

Is it feasible to implement VMAT planning for MSCC?

Introduction

Definitive management for Metastatic Cord Compression (MSCC) comprises of surgery or radiotherapy which is typically delivered using a simple palliative field placement technique. Volumetric Modulated Arc Therapy (VMAT) is a more sophisticated technique that uses numerous arcs of radiation to achieve the prescribed dose to the target area whilst reducing dose delivered to surrounding normal tissue. VMAT has been previously too complex and resource intensive to be considered in the emergency setting for MSCC, however recent automated developments have meant using VMAT has now become a potentially viable option.

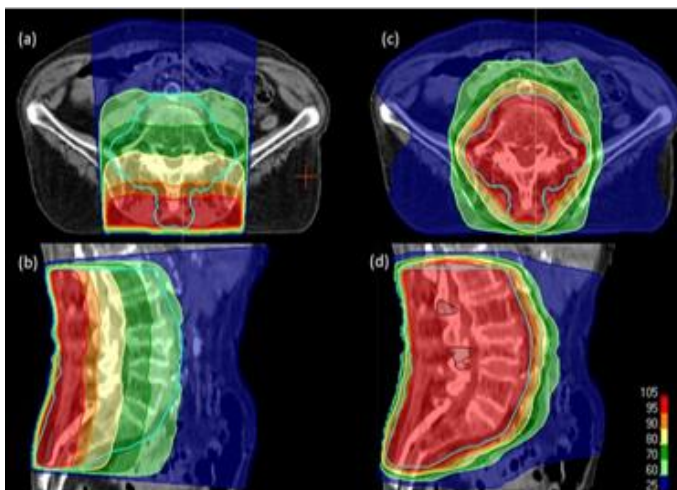


Figure 1: Dose delivered to a patient presenting with pain due to vertebral metastases in lumbosacral region treated with a single posterior field (a) & (b); replanned with VMAT, dose distributions in (c) & (d). Dose displayed as % of original prescription (8Gy to Dmax in 1 fraction). PTV displayed in light blue.

Background

A recent audit of 93 cord compressions treated in a 12 month period in our centre showed considerable variation in practice including number of fields used, energy and depth of prescription. For example:

- For the 43 thoracic spine compressions treated, the median prescribed depth was 5cm, range 3- 9cm.
- 38 lumbar prescriptions, 32 used 6MV, 6 used 10MV.
- There is no current protocol to define treatment fields within the department.

Underdosing the target may contribute to higher reirradiation rates, and poorer symptom/local tumour control. As a result we generated VMAT plans for 15 patients who were treated for MSCC using a semi-automated technique to assess target coverage; all Planning Target Volume (PTV) dose statistics were significantly improved using VMAT rather than a single field (please see figures 1&2).

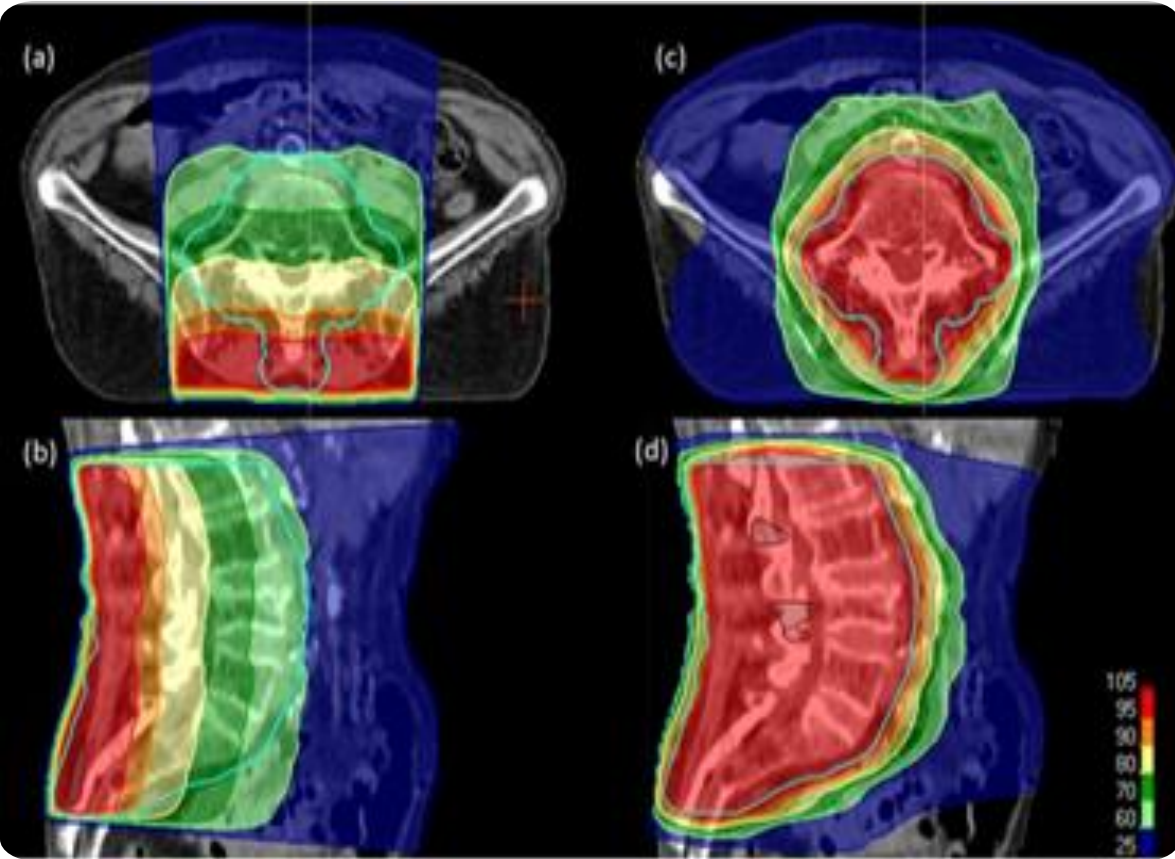
Trial Proposal: VAMOS

We propose:

1. A standardised protocol for target delineation and prescribing of radiotherapy for MSCC.
2. An exploratory randomised feasibility study in 30 MSCC patients to compare an automated VMAT planning technique with the current standard of care using simple field placement which may allow us to answer “is VMAT a feasible treatment technique for patients presenting with MSCC in an emergency context?”.

| | Mediant ± 1SD | | P value |
|----------|---------------|--------|---------|
| | Single Field | VMAT | |
| PTV D98% | 11±20% | 95±1% | <0.005 |
| PTV D50% | 84±10% | 100±0% | <0.005 |
| PTV D2% | 112±13% | 102±1% | <0.005 |

Figure 2: Target dosimetric statistics for the standard of care single field compared with VMAT for MSCC.



- Dose delivered to a patient presenting with pain due to vertebral metastases in lumbosacral region treated with a single posterior field **(a)** & **(b)**; replanned with VMAT, dose distributions in **(c)** & **(d)**. Dose displayed as % of original prescription (8Gy to Dmax in 1 fraction). PTV displayed in light blue.