ORIGINAL ARTICLE

Longterm survival outcomes of patients undergoing treatment with radiofrequency ablation for hepatocellular carcinoma and metastatic colorectal cancer liver tumors

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Abstract

Background: We aim to investigate long-term survival outcomes in patients undergoing radiofrequency ablation (RFA), based on our longitudinal 5 and 10 year follow-up data.

Methods: All patients who underwent RFA for hepatocellular carcinoma (HCC) and colorectal liver metastasis (CLM) between 1999 and 2010.

Results: 320 patients were included with oncologic diagnoses of HCC in 122 (38.1%) and CLM in 198 (61.9%). The majority of patients had a single tumor ablation (71% RFA 1 lesion). Minimum 5 year follow-up information was available in 89% patients, with a median follow-up of 115.3 months. In patients with HCC, disease eventually recurred in 73 (64%) patients. In patients with CLM, disease recurrence was ultimately seen in 143 (84.1%) patients. In the HCC group, the 5- and 10-year overall survivals were 38.5% and 23.4%, while in the CLM group, the 5- and 10-year overall survivals were 27.6% and 15%, respectively.

Conclusions: The use of RFA as a part of treatment strategy for primary and metastatic liver tumors imparts 10-year overall survivals of >23% and 15%, respectively. This study indicates that long-term survival is possible with RFA treatment.

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Introduction

For patients with liver metastases from colorectal cancer and neuroendocrine tumors, complete surgical resection is currently the only curative option. Colorectal cancer is the third most common cancer worldwide and it is ranked the second most frequent cause of cancer associated mortality in the industrialized countries.[1] Around 50% of colorectal cancer patients eventually develop liver metastases.[2] Studies have demonstrated that patients with untreated colorectal liver metastatic lesions have 31% survival rate at 1 year, 7.9% at 2 years, 2.6% at 3 years and 0.9% at 4 years.[3–5] The addition of chemotherapy regiments improves median survival from 6-12 months–20 months.[4] In the 1990's, irinotecan (FOLFIRI) and oxaliplatin (FOLFOX)-based regiments further improved response rate up to 50%.[3,6] Despite improvement in chemotherapy regiments and multi-modality approach in the last decade, patients with metastatic colorectal cancer continue to have a poor prognosis with medial survival of approximately 21 months.[3] Therefore, parenchymal sparing surgical resection with negative margins remains the gold standard for operable patients with metastatic colorectal cancer to the liver.

In patients with hepatocellular carcinoma (HCC), liver transplantation provides the best long term overall survival and disease-free survival, as it removes both the tumors and the cirrhotic background liver.[7] Due to modern advances in liver transplantation, recurrence rate for patients with HCC after liver

transplantation is 16%, with a median time from liver transplantation to HCC recurrence of 13 months.[8] Liver transplantation for HCC, however, is limited by strict eligibility criteria, high costs, and a limited availability of donor organs. The drop out rate for patients with HCC awaiting liver transplantation in contemporary series is 14.5%, which is mainly secondary to tumor progression or hepatic decompensation.[9] While the results with liver resection and hepatic transplantation are encouraging, approximately 70–80% of patients presenting with HCC and CLM are not resection or transplant candidates due to extent of their disease, presence of vascular invasion, or inadequate hepatic reserve. For the majority of patients with HCC or CLM who are not transplant or resection candidates, a number of treatment options including systemic chemotherapy, hepatic-artery directed modalities, isolated hepatic perfusion, external beam radiation therapy, and ablative techniques are currently available.

An obvious conundrum is that surgery and liver transplantation afford patients with CLM and HCC the best chance for a cure, but the vast majority of these patients are not candidates. Several local ablative treatments which include transarterial chemoembolization, percutaneous ethanol injection, and RFA were then developed. RFA particularly have emerged as a promising adjunct in the treatment of CLM and HCC in the past decade due to its safety, efficacy, and ability to provide more consistent results in local tumor control, especially in patients with limited hepatic reserve.[10,11] While there have been several studies evaluating 5-year survival in small cohorts of patients undergoing RFA as part of their treatment strategy for HCC or CLM, there are only limited data on 10-year survival, which is a time interval that we believe is equivocal with cure.[3,12–15] In this study, we sought to determine whether long-term overall survival at 10 years is obtainable in patients, who undergo RFA as part of their treatment for primary and metastatic colorectal hepatic malignancies.

