



Contents lists available at ScienceDirect

# The Egyptian Journal of Radiology and Nuclear Medicine

journal homepage: [www.elsevier.com/locate/ejrm](http://www.elsevier.com/locate/ejrm)

## Original Article

# Expandable radiofrequency electrodes for ablation of centrally placed hepatocellular carcinoma

Medhat Ibraheem Mohammad Ahmad

Department of Radiology, Sohag University Hospital, Sohag, Egypt



## ARTICLE INFO

### Keywords:

Radiofrequency ablation  
Centrally placed hepatocellular carcinoma  
Expandable electrode

## ABSTRACT

**Objective:** To regulate the safety, efficacy, complications, and prognostic factors for survival related to the utilize of expandable radiofrequency (RF) electrodes in the treatment of centrally placed hepatocellular carcinoma (HCC).

**Patients & methods:** Eighty-six patients with centrally placed single HCC ( $\leq 5$  cm) undergo RF ablation using expandable electrode. Therapeutic safety and efficacy were evaluated. Logistic regression analyses of risk factors for complication and multivariate cox-regression analyses for overall survival were recorded.

**Results:** No procedure -related major complications or death occurred. Primary and secondary complete ablation rate was 83.7% & 100%, respectively. We observed a strong association between, gender ( $P = 0.003$ ) and etiology of cirrhosis ( $P = 0.02$ ) and complications. Overall-survival rate after 25 months follow-up period was 74% and recurrence-free survival was 88.4%. No significant risk factor relationship for overall-survival could be detected.

**Conclusion:** The use of the expandable electrode in the treatment of centrally placed HCC tumors by RF ablation is safe and effective. Careful patient selection and the best approach choice (accurate placement and appropriate deployment) will get better the outcome.

## 1. Introduction

Hepatocellular carcinoma (HCC) placed centrally inside the liver and close to the hepatic hilum at Couinaud's segments IV, V, and VII are often not easy to treat.

Central hepatectomy is carried out on a large scale but it too linked with a great danger of residual tumor and the lack of survivors [1].

In the same way, transarterial chemoembolization (TACE) for centrally placed tumors can be challenging because of binary blood supply from the left and right branches of hepatic arteries [2].

With RF ablation therapies, although some studies have suggested overall similar complication rates compared with noncentral HCC, stricture-inducing thermal injury to central biliary structures occurs more often with central tumors, and once it occurs it is often difficult to treat with percutaneous intervention [3]. Moreover studies have determined that blood vessels bigger than 3 mm in diameter neighbouring to the tumor serve as a heat sink and limit integrity of tumor ablation [4].

A single-tip RF electrode was usually used for these tumors because ample visualization of the needle tip could be safeguard [5]. On other side, the straight electrode cannot be fixed into the liver during ablation

leading to the ablation outside the tumor due to the movement of electrode caused by patient respiration [5]. Also, to induce reasonable ablation in this situation, multiple overlapping ablations are recommended [5]. The ablation procedure mostly builds plentiful micro bubbles in heated tissue, and these raise the echogenicity of the ablated lesion. Hyperechogenicity makes further placement of the needle electrode difficult [6]. Ultimately, most centers cannot use more than one RF ablation device and electrode.

Multitined expandable electrodes are different from single-tip electrodes in that all the multiple electrode tips of an expanding electrode are active so that heat distribution within the tumor is more homogeneous and a reproducible sphere of ablation is created every time. Also, the more even dissemination of heat, the expanding electrodes include other safety features. The hooks of the electrode are settled within the liver tissue when deployed so no needle action is possible during RF ablation, which causes the procedure secure, and no electrode cooling is needed during ablation, building the procedure simple and brief [7].

In the present study, we recorded complete ablation rates, survival and complications of centrally placed HCC treated by expandable RF electrode. Our objective is to confirm the safety and effectiveness of the

Peer review under responsibility of The Egyptian Society of Radiology and Nuclear Medicine.

E-mail address: [mandw20022002@hotmail.com](mailto:mandw20022002@hotmail.com).

<https://doi.org/10.1016/j.ejrm.2017.09.008>

Received 18 May 2017; Accepted 22 September 2017

Available online 26 March 2018

0378-603X/ copyright 2018 The Egyptian Society of Radiology and Nuclear Medicine. Production and hosting by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

expandable RF electrodes for ablation of centrally placed HCC.

## 2. Patients and methods

### 2.1. Patients and selection criteria

Between January 2011 and December 2016, 186 patients underwent RF ablation for HCC at our center. In this study, we selected patients undergoing RF ablation for solitary HCC ( $\leq 5$  cm in diameter). We defined cases where the tumors located at Couinaud's segments IV, V, and VII. A total of 86 patients with 86 HCC who underwent RF ablation met the inclusion criteria and were enrolled in the study. The median follow-up period was 24.58 months (range, 8.71–62.3). Written informed consent was obtained from all patients for RF ablation treatment. Treatment decision was adopted after taking the advice of experienced consultants of surgeons, oncologists and gastroenterologists.

