Case Report



# A case of chemorefractory metastatic type AB thymoma sensitive to helical tomotherapy

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**Abstract:** Type AB thymoma associated with multiple metastases is rarely encountered. This paper describes the therapeutic effect of new radiotherapy, helical tomotherapy (TOMO), in a thymoma patient with multiple metastases. A male patient aged 52 was diagnosed as type AB thymoma with multiple metastases. Two-cycle chemotherapy was administered as the primary therapy. The efficacy evaluation indicated progressive disease (PD), so radiotherapy was added to the initial treatment. The re-evaluation of efficacy indicated PD under chemotherapy and partial response (PR) in the radiotherapy area, so the latter treatment was changed to TOMO. The TOMO treatment was effective. However, due to the severe bone marrow suppression, the radiotherapy was stopped, and the patient was discharged. We concluded that the development of type AB thymoma associated with multiple metastases was fast, and the patient was sensitive to radiotherapy but not chemotherapy. Thus, TOMO can be selected as the primary palliative therapeutic regimen for chemotherapy-resistant thymoma patients, but the patient tolerance of TOMO requires careful evaluation and further clinical study.

**Keywords:** Thymoma; chemotherapy; radiotherapy; metastasis; tomotherapy (TOMO)

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## Introduction

Type AB thymoma associated with multiple metastases is rarely seen in the clinic (1). Chemotherapy is the main treatment for these tumors, but most patients are clinically non-responsive to chemotherapy, so radiotherapy is often used for symptomatic relief (2). However, the therapeutic effect and feasibility of a new type of radiotherapy, helical tomotherapy (TOMO), have not yet been reported. In order to deepen the understanding of thymoma and to assess the use of TOMO in its treatment, we retrospectively reviewed patient medical records at the Department of Radiation Oncology, The First Affiliated Hospital of Bengbu Medical University, in addition to the available literature indexed in PubMed.

## Case presentation

A male patient aged 52 with cough and expectoration was diagnosed with type AB thymoma by pathology and immunohistochemistry (*Figure 1A,B,C,D*). PET/CT indicated an anterior mediastinal mass, invasion of the pleura and pericardium associated with the right hip bone and systemic multiple lymphatic metastases (stage IVB)

