

FULL PAPER

Comparative study amongst surgical resection & radiofrequency in treatment of hepatocellular carcinoma

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The purpose of this research was to compare the effects of radiofrequency ablation on early hepatocellular carcinoma (HCC) to those of surgical liver resection in terms of the following outcomes: Intraoperative blood loss as well as transfusion, operation time, respectability time, hospital stay, intensive care unit stay, and postoperative morbidity. Forty individuals diagnosed with a hepatocellular carcinoma were compared on a number of different metrics, including demographic and biochemical make-up, surgical as well as post-operative details, complications, and cost. When compared to the surgical resection group, the radiofrequency ablation group experienced significantly shorter operation, resection, blood loss, transfusion, hospital, and intensive care unit (ICU) stays. In comparison to the surgical resection group, the RFA group had fewer cases of postoperative bleeding, bile leak, and chest infection. We conclude that radiofrequency ablation is preferable to hepatic resection because it reduces the surgery duration, the need for blood transfusions, the length of time spent in the hospital, as well as the number and severity of postoperative problems.

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KEYWORDS

Hepatocellular carcinoma; radiofrequency ablation; surgical resection.

Introduction

It has been observed that hepatocellular carcinoma is the 5th most prevalent malignancy, and also it is one of the most aggressive cancers in humans [1]. Over 850 000 new instances of HCC are diagnosed every year, making it the world's second most common reason for cancer-related death [2].

The curability and survival rates after HCC after using the currently available HCC treatments remain unsatisfactory, despite the discovery of many therapeutic modalities [4]. Improving the therapeutic effects, decreasing

the number of injuries and deaths, and increasing the treatments' acceptability and applicability are all workable ways to maximize treatment usability [3].

The majority of significant worldwide medical associations advise radiofrequency ablation (RFA) and surgical resection as the initial treatment for patients with the early-stage HCC due to the poor viability of liver transplantation [4,5].

Clamp crush, or finger fracture, as the original prototype technique for liver resection, is linked to a significant risk of intraoperative hemorrhage during

parenchymal transection as well as the primary barrier to surgical success [1].

However, RFA has acquired acceptance as the first-line treatment for patients with the early-stage HCC since it is less expensive, carries a lower risk of tissue damage, has fewer complications, and requires less time spent in the hospital than surgical excision. Unfortunately, there are still differences in the recommended first-line treatments for HCC \geq 2 cm across international organizations and there are differences in the evidence comparing RFA and surgery for the treatment of early-stage HCC [6,7].

The aim of this study to compared the use of radiofrequency and surgical excision in the treatment of early-stage hepatocellular cancer.

Patients and methods

40 patients with HCC enrolled for surgical resection starting from May 2021 to May 2023 at Al-Zahraa University Hospital and Nasser Institute for Research and Treatment, Cairo. The trial protocol was approved by Al-Azhar Faculty of Medicine Committee for Medical Research Ethics.

Inclusion criteria were: (1) Early focal lesion $<$ 5cm or three tumors; each is 3 cm or smaller, (2) patients with Child-Pough A, (3) patients with no extra-hepatic metastasis, (4) patients fit for surgery and general anesthesia, (5) patients with no other body malignancies, and (6) patients with no tumor thrombus in IVC or main Portal or hepatic veins. Exclusion criteria included: (1) focal lesion \geq 5cm or more than 3 tumors, (2) patients with Child-Pough B and C, (3) multi-centric lesion (more than 3 tumors), (4) patients with extrahepatic metastasis, (5) patients with contraindications for surgery and general anesthesia, e.g., TB, renal failure, (6) patients with any other body malignancies, and (7) for RFA: (i) Tumor location near hilar structure, (ii) previous treatment for the hepatocellular carcinoma with TACE, (iii) percutaneous ethanol

injection or chemotherapy, and (iv) evidence of vascular invasion into major portal or hepatic vein branches.

Diagnostic workup and investigations

I) Diagnosis of HCC with assessment of respectability depends on: (1) History taking; personal, Present and past, (2) Laboratory investigations; ALT, AST, PT, PC %, Viral markers: HCV, HBV, and tumor marker (α -Feto Protein), (3) Imaging techniques; Chest X ray, Abdominal ultrasound, Spiral Triphasic CT scan, Magnetic Resonance Images (MRI), and Upper GI endoscopy, (4) Staging of cirrhosis by Child Pough classification, and (5) Staging of HCC by BCLC.

