

Radiation-induced Myelitis in a Patient with Non-compressive Metastatic Breast Cancer to the Cervical Spine- A cause of significant neurological impairment and loss of function



Dr Miguel Rodriguez Ruiz, Mr Manish Desai
London Spinal Cord Injury Centre, Royal National Orthopaedic Hospital NHS Trust, Stanmore, United Kingdom

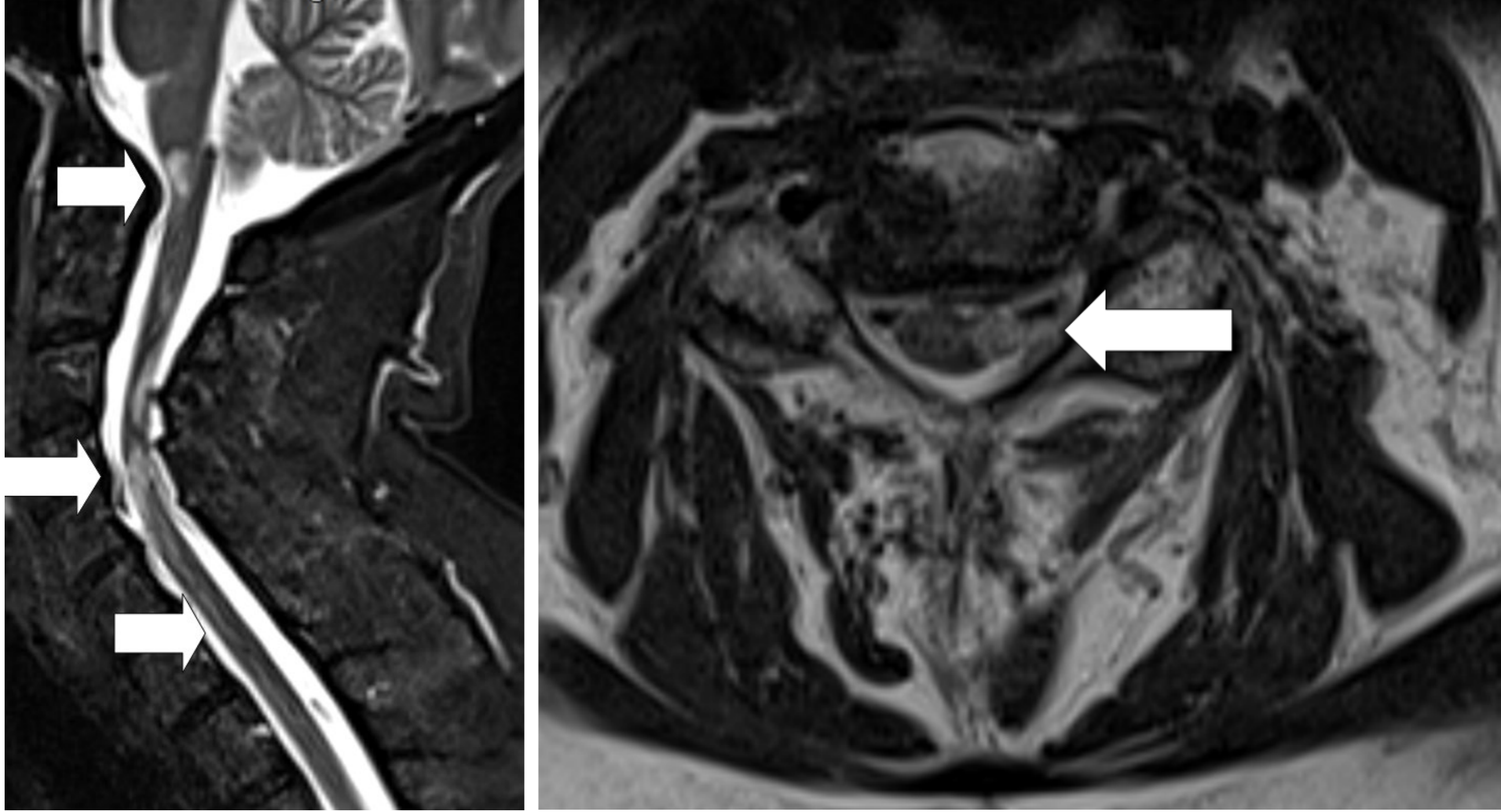


Case Description and Diagnosis

- A 50-year-old female with breast cancer diagnosed in 2011 was treated with radiotherapy and Tamoxifen until 2016 when she achieved remission.
- In 2019 she developed upper back pain and MRI confirmed non-compressive extensive cervical spine and L1 metastatic lesions from recurrent primary breast cancer (Figure 1). She received one cycle of radiotherapy at a dose of 8 Gy directed at the cervical spine for pain control.
- This was well tolerated until 3-4 months later when there was gradual reduction of power in the left upper limb. 10 months post-radiotherapy, her lower limbs and gait began to be affected and there was subsequent progression in spinal cord dysfunction with severe trunk and lower limb spasticity significantly affecting her balance and mobility.
- In April 2022, MRI spine confirmed Radiation-induced Myelitis from C2-C6 (Figures 2 and 3) and she was diagnosed with a Spinal Cord Injury with neurological level of C2 AIS D (Figure 4).



