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Combined Hepatectomy and Radiofrequency Ablation for Multifocal Hepatocellular Carcinoma: A Novel Concept for Curative Treatment and Reported Cases at Phramongkutklao Hospital

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Abstract

Objective: To evaluate the criteria in patient selection, safety and short-term results of combined hepatic resection and radiofrequency ablation (RFA) for multifocal hepatocellular carcinoma.

Background: The role of combined resection and ablation has been previously reported in patients with colorectal liver metastasis. For multifocal hepatocellular carcinomas (HCCs) that are untreatable with resection only, locoregional therapies added to hepatectomy have been introduced. Combined resection and RFA play an even more important role in the management of HCC because of the high frequency of multifocal tumors and associated cirrhosis.

Materials and Methods: Case records of three patients who had six HCCs in their livers undergoing hepatectomy combined with ultrasound-guided intra-operative RFA were reviewed. The mean diameter of the resected tumors was 3.4 cm (range 2-5 cm) and that of ablated tumors was 2 cm (range 1-3 cm). We evaluated the criteria in patients' selection, safety and short-term results of combined hepatic resection and RFA.

Results: The primary effectiveness rate of RFA was 100 % in the first three months. There was no procedure-related death occurred and there were no hepatectomy-related complications and an RFA-related complication in all three patients.

Conclusions: Combined hepatectomy and RFA is an effective and safe treatment modality for multifocal HCCs. However, this strategy should be performed following strict patient's selection and within the context of prospective clinical trials.

Keywords: Hepatocellular carcinoma, hepatectomy, radiofrequency ablation

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INTRODUCTION

Hepatic resection is still the mainstay of curative treatment for hepatocellular carcinoma (HCC), with perioperative and survival results improving in recent years.¹ Most common reasons to exclude patients for resection are extrahepatic disease, tumor location, inadequate functional hepatic reserve or proximity to major vascular structures.² In an attempt to provide treatment for the overwhelming number of patients who are not candidates for hepatic resection only, some possible treatment approaches to potentially curing HCCs have been explored.³ Radiofrequency ablation (RFA) is a rapidly growing thermal ablative therapy for small HCC that is also potentially curative. Prospective randomized trials have shown that RFA is superior to ethanol injection in inducing complete tumor necrosis, resulting in better long-term progression-free and overall survival.^{4,5} Hepatectomy in combination with radiofrequency ablation (RFA) for multifocal hepatic tumors has recently been introduced.⁷⁻⁹ The purpose of this study was to evaluate

the short-term results, safety and complications of this combined treatment in patients with multifocal HCCs.

PATIENTS AND METHODS

Between April and November 2008, all three patients were considered to have unresectable HCCs on the basis of bilobar tumors distribution and inadequate functional hepatic reserve as pictures shown (Figure 1-3).

Barcelona Clinic Liver Cancer (BCLC) Group Classification of hepatocellular carcinoma was used to assess the resectability of tumors. All have Child-Pugh Class A liver cirrhosis and patient No. 1 underwent transarterial chemoembolization for downstaging of the tumors before the treatment. No patient underwent portal vein embolization prior to hepatectomy. The hepatectomy procedure performed in the patients consisted of a segmentectomy VI and VII, segmentectomy V and segmentectomy VI for patients No. 1, 2 and 3 respectively followed by radiofrequency

