



Importance of magnetic resonance imaging and positron emission tomography as preoperative staging tests prior to liver resection

Mustafa Raoof, Yuman Fong

Department of Surgery, City of Hope National Cancer Center, Duarte, CA, USA

Correspondence to: Yuman Fong, MD. Sangiacomo Chair and Chairman, Department of Surgery, City of Hope National Medical Center, 1500 E Duarte Rd., Duarte, CA 91010, USA. Email: yfong@coh.org.

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More than half the patients with colon cancer will eventually manifest metastases to the liver. Treatment of this form of stage IV cancer has greatly evolved over the last four decades. Once a disease with a uniformly fatal outcome, it is now cured in over a third of the patients, and over 50% of the patients live more than 5 years (1). Liver resection, when possible, is now a mainstay of treatment for hepatic colorectal metastases (2). Many radiologic staging exams exist that help assess patients for appropriateness of surgery, help plan procedures, and help guide safe resections for best outcomes and potential cure (3).

A paper in the December 8, 2023, issue of *Lancet Oncology* emphasizes once again the importance of magnetic resonance imaging (MRI) as preoperative staging prior to treatment of hepatic colorectal metastases (4). In this paper, Görgec and his colleagues at 14 different liver surgery centers in the Netherlands, Belgium, Norway, and Italy examined data from 325 patients with colorectal liver metastases being evaluated for local treatment. All of these patients had contrast-enhanced computed tomography (CT) before enrollment. They looked at the influence of a contrast-enhanced MRI on clinical planning and outcome. A change in local treatment plan based on the MRI was observed in 31% of patients, including more extensive local therapy in 13%, less extensive therapy in 4%, and 11% for whom local therapy was revoked (4).

These findings are not surprising given the usual

treatment course for metastatic colorectal cancer. In general, most patients with stage IV disease will now have chemotherapy prior to attempted resection. Chemotherapy decreases sensitivity of CT (3) and sonography because of steatosis (5). However, with fat subtraction sequences, the sensitivity of MRI in detecting liver metastases remains high. In a study by Granata *et al.* published in 2019, a comparison of gadolinium contrast-enhanced MRI versus multidetector CT was performed (6). In this study, 3 different readers were also used to determine the multi- and intra-reader variability. The sensitivity per patient by MR was between 97% and 100%, while the sensitivity per patient by a multidetector CT was 72% to 78% (6). In a meta-analysis of 15 studies comprising data from 2,955 patients with 4,742 colorectal liver metastases, MRI was also the most sensitive for looking at residual colorectal metastases after neoadjuvant chemotherapy (7).

Others have insisted that positron emission tomography (PET) scanning prior to liver resection is mandatory. However, in a prospective trial of PET scanning in patients whose preoperative staging included multidetector CT as well as CT portography, PET scan detection of lesions within the liver was poor (3). Viable sub-centimeter lesions were detected in patients naïve to chemotherapy 8% of the time. In patients who had undergone neoadjuvant chemotherapy, the performance was even worse with viable lesions that were subcentimeter detected only 4% of the

time (8). This is understandable since the background uptake of fludeoxyglucose F18 (^{18}F -FDG) in the liver is very high.

^{18}F -FDG PET was useful for detecting metastatic disease outside the liver. This prospective trial of 125 patients, where the surgeons were blinded to the PET scan study until they explored in the operating room, demonstrated that the PET scan was helpful in the detection of additional extrahepatic disease. One-third of the time, the PET scan detection of extrahepatic disease altered therapy (3).

Given these data, it is evident that prior to liver resection, it is essential for the patient with metastatic colorectal cancer to the liver to be staged both by an MRI of the liver as well as a whole-body PET scan. This would give the greatest chance that patients inappropriate for surgery will be saved from surgical exploration. This will also provide the best chance that all disease is found and the appropriate surgical plan is implemented for the best long-term outcome for the patient.

These data would also encourage future trials of standard preoperative imaging versus a regimen that includes MRI of the liver and whole-body PET scanning. While that is a challenging study to perform, an alternative would be a matched-pair retrospective study examining influence of preoperative imaging on outcomes of liver resection. We should examine outcome of patients who have undergone liver surgery over the last decades to determine if those who had been subjected to MRI or PET or both scanning before surgery have a longer disease-free survival, and possibly a better long-term survival.

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