### 2.2. Diagnosis and staging of HCC

Contrast-enhanced triphasic CT and US were performed for planning before the RF ablation session in all patients. The diagnosis of HCC was assigned by using the non-invasive criteria defined by the American Association for the Study of Liver Disease recommendations, which consisted of arterial hyper enhancement with washout seen on portal or delayed-phase images [8].

### 2.3. RF ablation techniques

All RF ablation procedures were conducted percutaneously under ultrasound guidance, the same as described in previous study [9]. We used a temperature-controlled 460-kHz generator (model 1500X, RITA Medical Systems, AngioDynamics), capable of producing a maximum output of 250 W. The system has a 15-gauge electrode, contains nine deployable curved tines, see Fig. 1. The electrode has the configuration of a Christmas tree when fully extended and capable of ablation of 5 cm. The tip of the hooks have thermocouples that describe real-time temperature at the treatment site. The strategy to achieve complete necrosis of the tumor was to ablate a peripheral margin of 0.5–1 cm of normal hepatic tissue surrounding the tumor as well as the entire tumor itself



Fig. 1. Multitined expandable electrode is an array of 9 curved electrode tines ("prongs") that are deployed from the hollow needle tip in a Christmas treelike fashion.

so.

The optimal tip site is the proximal portion of the lesion to allow forward-facing tines to deploy outward into the lesion in a Christmas-tree configuration. The tines are deployed in stages to achieve incremental size and temperature targets: marks of 2 cm, 3 cm, ..., 5 cm with power set to 50 W, 70 W, ..., 110 W, and target temperature at 60 °C, 70 °C, ..., 105 °C, and treat for specific time intervals or until the target temperature (105 °C) is reached. If the target temperature is not reached at any stage within 3 min, power should be increase by 20 W. If the target temperature is still not reached, electrode rotation to move out of the vessel done.

Multiple overlapping ablations techniques was used whenever necessary accordingly to the volume of the tumor and to the spread of hyperechogenic area induced by RF energy deposition during the procedure.

Dispersive electrodes or grounding pads were attached to the patients' thighs. The ablation time of each cycle was 12 min and up to 20 min according to the size of the lesion. At the end of the procedure, tract ablation is possible by retracting the prongs and pulling back the electrode slowly while maintaining the 70 °C reading. RF ablation session was defined as a single intervention that consisted of one or more applications performed. RF application was defined as insertion of the electrode into the tumor during the same session.

### 2.4. Post procedural follow-up

Length of hospital stay after each RF ablation procedure did not exceed 24 h to notice any kind of complications using all means available diagnostic methods, if indicated. The response to RF ablation was determined as incomplete or complete ablation based on US and triphasic CT examinations performed one month after each ablation procedure. Patients with a complete ablated HCC were subjected to follow-up program using ultrasound and tri-phasic CT examinations every 3–6 months.

HCC with incomplete ablation, defined as appearance of enhancing tumor tissue adjacent to the ablated area were subjected to RF ablation provided that the availability of the same right circumstances. Distant tumor progression defined as, the emergence of one or several tumor(s) not adjacent to the ablation zone. The end point was the death or the date of the last follow-up or the date of the most recent follow-up visit.

### 2.5. Data analysis

Data analysis was carried out using SPSS computer program version 22.0. The data were tested for normality using Shapiro test which was significant indicating the use of not parametric tests as data was not normally distributed. Quantitative data were expressed as means  $\pm$  standard deviation and compared using Mann-Whitney test, categorical variables were compared using Chi-square ( $\chi^2$ ) test. Overall survival (OS) rates was calculated by the Kaplan–Meier method and compared by univariate log rank test. Independent factors for OS were identified by multivariate analysis of factors significant in univariate analysis using a Cox proportional hazards model. Significant risk factors for occurrence of complication after RFA were identified by multivariate logistic regression analysis of risk factors significant in univariate analysis. Statistical significance was set at  $p < 0.05$ . Statistical analyses were performed using.

## 3. Results

### 3.1. Baseline characteristics

The general characteristics of the 86 patients with 86 HCC included in this study are summarized in Table 1. All patients at time of RF ablation had cirrhosis. Eighty-two (95.3%) patients classified as Child class A. The mean age of the patients was  $65 \pm 10$  years.

Download English Version:

<https://daneshyari.com/en/article/8822002>

Download Persian Version:

<https://daneshyari.com/article/8822002>

[Daneshyari.com](https://daneshyari.com)