

No.10059

**Microwave Ablation of Pelvic Malignant Bone Tumors**

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Level of Evidence: IV (Retrospective series)

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Background: A considerable percentage of primary or secondary malignancy developed from pelvis. The current widely used surgical treatment is en bloc resection of tumor-bearing bone followed by reconstruction. The high rate of complication and mechanical instability often contribute to poor results. Given the poor prognosis and high mobility for pelvic malignancy, some authors think that consideration should be given to pursuing no operative management in patient with large and high grade sarcoma although radiation therapy is not curative, and chemotherapy is even less useful for the majority of cases, because it rarely ever completely eradicates the primary lesion. Some surgeons in China would rather only do resection without any reconstruction leaving a flail joint. New approaches are needed to further overcome the difficult.

Questions/Purposes: 1. Does the local ablation by microwave induced hyperthermia can be safely used to treat pelvic malignancy? 2. What are the benefits of microwave local ablation compared with traditional en bloc resection?

Patients and Methods: After careful dissection of the tumor-bearing bone and the extruded tumor bulk from surrounding normal tissues, of course with safe margin, the microwave antennae array was inserted into the tumor mass for emitting electromagnetic microwave which produces tumor cellular death via thermo-coagulation. The antennae array consisted of 3 to 8 antennae according to the tumor range detected by IMR. During surgery, multiple thermocouples were placed in various critical locations to monitor the temperature within and around the bulk. The duration of irradiation is determined to ensure that the temperature at **any part** of the tumor-bearing bone reached 70 to 80 °C or higher and 10 to 20 minutes. Then, the loose devitalized tumor tissues were removed by cutting or curettage leaving behind the defective bone scaffold for reconstruction and strengthening using any of the currently accepted methods, such as autograft, allograft, or cementation. When the lesion is close to the joint but not within the joint, a special cooling system could be used to protect the cartilage, thus saving the joint. In this way, the continuity of pelvis and the hip joint were preserved. From May 1994 to December 2012, 206 patients with pelvic malignant tumors received radical thermotherapy. The series include 91 cases with high grade malignancy tumor, 80 cases with low grade malignancy tumor, and 35 cases with metastatic carcinoma. The retrospective results were reported here.

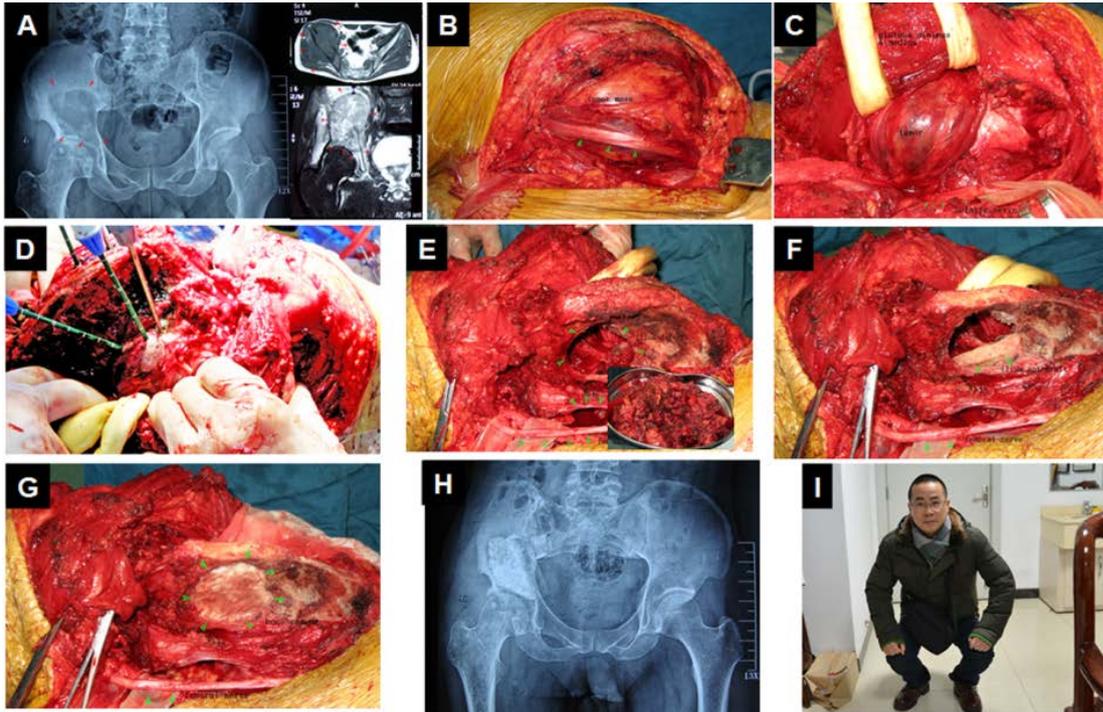


Fig 1: Surgical procedure for a patient with pelvic MFH

A: Image data

B: internal pelvic space exposure

C: external pelvic space exposure

D: microwave ablation

E: after remove of the dead soften tumor tissues

F: autograft from ilium

G: filling the defect with the mixture of bone cement and allograft bone chips

H: x-ray film after operation

I: Function is excellent after surgery 4 years

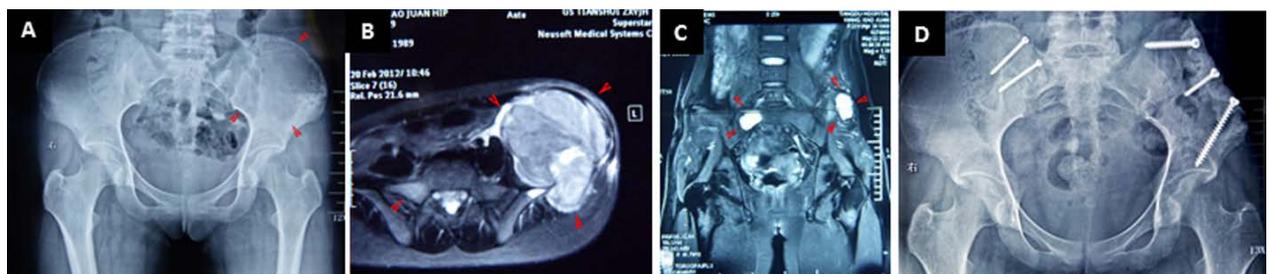


Fig 2: Ewing's sarcoma involving left ilium and right sacrum wing

It could be very hard to resect two sides tumor. MWA can be used with very simple reconstruction by screws and cement at both sides.

Results: The over 3-year survival rate was 45.5% for high-grade malignancy, 87.5% for low-grade malignancy. In the majority of the patients, cosmetic and useful limbs were preserved. Local recurrence occurred in 15 patients (7.2% local recurred rate), 3 cases had revision surgery and were under following-up, the other cases died from lesion. Six patients had deep infection (2.4%), which resolved by irrigation, debridement, and

administration of system antibiotics. A fistula developed in two patients. The complication rate is lower than the literature reports.

Conclusions: If the traditionally defined wide margin could be identified using en bloc resection technique, MW ablation can achieve a similar goal while retaining the curetted cortical bone intact, thus making reconstruction easier and more durable. The application of microwave induced hyperthermia for treatment of pelvic tumors is an effective, simple, and inexpensive method. The oncological and functional results are encouraging. The novel method reported here in has the following advantages: 1, greatly simplified the surgery process and shorten the operation time. 2, increased the local and system control rate. 3, greatly improved the functional outcome because it could keep the leg length and stability of pelvic girdle.