

Comparison of Combination Therapies in the Management of Hepatocellular Carcinoma: Transarterial Chemoembolization with Radiofrequency Ablation versus Microwave Ablation

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ABSTRACT

Purpose: To compare retrospectively the outcomes and complications of transcatheter arterial chemoembolization with drug-eluting embolic agents combined with radiofrequency (RF) ablation or microwave (MW) ablation in treatment of hepatocellular carcinoma (HCC).

Materials and Methods: From 2003–2011, 89 patients with HCC received a combination therapy—transcatheter arterial chemoembolization plus RF ablation in 38 patients and transcatheter arterial chemoembolization plus MW ablation in 51 patients. Local tumor response, tumor progression-free survival (PFS), overall PFS, overall survival (OS), and complications were compared. Overall PFS and OS were compared between the two treatment groups in multivariate analysis controlling for Child-Pugh class, Barcelona Clinic Liver Classification stage, and index tumor size.

Results: Complete local tumor response was achieved in 37 (80.4%) of the tumors treated with transcatheter arterial chemoembolization plus RF ablation and 49 (76.6%) of the tumors treated with transcatheter arterial chemoembolization plus MW ablation ($P = .67$). The median tumor PFS and overall PFS were 20.8 months and 9.3 months ($P = .72$) for transarterial chemoembolization plus RF ablation and 21.8 months and 9.2 months for transarterial chemoembolization plus MW ablation ($P = .32$). The median OS of the transcatheter arterial chemoembolization plus RF ablation group was 23.3 months, and the median OS of the transcatheter arterial chemoembolization plus MW ablation group was 42.6 months, with no significant difference in the survival experience between the two groups (log-rank test, $P = .10$). In the multivariate analysis, Barcelona Clinic Liver Classification stage was the only factor associated with overall PFS and OS. One patient in the transcatheter arterial chemoembolization plus RF ablation cohort (3%) and two patients in the transcatheter arterial chemoembolization plus MW ablation cohort (4%) required prolonged hospitalization (< 48 h) for pain management after the procedure ($P = 1.00$).

Conclusions: Based on similar safety and efficacy outcomes, both combination therapies, transcatheter arterial chemoembolization plus RF ablation and transcatheter arterial chemoembolization plus MW ablation, are effective treatments for HCC.

ABBREVIATIONS

BCLC = Barcelona Clinic Liver Classification, CI = confidence interval, HCC = hepatocellular carcinoma, MW = microwave, OS = overall survival, PFS = progression-free survival

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In recent years, a combination therapy of transcatheter arterial chemoembolization and percutaneous ablation has been gaining traction as a treatment option for hepatocellular carcinoma (HCC), with the goals of achieving better overall survival (OS) and improving prognosis (1–6). Several previous studies suggested that the effectiveness of transcatheter arterial chemoembolization combined with radiofrequency (RF) ablation is better than monotherapy and may have a synergistic effect in treating HCC (1–5). These results were further confirmed by a meta-analysis of randomized controlled trials by Ni et al (2), which demonstrated that the combination of transcatheter arterial chemoembolization and RF ablation has better effectiveness than either transcatheter arterial chemoembolization or RF ablation monotherapy alone. Although the evidence for combining transcatheter arterial chemoembolization and microwave (MW) ablation compared with monotherapy is less robust, a few more recent investigations also demonstrated improved efficacy of transcatheter arterial chemoembolization and MW ablation combination therapy (3,5).

Although combining transcatheter arterial chemoembolization with either RF ablation or MW ablation has shown survival benefits compared with monotherapy, the question of whether one of these percutaneous ablation combination modalities has a survival benefit advantage over the other is yet to be answered. The aim of this study was to investigate differences in local tumor response, progression-free survival (PFS), OS, and potential complications for combined treatment of HCC with transcatheter arterial chemoembolization with drug-eluting embolic agents plus RF ablation versus transcatheter arterial chemoembolization with drug-eluting embolic agents plus MW ablation.

MATERIALS AND METHODS

This retrospective study was conducted with institutional review board approval and adherence to Health Insurance Portability and Accountability Act guidelines. Written informed consent was obtained from each patient before treatment.

Patients

Consecutive patients with HCC who underwent transcatheter arterial chemoembolization with drug-eluting embolic agents in conjunction with RF ablation or MW ablation at our institution from November 1, 2003, through November 1, 2011, were included in the present analysis. The demographic and baseline disease characteristics of both cohorts are summarized in [Table 1](#). The transcatheter arterial chemoembolization plus RF ablation treatment group preceded the transcatheter arterial chemoembolization plus MW ablation treatment group because the interventional radiology department transitioned from using RF ablation to MW ablation at a mid-time point in 2009.

There were 38 patients treated with transcatheter arterial chemoembolization plus RF ablation (12 with multiple tumors) and 51 patients treated with transcatheter arterial chemoembolization plus MW ablation (17 with multiple tumors). There was no statistically significant difference between the two groups in patient demographics, including age, sex, and etiology of liver cirrhosis, and no significant difference in tumor characteristics, including tumor size, number of tumors, and Barcelona Clinic Liver Classification (BCLC) staging. The transplantation rate was 37% in the transcatheter arterial chemoembolization plus RF ablation group and 22% in the transcatheter arterial chemoembolization plus MW ablation group ($P = .11$). However, there were differences between the two groups based on Child-Pugh classification and follow-up time. Three patients in the transcatheter arterial chemoembolization plus RF ablation group and one patient in the transcatheter arterial chemoembolization plus MW ablation group had unknown Child-Pugh scores because of loss of outside charts. Among the remaining patients, 17 of 35 (49%) and 8 of 50 (16%) were Child-Pugh B in the transcatheter arterial chemoembolization plus RF ablation and transcatheter arterial chemoembolization plus MW ablation groups, respectively ($P = .001$). The median follow-up time among all survivors was 32.6 months (range, 14–82 mo). Among survivors in the transcatheter arterial chemoembolization plus RF ablation group, the median follow-up time was 55.6 months. Among survivors in the transcatheter arterial chemoembolization plus MW ablation group, the median follow-up time was 28.1 months ($P = .001$).

Evaluation and Staging

HCC was diagnosed by the presence of a hypervascular liver mass > 1 cm with arterial uptake followed by “washout” of contrast in the venous-delayed phases on either multiphase computed tomography (CT) or magnetic resonance (MR) imaging in accordance with the American Association for the Study of Liver Diseases guidelines (7). The only exclusion criterion was evidence of distant metastasis.

Before consideration for intervention, patients were assessed with either MR imaging or triphasic CT imaging and evaluated for baseline liver function, hematology, coagulation studies, and serum alpha fetoprotein. Underlying disease burden was staged with the Child-Pugh criteria, United Network for Organ Sharing, and the BCLC classification. Patient demographics, histologic analysis, and assessment of portal venous hypertension and its sequelae were also taken into consideration before intervention.

Combination Therapy

Transcatheter arterial chemoembolization plus RF ablation and transcatheter arterial chemoembolization plus

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