

## Long-Term Results of Percutaneous Radiofrequency Ablation of Unresectable Colorectal Hepatic Metastases: Final Outcomes

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### Key Words

Percutaneous radiofrequency ablation · Colorectal metastases · Hepatic metastases

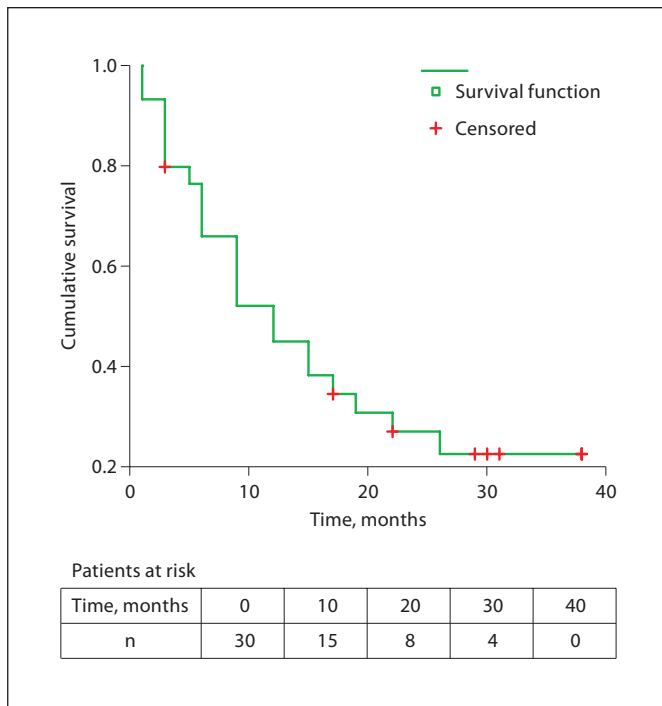
### Abstract

**Introduction:** Percutaneous radiofrequency ablation (PcRFA) provides alternative means of treating patients with unresectable colorectal liver metastases. We previously reported our initial experience in 30 patients treated with PcRFA. We present the final long-term results in these 30 patients. **Methods:** The final outcome of the 30 patients treated with PcRFA is reported, 30 months following the initial results published in 2004. **Results:** Thirty patients (21 males and 9 females), median age 74.5 (44–85) years, underwent PcRFA for 57 lesions in 60 sessions. The final results in this cohort of patients are reported: 28 dead and 2 lost to follow-up. Median follow-up was 22 (3–53) months. Median size was 31 (8–70) mm. Nineteen lesions required repeat PcRFA. Median ablation time per lesion was 12 (4.5–36) min. Eleven patients received chemotherapy pre-PcRFA and 15 received chemotherapy post-PcRFA. Three patients went on to have limited hepatectomies. Complications occurred in 3 (5%) and median hospital stay was 1 (1–7) day. The median hepatic disease-free survival was 12 (95% CI 6.1–17.9) months and actuarial survival was 23.2 (95% CI 18.5–27.8) months. **Conclusion:** PcRFA is safe and associated with increased disease-free and overall survival in patients with unresectable colorectal hepatic metastases.

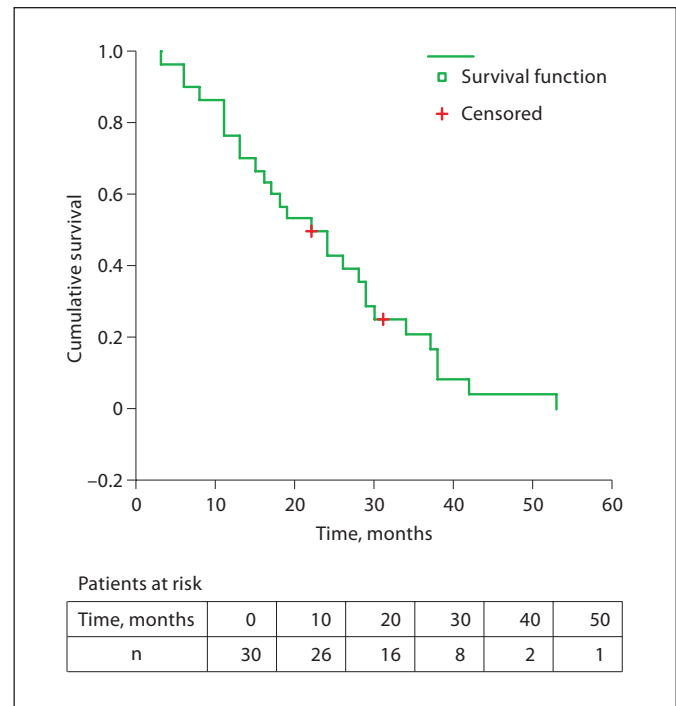
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### Introduction

Liver metastases occur in approximately 50% of all colorectal cancer patients [1]. The median survival in untreated metastases ranges between 6 and 9 months [2]. Surgical resection is considered optimal treatment but only 10–25% are suitable for immediate resection [3]. In patients unsuitable for resection, chemotherapy has been the main treatment. Combined oxaliplatin or irinotecan and 5-fluorouracil regimes result in a median survival of 15–20 months [4]. Radiofrequency ablation (RFA) uses focused heat from mono-polar electro-cautery to induce coagulative necrosis of tumour cells [5]. It is used on the basis that a reduction in tumour load may prolong survival. Published results on RFA are limited due to the diverse case mix (primary hepatic carcinoma and hepatic metastases from different primaries), different techniques (intra-operative and/or percutaneous RFA, PcRFA) and short follow-up duration. We previously reported our initial PcRFA experience in 30 patients with unresectable colorectal hepatic metastases treated with PcRFA at a median follow-up of 17 months [6]. The 11 patients who were alive at the end of our initial study have since died or have been lost to follow-up. We report the final outcome of all 30 patients 30 months following our initial report.



