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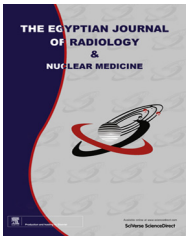

ORIGINAL ARTICLE

Role of percutaneous ultrasonographic guided radiofrequency ablation in the management of hepatocellular carcinoma

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KEYWORDS

Radiofrequency ablation;
HCC;
MDCT

Abstract *Purpose:* To evaluate the effectiveness of percutaneous ultrasonographic guided radiofrequency thermal ablation in the management of hepatocellular carcinoma.
Patients and methods: This study included 100 patients presented with HCC showed 110 lesions, 91 lesions in the right lobe and 19 lesions in the left lobe. 86 were males (86%) and 14 were females (14%). All patients were subjected to laboratory investigations and imaging assessment including CT chest, bone scan, abdominal US and Triphasic Multislice Computed Tomography (MSCT) of the abdomen. The Radio Frequency Ablation (RFA) systems used were Radiofrequency Interstitial Thermal Ablation (RITA) System and RF 3000 monopolar system.
Results: Good ablation was achieved in 92 of 100 (92%) patients treated by RFA after the first session, incomplete necrosis found in 8 of 100 patients (8%). Local recurrence after RFA treatment occurred in 36 of 100 patients (36%). Local recurrence occurred after one month in one of 36 patients (2.8%), after 3 months in 24 of 36 patients (66.7%), after 6 months in 8 of 36 patients (22.2%), after 9 months in 2 of 36 patients (5.5%) and after 12 months in 1 of 36 patients (2.8%). At the end of the first year, the survival of the patients was (97%), at the end of the second year, the survival of the patients was (71.0%).
Conclusion: Radiofrequency thermal ablation is a simple, effective and less expensive technique with a low morbidity compared with surgical treatment. Radiofrequency thermal ablation can produce significant long-term survival rates and excellent local control for cirrhotic patients with early stage, unresectable HCC.

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1. Introduction

Hepatocellular carcinoma (HCC) is the fifth most common cancer in the world (564,000 cases per year) and the third most frequent cause of cancer-related deaths (1).

Surgical resection is considered to be potentially curative therapy. However, only about 20% of HCC patients are resectable; the remainders are irresectable because of multifocal tumors, advanced tumors, tumor location precluding complete resection, or poor hepatic functional reserve (2).

Different locoregional therapies have been developed for irresectable liver tumors with an attempt to achieve local tumor control. These include transarterial chemoembolization (TACE), percutaneous ethanol injection (PEI), and various thermal ablation therapies such as cryotherapy, interstitial laser therapy, microwave coagulation and radiofrequency ablation (3,4).

For irresectable tumors, RFA seems to be the most effective treatment among other locoregional therapies. The main advantages of RFA include low morbidity and mortality rates, effective tumor ablation and preservation of maximal normal liver parenchyma (5). However, despite the high complete necrosis rate of RFA, early tumor recurrence within one year, either local tumor recurrence or new tumor formation, remains a significant problem (6).

Radiofrequency ablation (RFA), also known as ''radiofrequency thermal ablation,'' is a recently developed thermoablative technique. It induces temperature changes by using high-frequency alternating current applied via electrodes placed within the tissue to generate areas of coagulative necrosis and tissue desiccation. Radiofrequency ablations can be applied percutaneously, laparoscopically, or at open surgery (7).

1.1. Aim of the work

The aim of this study was to evaluate the effectiveness of percutaneous ultrasonographic guided radiofrequency thermal ablation in the management of HCC.

2. Patients and methods

2.1. Population

Between March 2011 and April 2013, 100 patients had HCC showed 110 lesions, 91 lesions in the right lobe and 19 lesions in the left lobe included in this study, 86 males (86%), and 14 females (14%). Their age ranged from 35 to 73 years, with a mean age of 57.45 years. The patients referred to the Radiodiagnosis Department, Tanta University and National Liver Institute, Menufya University and planned to be treated with RFA. Exclusion criteria were based on patients with eligibility for surgical resection, extra hepatic metastases, diffuse infiltrative type HCC, vascular or bile duct invasion, severe coagulation disorder as prothrombin concentration less than 50% and platelet count less than 70/000 cmm^3 and uncountable ascites, lesion more than 5 cm or more than 3 lesions. The study was approved by the ethics committee of our institution. Written informed consent from the patients was obtained prior to each examination.

2.2. Methods

I. Pre-RFA Procedure Assessment
1. Thorough history taking.
2. Clinical examination.
3. Laboratory investigations
4. *Imaging assessment:*

The aim of pre RFA radiological assessment was to evaluate intrahepatic disease and to exclude extrahepatic extension.

4.1. *High resolution CT chest:* Preprocedural CT chest was routinely done.

4.2. *Abdominal US with color Doppler study:*

Using electronically focused curvilinear transducers ranging in frequency from 2.5 to 5.0 MHz combined with a color Doppler system (Sonoline Sienna, Siemens Medical Systems, USA). The size, multiplicity, location and echopattern of the hepatocellular carcinomas were assessed with Couinaud nomenclature as well as confirming the patency of portal and hepatic veins, bile duct invasion, LN enlargement and ascites.

4.3. *Triphasic CT examination:*

Triphasic Multislice Computed Tomography (MSCT) study of the abdomen was performed on a spiral CT scanner (Somatom plus 2; Siemens, Erlangen, Germany). All patients initially underwent a baseline pre-contrast scan; followed by three scans performed at 20, 60, and 180 s after intravenous administration of 100 ml of contrast medium (Ultravist 370, Schering, Berlin, Germany) at a rate of 3 ml/s, to arterial, portal/venous and equilibrium phases, respectively. The size, multiplicity and location of the hepatocellular carcinomas were assessed with Couinaud nomenclature as well as that the disease confined to the liver, without evidence of vascular invasion or extra-hepatic metastases or biliary dilatation.

II. Radio Frequency Ablation (RFA) systems used:
A. Radiofrequency Interstitial Thermal Ablation (RITA) System:

Ablation was done by 1500 generator (Starburst XL, RITA Medical System) with a power of up to 150 W and 9 electrode prongs, 5-cm thermal ablation catheter which is 14 or 15G and 12, 15, or 25 cm in length. It contains one electrode in the center and 4 prongs having thermocouples at the tips and a monitor that displays tissue temperature and impedance around the tip of the needles. This system allows the ablation of lesions that are 5 cm in diameter.

B. RF 3000 monopolar system produced by Boston Scientific Corp. (Natick, MA, USA; formerly Radiotherapeutics):

Ablation was done by 3000 generator with a power of up to 200 W and the LeVeen electrode is a 15 gauge, 15 cm long insulated cannula with 1 cm shaft markers and echogenic tip that help to guide insertion under ultrasound guidance. It