Materials and methods

After Institutional Review Board approval, a single-institution review of all patients (n = 320), who underwent RFA as part of their treatment for hepatocellular carcinoma and colorectal liver metastasis at the University of Pittsburgh Medical Center between 1999 and 2010 was performed. Patients who underwent RFA for treatment of other hepatic lesions were excluded from the study. Data were retrospectively analyzed from a prospective institutional hepatic cancer registry. The primary endpoint of the study are long term 10-year overall survival outcome and tumor recurrence, following RFA for treatment of HCC and CLM.

Treatment planning for patients with hepatic malignancy is carried out under the direction of a multidisciplinary liver tumor board, which is comprised of hepatobiliary surgeons, transplant surgeons, medical oncologists, hepatologists, and hepatobiliary radiologists. The diagnosis of HCC was based on the criteria defined in the practice guidelines of the European Association for the Study of Liver (EASL) or the American Association for the Study of Liver Disease (AASLD). Preoperative scans using either triphasic helical axial computed tomography (CT) or liver magnetic resonance imaging (MRI) were obtained within 1 month before the ablations to allow for the most accurate planning. All patients were initially evaluated for resection, ablation, transplantation, or combination of treatments, based on their extent of disease, tumor characteristics, degree of medical comorbidities, and pre-existing liver reserve. All RFA procedures were performed in the operating room under general anesthesia. Microwave technology was not used. Laparoscopic, open, and percutaneous approaches were all utilized and their applications were at the discretion of the treating surgeon. Laparoscopic ablation was normally performed via three laparoscopic ports under intraoperative ultrasound guidance to ensure proper placement of RFA probe. Tissue biopsy was routinely obtained from the tumors prior to ablation. Patients were normally admitted to the floor postoperatively.

Table 1 Patient demographics

Variables	HCC (n = 122)	CLM (n = 198)
Age (years)	65.7 (range 33–92)	64.7 (range 33–90)
Gender (Male:Female)	84:38	119:79
Race (n)		
a. White	98 (80.3%)	188 (94.9%)
b. Black	18 (14.8%)	7 (3.5%)
c. Others	6 (4.9%)	3 (1.6%)
RFA site (n)		
a. Single lesion	110 (90.2%)	117 (59.1%)
b. 2 lesions	10 (8.2%)	40 (20.2%)
c. $\geq$ 3 lesions	2 (1.6%)	41 (20.7%)
RFA approach (n)		
a. Laparoscopic	90 (73.8%)	12 (6.1%)
b. Open	30 (24.6%)	182 (91.9%)
c. Percutaneous	2 (1.6%)	4 (2%)
AFP (ng/ml)	36.6 (range 1.7–540)	Not applicable
CEA (ng/ml)	Not applicable	16.1 (range 0.5–636)
Total bilirubin (mg/dL)	1.1 (range 0.2–4.1)	0.6 (range 0.1–2.4)
Albumin (g/dL)	3.7 (range 2.3–5.3)	4 (range 2.1–4.9)
INR	1.2 (range 0.9–1.9)	1.1 (range 0.8–3.3)
Platelet (1000/mm^3)	119 (range 13–341)	210 (range 72–703)
BUN (mg/dL)	14.9 (range 5–35)	15.4 (range 3–80)
Creatinine (mg/dL)	1 (range 0.5–3.9)	1 (range 0.5–8.4)
Child-pugh classification		
a. Child A	102 (83.6%)	196 (99%)
b. Child B	20 (16.4%)	2 (1%)
Average MELD score	10 (range 6–34)	8 (range 6–31)