



# Expanding the Reach of Laparoscopic Surgery: Combined Methylene Blue and Embolization Coil Marking for Preoperative Abdominal Tumor Localization

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J Clin Interv Radiol ISVIR

## Abstract

Small lesions present a technical challenge for surgical excision due to poor intra-operative localization laparoscopically, resulting in suboptimal outcomes such as conversion to laparotomy. Here, we present the case of a 79-year-old man who underwent computed tomography-guided localization of a small right paracolic gutter soft tissue lesion. This allowed the surgeon to easily identify the tumor laparoscopically allowing for a less invasive resection. By increasing cases performed via laparoscopy instead of an open approach, image-guided preoperative localization can lead to improved patient outcomes

## Keywords

- ▶ image-guided localization
- ▶ small tumors
- ▶ laparoscopic surgery

## Introduction

The utility of laparoscopic surgery has expanded over the decades. In many cases, laparoscopic surgery offers less complications, less pain, and shorter hospital stays than its open counterpart.<sup>1</sup> However, tumor visualization can remain challenging depending on its size and location. The use of preoperative localization has been shown to be safe and effective in other parts of the body, such as the lungs. Pulmonary nodules are often not well visualized during minimally invasive wedge resection with video-assisted thoracic surgery (VATS), which has historically led to an increased rate of conversion to open thoracotomy, as well as increased morbidity.<sup>2</sup> The solution to this problem has been preoperative localization of nodules with either hook wires, methylene blue, or embolization coils. Embolization coils also demonstrated fewer dislodgments and perioperative complications compared with hook wires.<sup>3</sup> An

amalgam technique, utilizing both embolization coils and methylene blue administration, for lung nodule localization prior to wedge resection was described previously by Krishnakurup et al.<sup>4</sup> By applying a similar technique, preoperative location of tumors can be performed, allowing for less invasive resection. We present a case of preoperative localization of a small abdominal tumor with methylene blue and an embolization coil, allowing for successful laparoscopic resection.

## Case Report

The patient is a 79-year-old man with a history of stage II or T3N0 cecal adenocarcinoma status post right hemicolectomy. He presented for a 6-month routine follow-up imaging, which demonstrated a 1.4 × 1.3 × 2.7 cm ill-defined soft tissue density within the right paracolic gutter (▶ **Fig. 1**), which subsequently demonstrated this solitary site of

DOI <https://doi.org/10.1055/s-0045-1801843>.  
ISSN 2457-0214.

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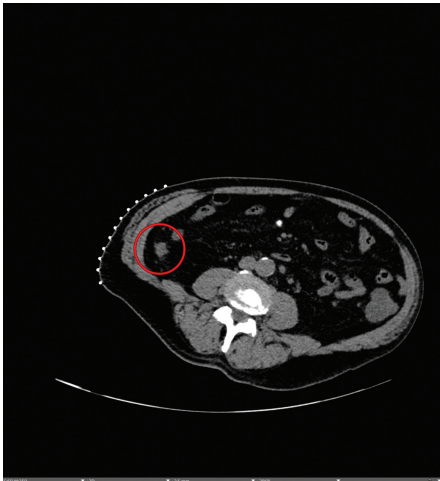
Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

increased avidity on positron emission tomography (PET) imaging, with maximum standardized uptake value (SUV) of 5.8. The lesion was not well visualized sonographically due to difficulty in distinguishing the lesion from intraperitoneal fat. Interventional radiology (IR) was consulted to help localize this soft tissue lesion for surgery to perform a laparoscopic resection.

