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Long-term outcomes after hepatic resection combined with radiofrequency ablation for initially unresectable multiple and bilobar liver malignancies

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ABSTRACT

Background: Hepatic resection (HRE) combined with radiofrequency ablation (RFA) offers a surgical option to a group of patients with multiple and bilobar liver malignancies who are traditionally unresectable for inadequate functional hepatic reserve. The aims of the present study were to assess the perioperative outcomes, recurrence, and long-term survival rates for patients treated with HRE plus RFA in the management of primary hepatocellular carcinoma (HCC) and metastatic liver cancer (MLC).

Methods: Data from all consecutive patients with primary and secondary hepatic malignancies who were treated with HRE combined with RFA between 2007 and 2013 were prospectively collected and retrospectively reviewed.

Results: A total of 112 patients, with 368 hepatic tumors underwent HRE combined with ultrasound-guided RFA, were included in the present study. There were 40 cases of HCC with 117 tumors and 72 cases of MLC with 251 metastases. Most cases of liver metastases originated from the gastrointestinal tract (44, 61.1%). Other uncommon lesions included breast cancer (5, 6.9%), pancreatic cancer (3, 4.2%), lung cancer (4, 5.6%), cholangiocarcinoma (4, 5.6%), and so on. The ablation success rates were 93.3% for HCC and 96.7% for MLC. The 1-, 2-, 3-, 4-, and 5-y overall recurrence rates were 52.5%, 59.5%, 72.3%, 75%, and 80% for the HCC group and 44.4%, 52.7%, 56.1%, 69.4%, and 77.8% for the MLC group, respectively. The 1-, 2-, 3-, 4-, and 5-y overall survival rates for the HCC patients were 67.5%, 50%, 32.5%, 22.5%, and 12.5% and for the MLC patients were 66.5%, 55.5%, 50%, 30.5%, and 19.4%, respectively. The corresponding recurrence-free survival rates for the HCC patients were 52.5%, 35%, 22.5%, 15%, and 10% and for the MLC patients were 58.3%, 41.6%, 23.6%, 16.9%, and 12.5%, respectively.

Conclusions: HRE combined with RFA provides an effective treatment approach for patients with primary and secondary liver malignancies who are initially unsuitable for radical resection, with high local tumor control rates and promising survival data.

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1. Introduction

Hepatic resection (HRE) has been recognized as the sole curative treatment of choice for patients with primary hepatocelluar carcinoma (HCC) and metastatic liver cancer (MLC), offering long-term survival between 20% and 30% at 5 y [1,2]. However, hepatectomy can be performed only in approximately 10%–20% of such patients [3–5]. The primary obstacles to complete resection in most patients who present with multiple or bilobar diseases are the need to leave sufficient residual functional hepatic parenchyma to support posthepatectomy hepatic function after surgical curative resection [6,7].

A large volume of the literature on radiofrequency ablation (RFA) for primary and metastatic liver tumor is available, and its safety, efficacy, repeatability, acceptable local control recurrence, and long-term survival rates have been well demonstrated [8–10]. Although traditional limits to liver resection have been exceeded as advancements in hepatic surgery and postoperative patient management in the last two decades, patients with multiple or bilobar liver tumors are often still considered for palliative chemotherapy only, because of too small future liver remnant volume.

Strategies designed to increase the proportion of patients who are candidates for complete surgical treatment of liver metastases are emerging. Hepatectomy with simultaneous intraoperative RFA has been reported with a curative intent. However, the clinical outcomes after this procedure are still lacking and confusing. Our surgical group has rich experience with liver resection and RFA [11–13]. Therefore, we use RFA either as an adjunct to resection or as the primary modality of treatment for patients who were not candidates for curative resection. The safety in terms of complications and the efficacy in terms of local control or local recurrence, and long-term survival after HRE plus RFA are also described.

2. Materials and methods

2.1. Patient population

The protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in *a priori* approval by the Clinical Trial Ethics Committee of West China Hospital, Sichuan University. The ethics committee also approved the retrospective analysis of patient data without the informed consent because of the low risk for breaching confidentiality. A retrospective analysis of prospectively collected data of patients with HCC and MLC who had undergone elective liver resection or RFA at our hospital was performed. Only patients who underwent combined HRE and RFA between Jan 2007 and May 2013 were included in this analysis. Demographic, perioperative outcomes, and long-term survival data were retrospectively collected and analyzed. All patients were histologically confirmed primary or metastatic hepatic malignancies.

2.2. Inclusion and exclusion criteria

The preoperative assessments included liver function evaluation based on liver biochemistry, serum tumor marker test, coagulation profiles, Child–Pugh classification, ultrasonography, colonoscopy, computed tomography (CT) scan, magnetic resonance imaging (MRI), and hepatic digital subtraction angiography. Liver volumetric CT had been done to estimate the future liver remnant volume for all the patients with complicated multiple or bilateral tumors.

Inclusion criteria were as follows: (1) patients with liver function of Child–Pugh class A or B; (2) patients who were deemed initially unresectable because of the number or bilobar location of tumors, tumor proximity to major vascular structures, and the presence of cirrhosis with a functional hepatic reserve inadequate to tolerate HRE or RFA; (3) patients with the absence of extrahepatic diseases; and (4) patients were considered for RFA even if they had tumor close to a major portal or hepatic vein branch or the inferior vena cava, but they were excluded if tumor involved the main right or/and left bile duct [14]. Patients with refractory ascites, patients with platelet count $<15 \times 10^9$/L, patients whose prothrombin time was prolonged more than 3.0 times above normal, patients with poor general condition who could not tolerate surgery or were unwilling to receive surgical intervention, and patients treated with HRE or RFA alone were excluded from the present study.

2.3. HRE combined with RFA

In the present study, all patients were treated surgically with both resection and RFA during one surgical procedure. Routinely, the HRE was performed first. Surgical resection was carried out under general anesthesia. The right subcostal incision with a midline extension was chosen. On entering the abdomen, an initial exploration was performed to preclude the presence of extrahepatic disease. Liver resections were defined according to the Couinaud classification of liver segments. HRE was considered anatomic when at least one segment was removed entirely; all other resections were defined as nonanatomic or atypical. Major hepatectomy was defined as resection of more than three Couinaud segments, whereas "minor" hepatectomy was defined as resection involving one or two segments. Portal triad clamping was prepared in all patients; however, only 45 patients required intermittent portal triad clamping (15-min clamping and 5-min release periods) to control intraoperative blood loss.

Intraoperative ultrasonography (IOUS) was routinely performed to estimate the number, size, location, and vascular proximity of the hepatic lesions, and to give an accurate vascular map of liver anatomy. After removal of the large lesion, the remaining unresectable lesions were treated with RFA by using a commercially available system (Cool-Tip System; Radionics, Burlington, MA) and a needle electrode with a 2- or 3-cm exposed tip and with ultrasound guidance (Vivid4; GE Healthcare). The comprehensive approaches used for RFA have been detailed by our group previously [11–13]. Treatment continued until complete ablation features were achieved by ultrasonography.