Figure 1: MRI scan April 2019- metastatic lesions in the cervical spine



Figures 2 and 3: MRI Scan April 2022- Sagittal and Axial slices showing Radiation-induced Myelitis spanning from C2-C6

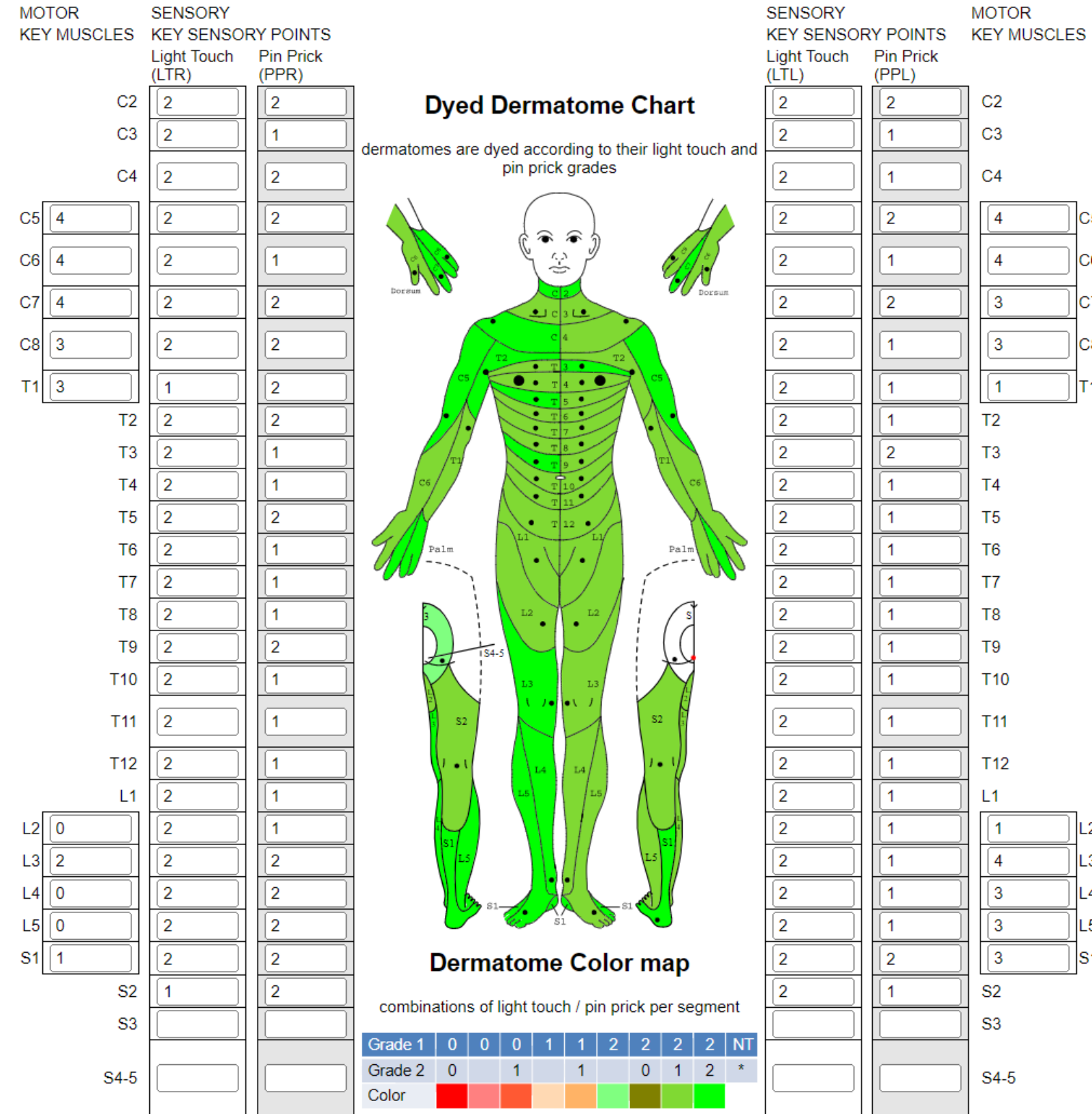


Figure 4: ASIA Chart

Discussion

- Radiation-induced Myelitis is a non-traumatic, non-compressive Spinal Cord Injury that occurs when the spinal cord is exposed to ionising radiotherapy in doses beyond its tolerance.
- It is a rare but feared complication, making the spinal cord one of the most critical dose-limiting organs in the use of radiotherapy.¹ Provided the spinal cord does not exceed a total of 45-50Gy in 1.8-2 Gy daily fractions, the risk of permanent Spinal Cord Injury is estimated from 0.03% to 0.2%.²
- While our patient did not exceed this total dose of radiotherapy, we hypothesize that 2 distinct timeframes of irradiation 8 years apart played a contributing role in the development of Radiation-induced Myelitis.
- She developed significant sensory-motor and autonomic dysfunction characterised by tetraplegia, severe spasticity, severe neuropathic pain, and significant bladder and bowel dysfunction. The patient became fully dependent for all activities of daily living, including becoming a permanent Electric Wheelchair user.

Conclusions

- Radiation-induced Myelitis has become a rare complication following conventional fractionated radiotherapy but cases are re-emerging with the increasing role of stereotactic body radiotherapy and reirradiation.^{1,3}
- The pathophysiology of RM is still poorly understood but seems to be related to endothelial damage, small vessel ischaemia and disruption of the blood-spinal barrier. Vascular endothelial growth factor seems to play a big role.¹

1. Wong CS, Fehlings MG, Sahgal A. Pathobiology of radiation myelopathy and strategies to mitigate injury. Spinal Cord. 2015 Aug;53(8):574-80.
2. Schultheiss TE. The radiation dose-response of the human spinal cord. Int J Radiat Oncol Biol Phys. 2008 Aug 1;71(5):1455-9.
3. Khan M, Ambady P, Kimbrough D, Shoemaker T, Terezakis S, Blakeley J, Newsome SD, Izbudak I. Radiation-Induced Myelitis: Initial and Follow-Up MRI and Clinical Features in Patients at a Single Tertiary Care Institution during 20 Years. AJNR Am J Neuroradiol. 2018 Aug;39(8):1576-1581.