Laparoscopic microwave ablation for the treatment of primary and metastatic liver malignancies.

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INTRODUCTION

Primary and metastatic liver malignancies represent a significant threat to the life of affected individuals and pose a great therapeutic challenge for surgeons and other specialists tasked with the treatment of these tumors. Primary liver cancer is the sixth most frequent tumor worldwide, with a rising incidence and wide geographic range. The management of hepatocellular carcinoma (HCC) and cholangiocarcinoma (CC) is complex when detected before disseminated disease occurs.

Metastatic cancers to the liver are seen more frequently than primary tumors, and within these tumors, colorectal (mCRC) and neuroendocrine tumors (mNET) are the malignancies most frequently responsive to loco-regional therapy.

There are several therapeutic options for the management of these tumors. The surgical options include: liver transplantation, and complex open, laparoscopic and robotic assisted resections. Non-operative options frequently used are chemo or radioembolization. Each modality has distinct advantages, intrinsic risks, and associated costs and utilization of healthcare resources. The current Coronavirus pandemic is teaching us the value of careful utilization of equipment and supplies. Thus, determining therapeutic options with the best cost/benefit is of paramount importance.

AIM OF THE STUDY

The aim of this review is to assess the therapeutic value and safety of laparoscopic ultrasound (LUS) guided microwave ablation (MWA) as a technique for the treatment of primary and metastatic liver malignancies.

METHODOLOGY

Study design

Retrospective case series conducted to evaluate the short and long term outcomes of LUS guided MWA. A total of 143 patients were treated with LUS guided MWA for the management of primary and metastatic malignancies to the liver.

Data collection

Patients were selected for LUS guided MWA by preoperative evaluation of CT scan and cross-sectional liver imaging, as well as tumor markers and history of malignant disease or predisposing risk factors such as cirrhosis. Patients cleared for general anesthesia underwent a staging laparoscopy. Those patients with extrhepatic malignant disease identified by laparoscopy that was not detected by preoperative imaging studies were excluded. Outcomes recorded were- pathology of the tumor, number of LUS guided MWA sessions needed, average time to recurrence or second LUS guided MWA, operative mortality and complications.

Microwave ablation technique

All patients with previous abdominal surgical history underwent laparoscopic lysis of adhesions to adequately expose the liver and exclude occult peritoneal disease. A LUS probe (Hitachi-Aloka Medical, Ltd.) was introduced to identify the site or sites of the tumor burden. With LUS guidance, an automated 16-gauge biopsy needle was used to obtain 4 cores of tumor tissue. Two samples were sent for frozen section and two sent for permanent section pathologic examination. Once the diagnosis of malignancy was confirmed histologically, a 2.4 GHz microwave antenna (Amica, Mermaid Medical) was introduced into the tumor with LUS guidance for precise placement of the antenna. The energy used, ablation time length, and number of antenna placements varied depending on the size of the tumor, shape, and locations within the liver.

The entire surface of the liver was imaged with LUS to confirm the location of the tumor and compare it to the enhanced MRI or CT scan images available in the OR. The size of the tumor was measured with LUS to match the preoperative images. With the antenna in place, time length, and energy used was selected to ablate 1 cm beyond the edge of the tumor to achieve “free margins” based on the pattern developed by the manufacturer of the equipment. The ablation progress was verified with real time ultrasound. Once the ablation was completed a repeat ablation was done by repositioning the antenna if the tumor edges were still discernable by ultrasound. The efficacy of ablation was assessed by post operative contrast enhanced MRI at 1 and 6 months after ablation, and trend of tumor markers.

RESULTS

143 patients underwent 211 MWAs in a 6-year period. Mean age: 68 (23 - 86). Males 59%. Females 41%

HCC 52% (n=68), CCC 3% (n=4), mCRC 24% (n=32), mNET 7.5% (n=10), other tumors 14.2% (n=20). 83.2% (n=119) underwent one LMWA, 16.7% (n=24), had two to more LMA's. Average time of a second primary or recurrent disease to occur: 23 months. Operative mortality 0.7% (n=1), Morbidity: 7.7% (n=11), all of the patients with underlying cirrhosis.

DISCUSSION

There is a robust body of evidence that microwave ablation of primary and metastatic tumors is an effective treatment option with survivals comparable to those of liver resections, and that local recurrences can be treated effectively with repeated ablations. (3,4) Our series, demonstrates that LUS guided MWA is a safe technique with minimal mortality and complications. We replicated the therapeutic value of complete ablations, that were achieved in 83% of the patients with primary and secondary malignancies. The length of time for new tumors or recurrent disease to occur, was almost 2 years. When a recurrence or a new tumor occurred, they were managed with a repeat ablation. After a second recurrence, those patients were managed with Y-90 radioembolization.

This result were achieved in a high risk population, 79% of the patients were older than 60 and 57% had BMI greater than 30. Furthermore all of the complications occurred in patients with Childs A or B cirrhosis.

CONCLUSION

LUS guided MWA can be a significant primary component of multimodality treatment for complex primary and secondary liver malignancies. This is the largest patient cohort of the largest series compiled to date with a single operative technique from a single institution.

This data supports the use of LUS guided MWA as a viable alternative to resection and transplantation. We recommend increased surgical participation in minimally invasive liver ablation for treatment of primary and metastatic liver malignancies.

REFERENCES