

Irreversible Electroporation versus Radiofrequency Ablation as a Treatment Option in Hepatocellular Carcinoma

Brennan C. Cronquist (bcronquist11@gwu.edu), Daniel Scher, MD
The George Washington University School of Medicine and Health Sciences

Background

In the United States, Hepatocellular Carcinoma (HCC) has an incidence of 7.7 per 100,000. This incidence rate has seen a steady increase from 1992, which had an incidence of 4.1 per 100,000.¹ HCC is the most common cause of primary liver cancer worldwide and ranks number four among most cancer-related deaths.

The gold-standard treatment for early-stage HCC is surgical resection, however many of these patients are not candidates for surgery. In these patients, the treatment of choice is HCC ablation, with

Radiofrequency Ablation (RFA) being the gold standard.¹ Irreversible Electroporation (IRE) is a newer ablation technology that uses a form of low-energy DC, at a high voltage, to disrupt the cell membrane of the

HCC lesion by creating nano-pores. This process disrupts the homeostasis of the lesion, leading to apoptosis and eventual cell death.² The purpose of this research is to compare the 12-month Local Recurrence Free Survival (LRFS), Technical Success Rate (TSR), and

Major Adverse Event Rate (MAE) of IRE and RFA to determine if IRE could replace RFA as the gold standard ablation technique in HCC.

Methods

A literature review was done using the PubMed database to compare the 12-month LRFS, TSR, and MAE of IRE to RFA. MAE was defined as complications that were life-threatening or resulted in hospitalization. TSR was defined by complete ablation of the treated HCC lesion. A total of 3 studies were used in this review, with their results compiled and reviewed. Between the 3 studies, a total of 201 cases were compared and reviewed. Of these cases, 105 received IRE, while 96 of the cases received RFA.^{3,4,5}

Learning Objectives

The purpose of this article is to compare two methods of Hepatocellular Carcinoma ablation, Radiofrequency Ablation (RFA) and Irreversible Electroporation (IRE), to determine whether IRE is a suitable alternative to RFA.

Results/Discussion

76.9% of lesions receiving IRE achieved 12-month LRFS, compared to 84.3% of RFA lesions. This result showed no significance on a 95% CI ($p=.1936$).^{3,4,5} IRE had an MAE percentage of 1.9% compared to 0% of RFA treated lesions. This result showed no significance on a 95% CI ($p=.17384$).^{3,4,5} The TSR of IRE-treated lesions was 92.04% compared to 98.11% for RFA treated lesions. This result showed no significance on a 95% CI ($p=.07186$).^{3,4,5}

Intervention	# of Cases	12-mo LRFS	TSR	MAE
RFA	96	84.3%	98.11%	0%
IRE	105	76.9%	92.04%	1.9%

This review indicates that IRE could be a suitable replacement for RFA in the treatment of HCC. Although currently regarded as an option only when RFA is not recommended, IRE shows no significant difference in short-term effectiveness or safety.^{3,4,5} As IRE is a relatively new technology, more research needs to be done to determine its long-term effectiveness and safety.

References

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Future Directions

We propose that more research should be done with propensity matching of patients and tumors to determine if IRE proves to be equally successful in comparable tumors and patients as those treated with RFA.