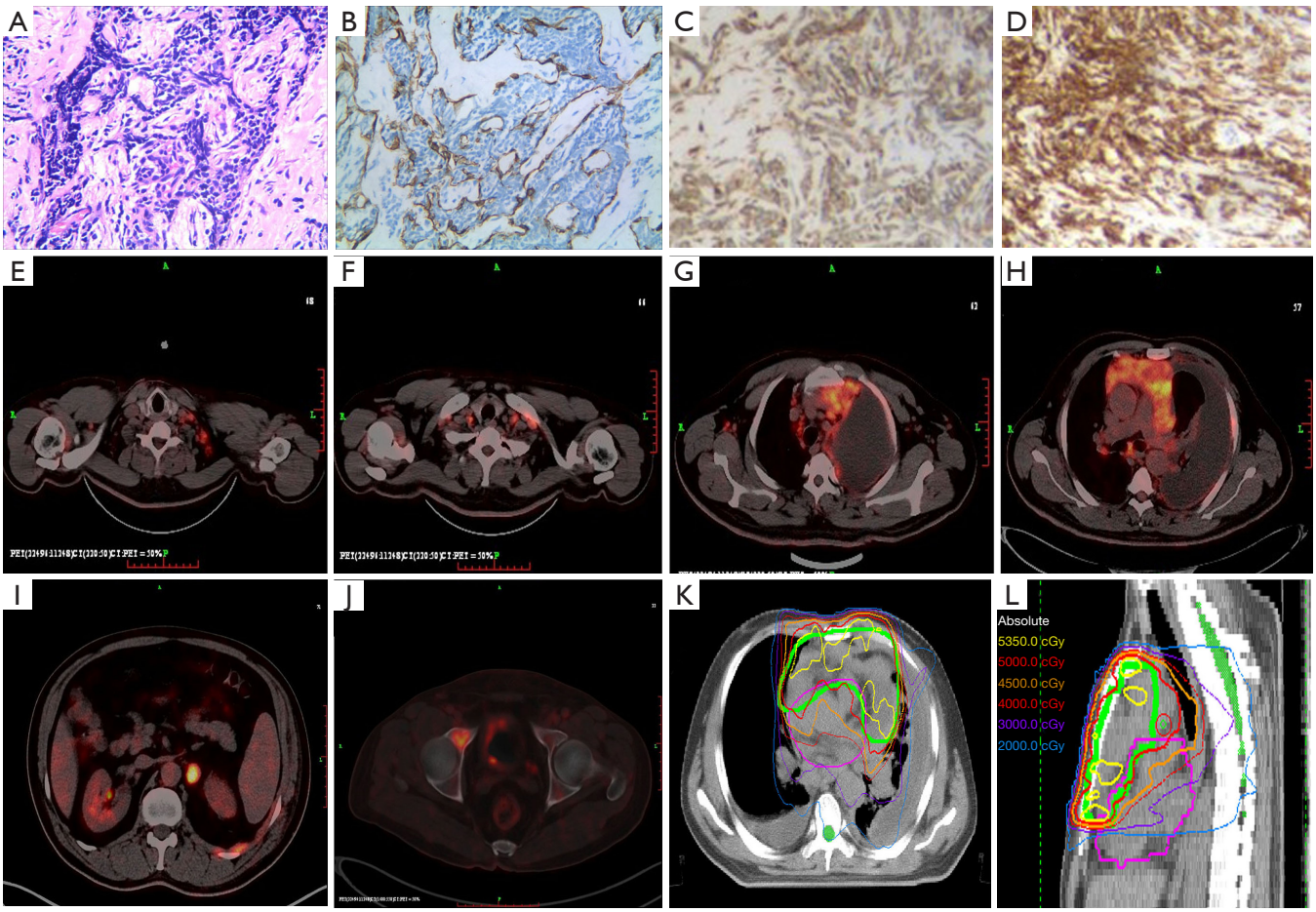


**Figure 1** Histopathologic images of thymoma puncture (×400). (A) HE staining; (B) IHC CK staining; (C) IHC LCA labeling; (D) IHC CD7 labeling. The immunohistochemical results were generalized as follows: epithelial component CK (+), lymphocyte LCA (+), CD7 (++), CD2 (+), CD99 (+), CD3 (+), CD4 (–), CD43 (–), CD20 (–), Syn (–), CD5/6 (–), CgA (–), CD1α (+), Ki-67 (+, about 50%). Systemic PET-CT examination before treatment. There were abnormal increases in FDG metabolism, and metastasis was considered in the following sites: (E) the lymph node of the left neck; (F) the lymph node of the supraclavicular area; (G,H) the anterior mediastinum, locally connected with pleura and pericardium; the bilateral lung hilum (multiple enlarged lymph nodes); the mediastinal prevascular space; the paratracheal, retrocaval, subcarinal, and paraesophageal areas; the bilateral axilla; the left pleura (thickening); (I) the retroperitoneal lymph node (enlargement); the left pleura (thickening); and (J) the right acetabulum. The first IMRT schedule chart. (K) Typical fault map of thymoma primary lesion radiotherapy. The size of the radiotherapy field can be seen from the (L) lateral view. As can be observed, the radiotherapy schedule met the requirements.

(*Figure 1E,F,G,H,I,J*).

After a definitive diagnosis, chemotherapy was administered for 2 cycles (CAP regimen, once every 3 weeks), as the primary therapy. The efficacy evaluation indicated PD, which prompted the use of IMRT (54 Gy/30 fractions) for primary lesion (*Figure 1K,L*). In the meantime, a chemotherapy regimen (DP regimen, once every 3 weeks) was used for 2 cycles during radiotherapy. After radiotherapy, a re-examination of PET-CT illustrated the obvious shrinkage of the anterosuperior mediastinal primary masses, without a significant increase in SUVmax in the residual masses; the areas that did not receive radiotherapy showed lesion enlargement (*Figure 2A,B,C,D*). The efficacy evaluation indicated PD under chemotherapy and PR in the radiotherapy area, so TOMO was used further.