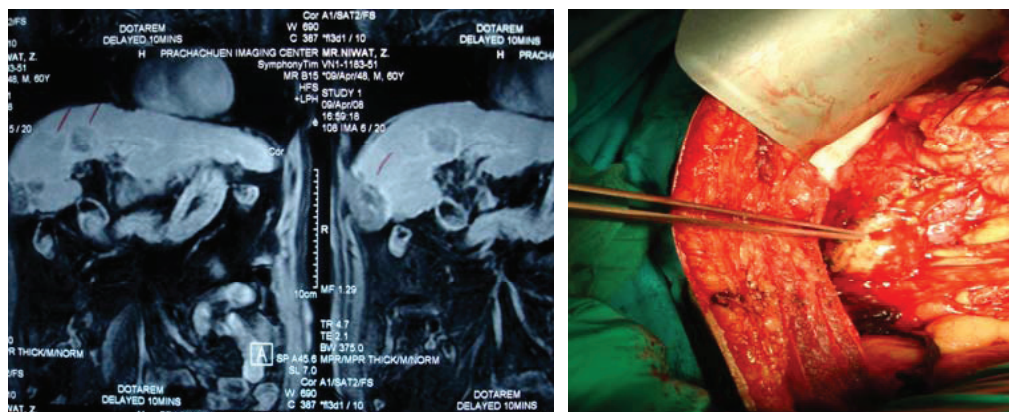


Figure 1 Patient No. 1 HCCs segment IV, VI

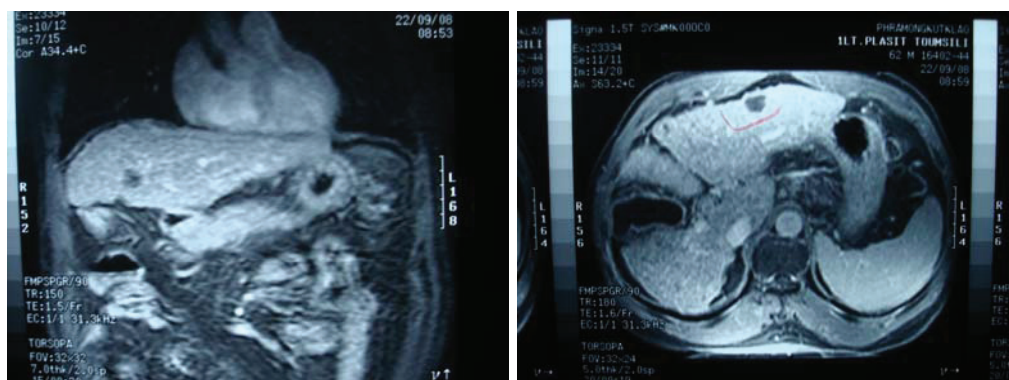


Figure 2 Patient No. 2 HCCs at Segment V and II (Atrophy of Right Hepatic Lobe)

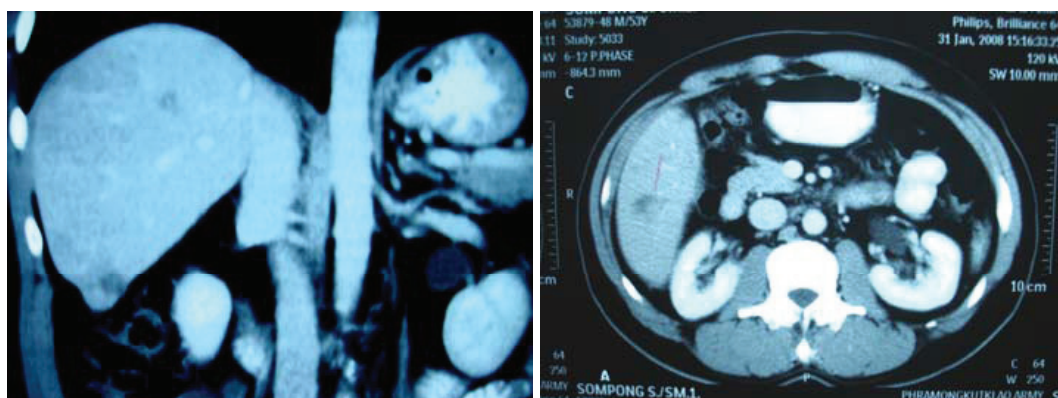


Figure 3 Patient No. 3 HCCs at Segment VI and IV

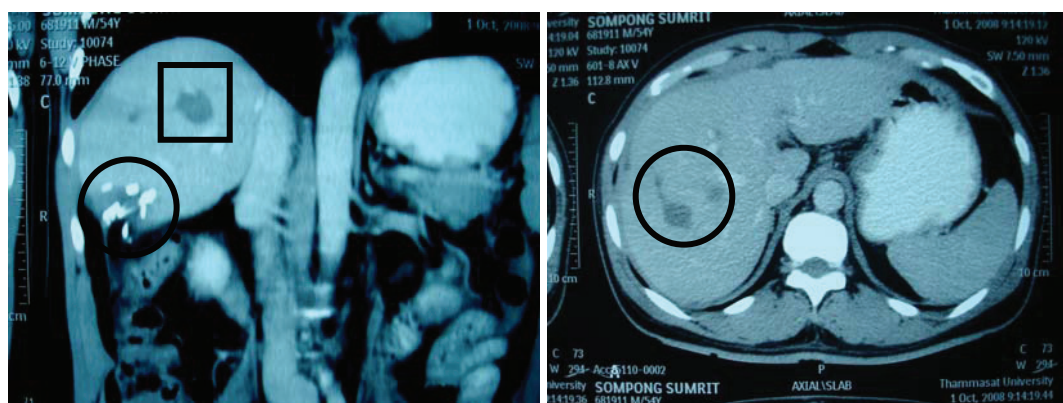


Figure 4 Post combined segmentectomy VI and RFA segment IV in patient No. 3
Circle = surgical site; Square = RFA site

