



Evaluation of simultaneous laparoscopic resection for liver metastases and colorectal cancer

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Colorectal cancer (CRC) is the third most common cancer in males and the second most common in females, with an incidence of about 1.4 million cases in total, and 693,900 related deaths in 2012 (1). During the natural progression of CRC, approximately 50% of patients develop hepatic metastases, of whom 15% to 50% have synchronous liver metastases (2,3). Laparoscopic hepatectomy for liver tumors was first reported in the 1990s (4). However, application of laparoscopic techniques to liver surgery only slowly developed due to surgery complexity and intraoperative hemorrhage concerns. Over the last decade, laparoscopic hepatectomies have been performed in many experienced centers, and laparoscopic surgery is now widely adopted for the treatment of CRC. The laparoscopic procedure for colorectal and liver malignancies has produced outcomes comparable with those of open surgery (5,6). Abu Hilal *et al.* reported on the laparoscopic management of CRC-related liver metastases and concluded that the minimally invasive method was feasible and oncologically safe and effective (7,8). Although the laparoscopic approach to abdominal malignancy treatment was initially met with skepticism, this technique has been increasingly used in selected patients with CRC or liver cancer, with oncological radicality comparable to that of conventional open surgery.

Reports on combined hepatic and colorectal laparoscopic resections are sporadic. These resections are often referenced as associated procedures in a large series of colic or hepatic laparoscopic resections, and details about the combined technique and their specific results have not been provided. Simultaneous resection of the colorectum and liver for patients with synchronous liver metastases has been

practiced in many high-volume centers, but this procedure has often been associated with increased complications and mortality. Prolonged vascular clamping could contribute to transient portal hypertension and intestinal mucosal edema, which might ultimately lead to colorectal anastomotic leakage. Authors who have voiced reluctance to use the combined procedure have argued that the association of two surgical sites may increase complication rates by causing contamination. In addition, the risk of intestinal edema after the Pringle' maneuver and the compromised status due to impaired postoperative liver function could be connected to colorectal anastomotic leakage.

Although the simultaneous laparoscopic approach appears to be a logical choice for CRC cases requiring minor hepatectomies, no large series of such procedures have been published. This is likely because these procedures require either surgeons with both laparoscopic colorectal and liver experience or close cooperation between two surgical teams. There has also been a tendency toward extending the criteria for synchronous resections. Therefore, it is necessary to plan an optimal combined surgery for both primary CRC and liver metastasis. The optimal strategy for synchronous resectable colorectal liver metastases remains controversial. If the synchronous liver metastases can be resected, then there would be three options for patients' long-term survival: hepatectomy followed by colectomy, colectomy followed by hepatectomy, or simultaneous combined resection. Although combined resections have been associated with increased complications and mortality rates, recent studies have revealed benefits and safety, even when major hepatectomies are performed (9).

Unfortunately, it is impossible to obtain a valid conclusion regarding the benefits and risks of simultaneous laparoscopic resection for synchronous colorectal liver metastases in the absence of randomized controlled trials, despite the few simultaneous laparoscopic resection meta-analyses that have been published (10-12). All studies comparing simultaneous and staged resection of primary CRC and synchronous liver metastases suffer from treatment-selection bias, as synchronous resections are performed in patients who have often had right-sided colonic operations with smaller, fewer, and unilobar liver metastases; as a result, these cases frequently have comparably minor hepatic resections compared with staged resections (13,14). Propensity score matching analysis has become increasingly important in evaluating retrospective cohorts for reducing the impact of treatment-selection bias on the comparison of treatment to non-randomized control using observational data. This statistical method decreases selection bias in retrospective studies and provides an objective evaluation between two different surgical procedures.

As discussed in this paper, the primary concerns with simultaneous laparoscopic liver and colorectal resection are related to increased morbidity due to congestion and added intraoperative fluid load, which might lead to increased anastomotic leakage. To evaluate the validity of simultaneous laparoscopic resection for synchronous colorectal liver metastases, it is theoretically important to compare the perioperative outcome of laparoscopic simultaneous resection with that of laparoscopic colorectal resection. Propensity score matching can be used for an appropriate weighing of the effects of various CRC conditions. Simultaneous laparoscopic liver and colorectal resection might not increase postoperative morbidity related to laparoscopic colorectal resection in select patients. Guillou *et al.* reported that anastomotic leakage rate was not increased by combined laparoscopic liver resection when the rate was compared to that reported by an experienced surgeon performing isolated laparoscopic colorectal resection (15). Clamping the hepatoduodenal ligament has been described as a risk factor for postoperative anastomotic leakage. A multicenter survey of simultaneous laparoscopic liver and colorectal resections reported that the association of laparoscopic colorectal resection did not appear to increase hepatectomy-related morbidity compared with rates reported by expert teams performing isolated laparoscopic liver resections (6).

Although an international multicenter study of

simultaneous laparoscopic resections of primary colorectal tumors and liver metastases reported no association between major hepatic resections and adverse postoperative courses (16), further and larger studies are needed, as this study includes only a small number of major hepatic resections. For patients with multiple or huge liver metastases, the liver disease may progress and become unresectable during the treatment period for primary CRC. Mentha *et al.* advocated the liver-first approach for patients with synchronous colorectal liver metastases (17). For patients in need of a simultaneous resection with a major hepatectomy, this liver-first approach may be safer and more practical.

Among the various approaches for synchronous colorectal liver metastases, simultaneous laparoscopic liver and colorectal resection can be performed safely with an acceptable morbidity risk. As the surgical procedure for laparoscopic liver resection has become more sophisticated in recent years, simultaneous laparoscopic colorectal resection with minor hepatic resection offers a promising treatment approach. Compared with open surgery, this combined procedure provides the advantages of reduced hospital stay and quicker patient enrollment in adjuvant chemotherapy.

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