**Fig. 1.** Kaplan-Meier survival curve demonstrating final analysis of disease-free survival in patients undergoing PcRFA for colorectal hepatic metastases.



**Fig. 2.** Kaplan-Meier survival curve demonstrating final analysis of overall survival in all patients undergoing PcRFA for unresectable colorectal hepatic metastases.

## Materials and Methods

Data were collected on 30 patients treated with PcRFA between August 1998 and July 2006. All patients had metastatic colorectal carcinoma isolated to the liver and deemed inoperable due to the anatomy of the lesion or patient co-morbidity. Selection criteria for PcRFA were lesions  $<6$  in number and  $<70$  mm. Treatment was decided at the institution multidisciplinary meeting with input from the hepatic surgeon, oncologist and radiologist. PcRFA was performed under radiological guidance using a technique described previously [5, 6]. Post-PcRFA response and monitoring was assessed using CT 1 week after RFA and 3-monthly thereafter. Statistical analysis was performed using SPSS v.13. Actuarial survival was calculated using Kaplan-Meier analysis.

## Results

30 patients (21 males and 9 females), median age 74.5 (44–85) years, underwent PcRFA to 57 lesions in 60 sessions between 1998 and 2006. Survival analysis was performed from the time of first ablation. The median lesion size was 31 (8–70) mm. Nineteen (33%) lesions required repeat PcRFA. The median ablation time per lesion was 12 (4.5–36) min and the median hospital stay was 1 (1–7)

day. Eleven patients received chemotherapy pre-PcRFA and 15 received chemotherapy post-PcRFA. Complications occurred in 3 cases (5%), 1 pneumothorax and 2 subcapsular haematomas, all of which were treated conservatively. Of the 11 patients alive at the end of the first study period, 9 died from cancer causes and 2 were lost to follow-up. The median follow-up was 22 (3–53) months. The median hepatic disease-free survival (DFS) was 12 (95% CI 6.1–17.9) months (fig. 1), and the median actuarial survival was 23.2 (95% CI 18.5–27.8) months (fig. 2) from date of the first PcRFA.

## Discussion

### Median Follow-Up

The median period of follow-up increased from 17 (3–37) months in our initial report to 22 (3–52) months. The modest increase despite analysis 30 months after the initial study is probably due to the small number of patients alive (11 of 30) at the end of the first study. The median follow-up in these 11 patients since our last report was 12.9 months. Nine patients died from cancer-related

causes (6 extra-hepatic metastases, 3 liver disease progressions) and 2 were lost to follow-up. The first patient had successful PcRFA but subsequently developed new hepatic metastases and was being considered for surgical resection but moved away. Another patient was last seen in 2001 with unresectable metastases and no further treatment.

#### *Disease-Free Survival and Overall Survival*

The median actuarial hepatic disease-free period from the first PcRFA increased from 9 (95% CI 3.9–14) to 12 (95% CI 6.1–17.9) months and the median actuarial survival increased from 22 (95% CI 12.9–31.1) to 23.2 (95% CI 18.5–27.8) months. The survival benefit is reflected in the narrowing of the confidence intervals. Our median survival is lower than in other series and several reasons exist for this. The first reason is sample selection and bias. All the patients in our study had unresectable metastases and represent the terminal spectrum of disease. Most other studies use PcRFA in patients for a variety of indications including cure or patient refusal for major surgery which suggests a sample population with already better prognosis [7, 8]. One of the largest series on PcRFA (117 patients with 179 hepatic lesions) reported a median survival of 36 (95% CI 28–52) months and estimated 1-, 2- and 3-year survival at 93, 69 and 46%, respectively [7]. However, indications for PcRFA include refusal for surgery (n = 22) and previous metastectomy (n = 24). Only half the patients (49.5%, 58/117) underwent PcRFA for indications similar to that of our study (unresectable disease). Secondly, many studies also use PcRFA in combination with open RFA and/or surgical resection, again suggesting a sample population who were able to tolerate

major surgery [8]. Finally, patients in our study were older (median 74.5 vs. 67 years) which is associated with greater co-morbidity and decreased overall survival [7]. Thus, although the median survival in our series is 12.8 months shorter than the largest PcRFA study, it occurs in a group with a worse initial prognosis and who were 7.5 years older on average [7]. It is difficult to assess the independent survival benefit provided by radiotherapy or chemotherapy. The Chemotherapy and Local Ablation vs. Chemotherapy trial is currently investigating this. Further investigations into the quality of life of these patients may further support utility of PcRFA.

#### *Complications*

The overall complication rate in our series was 5% (3/60 PcRFA treatments). Two subcapsular hepatic haematomas were treated conservatively and another patient had a small right pneumothorax, which did not require thoracostomy. This complication rate is consistent with other reports [9].

#### **Conclusion**

All patients in our series represent the terminal spectrum of disease with unresectable colorectal hepatic metastases and excessive co-morbidity associated with poor survival. Percutaneous RFA is well tolerated and provides an effective means of prolonging disease-free and overall survival in these patients. Further trials are underway to establish individual survival benefit of local treatment and chemotherapy. Studies into the quality of life in these patients are required.

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