HIGH-INTENSITY FOCUSED ULTRASOUND FOR TREATMENT OF UNRESECTABLE TUMORS LOCATED IN THE WALLS OF CHEST AND ABDOMEN IN 10 PATIENTS

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ABSTRACT

Objective: To present our results of high-intensity focused ultrasound (HIFU) treatment in 10 patients with unresectable tumors involved in the walls of chest and abdomen. Methods: Tumors located in the walls of the chest and abdomen in 10 patients were treated by HIFU, including local recurrence of fibrosarcoma in 1 case and local invasion or metastases in 9 cases. All of the 10 patients had received anti-cancer treatments before HIFU, 3 patients were complicated with intercostal neuralgia. Results: Partial responses were obtained in 2 patients, minor response in 1 patient, stable disease in 4, progressive disease in 2 after HIFU treatments. All the intercostal neuralgia in 3 patients was disappeared after HIFU. Bone scan showed that site of rib metastasis before HIFU became normal after HIFU in one patient. Conclusion: Our preliminary results showed that HIFU could get good results for patients with malignant tumors located in the walls of chest and abdomen if they are focal tumors, even if they are complicated with intercostal neuralgia.

Key words: Malignant tumor; HIFU; Chest wall; Metastasis; Intercostal neuralgia

The incidence of primary tumors in walls of chest and abdomen is limited, most of them are distance metastases or local invasion of malignant tumors. Usually they occur during or after anti-cancer treatments, and the conditions of patients are usually complex, local structure beside each tumor is various and the biological behavior of tumors is different. Unresectable tumors located in the wall of chest and abdomen in 10 patients were treated by HIFU in our hospital, this report reviews the therapeutic effect.

MATERIALS AND METHODS

From February 2001 to March 2002, 59 patients received extracorporeal HIFU treatment for malignant tumors in our hospital. The walls of chest and abdomen, the tumor site, were focused as treatment target in 10 patients, including 6 men, 4 women, mean age 52, range 19 to 79 years. They were local recurrence in 1 case and metastases or local invasions in 9 cases. The tumor sizes were between 3 cm - 5 cm in 3, between 5 cm - 8 cm in 3 and above 8 cm in 4 patients. They were multiple tumors in 8 cases. Seven patients received surgical resection before the HIFU, 6 received radiotherapy and 6, received chemotherapy. Six patients received the two kinds of anti-cancer treatments before HIFU. The diagnosis of all patients was proved by cellular pathology. 3 patients were complicated with severe intercostal neuralgia. All patients signed informed consent forms in accordance with the specification stipulated by the Helsinki Committee before treatment.

One patient received 3 times of HIFU treatments. One received, twice of HIFU and the others has only one HIFU treatment. All the patients were followed up after the HIFU treatment. Because of patients in advanced stage, we evaluated the results of HIFU treatment at 3 to 6 months after HIFU treatment. 5 patients continued to receive chemotherapy after the HIFU according to individual conditions.

HIFU therapeutic system was designed by Chongqing Hifu Co. Ltd., China. The ultrasound beam...
was produced by 12-cm diameter piezoelectric ceramic transducer PZT-4 with focal length of from 135 mm to 105 mm, operating at frequency 0.8 mHz. 3.5 mHz diagnostic ultrasound scanner was used for guiding the target point during the HIFU treatment. The beams of the therapeutic transducer and diagnostic scanner were completely overlaid each other and were moved in the same direction all together under computer control. The output acoustical power was from 8750W/cm² to 17850W/cm².

The HIFU treatment was performed as description as Dr. Wu [1].

RESULTS

The general situations of all patients were shown in Table 1. The entire tumor was treated by HIFU in 5 cases. Partial tumor was treated in 5 cases. Partial response was observed in 2 patients (Figure 1 and Figure 2), minor response in 1, stable disease in 4, progressive disease in 2 until 3 to 6 months after HIFU treatments. A patient with 0.57 FEV1.0/L of lung function was smoothly recovery during the HIFU treatment (Figure 3). Rib metastasis shown by bone scan in one patient before HIFU was disappeared after the treatment (Figure 4). All 3 patients with intercostal neuralgia did not need analgesic medicine after HIFU treatment. 2 patients with progressive disease had tumor sizes above 8 cm, one patient with metastasis tumor (8 cm × 10 cm²) near clavicle from breast cancer had to received partial HIFU treatment because of the breath problem in the operation. The other with recurrent tumor (12 cm × 8 cm²) of malignant fibrous histiocytoma within the right chest was designed to perform 2 times of HIFU treatments, but the second HIFU was canceled because of the skin burn occurred after first HIFU treatment. This patient received 3 times radiofrequency after the HIFU died of respiration impairment 5 months later. All others were alive until now with follow-up 3 ~ 15 months.

![2 times surgical resections](image1)

![radiotherapy](image2)

![Before the treatment of HIFU](image3)

![After the treatment of HIFU](image4)

Fig. 1. Case 2, malignant fibrosarcoma recurrence located in the left wall of the chest after 2 surgical resections. After the treatment of HIFU, MRI showed that tumor site devitalization.