Surgical resection

Tumor resection was carried out under general anesthesia by modified right subcostal incision with extension to left be made. Some cases modified with upper midline removing xiphoid process. Each person had an ultrasound done to confirm the location as well as the size of the tumor. In most cases, only the side of the liver that would be removed was mobilized, and no more than necessary. Once the tumor was located, a resection line was marked on the liver's surface with an argon diathermy, 1 cm from the tumor's edge. Hepatectomy was classified as either major (involving the removal of more than three of the liver's segments) or minor (involving the removal of two or fewer of the segments).

Radiofrequency ablation

RFA was carried out using the starburst radiofrequency ablation device that was made available by Angio dynamics in the United States. The electrode was successful in generating total necrosis of the tumor, including ablation of a margin of normal tissue that was one centimeter in width. Under the influence of both general and local anesthesia,

a skilled interventional radiologist carried out the treatment percutaneously while the patient was sedated intravenously. Individuals were transferred to the intensive - care unit. After a period of 4 weeks following the procedure, a spiral contrast-enhanced CT was carried out.

Follow-up

The length of the surgery, the amount of blood lost, and the requirement for a transfusion of red blood cells or other blood products were some of the short-term effects of the treatment. Following the surgery, the biochemistry of the liver as well as the coagulation profile was evaluated on days 1, 3, and 7. Complications associated to the treatment, including those that were considered severe (Clavien–Dindo Grade IIIa or higher), as well as operation mortality and length of hospital stay, were tracked prospectively in both groups. The term "operative mortality" refers to deaths that occurred following treatment during the same hospital admission. After one week and one month have passed since the operation, a spiral CT will be performed. After the procedure, there will not be any adjuvant treatment administered. In terms of the patients' long-term outcomes, each individual was routinely monitored at an outpatient clinic. In the first year, evaluations of liver function (complete blood count, liver biochemistry, and coagulation profile), serum AFP level, and spiral CT were performed every three months; after that, evaluations were only performed once every six months.

Financial cost

Financial cost of the operation and stay at hospital pre- and post-surgical and investigations.

Statistical analysis

The SPSS (statistical package for social science), (Inc., version 10.0.7) software program was utilized for the purpose of doing statistical analysis on the collected data. We made use of the mean in addition to the standard deviation. In order to analyze qualitative variables, a Chi-square test was carried out, and the p-value needed to be under 0.05 to be considered statistically significant. A p-value of less than 0.05 according to the Fischer exact test for 2x2 tables indicated significance. For quantitative variables that were not regularly distributed, a Mann-Whitney test was performed, and a p-value of below 0.05 was necessary to determine statistical significance.

Results

Demographic and biochemical characteristics

In forty patients, twenty patients (Group A) underwent liver resections were performed using Cavitron Ultrasonic Aspirator (CUSA), which was the most available technique, and the other twenty patients (Group B) underwent tumor ablation using the percutaneous radiofrequency ablation (RFA). Demographic and Biochemical data of all participated groups are tabulated (Table 1) and compared. Age and sex distribution between both groups, group A included 17 men (85%) besides 3 women (15%) with a mean age of 54.42 ± 7.04 (years) as compared to group B which included 16 males (80%) and 4 females (20%) with a mean age of 58.14 ± 6.12 (years). There was no significant statistical variance.

Short-term outcomes

When contrasted with the group that underwent hepatic resection, the RFA group experienced a shorter duration for the surgery as well as reduced blood loss during the operation (Table 2). This was mostly due to the fact that a method with a reduced risk of complications, known as percutaneous, was

utilized in the majority of RFA participants. The RFA group had significantly lower incidence of postoperative bile leak, hemorrhage and chest infection than those in the hepatic resection group while other complications are almost the same in both groups (Table 3).

