An Analysis of Recurrence-Free Survival and Adverse Events in Thermal Ablative Techniques for the Treatment of Primary and Secondary Liver Cancers

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Introduction

Primary and secondary hepatic tumors are relatively common and significantly impact overall survival, being the 5th most common cause of cancer related death in men and 7th in women. Surgical resection has long been considered the gold standard for the local treatment of both primary (Hepatocellular, Cholangiocarcinoma, and Gallbladder Cancer) and secondary (Metastatic Colorectal, Metastatic Neuroendocrine, Other Metastatic Disease) liver tumors.

In the last decade, however, the treatment landscape for liver cancers have changed due to technical developments and innovations that have improved the performance of RFA and broadened the availability of other ablative technologies, such as microwave ablation (MWA) and laser ablation (LA). The latest generation of MWA systems can achieve larger ablation areas than RFA and LA, with a multifiber technique that uses very thin needles, allowing physicians to treat nodules in at-risk locations with high flexibility and a very low risk of complications.

Purpose of Pilot Study

Evaluate our 20 years of experience with RFA and MWA by analyzing recurrence-free survival, overall survival, and adverse events among six liver cancer subtypes.

Methods

- We conducted a review of the 3500-patient Hepato-Pancreatico-Biliary database for all patients who underwent either RFA or MWA from 5/1998 to 3/2019. A clinical change to MWA was performed during 2009 based on technical changes in the technology.
- Summary Tables comparing populations receiving MWA or RFA were generated using Microsoft Excel.
- Statistical analysis will be performed using chi-square, logistic regression and t-test when appropriate with JMP version 14 software.

Results

Patients/Lesions	249/249
Sex (M/F)	150/99
Age	61.25 ± 11.52 (Median = 61.35, Range: 26.44 – 87.78
BMI	29.24 ± 6.28 (Median = 28.154, Range: 17.19 – 54.74
Charlson Comorbidity Index Scores	8.0 (0-13)
Tumor Type (Number of Patients)	
Benign Liver/Biliary	6 (2.41%)
Cholangio Carcinoma	8 (3.21%)
Hepatocellular Cancer	58 (23.29%)
Metastatic Colorectal Cancer	119 (47.79%)
Metastatic Neuroendocrine Cancer	25 (10.04%)
Other Metastases to the Liver	33 (13.25%)
Maximum Diameter of Lesions (cm)	3.57 ± 2.39 (Median = 3, Range: 0.7 – 13.7)
Incision Type	
Hockey Stick	18 (7.22%)
Laparoscopic	108 (43.37%)
Midline	71 (28.51%)
Subcostal	43 (17.27%)
Unknown	9 (3.61%)
Concomitant Ablation with Liver Resection	2 (.80%)
Operation Time (min)	118.41 ± 59.22 (Median = 120, Range: 35 – 420)
Median Duration of Stay	4 (Range: 0-27)
Total Number of Complications*	107
Median Follow Up Time (Months)	38.54 (Range: .49 – 193.35)

Table 1A. Summary Data for Patients Undergoing Microwave Ablation Therapy

Patients/Lesions	307/307
Sex (M/F)	180/127
Age	60.5 (18.3 – 87.9)
BMI	26.8 (16.6 – 64.0)
Charlson Comorbidity Index Scores	8.0 (0-13)
Tumor Type (Number of Patients)	
Benign Liver/Biliary	10 (3.26%)
Cholangio Carcinoma	9 (2.93%)
Hepatocellular Carcinoma	56 (18.24%)
Metastatic Colorectal Cancer	166 (54.07%)
Metastatic Neuroendocrine	57 (18.57%)
Other Metastases to the Liver	29 (9.45%)
Maximum Diameter of Lesions (cm)	3.5 (.4-20)
Incision Type	
Hockey Stick	46 (14.98%)
Laparoscopic	54 (17.60%)
Midline	60 (19.54%)
Subcostal	97 (31.60%)
Mercedes-Chevron	10 (3.26%)
Unknown	40 (13.03%)
Concomitant Ablation with Liver Resection	23 (7.49%)
Operation Time (min)	150 (45-360)
Median Duration of Stay	6 (0-57)
Total Number of Complications*	23
Median Follow Up Time (Months)	31.64 (.492 – 236.65)

Table 1B. Summary Data for Patients Undergoing Radiofrequency Ablation Therapy

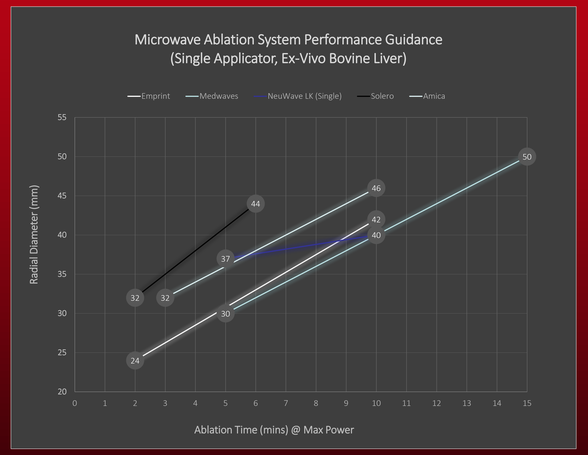

Figure 1: Comparison of Efficacy of Various Microwave Ablation Systems

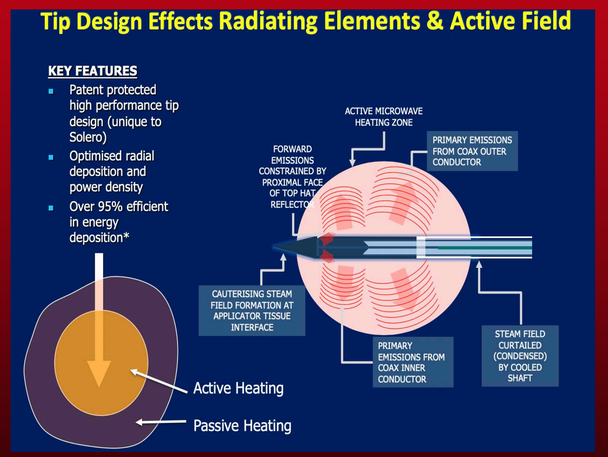

Figure 2: Effects of Tip Design in Microwave Ablation Technologies

Results

- A total of 249 patients underwent MWA
- A total of 307 patients underwent RFA.
- The majority of ablations were performed for Metastatic Colorectal, Hepatocellular Carcinoma, and Metastatic Neuroendocrine Tumors.
- A majority of MWA ablations were performed laparascopically
- The majority of RFA ablations were performed via open surgical protocols

Conclusions

- Thermal ablation has evolved dramatically in the last two decades. Specifically, it has:
  - Provided an alternative to surgery as a more minimally invasive technique
  - Provides equivalent outcomes to patients who undergo surgery
  - Moved towards preferential use of MWA due to its theoretical benefits compared to RFA.
- Current research suggests that combined therapies (i.e combining local and regional techniques) results in improved outcomes for patients with inoperable liver tumors

Acknowledgements

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