Computed tomography (CT) guided localization was performed by injecting methylene blue and deploying a micro-coil into the lesion in question (**Fig. 2**). Laparoscopic ultrasound could not be employed because the lesion was difficult to distinguish from intraperitoneal fat. The patient was placed in the supine position and the right lower quadrant was prepped and draped in the usual sterile fashion. The previously visualized PET-avid, intra-abdominal soft tissue lesion was once again identified. One percent lidocaine was administered, and a 17-gauge trocar needle was advanced into the lesion. Approximately 0.2 mL of methylene blue dye was injected. Next, a 10 mm × 10 cm

MR eye coil (Cook Medical) was advanced into the lesion. There was no particular reason for using this type of coil. The aim of coil deployment was to visualize the coil pack and methylene blue via laparoscopy. The coil was a second method of confirmation of target due to the probability that methylene blue by itself may dissipate on its own. The trocar needle was then removed, and hemostasis was achieved with manual compression. A clean, dry sterile dressing was placed over the puncture site. The lesion was successfully localized and completely excised.

The patient then went on to have successful laparoscopic resection of the mass. Pathologic examination revealed a piece of firm, tan tissue with attached fatty tissue. The specimen measured 3.7 × 2.5 × 1.7 cm with a coiled wire that extended through two surfaces of the specimen. The specimen was serially sectioned to reveal a spiculated, tan to tan-pink cut surface. The final pathology demonstrated moderately differentiated adenocarcinoma with strong immunoreactivity for CK20 and CDX2 without staining for CK7, supportive of metastatic colonic adenocarcinoma.

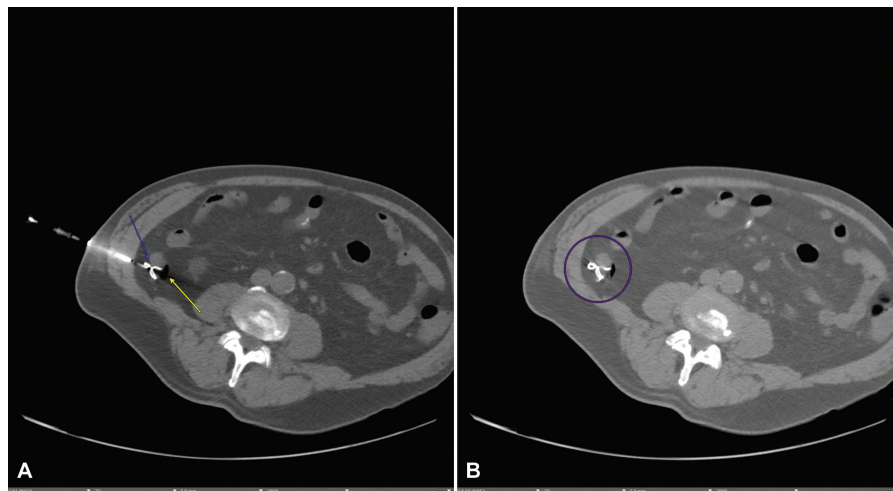


**Fig. 1** Axial computed tomography (CT) image shows the ill-defined soft tissue density within the right paracolic gutter (red circle).

## Discussion

Laparoscopic procedures are accepted as the gold standard for surgical intervention. Compared with open surgical procedures, the primary benefits of laparoscopic surgery include reduced postoperative pain, shorter postoperative hospital stays, and faster recovery time. Additional advantages of laparoscopic surgery include decreased incidence of wound infections and reduced perioperative morbidity.<sup>5</sup>

Preoperative localization facilitates laparoscopic removal of small lesions instead of using an open surgical approach. In this case, methylene blue and an embolization coil were used in conjunction for successful localization and laparoscopic removal of a small abdominal tumor. By increasing cases performed via gold standard laparoscopy instead of an open approach, image-guided preoperative localization can evidently lead to improved patient outcomes.



**Fig. 2** Computed tomography–guided localization. (A) Micro-coils advanced into the lesion (blue arrow) using a 17-gauge trocar needle; methylene blue (yellow arrow) was advanced in a previous unshown step. (B) Micro-coil and methylene blue within the lesion (blue circle) after the trocar needle was removed.

## Conclusion

This case demonstrates that preoperative intraperitoneal tumor marking can be performed effectively and safely with methylene blue and embolization coils, allowing for successful identification and resection at laparoscopy. Performing more cases using the gold standard laparoscopic approach can lead to improved patient outcomes.

### Funding

None.

### Conflict of Interest

None declared.

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