Liver enzymes showed marked improvement after treatment; ALT became near normal in both groups with mean value of 56.4 ± 4.35 in liver resection group and 58.2 ± 4.3 in RFA group with no significant alteration among both groups. Also, AST in both groups was near normal with mean 45.9 ± 5.6 in liver resection group and 51.3 ± 3.5 in RFA group with no significant change. AFP showed marked improvement in both groups after treatment with mean value of 58 ± 17.3 in liver resection group and 63.5 ± 16.3 in RFA group with no significant alteration amongst both groups. Median ICU and hospital stay was significantly shorter in the RFA group. Cost of

RFA was significantly lesser than that of liver resection (Tables 4, 5, and 6)

Case presentation

RFA Procedure

Radiofrequency ablation was conducted under US guidelines after US/CT confirmed HCC. During radiofrequency ablation, either the RITA UniBlate (AngioDynamics, Queensbury, NY) or the VIVA (STARmed, Goyang, Korea) commercially available ablation device was employed. Standard manufacturer guidelines were used to configure the radiofrequency power levels and ablation times. After radiofrequency ablation, patients underwent contrast-enhanced CT or US to evaluate the procedure's technical success as well as any problems. A second session of RFA was conducted without delay if persistent tumor enhancement was noticed on the subsequent imaging (Figure 1).



FIGURE 1 Images in a 70-year-old man with hepatocellular carcinoma (a) selected axial CT image showing enhancing HCC at segment VI before radiofrequency ablation. (b) Ultrasound image of lesion before radiofrequency ablation. (c) Ultrasound image of lesion after radiofrequency ablation.

Discussion

Over 90% of cases of primary liver cancer, which is the most common cause of cancer-related death, are caused by HCC. It ranks as the fifth most common cancer, and for women, it ranks seventh. If HCC is left untreated, the prognosis is usually not good. RFA, liver transplantation, and surgical resection make up the curative treatment. Multiple disciplines are involved in the management of cirrhotic HCC [8].

Radiofrequency ablation (RFA) has been widely used for the treatment of hepatocellular carcinoma (HCC) during the last decade. As it is minimally invasive and potentially curative, in the current study forty patients diagnosed as HCC were included, all of them are diagnosed positive HCV, they were divided into two groups, twenty patients (Group A) underwent liver resections were performed using Cavitron Ultrasonic Aspirator (CUSA), which was the most available technique, and the other twenty

patients (Group B) underwent tumor ablation using the percutaneous radiofrequency ablation (RFA). Predominant males were observed in our results compared to female for the incidence of HCC and this coincides with previous reports [8].

Both groups were evaluated by matching them on baseline characteristics for instance serum bilirubin, serum albumin & serum AFP. They were evaluated for intra- and post-operative data for resection versus radiofrequency ablation. Participants with the early-stage HCC the RFA group experienced a shorter duration for the surgery as well as reduced blood loss during the operation and this were agreement with Takayama and his colleagues who conclude that less operative time was observed in RFA group [9], also Jin and his colleagues [10], reported lesser intraoperative blood loss with RFA than the surgery.

In the present work the RFA group had significantly lower incidence of postoperative bile leak, hemorrhage & chest infection than those in the hepatic resection group while other complications are almost the same in both groups, this was observed in many studies e.g., Hasegawa *et al.* [11] reported that RFA is safer with fewer complications, also Huang *et al.* [12] reported that the incidence of more severe complications, as, liver abscess, bile duct injury, and procedure-related hemorrhage, appeared to be lower in patients done by RFA. The patients who underwent surgical resection had a higher rate of post-procedure morbidity than those in the RFA group in the study done by Wei and his colleagues [13].

There was a statistically significant distinction in hospitalization duration amongst the two groups. Furthermore, this coincides with the study done other colleagues [14,15] while there was no significant distinction among the two groups in a previous trial [2].

In the current work the laboratory finding showed marked improvement after

treatment; ALT, AST and AFP became near normal in both groups with no significant alteration among both groups. Cost of RFA was significantly lesser than that of liver resection and this were reported by previous studies [16,17].

Conclusion

In the treatment of a hepatocellular carcinoma, radiofrequency ablation (RFA) was found to be more effective than resection of the liver in terms of operative time, amount of blood lost during the procedure, number of blood transfusions required, length of hospital stay, and postoperative problems (such as hemorrhage and bile leak).

Limitation of the study

The limitation of this study is the small number of the included patients and single center study.

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Conflict of Interest

We have no conflicts of interest to disclose.

Ethical approval

An informed written consent from all participants involved in the study The Al-Azhar University Local Ethics Committee, Faculty of Medicine (for Girls), accepted the study methodology; all methods followed the Declaration of Helsinki.

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