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Infectious complications in combined colon resection and ablation of colorectal liver metastases



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Abstract

BACKGROUND: The multifactorial incidence of infectious complications carries considerable consequences for patients undergoing more extensive surgery with intent to cure metastatic colorectal cancer. Advances in ablation techniques have emerged as an efficacious method in regional control for liver metastasis from colorectal cancer; however, the degree of increased risk of infectious complications when ablation is performed in combination with colon resection has not been defined.

METHODS: An analysis of a single institution's prospective database from August 1998 to December 2012 was performed for patients undergoing colon resection. Patients were stratified into a colon resection combined with either microwave ablation (MWA) or radiofrequency ablation (RFA) compared to a colon resection only group. Variables included baseline clinicopathologic data, type of operation, complication grade, and infectious outcome. Fisher exact test, Student *t* test, and analysis of variance were used to detect significance levels of *P* values less than .05.

RESULTS: A total of 132 patients with colon cancer of various origins were identified. The group of colon resection combined with RFA and/or MWA was 53 patients (34 male:19 female) and was compared to a matched group of 79 patients (40 male:39 female) who underwent colon resection alone. Median age (58 vs 60 years; *P* = .209), complication rate (60.7% vs 62.5%; *P* = .722), infection rate (28.7% vs 35.4%; *P* = 1.0), mean blood loss (352.7 vs 468.4 mL; *P* = .452), mean blood transfused (1.36 vs .76 U; *P* = .247), and receipt of neoadjuvant chemotherapy (47.1% vs 51.85%; *P* = .724) were all similar between the ablation group and colon only group, respectively. Transfusion rate was higher in the ablation group (39.6% vs 18.9%; *P* = .016). Overall complication rate was 60.6%, with 32.6% infections. One mortality was observed in each group. High-grade (grade, III to V) complications (35.8% vs 18.9%; *P* = .0112) and liver-specific complications (*n* = 4; *P* = .024) were significantly increased in the combined ablation group.

CONCLUSIONS: Combining MWA or RFA techniques with colon resection for liver metastasis appears to have similar infectious and overall complication rates when compared to performing an

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isolated resection of the primary colon cancer alone, although there may be a higher degree of complication seen in the more aggressive approach for curative intent in patients with colorectal liver metastasis.

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Colorectal cancer is the 3rd most common cancer in both men and women with nearly half of those patients developing a liver metastasis during their course of disease.¹ Sadly, it is the 2nd highest cause of cancer-related deaths overall, comprising 10% of cancer mortalities.² Current treatments are focused on complete eradication of all viable disease including colon resection combined with surgical resection or ablation³ of all metastases while still conserving hepatic parenchyma.⁴ Resection of both the primary tumor and liver metastases improves the patient survival; however, liver resection comes with a high rate of postoperative complications,⁵ and not all patients are eligible for hepatic resection with metastatic disease to the liver. Open liver resections as compared with laparoscopic liver resections have a significantly higher morbidity, yet even minimally invasive procedures still pose moderate rates of complication in the setting of metastatic colon cancer.^{6,7} Improved survival has only been observed in patients who were free from postoperative complication after liver resections.⁸ The development of radiofrequency ablation (RFA) and microwave ablation (MWA) has expanded the potential for surgical eradication of disease with the benefit of decreased morbidity in the treatment of borderline resectable metastatic liver disease.⁹⁻¹²

Despite this reduction of morbidity and mortality rate by using ablative techniques in liver surgery, there is still a persistent threat of infectious postoperative complications. Infectious complications are the most common morbidity seen in patients having undergone RFA. It has been reported that 27% of all the infectious complications are hepatic abscesses directly related to the ablation zone.¹³ Hepatic abscesses, while relatively simple to treat with antibiotics and percutaneous drainage, greatly increased length of stay and cost of health care.¹⁴ Although expanding the indications for combined colon resection and liver ablation in patient with synchronous presentation, it is becoming imperative to identify risk factors and preventive measures to better improve liver-related outcomes for metastatic colorectal cancer patients. The multifactorial nature of infectious complications from colon resection carries considerable consequences for patients undergoing more extensive surgery with intent to cure metastatic colorectal cancer.

Previous studies evaluated hepatic abscess formation when RFA was performed in conjunction with various colorectal procedures. They found that there was no increased risk of abscess formation with simultaneous procedures.¹⁵ This study investigates the rate of all infectious complications in the setting of combined colonic resection and liver metastasis ablation in effort to define the general perioperative risk.

Methods

An analysis of a single institution's prospectively maintained database was performed for patients undergoing colon resection by the Division of Surgical Oncology at the University of Louisville from August 1998 to July 2014. This study was approved by the Institutional Review Board for Human Study at the University of Louisville. Fifty-three patients were identified who had a colon resection combined with either MWA or RFA as part of their operation as recognized by procedure codes. These patients were compared to a matched cohort on approximately a 1.5:1 basis. The control group of 79 patients underwent colon resection only during the same period. Examined variables included baseline clinicopathologic data, operative factors based on anatomic resection of the colon, perioperative elements, and infectious outcomes. Complications were based on a standardized grading scale.¹⁶ Grade I and II complications required medical management with oral medications or intravenous infusions. Grade III complications involved escalation of care or radiologic or operative intervention. Grade IV complications resulted in organ dysfunction or chronic impairment. Finally, deaths were recorded as grade V complications. Continuous variables were analyzed using mean or median values where appropriate. Fisher exact test, Student *t* test, and analysis of variance were used to compare the 2 groups. *P* values of less than .05 were considered statistically significant.

Results

A total of 132 patients with colon cancer were identified (Table 1). There were 53 patients in the combined colon resection with RFA or MWA group (34 male; 19 female). This group was compared to a closely matched group of 79 patients (40 male; 39 female) who underwent colon resection alone. The colon only group was drawn from a shorter time frame over the most recent 2 years because the frequency of isolated colon resections performed was much greater than the patients who needed multimodality treatments, therefore our matching did not obligate a more lengthy search based on operative codes from the database. The mean age for the colon resection only group (60.4 years) was similar compared to the combined ablation group (58.2 years; *P* = .210). There was no difference in the mean body mass index between groups (colon only, 28.18 kg/m² vs ablation, 28.20 kg/m²; *P* = .975). Patients in both groups had similar past cardiac (*P* = .504), pulmonary (*P* = .403), underlying liver disease (*P* = .403), and history of diabetes mellitus (*P* = 1.0). There were

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