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Stereotactic body radiotherapy for superior vena cava syndrome

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Tumor-related superior vena cava syndrome (SVCS) is characterized by the syndrome in which the superior vena cava is blocked by the tumor of the right upper lobe of the lung or the lymph nodes in the 4R region of the mediastinum. As the first diagnosis symptom, SVCS occurs in about 1.7% non-small cell lung cancer cases (NSCLC) [1]. Stereotactic body radiotherapy (SBRT)T has been gradually tried for SVCS [2], but limited to small lesions with a diameter of less than 5 cm. We successfully applied SBRT in the treatment of SVCS due to compression of a large lung squamous cell carcinoma and 4R lymph nodes.

A 63-year-old male with the complaint of a 2 weeks history of swelling of the head, face and neck (Fig. 1). Chest computed tomography (CT) revealed right upper lobe hilar space-occupying lesion, mediastinal lymph node enlargement, and metastasis was considered (Fig. 2, 3). Lung tumor puncture biopsy was performed and pathology suggested a (lung puncture) malignant tumor, and it was consistent with squamous cell carcinoma combined with immunohistochemical results. Immuno-histochemical results were: CK7(–), TTF-1(–), NapsinA(–), Syn(–), P40(–), CK5/6(+), CD56(focal+). Due to the compression of the superior vena cava, the patient often got edema of the head, face, neck and upper arm, accompanied by irritating dry cough, dyspnea, near-death and severe headache. SVCS belongs to the emergency of oncology department. After discussion in our department, we worked out the radiotherapy plan of SBRT for primary focus of the lung and mediastinal lymph nodes. After enhanced CT positioning in a prone position, GTVp delineated para-hilar lesions of the upper lobe of the right lung. GTVnd sketched the swollen and fused lymph nodes in 4R and 3A regions. GTVp and GTVnd are fused to form GTV, and the target area PTV is planned (Fig. 4). The final PTV volume was 250 cc, and the prescription volume was large, so we gave the prescription dose:

Figure 1. Before Treatment (left), after treatment (right)

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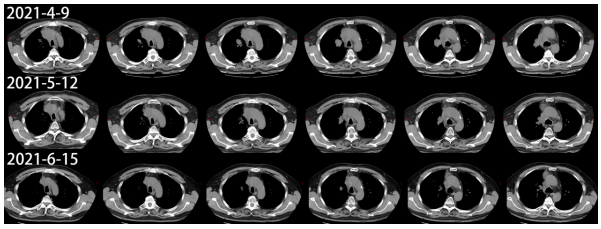

Figure 2. Computed tomography (CT) before treatment (2021.4.9), after (2021.5.12 2021.6.15). Tumor shrank significantly

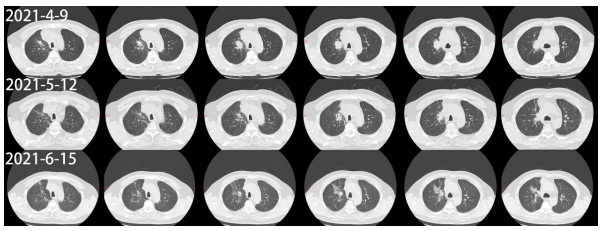

Figure 3. Computed tomography (CT) before treatment (2021.4.9), after (2021.5.12 2021.6.15). No collapse of trachea

50 Gy/10F, and 95% isodose line covered PTV in the planned target area. FFF mode, volume intensity modulation technique (VMAT) and RapidArc optimization algorithm were used in all the treatment techniques. Dose verification and image-guided radiotherapy were performed before each treatment (Fig. 5). The positioning error for patients was strictly limited within 5 mm. The patient refused simultaneous chemotherapy. During radiotherapy, patients were treated with dexamethasone, water intake restriction and other routine treatment to relieve severe SVCS symptoms such as craniofacial edema. Three days after the beginning of radiotherapy, the symptoms of the patients were temporarily aggravated, and the head and face edema disappeared obviously after treatment (Fig. 1), cough relieved without dyspnea and near-death feeling. Re-examination of the chest CT showed that the tumor was significantly reduced (Fig. 2, 3). During the 2-month follow-up, the hilar lesions and mediastinal lymph nodes in the right upper lobe were well controlled, and there were no symptoms of SVCS. The patient has agreed to receive sequential chemotherapy and is still in the follow-up.

The success of this case lies in the accurate image-guided localization. After SBRT, the superior vena cava was recanalized, dyspnea and facial edema were relieved. Despite the large size of the tumor, there were no complications above III grade attributed to

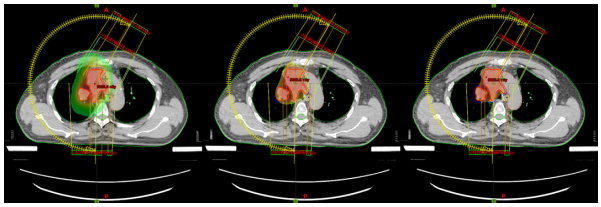

Figure 4. 50% dose (left), 80% dose (middle), 90% dose (right)

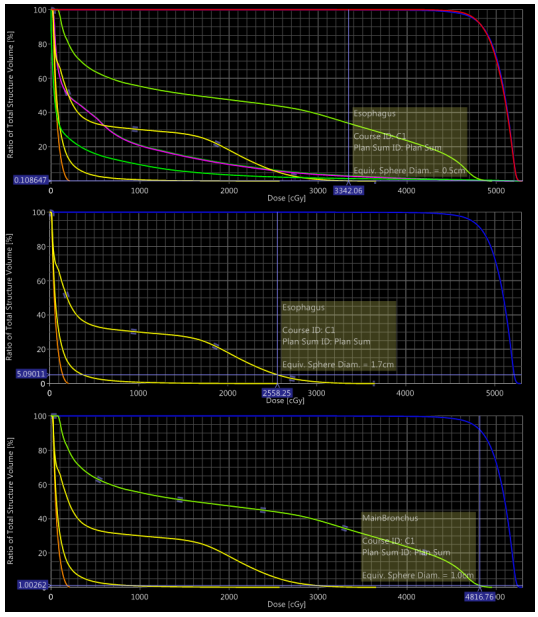

Figure 5. Dose-volume histogram limits (DVH) (%, Gy): Esophogus 0.1 cc, 3342.06 Gy (up); Esophogus 5 cc, 2558.25 Gy (middle); Bronchus 1 cc, 4816.76 Gy (down)

the large fractionation radiotherapy. SVCS caused by tumor compression is still a difficult problem in clinical treatment. Large fractionation SBRT therapy can still benefit SVCS patients with a large tumor size.

Conflict of interest

None declared.

Funding

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