The Value of Laparoscopic Staging for Patients With Colorectal Metastases

Matthew S. Metcalfe, MD; John S. Close, MD; Harish Iswariah, MD; Charles Morrison, MD; Simon A. Wemyss-Holden, MD; Guy J. Maddern, PhD

Background: Resection offers the only chance of cure for hepatic colorectal metastases. However, preoperative staging does not always reliably detect unresectable disease. The aim of this study was to investigate the role that laparoscopy with ultrasound may have in detecting unresectable disease, thus sparing patients from unnecessary laparotomy with the associated morbidity and cost.

Methods: A retrospective review of all patients considered for liver resection of colorectal metastases during a 3-year period was performed, analyzing factors likely to predict resectable disease, rates of resectability, and success of laparoscopic staging at detecting unresectable disease.

Results: Of 73 patients with resectable disease on computed tomography, 24 were deemed to need laparoscopy, and 49 proceeded directly to laparotomy. Those first undergoing laparoscopy had shorter disease-free intervals between diagnosis of colorectal cancer and detection of hepatic recurrence and greater numbers of hepatic metastases. Twelve of the 24 patients who underwent laparoscopy had unresectable disease, and 8 of these were detected at laparoscopy. Forty-six of the 49 patients proceeding to laparotomy directly had resectable disease.

Conclusions: Laparoscopic staging of hepatic colorectal metastatic disease detects most unresectable disease, preventing unnecessary laparotomy. The likelihood of disease being unresectable is in part predicted by the disease-free interval and the number of hepatic metastases.

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When hepatic metastases from colorectal cancer are resected, the 5-year survival rate is approximately 40%.\(^1\)\(^-\)\(^3\) However, sometimes resection is precluded either by more extensive hepatic metastases than detected on preoperative imaging or by peritoneal dissemination of disease. This occurs in between 9% and 51% of cases.\(^3\)\(^-\)\(^6\) Roughly equal proportions of unresectable cases are due to extensive hepatic and peritoneal dissemination of disease.\(^6\)

It is undesirable to subject a patient with unresectable disease to an unnecessary laparotomy. Laparoscopy may be used to detect peritoneal dissemination of disease and, when combined with ultrasound, may also assess the extent of hepatic involvement.

The aims of this study were to determine the rate of detection of unresectable colorectal metastases at laparoscopy in patients deemed to have resectable disease on preoperative imaging and to assess the resectability of disease in patients for whom preoperative laparoscopy is deemed unnecessary.

All patients who underwent laparoscopy or laparotomy to assess or resect hepatic colorectal metastases during a 3-year period, from January 1, 1999, to December 31, 2001, at the Queen Elizabeth Hospital were identified retrospectively from a computer database. Relevant medical records and imaging results were reviewed. All patients had undergone abdominal computed tomography (CT) within 1 month prior to surgery, the findings of which were consistent with resectable disease in terms of the position and distribution of hepatic metastases and the absence of extrahepatic dissemination.

The criteria for selecting patients thought likely to benefit from laparoscopic evaluation due to a high risk of unresectable disease despite CT findings were not formalized during the time of the study, but, in general, a short interval between primary diagnosis and the finding of hepatic metastases (the disease-free interval) and the presence of multiple hepatic metastases were thought to predict a greater likelihood of recurrent disease. The carcinoembryonic antigen...
(CEA) levels prior to surgery were noted when available from medical records of patients committed to laparoscopy, although this was not a factor used in the selection of patients for laparoscopy during this study. When laparoscopy was performed, it was performed immediately prior to intended laparotomy for resection or a week prior to surgery for resection.

At laparoscopy a 10-mm umbilical port and a 5-mm epigastric port were placed. If there was obvious peritoneal dissemination, then a biopsy sample of representative disease was obtained for histological confirmation, and the procedure terminated. If there was no obvious peritoneal dissemination on the abdominal wall, stomach, small or large bowel, or pelvic organs, then a second 10-mm port was inserted into the right upper quadrant, and a laparoscopic ultrasound probe was used to assess the hepatic disease. The left and right lobes were examined from the upper surfaces and also from below where possible.

