Reports of laparoscopic liver resection (LLR) date back to the early 1990’s (1,2). These reports were predominantly confined to retrospective case series from single institutions with a low number of overall patients. As acceptance of these technique grew and utilization expanded, an international consensus meeting was held in 2008 was held in Louisville, KY to review the safety of feasibility of this technique (3). Recommendations from this meeting established baseline terminology and efficacy of LLR. Final recommendations for LLR were conservative and limited to minor hepatic resections in carefully selected patients. The overall conclusion from this consortium was that patient safety and procedure efficacy should be monitored with a centralized registry as LLR is more broadly accepted. Six years later, a second international consensus conference was held in Morioka, Japan (4). This conference reviewed all current literature on LLR and concluded that while major laparoscopic liver resections were still considered explorative, minor LLRs, defined as resection of 2 or fewer Couinaud segments, were standard clinical practice. The committee’s literature review concluded that LLR was not inferior to open resection regarding operative morbidity and mortality, margin negativity, and overall survival. Based on these recommendations, the utilization of LLR for malignant disease has continued to expand in specialized centers most notably for hepatocellular carcinoma (HCC) and colorectal liver metastases (CLM) (5-7). LLR has repeatedly been shown to have superior perioperative outcomes and equivalent long-term oncologic results when compared to open resection (8-12). Perhaps the most convincing data on the benefits of LLR comes from the recently published randomized controlled trial on laparoscopic versus open resection for CLM (13). This study is the first to definitively demonstrate similar short-term oncologic outcomes between open and laparoscopic resection with better perioperative outcomes of decreased postoperative complication rates in the laparoscopic cohort (19% vs. 31%, P=0.012) and length of stay (53 vs. 96 hours, P<0.001) (13). Similar results have been shown for the management of HCC with improved perioperative outcomes and similar oncologic results in LLR when compared to open resection (14,15).

The surgical management of metastatic liver disease is not a new concept and has been studied for a number of different primary malignancies including melanoma (16). In a systematic review of liver resection for non-colorectal, non-neuroendocrine liver metastases there appears to be a benefit to resection across a wide array of pathology with expected overall survival ranging from 16–44 months. Regarding melanoma specifically, eighteen studies were reviewed and expected median overall survival was 21.8 months (16). Faries et al., reported on their experience with 1,078 patients with melanoma liver metastases (MLM) at a single institution (17). 5.4% of these patients were candidates for liver resection or ablation. Median overall survival was 24.8 months in the surgical cohort compared to 8 months in the non-surgical group. Similar results have been demonstrated at other high-volume institutions.
The current literature as it stands would suggest a benefit for surgical resection of melanoma liver metastases in highly selected patients. Of note, the only predictors of improved overall survival after resection of MLM were complete surgical resection (R0 resection) and stabilization of disease on systemic therapy prior to surgical resection (17). The latter point becomes particularly important today because the advent of combined immunotherapy (20) and BRAF/MEK inhibition (21) has dramatically improved the expected response rates and survival in metastatic melanoma. These results all favor an expanded role for the surgical management of melanoma metastases.

In a recent study by Aghayan and colleagues (22), a retrospective review on their series of LLR in the management of MLM at the Oslo University Hospital, Norway is presented. This series consists of a total of 11 patients with predominantly ocular melanoma that underwent a total of 13 resections for MLM. All of the reported procedures were done with curative intent. The time period from primary diagnosis to metastasectomy varied across the cohort ranging from 0–149 months. The majority of procedures were non-anatomic, parenchymal sparing resections. Only one case had to be converted from laparoscopic to open and 85% of cases achieved an R0 resection. There were no perioperative deaths and morbidity was quite low. 91% of this cohort had recurrent disease within a median of 5 months from LLR. Only one patient remained disease free at last follow-up. Four patients (36%) had liver only recurrence, while the remainder developed liver and/or extrahepatic disease following LLR. Median overall survival was 30 months with 1-, 3-, and 5-year overall survival of 82%, 45%, and 9%, respectively. Unfortunately, the authors do not provide us any insight into the overall denominator with the total number of patients evaluated over this time period with MLM that were not candidates for surgery. Additionally, there is no mention of systemic therapy received by these patients nor the length of stable disease prior to metastasectomy.

The current literature, including this report by Aghayan et al., on resection for MLM heeds caution. Certainly there is considerable selection criteria that must be evaluated prior to undergoing LLR for MLM as evidenced by the simple fact that only 11 patients underwent such a procedure over a 13 year time period at this specialty referral center in Oslo, Norway. The literature would suggest that only 5% of patient with MLM are eligible for surgical resection/ablation. In this current series, the overall denominator is unknown but, the authors are able to demonstrate the safety and feasibility of LLR in selected patients with MLM. Despite curative intent for each procedure, essentially all patients recurred within 1 year and overall survival was quite poor. The only long-term survivor in this cohort had metastatic melanoma of unknown primary, an established positive prognostic variable (23). These results, consistent with the remainder of the literature, further support the notion that even in highly selected patients with isolated metastatic disease, disseminated micrometastatic disease is the norm not the exception. Fortunately, the advent of immunotherapy and BRAF inhibition has revolutionized the treatment of metastatic melanoma and offers the ability to better control disease at initial presentation as well as treat occult micrometastatic disease in the adjuvant setting. This improved systemic therapy certainly opens the door for a more aggressive approach to patients with isolated liver metastatic disease and LLR will almost certainly prove to be the preferred method when feasible. These patients should be managed in a multidisciplinary clinic where all the available treatment modalities can be fully integrated into a clear and comprehensive treatment plan. Ideally future clinical trials will help us guide both patient selection and treatment sequencing in this complex clinical problem.

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None.

**Footnote**

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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