According to PET/CT imaging, the target area

 

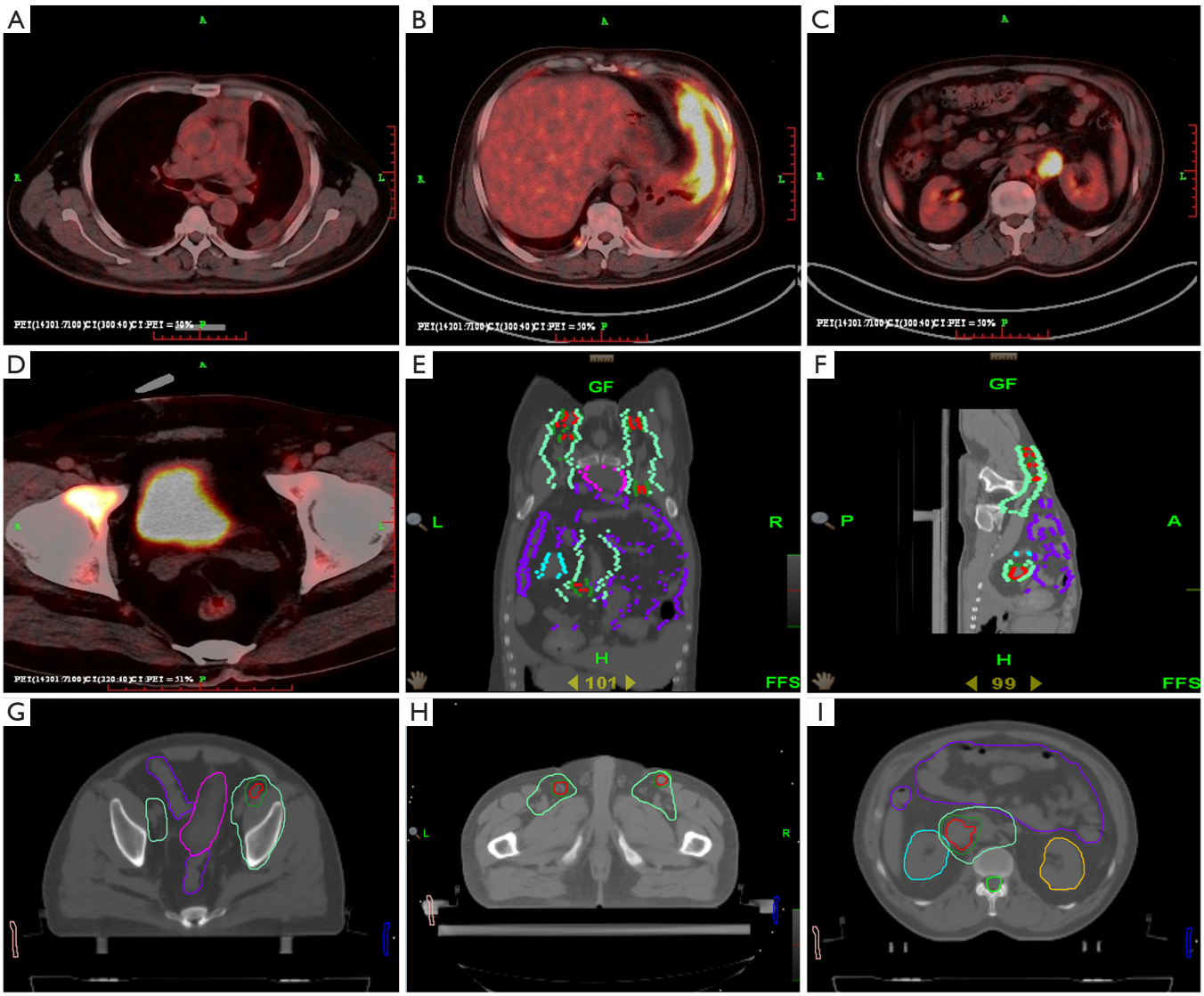


**Figure 2** PET-CT reexamination images after the first radiotherapy and before TOMO therapy. (A) This mainly shows anterior mediastinal occupation and no significant increase in FDG metabolism, suggesting that after radiotherapy on the primary thymus lesion, the tumor was inactive. The shrunken mass also indicates the effectiveness of local radiotherapy. (B) Left pleura thickening, (C) retroperitoneal multiple lymphadenectasis, and (D) the right acetabulum showed an abnormal increase in FDG metabolism; metastasis was considered. TOMO schedule chart. (E) and (F) are systemic figures of the TOMO schedule, showing the whole radiotherapy target volume which included the (G) acetabulum, (H) inguinal lymph nodes, and (I) abdominal lymph nodes. TOMO, tomotherapy.

