor. Major complications are those which are life-threatening if not correctly treated, increasing morbidity, mortality and hospital stay. Minor complications are more frequent⁷ and may include:

- Vascular: portal vein thrombosis, hepatic vein thrombosis, liver infarction (very uncommon due to the double hepatic vascularization from the portal vein and the hepatic artery), subcapsular hematoma (more frequent in cirrhosis and patients with altered coagulation), etc.
- Biliary: stenosis of the bile duct and biloma (due to heat damage), abscesses (the most common in some series), hemophilia, or even peritoneal bleeding, etc.

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Fig. 1 – Liver metastasis on CT between the cava, hepatic hilum and suprahepatic veins.

- Extrahepatic: gastrointestinal tract lesions, vesicular lesions (cholecystitis, more than perforation), hemothorax and pneumothorax, tumor dissemination, skin burns, etc.

The best strategy for reducing complications is considered to be the correct selection of cases, taking into account liver function (Child-Pugh class B or C increases the risk for liver failure after RFA), the lesion itself (size, location, etc.), as well as the type of approach.



Fig. 2 – CT coronal plane showing liver metastasis adjacent to vascular structures.

Most complications can be treated conservatively with antibiotics, percutaneous drainage or endoscopically, although surgical intervention is sometimes necessary.⁸

Liver infarction is a rare complication of RFA (although somewhat more common if percutaneous ethanol injection or arterial embolization are previously used) that may become fatal, although deaths have rarely been reported⁹ (we have found only one case). It is believed that at least arterial liver vascularization needs to be affected for a fatal outcome, but many authors argue that altered portal vein vascularization also needs to be associated.

The Pringle maneuver may not be necessary for RFA of all liver tumors, but it is an option in large tumors that are very vascularized or proximal to large blood vessels. Nevertheless, it should be done with caution as direct thermal damage may affect the vascular or bile structures as well as the parenchyma adjacent to the area of ablation (Fig. 2), which is increased with the lack of blood flow.¹⁰

Although the pathogenesis of hepatic infarction is not completely clear, it is important to consider this rare but fatal complication.

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Abdominal Paraganglioma Associated With MEN 2A

Paraganglioma abdominal asociado a MEN 2A

A 48-year-old woman, with no known family history of MEN-2A syndrome, underwent surgery for a thyroid nodule in April 1989. Total thyroidectomy was performed and the pathology study defined a bilateral medullary thyroid cancer (MTC). Due to the possibility that the patient could be an RET mutation carrier, we ordered genetic studies, suprarenal CT, catecholamines in 24-h urine test and parathyroid study. Calcium, phosphorus and PTH were normal. A mild increase of metanephrines was detected in 24-h urine tests (metanephrines 640 $\mu\text{g}/24\text{ h}$; normal levels 60–350 $\mu\text{g}/24\text{ h}$) and suprarenal CT demonstrated the existence of bilateral suprarenal tumors (right, 1.5 cm; left, 2.5 cm). The genetic study confirmed the RET mutation: c.1901G > A (p.C634Y). Given these findings, bilateral suprarenalectomy was performed.

After 15 years of follow-up without incidents, a new increase in arterial pressure levels was detected along with an increase in 24 h urine catecholamine levels (noradrenaline, 140 $\mu\text{g}/24\text{ h}$ (vn 12–86); adrenaline, 150 $\mu\text{g}/24\text{ h}$ (vn 2–23); normetanephrine, 684 $\mu\text{g}/24\text{ h}$ (vn 120–650); total metanephrine, 2444 $\mu\text{g}/24\text{ h}$ (vn 180–1000); total catecholamine, 289 $\mu\text{g}/24\text{ h}$ (vn 14–110); AVM, 25.6 mg/24 h (vn 1–10). Abdominal CT showed evidence of a mass with a hypodense center measuring 4.5×3 cm in the interaortocaval region above the left renal vein and in close contact with the vena cava (Fig. 1a). The findings of a metaiodobenzylguanidine (MIBG) scintigraphy were compatible with a mass showing increased uptake in the right suprarenal position suggestive of paraganglioma or right pheochromocytoma relapse (Fig. 1b).

The patient, who had previously been prepared with phenoxybenzamine, underwent surgery that revealed a tumor measuring 4–5 cm located in the area between the vena cava, left renal vein and aorta, which was completely removed. There were no post-OP complications, and catecholamine levels normalized. The pathology and immunohistochemistry studies of the surgical specimen reported a tumor measuring 5.5×4.5×2.5 cm surrounded by a fibrous pseudocapsule and evidence of ganglion cells in the interior with positive

immunochemistry for chromogranin A, sinaptophysin, enolase and vimentin, compatible with paraganglioma (Fig. 1c–d). After this last surgery, the patient continued to be clinically asymptomatic with normal 24-h urine catecholamine.

MEN 2A is a rare disease that is associated with MTC in 100% of cases, pheochromocytoma in 50% and hyperparathyroidism in 10%–15% of cases.¹ The association of paragangliomas with MEN 2A is exceptional in the scientific literature published to date² (bibliographic search on Medline in February, 2011).

Extra-adrenal paraganglioma and pheochromocytomas are chromaffin-type tumors, 95% of which are located in the intra-abdominal area (fundamentally adrenal glands), 2%–4% in the thorax and 1% in the neck. Paragangliomas are usually located in the sympathetic chain ganglia, while extra-adrenal retroperitoneal paragangliomas have a poorer prognosis.² 20% of these paraganglioma are potentially malignant and are usually multicentric. They present a high rate of local recurrence or metastasis. This recurrence can appear years or decades after the resection of the primary tumor, and long-term follow-up is therefore necessary.³

The clinical manifestations are determined by the capacity of some paraganglioma (39%) to secrete hormones such as catecholamines, gastrin, thyrocalcitonin, ACTH, VIP and PTH, among others; arterial hypertension is the most common symptom.³ In the case that we describe, the elevated hormone and blood pressure levels led to the suspected diagnosis.

The diagnosis of pheochromocytomas and paragangliomas is based on proper anamnesis and physical examination together with the determination of plasma catecholamine and/or metanephrine levels in 24-h urine. The tumor can be located with techniques such as MIBG (which has the capability to detect tumors <0.5 cm, metastatic and multicentric tumors), CT, NMR or PET. These techniques are also used during the follow-up of these patients for the early diagnosis of possible recurrences. In the case that we present, MIBG and CT detected the existence of the tumor, while the definitive diagnosis was provided by the immunohistochemistry and histology studies.⁴

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