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Teaching Case

Stereotactic radiation therapy for residual chemorefractory primary mediastinal non-seminomatous germ cell tumor after surgical thoracotomy

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Introduction

Among germ cell tumors (GCTs), postpubertal primary mediastinal nonseminomatous germ cell tumors (PMNSGCTs) have the worse prognosis, with a 5-year survival rate of 45% to 50% in the most recent and largest series.[1,2] This rare tumor represents only 1% of all primary mediastinal tumors, whereas only 1% to 5% of all GCTs are extragonadal, with the mediastinum being the most frequent location.[2] As a result, dedicated literature on this specific subgroup of GCT is limited.

The initial management of postpubertal PMNSGCT is similar to metastatic testicular nonseminomatous GCT (NSGCT) and includes cisplatin-based chemotherapy and surgery.[2] Rates of chemotherapy refractory cases and early progressions seem to be more elevated in PMNSGCT and lead to a worse prognosis.[3] Use of ablative radiation therapy (RT) in that context is not well described in the literature.

We report the case of successful treatment with high-dose, high-precision, external beam RT of a cisplatin-refractory PMNSGCT with early mediastinal recurrence after complete resection of the primary tumor.

Case report

A 35-year-old male with no medical history was referred to the emergency room with rapidly worsening dyspnea. A chest x-ray done in the community revealed an extremely enlarged mediastinum (Fig 1). A large bilobed irregular mass of 11.8 × 11.2 cm and 12.2 × 11.5 cm in the anterior mediastinum was seen on computed tomography (CT) scan with enlarged lymph nodes adjacent to the tumor, the largest being 1.7 × 2.0 cm, and no distant disease (Fig 2A). Scrotal ultrasound was normal. A CT-guided biopsy was performed, but pathology analysis was inconclusive. Elevated serum tumor markers with an alpha-fetoprotein (AFP) level of 22,474 μg/L and beta human chorionic gonadotrophin level of 36.4 IU/L were highly suggestive of NSGCT. (See Fig. 3.)

Chemotherapy was initiated with 1 cycle of etoposide/cisplatin, followed by 4 cycles of etoposide/ifosfamide/

Conflicts of interest: None.

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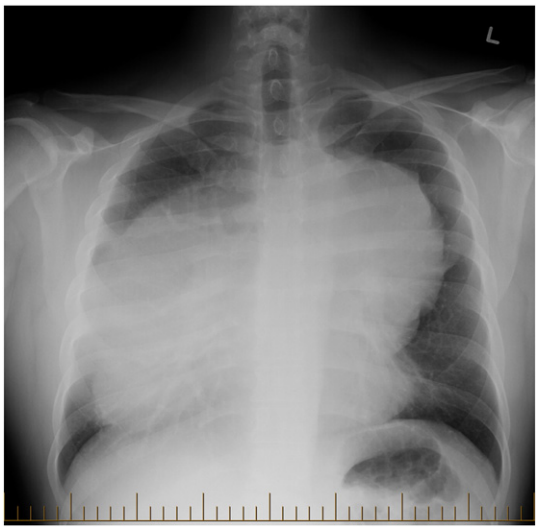

Figure 1 Posteroanterior chest x-ray in a 35-year old male reveals a large mediastinal mass occupying the entire anterior hemithorax.

cisplatin (VIP) with granulocyte-colony-stimulating factor support. Bleomycin was purposely omitted and replaced by ifosfamide to preserve pulmonary reserve in a patient who would likely require additional local thoracic treatment. Beta human chorionic gonadotrophin levels normalized (<0.5 IU/L), but AFP levels did not, despite a significant decrease to 35.2 μg/L. A partial response was observed on CT scan, in which the bilobed tumor decreased in size to 3.6 × 6.3 cm and 3.4 × 5.7 cm (Fig 2B).

