RESEARCH ARTICLE

Radiofrequency Ablation in Treating Colorectal Cancer Patients with Liver Metastases

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Abstract

Purpose: To evaluate efficacy of radiofrequency ablation (RFA) in treating colorectal cancer patients with liver metastases. Methods: During January 2010 to April 2012, 56 colorectal cancer patients with liver metastases underwent RFA. CT scans were obtained one month after RFA for all patients to evaluate tumor response. (CR+PR+SD)/n was used to count the disease control rates (DCR). Survival data of 1, 2 and 3 years were obtained from follow up. Results: Patients were followed for 10 to 40 months after RFA (mean time, 25±10 months). Median survival time was 27 months. The 1, 2, 3 year survival rate were 80.4%, 71.4%, 41%, 1 % respectively. 3-year survival time for patients with CR or PR after RFA was 68.8% and 4.3% respectively, the difference was statistically significant. The number of CR, PR, SD and PD in our study was 13, 23, 11 and 9 respectively. Conclusions: RFA could be an effective method for treating colorectal cancer patients with liver metastases, and prolong survival time, especially for metastatic lesions less than or equal to 3 cm. But this result should be confirmed by randomized controlled studies.

Keywords: Radiofrequency ablation - colorectal liver metastases-survival time

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Introduction

Liver metastases will develop at some point during the course of the disease in up to 50% of these patients with gastrointestinal tumors (Burrel et al., 2012). Patients with liver metastases generally receive chemotherapy, local treatment or surgery. Traditional chemotherapy has played a limited role in the management of these relatively resistant tumors leaving many physicians with a nihilistic attitude toward hepatic malignancies (Wilson et al., 2012). Surgery is the first choice for the treatment of colorectal liver metastasis, but 60-80% of patients were not suitable for surgery due to the limitation of state and tumor metastasis (Gillams et al., 2009). Transarterial chemoembolization (TACE) is used to the treatment of liver metastases when other curative treatment are not possible. Radiofrequency ablation (RFA) is emerging as an effective local treatment for other liver metastases smaller than 3cm in diameter (Hsu et al., 2011). Although intrahepatic recurrence rates of up to 60 percent have been reported. Survival of patients with liver metastases less than 3cm treated by RFA competes with that of surgical candidaties (Pathak et al., 2011). In clinical, we are usually using RFA to treat colorectal liver metastases by ultrasound and computed tomography (CT) guilding. Colorectal liver metastases severely affect the curative effect and prognosis of patients with colorectal cancer. Survival rate of patients with colorectal liver metastases was 23-71% in 5 years.

Materials and Methods

We retrospectively analysis 56 patients (man 35; woman21; mean age 63±14) with colorectal liver metastases in January 2010- April 2012. All patients were satisfying conditions as follows: 1, patients with colorectal liver metastases were confirmed by pathological biopsy. 2, liver metastasis number less than or equal to 3; 3, the tumor diameter less than or equal to 5 cm; 4, no portal vein tumor thrombus and extrahepatic metastases. All patients provided written, informed consent for the procedure, and our institutional review board approved the retrospective review of the patients' medical and imaging records.

RFA

Patients were considered for RFA regardless of proximity of the lesions to major portal or hepatic vein branches. RFA was preferentially undertaken percutaneously utilizing CT scan guidance. RFA was performed by using Therapeuties RF2000 system (Mountain View, Calif) in this study. Once in place power is applied by the RF2000 generator, which can deliver

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power up to 100W. Power was increased in a stepwise fashion beginning at 50W until maximum power was reached. Tumor ablation was continued at maximum power until tissue impedance increased to the point when power output fell rapidly (i.e., "roll-off"). If roll-off was unable to be achieved ablation was continued at maximum power for 15 minutes. Ablation was carried out a second time utilizing a similar stepwise increase in power until maximum power output was achieved. Ablation was again continued until roll-off for 10 minutes. Small tumors (<3cm) were ablated after a single passage of the electrode array into the center of the lesions. For larger tumors the electrode array was repositioned at 3-cm interval and ablation carried out as above so as to allow complete destruction of the tumor with a one-cetimeter margin. 87 lesions were treated by RFA in 56 patients, all of them were routine to protect liver, acid suppression and support treatment.

Follow-up

All patients were received examination of tumor markers, blood routine and liver function after RFA in one month. Enhanced CT scans were obtained every two month after RFA for all patients and evaluated the tumor changes. The standard of evaluation are follows: 1, complete response (CR): the tumor disappeared, all tumor foci were inactive; 2, partial response (PR): total diameter of tumor active part reduce > 30%; 3, stable disease (SD): total diameter of tumor active part reduce < 30% or increase > 20%; 4, progressive disease (PD): the total diameter of tumor active part increase > 30%. Follow-up time was 10 to 40 months, complications and survival time were all recorded.

