**Microwave Ablation Therapy of Hepatic Tumors by using Interactive MR Image Navigation**

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**Synopsis:** 130 patients with hepatic tumor were already treated by microwave ablation surgery. The patients consisted of 57 cases of primary hepatic cancer and 73 cases of metastatic hepatic tumor. The recurrence ratio of primary hepatic tumor was about 6.7 %. We have clinically applied interactive MR image navigation system to microwave ablation therapy of hepatic tumor, in order to decrease the local recurrent ratio of the treated hepatic tumor.

**Introduction:** Microwave ablation therapy is one of the feasible treatments of hepatic tumor. In a patient more than 10%, who were treated under ultrasonographic guidance, local recurrence had happened. In January 2000, we had started to use the microwave ablation therapy under MR guidance, but the ratio of recurrence was 6.7%. It seemed to be a complete ablation is one of the methods of decreasing a ratio of recurrence. Therefore, we have developed some tools and techniques, so called interactive MR image navigation, in order to increase the accuracy of treatment for every tumors.

**Patients and Methods:** From January 2000 through October 2003, 130 patients with liver tumors were treated with MRI-guided microwave thermoablation therapy at the Dept of Surgery, Shiga University of Medical Science. The patients consisted of 57 cases of primary liver cancer and 73 cases of metastatic hepatic tumor. All MR data were collected on a 0.5 T vertically oriented MRI system (SIGNA SP/i, GE Medical Systems, Milwaukee, WI). Real-time MR images sampled by a matrix of 256 x 128 pixels with a SPGR protocol (TR/TE 14/3.4 ms at a refresh rate of 2 sec/image). The image plane can be controlled by a surgeon with an optical tracking system, FlashPoint 5000 (IGT, Boulder, CO). An MR-compatible endoscopy was used as thoracoscope to assist MR guidance for most cases with liver tumors just below the diaphragm. Furthermore we have developed the cylindrical beam navigation system and applied it clinically (Fig.1). Using interactive MR image navigational system, we could easily to perform the complete ablation of hepatic tumor (Fig.2). When the surgical operation finished, we confirmed the result of treatment by the enhanced MR image. If the ablation area was insufficient, we could be able to repeat this therapy immediately by using this system.

**Results:** There was no major complication in this therapy. The MR-compatible endoscope, temperature mapping, cylindrical navigation system, enable us to treat safer, easier and more accurate treatment of the hepatic tumors, even though they are not clearly visible or locate near by a large vessels.

**Conclusions:** Interactive MR image navigation system enabled easier, safer and more complete treatment for hepatic tumor.

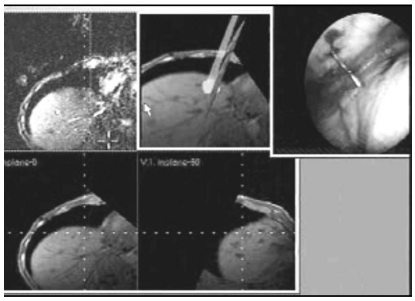

Fig.1 Intra-operative Image

**(upper left) real time MR image, (upper middle) cylinder beam navigation image**

**(upper right) thoracoscopic image, (lower) synchronized virtual image**

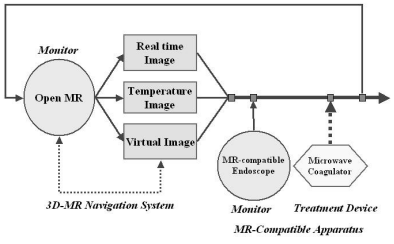


Fig.2 Interactive MR image navigational System