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Oncological emergency: myeloparalysis: role of brachytherapy

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Spinal cord compression (SCC) is a common oncological emergency, caused by a primary or metastatic tumour compressing the dural sac or directly involving the spinal cord. Delayed treatment leads to complete and irreversible paralysis and significantly reduces the patient's activities of daily living and quality of life. The treatment for malignant epidural compression includes neurosurgery or radiotherapy with steroid.¹ Radiotherapy is limited or contraindicated due to dose tolerance in cases where the SCC site was previously irradiated.

Brachytherapy is a type of radiation therapy that has been often used as a radical treatment for prostate, gynaecological and head and neck cancers etc. By delivering radiation directly from inside the tumour, brachytherapy delivers a higher dose to the tumour, while the surrounding tissue receives a lower dose. High-dose rate (HDR) brachytherapy allows the administration of a higher dose to the tumour within a few minutes.

This is the first reported use of HDR brachytherapy for emergency treatment of SCC in a patient with lung cancer, who underwent radical chemoradiotherapy. A 63-year-old man, who had new-onset back pain, was diagnosed with localised non-small-cell lung cancer cancer, cT4N0M0 stage 3A (Union for International Cancer Control V.8). He suddenly developed paralysis of the right leg with bladder and rectal disturbance. For this oncological emergency, he was promptly treated with radical chemoradiotherapy (60 Gy/30 fr) (figure 1A,B). As the tumour shrank, his symptoms gradually improved, and he was able to walk with a walking frame (figure 1C). After this treatment, the patient received maintenance therapy with a programmed death-ligand 1 inhibitor. Five months later, he suddenly developed farther back pain, with paralysis of the

right leg, and bladder rectal disturbance. due to tumour regrowth (figure 1D). As surgery was not indicated reirradiation was considered. As a maximum dose had previously been delivered to the spinal cord, (44 Gy) It was decided to treat with brachytherapy.

First, the patient was placed in the prone position. Under local anaesthesia, an applicator was placed in the centre of the tumour via a CT-guided technique (figure 2A,B). Single fraction brachytherapy was performed (8 Gy in one fraction). During the treatment planning, the dose was optimised at 8 Gy to cover 90% of the tumour. Moreover, the maximum dose applied to the spinal cord was 8 Gy (figure 2C). The irradiation procedure, specifically from the insertion of the applicator to its removal, took approximately 1 hour. No adverse events were observed.

After treatment, the patient's right leg paralysis and bladder rectal disturbance improved. A few days later, he was able to stand up and walk a short distance independently. One month later, CT images showed that the tumour had shrunk (figure 2D,E). His symptoms have improved within the next 3 months, and he is currently undergoing second-line chemotherapy.

The incidence of reirradiation for SCC, caused by bone metastasis, has recently increased. There have been some reports on reirradiation by stereotactic body radiotherapy (SBRT), intensity-modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT).^{2 3} Although these new external beam radiotherapy (EBRT) technologies increased the dose to the tumour and decreased the dose to the surrounding tissue, they were less effective than brachytherapy. Wust *et al* comparing the treatment planning for HDR brachytherapy, SBRT, IMRT and

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Figure 1 (A) Pretreatment image, (B) image of primary radiotherapy using intensity-modulated radiotherapy technique, (C) post-treatment image (after 3 months), (D) MRI scan (fat suppression T1-weighted image with contrast enhancement) at recurrence (red arrow); regrowth of tumour.

VMAT, concluded that HDR brachytherapy was the most effective single fraction treatment.^{4 5}

Since these new EBRT technologies require more precision and accuracy, their preparation times are longer: creating a fixture for each patient, creating a complex treatment plan, and verifying the treatment plan. In addition, each treatment session takes at least 20–30 min, and they often require a fractionated treatment schedule. HDR brachytherapy treatment plan is simple. Each session takes only a few minutes,

Figure 2 Patient and high-dose rate brachytherapy images. (A) Photograph of CT-guided insertion (patient in the prone position on CT board): black arrow; applicator; (B) CT image of CT-guided insertion—yellow arrow; applicator, (C) image of treatment planning—white line; 300% PD (24 Gy), orange line; 200% PD (16 Gy), red line; 100% PD (8 Gy), blue line; 50% PD (4 Gy). (D) prereirradiation image, (E) postreirradiation image (after a month). PD, prescribed dose=8 Gy.

furthermore, a single fraction may only be required. Its short treatment time is also advantageous in the context of the COVID-19 pandemic, when the exposure to SARS-CoV-2 needs to be minimised.

Brachytherapy is more invasive than EBRT in that it requires applicator insertion. In recent years, however, safer insertion techniques have been developed and CT-guided insertion has been established as a minimally invasive technique, which is used in various examinations and treatments such as tumour biopsy, radiofrequency ablation, cryotherapy and abscess drainage, etc. In this case example of emergency oncological treatment, HDR brachytherapy, specifically reirradiation, was effective for palliative therapy.

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REFERENCES

- Higdon ML, Atkinson CJ, Lawrence KV. Oncologic emergencies: recognition and initial management. *Am Fam Physician* 2018;97:741–8.
- Navarria P, Mancosu P, Alongi F, *et al.* Vertebral metastases reirradiation with volumetric-modulated Arc radiotherapy. *Radiother Oncol* 2012;102:416–20.
- Sasamura K, Suzuki R, Kozuka T, *et al.* Outcomes after reirradiation of spinal metastasis with stereotactic body radiation therapy (SBRT): a retrospective single institutional study. *J Radiat Res* 2020;61:929–34.
- Wust P, Beck M, Dabrowski R, *et al.* Radiotherapeutic treatment options for oligotopic malignant liver lesions. *Radiat Oncol* 2021;16:51.
- Ota Y, Masui K, Suzuki G, *et al.* Single-fraction image-guided high-dose-rate brachytherapy for head and neck cancer: three cases of palliative brachytherapy. *J Contemp Brachytherapy* 2020;12:273–8.