ablation of HCCs at segment IV in two patients and segment II in one. The resected HCCs were sectioned and confirmed to be hepatocellular carcinoma in all patients. The mean diameter of the resected tumor was 3.4 cm, and 2 cm for RFA tumors. All RFA procedures were performed under ultrasound-guidance by surgeon and radiologist who used an expandable electrode system (RF 3000 Radiofrequency Ablation System, Boston Scientific Cooperation). With this method a radiofrequency current is applied through a needle electrode inserted directly into the tumor, with the aim of destroying all malignant cells. This technique is considered safe and efficient.¹⁰ No complication or procedure-related death occurred and all patients recovered uneventfully in seven days after surgery.

Follow-up

All patients were followed by CT scans one month and three months after operations which used as a baseline study to evaluate therapeutic efficacy.

Completed radiofrequency ablation was found in all patients as follow up CT scans shown in patient No. 3 (CT not demonstrated any growing or enhancing tumor in the ablation zone) and subsequent contrast enhanced CT scan were planned to repeat every three months (Figure 4).

DISCUSSION

At the present time, hepatic resection has been one of the best treatment modality for patients with HCCs.^{6,10} RFA is a low risk procedure, with mortality rates of about 0.5 % and complication rates between 6.9 and 9.8 %.¹¹⁻¹⁴ However, especially following percutaneous RFA, local recurrence rates up to 40% are reported in large series.^{12,14} Tumor recurrences at other sites are common (28-70%), probably caused by negative patient selection.¹¹⁻¹⁶ The overall outcome after RFA is difficult to interpret, since results vary widely and follow up data are immature. Recurrence rates after RFA are higher than those after resection,

survival rates after RFA may be lower than those after resection.¹⁷ Thus, hepatectomy is principally recommended for patients with resectable HCCs. Combined resection and RFA may play an even more important role in the management of HCC because of the high frequency of multifocal tumors and associated cirrhosis, which limits the applicability of extended resection to encompass multifocal or bilobar HCCs. A previous study of patients with bilobar HCCs diagnosed after laparoscopy or laparotomy has shown that combined resection of HCC in one lobe and wedge resection or ethanol ablation of lesions in the contralateral lobe greatly prolonged the long-term survival compared with nonsurgical treatments.¹⁸

However, ethanol injection therapy can only achieve a complete necrosis of approximately 70%, even for tumors <3 cm. RFA is a better modality for treatment of the contralateral lesions and could even be used for deep-seated lesions. The strategy of RFA combined with resection is particularly useful for patients with a large tumor in one lobe and one or two smaller tumor nodules in the contralateral lobe, for which neither resection or RFA alone is adequate for treatment³. Although the strategy of combined RFA and resection may reduce the surgical risk compared with an extended hepatectomy aimed to encompass multiple tumors which is still a high-risk procedure in patients who have limited liver function reserve, the 5-year survival rate of 55% after combined resection and RFA in the study of Choi et al. is encouraging. Of a total of 66 tumors ablated, there was only one incomplete ablation and another two with local tumor progression after a median follow up of 22 months in the whole group². Choi et al. reported no operative mortality and 8% major complication rate, which are indeed very favorable results. However, it should be noted that their selection criterion for lobectomy of <10% retention at 15 minutes is quite restrictive. Nonetheless, RFA combined with resection should be considered the treatment of choice for multifocal HCCs that are otherwise not amenable to resection or liver transplantation.

CONCLUSION

Combined hepatectomy and radiofrequency ablation is a novel concept for curative treatment for multifocal hepatocellular carcinoma. The procedure

is safe and provides curative treatment option for HCC patients especially in many institutes that cannot perform liver transplantation. But this strategy should be performed following strict patient selection and within the context of prospective clinical trials. Thus far, there is no well established adjuvant therapy that could reduce tumor recurrence after resection or RFA to improve the long-term outcome. It is imperative that more research effort is devoted to the study of novel adjuvant therapies for HCC.

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