

# Intraoperative Use of Indocyanine Green Fluorescence Imaging for Detecting Superficial Liver Hemangioendothelioma

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Dear Editors,

Hepatic epithelioid hemangioendothelioma (HEH) is a rare vascular tumor of endothelial origin with low or intermediate grade malignancy.<sup>1,2</sup> Lesions are frequently subcapsular in up to 74.3% of the cases, according to a recent study.<sup>2</sup> It may be related to the use of oral contraceptives, viral hepatitis, alcohol abuse, history of ethylene exposure, and trauma.<sup>1,2</sup> The tumor is usually found in adults aged between 30 and 40 years with a female predominance. HEH can be a solitary lesion or present with multiple lesions in the liver. Metastases have been reported in 27%-37% of patients, usually in the lung.<sup>1,2</sup>

In our experience with open and minimally invasive liver surgery since 2000, we have surgically treated only four patients with this rare disease among more than a thousand liver resections. All were females aged between 32 and 41 years at the time of the diagnosis. Two of them were treated before 2007 and were treated with an open approach,<sup>3</sup> and 2 were treated with laparoscopy and robotic approach, respectively. One patient operated in 2003 presented a single liver recurrence and was treated with re-hepatectomy. This was a superficial recurrence, as usual. All patients are alive and well. One of the four patients operated on for HEH has lung metastases, but she has been followed with no symptoms and stable disease.

Recent studies showed that indocyanine green fluorescence imaging is a promising and useful intraoperative tool to detect additional small, superficial, and subcapsular tumor nodules that have been unrecognized by other diagnostic tools.<sup>4,5</sup> Given the fact that most hemangioepithelioma liver tumors are superficial and pre-operative magnetic resonance imaging (MRI) and/or CT scan and even intraoperative ultrasound may miss some small lesions, we decided to use indocyanine green fluorescence imaging in our last robotic case to improve our detection rate.

A 41 year-old female with HEH was referred for surgical treatment after chemoembolization of the right liver in other service. MRI showed multiple lesions in both sides of the liver and hypertrophy of the left liver. A multidisciplinary team decided for resection of lesions

from the left liver and proceeded with right hepatectomy where most lesions were located. The calculated future liver volume was 58%. During the operation, multiple superficial lesions were easily detected with observation only. Intraoperative ultrasound did not disclose any additional lesion (Figure 1). However, when indocyanine green fluorescence imaging was used, 7 other small lesions in the future liver remnant were found. These lesions were removed, and pathology confirmed neoplastic nature.

Indocyanine green fluorescence imaging technique is routinely used in our robotic liver procedures as it is an incorporated technique in the robotic platforms. It is important to ascertain negative surgical margins and identify ischemic segment, sector, or hemiliver during anatomic liver resections and in the detection of superficial liver tumors as already pointed out by other authors,<sup>4,5</sup> but we strongly recommend its use during surgery for HEH.

## Author Contributions

All authors equally contributed to acquisition of data, and/or analysis and interpretation of data.

Study concept and design: Marcel Autran C. Machado

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## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

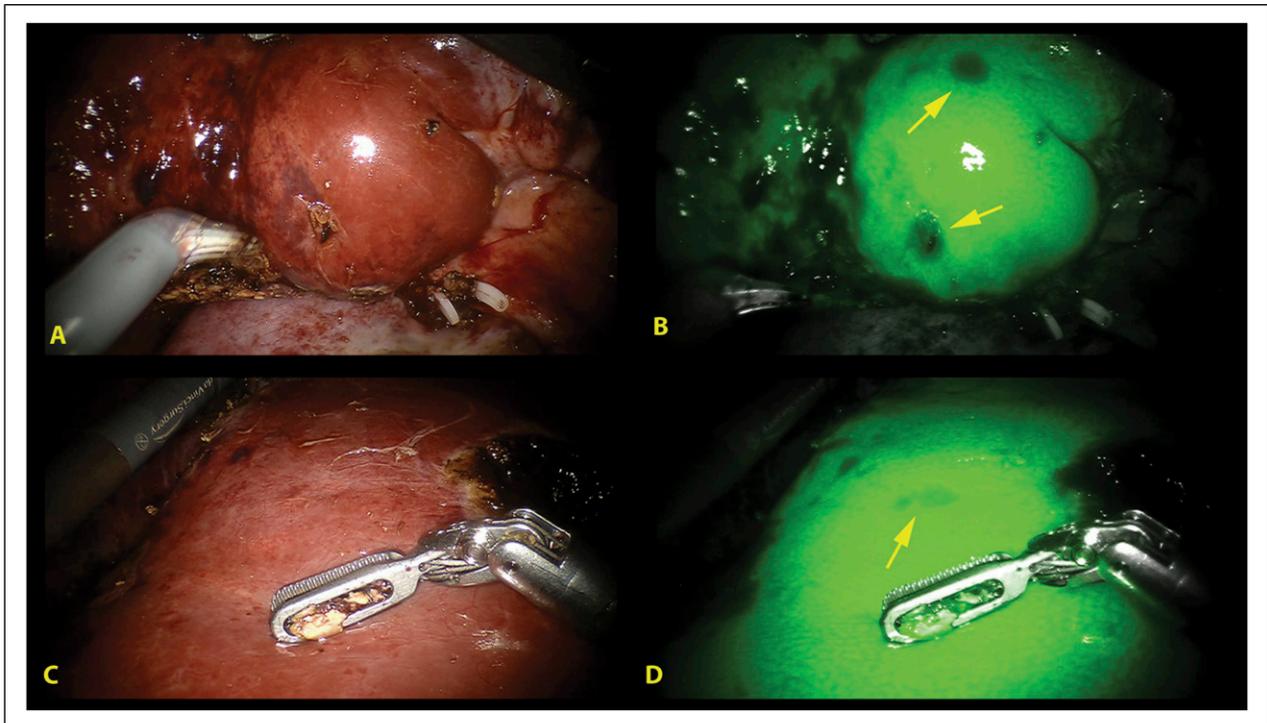
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**Figure 1.** Intraoperative use of indocyanine green fluorescence imaging for detecting superficial liver hemangioendothelioma. (A) Intraoperative view of the liver without fluorescence imaging. (B) Intraoperative fluorescence imaging of the liver after injection of indocyanine green shows two unsuspected superficial lesions (arrows). (C) Intraoperative view of the liver without fluorescence imaging. (D). Intraoperative fluorescence imaging of the liver after injection of indocyanine green shows an unsuspected superficial lesion (arrow).

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