Surgical median sternotomy with resection of the anterior left and right mediastinal tumor and partial thymectomy was successfully performed. The patient recovered rapidly from surgery and was discharged home within 7 days. Pathology of both 7.5-cm masses revealed mixed GCT with chemotherapy-induced necrosis but still contained viable cancer cells. The right tumor was 90% yolk sac germ cell tumor and 10% teratoma. The left tumor was 100% yolk sac tumor. The surgical margins were negative.

Shortly after the mediastinal surgical resection, the AFP tumor marker rapidly increased to 645.8 μg/L. A repeat CT scan and positron emission tomography-CT scan showed a new 3 × 2 cm solitary mass, consistent with a paracardiac lymph node, posterior to the xiphoid process (Fig 2C) with no other site of disease, including brain and testis. Second-line chemotherapy with paclitaxel/ifosfamide/cisplatin was started with granulocyte-colony-stimulating factor support. After 3 paclitaxel/ifosfamide/cisplatin cycles, again, tumor markers were trending down but did not normalize completely with an AFP level of 51.4 μg/L. High-dose chemotherapy and further surgical resection of the residual mass were discussed. The patient felt he could not tolerate higher-dose chemotherapy or a second thoracic surgery and asked for an alternative treatment option.

RT consisting of 50 Gy in 5 fractions on days 1, 4, 8, 11, and 14 were delivered to the residual solitary thoracic mass using 6-MV photons 1 month after chemotherapy. There were no acute or long-term toxicities reported. A linear accelerator–based stereotactic body RT (SBRT)

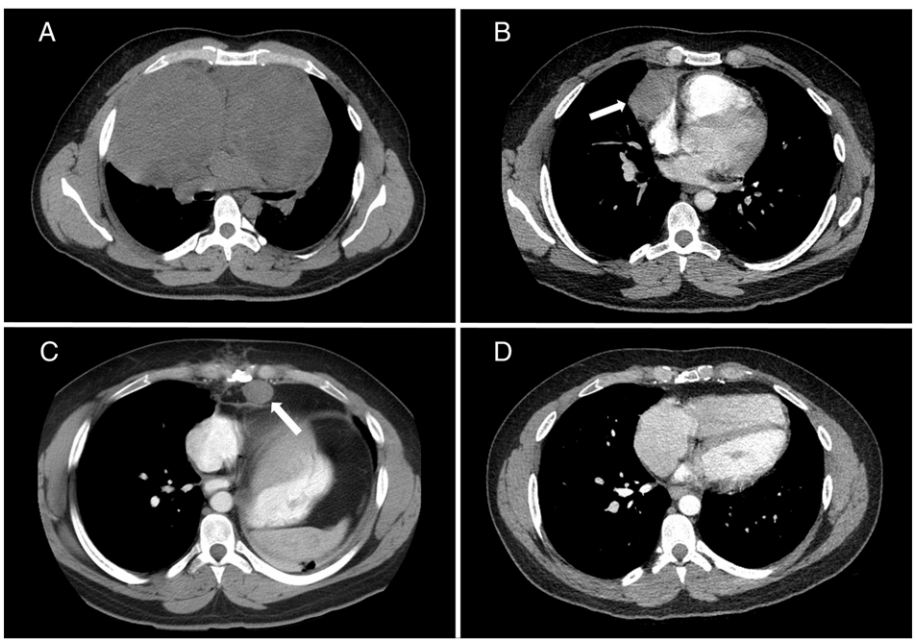

Figure 2 (A) Computed tomography (CT) scan at diagnosis, with evidence of a large mediastinal bilobed mass. (B) CT after first-line etoposide/ifosfamide/cisplatin with evidence of partial response with residual disease measuring 3.4 × 5.7 cm and 3.6 × 6.3 cm. (C) CT after first-line chemotherapy followed by surgical resection of residual with evidence of a new enlarged paracardiac node suggestive of recurrent disease. (D) CT 3 years post-stereotactic body radiation therapy showing sustained complete response.