was delineated which included the bilateral groin, and retroperitoneal metastatic lesions (56 Gy/28 fractions) (*Figure 2E,F,G,H,I*). During TOMO radiotherapy, the pain of the patient was significantly relieved and showed a marked decrease in leukocytes and platelets, and the treatment was stopped at the 18th time because the number of leukocytes and platelets continued to decrease greatly. The patient asked to be discharged and died after 50 days. The overall survival time of the patient from disease diagnosis to death was about 10 months.

## Discussion and conclusions

The incidence of thymoma accounts for 20% of all

 

mediastinal tumors, and the incidence is about 1.5 parts per million per year. The peak age of thymoma onset is 40–50 years old, with the condition being predominant in males (3). This is because androgen can promote the proliferation and maturation of thymoma cells, whereas estrogen can inhibit their growth (4). Although it has been proven that at least 67% of thymoma patients are non-smokers, thymoma and smoking have a certain correlation which needs further exploration (5).

Thymic epithelial tumors are mainly classified into thymic neuroendocrine tumors, thymic carcinoma and thymoma. Thymoma is usually seen as a "relatively benign" tumor and has slow-proliferating biological behavior, with only the advanced stages capable of spreading locally in the thoracic cavity. Extrathoracic recurrence and metastases are rare and mainly occur with thymic neuroendocrine tumors or thymic carcinoma. According to the WHO histological classification criteria, thymoma is divided into five pathological subtypes (A, AB, B1, B2, B3). One hundred percent of patients with type A and AB, 83% patients with type B1 and B2, and 36% of patients with type B3 have disease-free survival rates of more than 10 years (6).

In this case, there was a difference between the type AB thymoma diagnosed and the biological behavior. Therefore, we need to continue to improve the WHO prognostic criteria. Another prognostic factor is the presence of capsular invasion. The recurrence rate of noninvasive thymoma is approximately between 0% and 7%, while invasive thymoma is approximately between 11% and 36%. The recurrence of thymoma mainly occurs in the mediastinum or the pleural cavity region. Extrathoracic metastases are extremely rare and main associated with type B (6). In the case of a metastasis, the site of distant metastasis is usually the lung and the liver, in turn.

In our case, PD of type AB thymoma was associated with the rapid progression of multiple metastases, and patients being insensitive to chemotherapy; thus, radiotherapy is critical for patient treatment (2,7). Compared with traditional radiotherapy, the beneficial characteristics of the TOMO radiotherapy are that the tumor dose is more conformable, the adjustment of the tumor dose intensity is more accurate, and the adjustment of the normal tissue dose around the tumor is finer. Once radiotherapy of multiple tumors lesion is achieved by spiral tomography of multiple subfields, the risk of repeated exposure of normal tissues can be reduced with complex planning. Additionally, because of its unique design, spiral illumination can achieve an ultra-long range intensity-modulated field (60 cm × 160 cm) and does not need to contend with the connection problem of adjacent fields.

However, the efficacy of TOMO on thymoma associated with multiple metastases has not yet been reported. In the present case, although the efficacy of TOMO radiotherapy was significant and the pain at the radiotherapy site was relieved, the degree of bone marrow suppression was beyond our expectations, leading to treatment termination. This suggests that accurate evaluation of tolerance before TOMO radiotherapy is very important. Here, we detailed the treatment process and outcomes for a patient with type AB thymoma associated with multiple metastases treated by TOMO for the first time. The obtained results encourage relevant clinical research to confirm whether TOMO could be the primary palliative therapeutic regimen for thymoma patients in phase IV.

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## Footnote

*Conflicts of Interest*: The authors have no conflicts of interest to declare.

*Ethical Statement*: The study was reviewed and approved by Bengbu Medical University. Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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