Statistical analysis

All statistical analyses were performed by using SPASS17.0 and P value less than 0.05 was considered to indicate a significant. The measurement data were compared by using t test.

Results

32 patients were received one to four times RFA and received complete ablation in 56 patients. 24 patients received partial RFA. The patients were followed up for 10 to 40 months after procedure. The survival patients were 23 at the end of follow-up, the median survival time was 27 months. The 1, 2, 3 year survival rate were 80.4%, 71.4%, 41%, 1 % respectively. 3-year survival time in complete RFA group and partial RFA group were 68.8% and 4.3% respectively, the difference was statistically significant. The number of CR, PR, SD and PD in our study was 13, 23, 11 and 9 respectively. 39.3% (20/56) of patients were found new intrahepatic or other metastases and the median survival time was 7 months.

Complications: All patients received RFA were successful, no surgical related death. Needing special handled were 3 subcapsular hemorrhage, 2 pleural effusion, 1 bile duct injury, and 1 tumor metastasize planting, these complications were received symptomatic treatment and under control. Mainly symptoms occurred during RFA were fever (39, incidence was 69.6%) and puncture point pain (36, incidence was 64.2%), these symptoms were alleviated in 3 days after RFA.

Discussion

Liver is the most common metastasis place for colorectal cancer. Some literatures reported that more than 25% of patients diagnosed colon cancer has been spread to liver, about 25% in all patients with colorectal cancer occurred natural course of liver metastasis, and the prognosis of patients were obvious variation (Bruix et al., 2001). Other studies have also reported that the survival time of patients with colorectal liver metastasis was 23-71% in five years (Babawale et al., 2015). Main methods for treating colorectal liver metastasis including surgery, systemic chemotherapy and Transarterial chemoembolization (TACE) and radiofrequency ablation (RFA), percutaneous ethanol injection, percutaneous iodine particles implantation, etc. RFA is a physical ablation treatment for HCC, which is by the guidance of imaging technologies, including ultrasound, CT and so on (Hagness et al., 2013). The needle was directly percutaneous into the tumor, and using high frequency current in vivo tissue ion with the current changes in the direction of vibration, making organization around the electrode current friction to generate heat, so that the local tissue protein denaturation, membrane disruption, coagulation necrosis and carbonization, achieve the goal of treatment of tumor. Some scholars think that radiofrequency ablation has unique advantages compared to surgical treatment: 1, radiofrequency ablation could puncture into deeper tumor which cannot be resected; 2, radiofrequency ablation has less effect on normal liver tissue and liver function damage with small; 3, compared to traditional laparotomy, radiofrequency ablation is a minimally invasive surgery and lower incidence of complications; 4, some studies found that radiofrequency ablation can cause tumor cell necrosis which could cause specific cellular immunity and prevent tumor recurrence. But when the lesion is more than 5 cm, RFA therapy is difficult to achieve complete necrosis. RFA therapy complications may higher when the lesion located under the diaphragm or near the portal vein or inferior to vena cava and its application is suppressed (Chinn et al., 2001).

Radiofrequency ablation is an important auxiliary method for colorectal liver metastases, enhanced CT is a good indication selection for colorectal liver metastases and provide reference basis for the establishment of treatment, thus improve the overall efficacy of radiofrequency ablation for liver metastatic cancer, and reduce the recurrence rate (Mckay et al., 2006). RFA was preferentially undertaken percutaneously utilizing CT scan guidance which has those advantages: 1, puncture location, path, direction and distance are clear, could reduce blood vessels and bile duct injured. 2, curative effect, the tissue damage scope is clear by CT scanning; 3, patients can be received RFA repeatability. Nicholl reported that there was no difference between surgery and RFA for colorectal liver metastases (Nicholl et al., 2008). Some scholars pointed out that RFA could be

used to replace surgery as a choice for colorectal liver metastases (Riaz et al., 2010). When the tumor diameter is less than or equal to 3cm, there was no significant difference between surgery and RFA. But the curative effect of surgery is better than RFA if the tumor diameter is more than 3cm. RFA is characteristic of minimally invasive, rapid recovery, repeatable treatment and achieve completely ablation for multiple lesions (Germani et al., 2010). But because of lack of capsular and invasion growth for liver metastatic carcinoma, the recurrence rate is high after RFA. The main reason in addition to the biological characteristics of liver metastatic carcinoma and can not accurately judge the invasion scope, leading to insufficient ablation scope range and residual tumor tissues. In our study, 1 patient with 5 lesions in the liver, and treated with twice RFA, received ablation completely. There was no activity in ablation area 1 year after RFA. There were two new lesions in the liver and treated with RFA again, still alive after 26 months follow up.

To sum up, RFA can effectively control the development of colorectal liver metastases, prolong survival time, especially for metastatic lesions less than or equal to 3 cm. RFA is a local treatment after all, needs to combined with genetic tests, drug sensitive test and molecular targeted treatment, which is the key to the future research.

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