Repeated Percutaneous Radiofrequency Ablation for Hepatocellular Carcinoma in Patients with Cirrhosis: Assessment of Safety Based on Liver Function and Portal Hypertension Parameters

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ABSTRACT

Purpose: To evaluate changes in liver function and portal hypertension parameters after repeated percutaneous radiofrequency (RF) ablation for hepatocellular carcinoma (HCC) in patients with cirrhosis.

Materials and Methods: This study included 24 patients (male-to-female ratio, 15:9; mean age, 59.4 y) with early-stage HCC (mean tumor size, 1.91 cm) and cirrhosis who underwent three consecutive treatments with RF ablation between April 1999 and August 2011. Serial changes of liver function and portal hypertension parameters after repeated RF ablation were compared with baseline values using a mixed model and Wilcoxon signed rank test.

Results: The interval between the first and second RF ablation measurements and between the second and third RF ablation measurements was 26.1 months ± 18.3 (range, 3.8–65.8 mo) and 16.6 months ± 9.8 (range, 4.7–35.4 mo), respectively. Total bilirubin level was significantly increased between the first RF ablation and 6 months after the third RF ablation (0.75 g/dL ± 0.37 to 1.06 g/dL ± 0.68, $P = .001$), but all values were within the normal range. No other liver function parameter showed a significant change ($P > .05$ for all). Portal hypertension parameters did not show significant changes between the first RF ablation and 6 months after the third RF ablation ($P > .05$).

Conclusions: Repeated RF ablation for controlling recurrent HCC did not seem to affect liver function and portal hypertension in patients.

ABBREVIATIONS

HCC = hepatocellular carcinoma, CPS = Child-Pugh score

Radiofrequency (RF) ablation as a locoregional treatment for hepatocellular carcinoma (HCC) is a safe and effective method either as treatment of early-stage HCC along with surgical resection or as bridge management before transplantation (1,2). Generally, RF ablation is considered to be feasible in patients in whom surgical resection was not indicated because of impaired liver function (3). However, local and remote intrahepatic recurrences after ablation are major issues and are frequently observed during the follow-up period. According to a previous study, cumulative local tumor progression rates were 27% and 37% at 5 years and 10 years, respectively. Cumulative remote intrahepatic recurrence rates were also high, approaching 75% at 5 years (4). Although it is well known that RF ablation is safe for patients with impaired liver function, the situation of repeated treatment is often encountered, and the effects on underlying liver function and severity of portal hypertension have not been established (5,6). To our knowledge, there are a few studies that review the short-term or long-term effects of single-session RF ablation (3,7) but no reports of effects of repeated RF ablation alone on liver function and portal hypertension. The purpose of this study was to evaluate changes in liver function and portal hypertension after repeated RF ablation in a consecutive series of patients with liver cirrhosis and HCC.

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MATERIALS AND METHODS

Patients

This retrospective study was approved by our institutional review board, and the need for written informed consent from patients was waived. We conducted a review of our departmental database of RF ablation procedures and accompanying data to enroll patients who were treated only with RF ablation and who underwent no other therapies, including hepatic resection, transarterial chemoembolization, radiation therapy, or systemic chemotherapy, for HCC. Between April 1999 and August 2011, ultrasound (US)-guided percutaneous RF ablations were performed for the treatment of 5,196 HCCs in 3,169 patients (male-to-female ratio, 2,481:688; mean age, 59.1 y; age range, 24–91 y) at Samsung Medical Center in Seoul. Among these HCCs, we evaluated 1,703 treatment-naïve tumors (mean size, 2.1 cm; size range, 0.5–4.9 cm) in 1,543 consecutive patients (male-to-female ratio, 1,169:374; mean age, 58.6 y; age range, 24–86 y) that were initially diagnosed and treated with US-guided percutaneous RF ablation as a first-line option, and 895 of these patients (58.0%; 895 of 1,543) experienced first recurrences. The workflow of enrollment for this study is described in detail in Figure 1. There were 24 patients with HCC and cirrhosis who underwent three consecutive RF ablation therapies for HCC and subsequent intrahepatic tumor recurrences who were finally included in the study. The baseline characteristics of the 24 patients are summarized in Table 1. Our institutional criteria for feasibility of US-guided percutaneous RF ablation procedures were as follows: (*i*) a single nodular HCC < 5 cm in maximum diameter, (*ii*) multinodular HCCs (≤ 3 in number, each < 3 cm in maximum diameter), (*iii*) Child-Pugh class A or B liver cirrhosis, (*iv*) absence of portal vein thrombosis or extrahepatic metastasis, and (*v*) prothrombin time ratio $> 50\%$ (or international normalized ratio < 1.7) and platelet count $> 50{,}000$ cells/mm^3 (50×10^9/L). In patients who were candidates for surgery, surgical resection was primarily recommended. However, patient age, comorbidity, and preference were also considered.

