PERCUTANEOUS ULTRASOUND-GUIDED RADIOFREQUENCY ABLATION OF INTRAHEPATIC CHOLANGIOCARCINOMA

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This study evaluated the clinical applications, treatment effects, and complications of percutaneous ultrasound (US)-guided radiofrequency ablation (RFA) of intrahepatic cholangiocarcinoma. Ten patients (6 men and 4 women) with histologically proven cholangiocarcinoma underwent US-guided percutaneous RFA. Tumor diameters ranged from 1.9 to 6.8 cm. There were 12 sessions of RFA for 10 solitary cholangiocarcinomas. Eight patients were treated at a single session and two patients had two treatment sessions. The efficacy of RFA was evaluated using contrast-enhanced dynamic computed tomography 1 month after treatment and then every 3 months. Complete necrosis was defined as lack of contrast enhancement of the treated region. There was complete necrosis in eight tumors. In two patients with large tumors (4.7 and 6.8 cm in diameter), enhancement of residual tissue was observed after RFA treatment, indicating residual tumor. Complete necrosis was seen in all five tumors (100%) with diameters of 3.0 cm or less, two of three tumors (67%) with diameters of 3.1–5.0 cm, and one of two tumors (50%) with diameters of more than 5.0 cm. A large biloma was found in one patient after treatment. No serious complications occurred in the other nine patients. In conclusion, percutaneous RFA is effective and successful in the treatment of intrahepatic cholangiocarcinoma of 3 cm or less and satisfactory for tumors of 3–5 cm. The rate of serious complications after RFA is low. Further follow-up is necessary to determine long-term efficacy.

Key Words: cholangiocarcinoma, liver, neoplasm, radiofrequency ablation
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Cholangiocarcinoma is the second most common primary hepatic neoplasm [1]. Surgical resection of the tumor offers the best chance for long-term survival. However, patients with liver cirrhosis or chronic hepatitis are not candidates for surgical resection because of poor hepatic reserve [2,3]. The alternative technique, radiofrequency ablation (RFA), is a relatively new, minimally invasive therapy for primary and metastatic liver tumors. Percutaneous RFA for hepatic neoplasm is a recent innovation, but the results of preliminary clinical series and animal studies are encouraging and show that it is technically feasible and has minimal morbidity [4–8].

Although RFA is effective in the treatment of hepatocellular carcinoma and liver metastasis, to the best of our knowledge, its clinical efficacy in the treatment of intrahepatic cholangiocarcinoma has not been reported. The purpose of this paper is to describe our experience with percutaneous ultrasound (US)-guided RFA in intrahepatic cholangiocarcinoma and to report on the technique, its complications, and efficacy.

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Materials and Methods

Patients

From January 2002 to October 2004, 10 patients underwent percutaneous US-guided RFA to treat intrahepatic cholangiocarcinoma. The study was approved by our institutional review board, and informed consent was obtained from all patients before the procedure. Of the 10 patients, two patients refused surgery and the other eight were not considered surgical candidates because of advanced age and either comorbid conditions (4 patients) or poor hepatic reserve (4 patients). No tumors were located near the intrahepatic great vessels.

There were six men and four women with a mean age of 66.2 years (range, 38–86 years) (Table). All 10 patients had pathologic confirmation of the diagnosis from US-guided biopsy performed, either in advance or at the time of RFA. Tumor size ranged from 1.9 to 6.8 cm (mean, 3.4 cm). Tumors were classified into three groups depending on size: five tumors had a diameter of 3 cm or less, three tumors were between 3.1 and 5 cm, and two tumors were larger than 5 cm.

Radiofrequency tumor ablation technique

All patients were interviewed before treatment by one of the two experienced interventional radiologists (Yi-You Chiou, YYC; and Yi-Hong Chou, YHC), and were assessed with US before the procedure to determine whether the tumor was amenable to ablation under US guidance. Nine patients received meperidine analgesia and one patient was under conscious sedation (with droperidol, midazolam and fentanyl), administered and monitored by anesthesiologists.

Two different RFA devices were used with techniques that have been described previously [9,10]: the RITA (radiofrequency interstitial tissue ablation) device (Rita Medical Systems, Mountain View, CA, USA) and the Radionics device (Radionics, Burlington, MA, USA). With the RITA device, ablation was performed using an expandable needle electrode (Starburst, 2–3 cm, or Starburst XL, 3–5 cm). With the Radionics device, treatment involved either a cluster (three-prong, 2.5 cm active tip) or a single (2 or 3 cm active tip) needle electrode, depending on the size of the tumor. Each tumor received one to four ablations in one session. The number of ablations performed in one session was based on the size of the tumor.

Imaging assessment

After RFA, all patients underwent immediate follow-up US or contrast-enhanced dynamic computed tomography (CT) to evaluate the possibility of bleeding or fluid accumulation. The efficacy of RFA was evaluated using contrast-enhanced dynamic CT 1 month after treatment and then every 3 months. Treated tumors were assessed for residual tumor and size changes. All follow-up images were also assessed for the development of new metastatic disease and ancillary peritumoral changes.

Residual disease was defined as persistent tumor without necrosis in an area or areas after ablation, as determined at the 1-month follow-up study. Recurrent disease was defined as new tumor development after at least one imaging study had demonstrated complete eradication of tumor. Assessment of images was performed in consensus by three experienced radiologists (YYC, YHC, and Jen-Huey Chiang).

Table. Demographic data of 10 patients with intrahepatic cholangiocarcinoma

Age (yr)	Gender	Location	Size (cm)	Viable tumor	Pre-RFA		Post-RFA	
					CEA*	CA19-9*	CEA	CA19-9
71	M	S2	2.2	No	0.8	12.2	1.6	13.2
63	F	S4	1.9	No	2.4	16.9	3.0	14.2
38	F	S4	5.1	No	7.6	28.3	3.8	24.0
75	F	S2–3	4.6	Yes	2.8	73.2	2.7	56.6
86	M	S6	2.4	No	ND	ND	ND	ND
59	F	S6–7	6.8	Yes	22.4	86.3	14.0	42.7
73	M	S5	2.3	No	ND	ND	1.0	9.8
63	M	S7	3.1	No	ND	ND	ND	ND
67	M	S7	2.5	No	5.9	26.4	3.2	16.1
73	M	S8	3.5	No	ND	ND	1.8	11.7

*Normal range: carcinoembryonic antigen (CEA) < 6.00 ng/mL; CA19-9 < 34.60 U/mL. ND = no available data.