At laparotomy, a limited right subcostal incision was made initially to assess resectability. Extrahepatic disease was first excluded, then ultrasound of the liver was used to confirm the CT findings of metastases. If the disease still appeared resectable after this, the incision was extended to a rooftop, the liver was mobilized, and the appropriate resection was performed.

All laparoscopic surgery, including ultrasound examinations, and all laparotomies, with or without liver resection, were performed by the senior author (G.J.M.) who had considerable experience with these procedures prior to study commencement. The same surgeon was responsible for the decision of whether to perform laparoscopy prior to laparotomy in each patient.

Seventy-three patients were operated on to assess or resect hepatic colorectal metastases during the study period. Forty-nine were deemed to be at low risk of having unresectable disease and proceeded straight to laparotomy, and 24 were suspected of having a high risk of unresectable disease and were committed first to laparoscopy. The disease-free intervals, number of metastases, and the CEA levels are compared between these groups in the Table. The disease-free interval was significantly longer, the number of metastases significantly fewer, and CEA levels significantly lower in the patients who did not undergo laparoscopy before laparotomy.

Of the 24 patients committed to laparoscopy, no operations were abandoned due to adhesions. Three patients did not have intraoperative ultrasonography due to obvious peritoneal dissemination. Eight patients had unresectable disease on the findings at laparoscopy. Of these, 4 had peritoneal disease, and 5 had more extensive intrahepatic disease than recognized on CT (1 patient for both reasons). Thus, one third of patients deemed to have resectable disease on the findings at laparoscopy: 1 of these had peritoneal seedlings in the mesentery of the small bowel; the other, a malignant and unresectable portal lymph node. One patient had extensive metastases in both lobes of the liver. The initial intention was to perform multiple wedge resections of these, but at laparotomy this was found not to be safe due to the proximity to major vascular structures.

In 3 of 16 cases, laparoscopic intraoperative ultrasound findings revealed fewer hepatic metastases than the CT results suggested. In 6, the findings were the same as on CT, and in 7, more hepatic metastases were found, rendering the disease unresectable in 5 patients. There were no discrepancies between intraoperative ultrasound findings at laparotomy and laparoscopy.

Of the 49 patients who proceeded to laparotomy without prior laparoscopy, 46 (94%) underwent successful resections. Of the 3 that were unsuccessful, one patient had unresectable disease adherent to the vena cava, another had peritoneal dissemination, and one had 5 metastases in the right lobe and another in the caudate. An extended right hepatectomy and caudate resection was deemed unsafe as the left lobe was too small.

Of 73 patients, 24 (33%) underwent laparoscopy, and 49 (67%) proceeded directly to laparotomy. Twelve patients (50%) who initially underwent laparoscopy had unresectable disease, and 8 (67%) of these were detected at laparoscopy, preventing unnecessary laparotomy. The patients who went straight to laparotomy had longer disease-free intervals, fewer hepatic metastases, and lower CEA levels than those selected for laparotomy. Forty-six (94%) of the patients who proceeded directly to laparotomy had resectable disease. Overall, 58 (79%) of patients had resectable disease. The patients deemed at high risk of unresectability had significantly shorter disease-free intervals and significantly more hepatic metastases.

The strengths of this study are that the same surgeon reviewed the clinical information and CT scan findings and decided in all cases whether a laparoscopy was indicated. The same surgeon was also present at all operations, ensuring consistency in what was deemed resectable or unresectable in each case, particularly regarding the distribution of metastases in the liver.

The drawbacks of this study include the relatively small number of patients, particularly in the laparoscopy group, and that the data were collected retrospectively, so precise information was not available to cover all aspects

### Number of Hepatic Metastases and Disease-Free Interval in 73 Patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Laparoscopy (n = 24)</th>
<th>No Laparoscopy (n = 49)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatic metastases, No.</td>
<td>3.5 (1.8)</td>
<td>1.9 (1.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Disease-free interval, mo</td>
<td>13.9 (7)</td>
<td>24.1 (9)</td>
<td>.002</td>
</tr>
<tr>
<td>CEA, ng/mL†</td>
<td>69 (46)</td>
<td>116 (85)</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Abbreviation: CEA, carcinoembryonic antigen.
*Values are given as mean (SD); statistical analysis by t test.
†Data available for 57 cases.
of all cases. In particular, the reasons behind the decision to perform laparoscopy first or proceed directly to laparotomy are not clearly documented in all cases.