Assessment before RF Ablation

We assessed underlying liver disease of subjects based on clinical, laboratory, and imaging findings. Portal hypertension was diagnosed in the presence of esophageal varices or splenomegaly with a platelet count $< 100{,}000$ cells/mm^3 (100×10^9/L), according to current

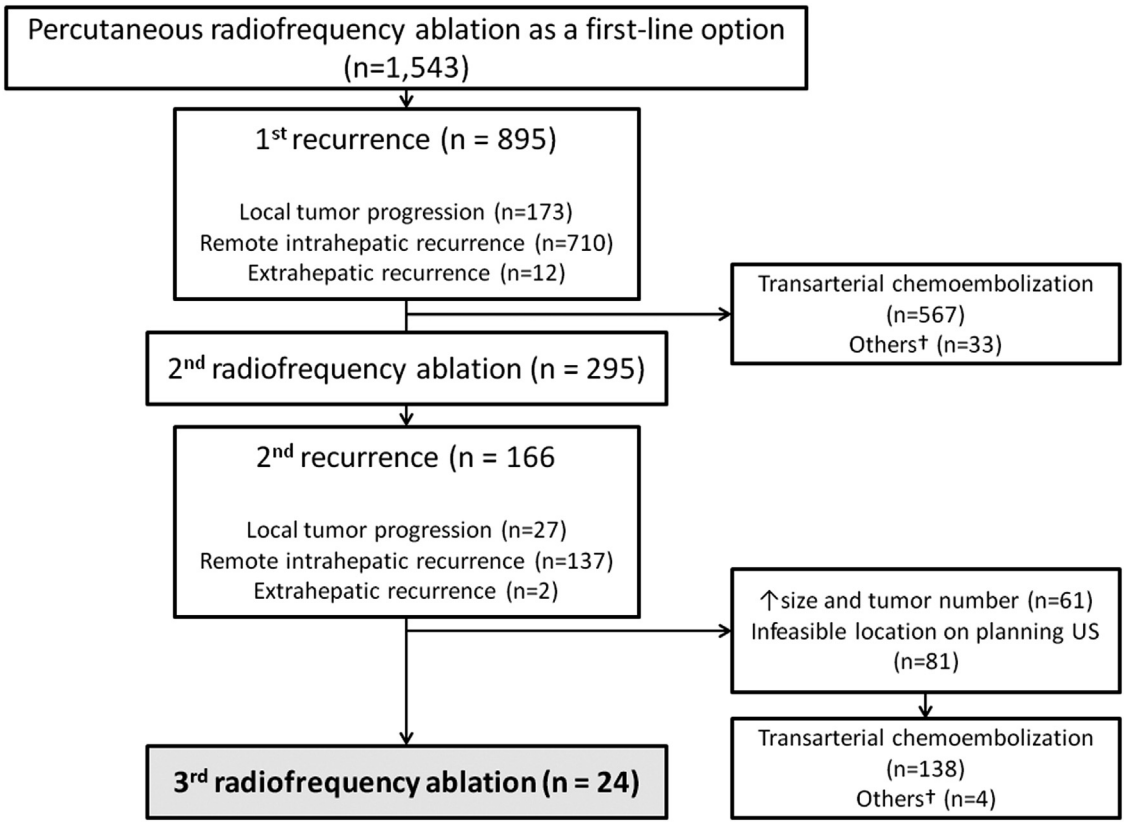

Figure 1. Flow chart of inclusion and exclusion criteria for the present study. There were 1,543 consecutive patients initially diagnosed and treated with US-guided percutaneous RF ablation as a first-line option. Of these, 895 patients experienced first recurrences, and 295 were treated with a second RF ablation. Among the 166 patients who experienced the second recurrences, 24 patients with HCC and cirrhosis who underwent three consecutive RF ablation therapies for treatment-naïve HCC and subsequent intrahepatic tumor recurrences were included in the study. †Others = radiation therapy, systemic chemotherapy.