The study findings are broadly consistent with the available literature on the subject. Although in a study by Rahusen et al, only 52% of patients with hepatic colorectal metastases had resectable disease, and this is a lower rate than in our study. This may be due to the preoperative imaging used to determine resectability. However, the detection rate of unresectability at laparoscopy with ultrasound was 75%, similar to the findings in our study. Only 3 of the 50 patients in the study by Rahusen et al could not undergo laparoscopy due to adhesions, confirming that this may be a relatively rare occurrence.

A prospective study by Jarnagin et al found the risk of unresectability to be related to clinical risk score (CRS), despite preoperative imaging findings to the contrary (including at least 1 CT scan within 1 month of surgery). The CRS is derived from 5 factors which were originally developed to predict risk of recurrence of disease after hepatic resection. The factors are (1) the node status of the original colorectal pathological findings, (2) the interval between original diagnosis and detection of hepatic metastases, (3) the CEA level, (4) the number of hepatic metastases, and (5) the largest hepatic tumor size. They found that with a high CRS, the chances of unresectable disease were 42%, whereas with a low score, resection was likely to be precluded in only 12%. This is comparable with the finding in the current study of a rate of unresectable disease of 50% in patients deemed to be at high risk. Jarnagin et al. found that laparoscopy was impossible in only 9 of 103 patients, due in each case to adhesions. They discovered 14 (64%) of 22 patients who had unresectable disease at laparoscopy, similar to the rate of 67% in the current study. The rate of 12% for unresectable disease reported in the patients with a low CRS is similar to the rate of 6% in our study.

The findings of this study specific to colorectal liver metastases are also broadly in line with those pertaining to laparoscopy in the staging of other upper gastrointestinal malignant processes, including gastric carcinoma, pancreatic adenocarcinoma, and periampullary adenocarcinomas. The general consensus reached is that with careful selection of cases thought likely to be at risk of being unresectable, for all these malignancies, laparoscopy may sometimes prevent unnecessary laparotomy, often due to the detection of peritoneal seedings missed on imaging.

The implications of this study are that laparoscopy and intraoperative ultrasonography should be used when there is a high index of suspicion that unresectable disease may be present, as it will usually detect unresectable disease missed on preoperative imaging.

This study offers support for the findings of Jarnagin et al. that laparoscopy can be effectively targeted at patients who can be predicted to be at high risk of having unresectable disease, according to the CRS developed by Feng et al, originally developed to predict recurrent disease after resection. Whether one should extrapolate from this that laparoscopy should only be offered to high-risk patients, as suggested by Jarnagin et al., is debatable. Six percent in the current study and 12% in the study by Jarnagin and colleagues of low-risk patients would undergo unnecessary laparotomy, with the attendant increased length of recovery and possible delay in commencing adjuvant therapy.

An alternative implication could be suggested that in high-risk cases, the laparoscopy should be scheduled in advance of a proposed resection, perhaps on an ambulatory surgery basis so that theater time is not lost with unresectable cases. By contrast the low-risk cases could have laparoscopy and laparotomy scheduled for the same theater session, with the expectation that the resection will proceed. The stratification of risk may also allow better informed consent to be obtained from patients.

Further research with prospective data collection would be useful to confirm the results in this study and others, particularly to validate the value of CRS to predict risk of unresectable disease in a center remote from where it was derived. In summary, laparoscopic evaluation of hepatic colorectal metastases is a useful staging procedure prior to resection, particularly when there are clinical reasons to suspect that this is likely.

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Corresponding author and reprints: Guy Maddern, PhD, Department of Surgery, University of Adelaide, The Queen Elizabeth Hospital, Woodville Road, Woodville SA 5011, Australia (e-mail: guy.maddern@adelaide.edu.au).

REFERENCES