

Implementing 2# spine SABR for symptomatic metastases

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Background

A randomised study has demonstrated that spine SABR can be safely delivered and provides superior pain control for symptomatic spine metastases, in comparison to conventional radiotherapy (34% complete pain response at 3 months with SABR vs. 14% with conventional RT. No pain reported at 6 months in 32% of SABR patients vs. 16% of conventional RT patients)^[1].

GenesisCare UK has treated spine SABR cases regularly since 2018 in our network of complex SABR centres. Patient selection has historically been limited to the oligometastatic & oligoprogressive setting. In light of a growing evidence base, this was opened to limited symptomatic metastases in April 2021 as per the randomised study inclusion criteria.

All SABR cases treated at GenesisCare pass through SABR Advisory Team MDT for ratification of patient suitability. All suitable referrals then pass through an additional MDT meeting – the 'SABR huddle' – where the planning & treatment approach for each case is decided with the central stereotactic team, the local treating team, and a SABR Advisory Team clinician present.

Dosimetric Case Study

Spine SABR at GenesisCare has followed standard UK convention^[2] ^[3] for the reporting of normal tissue dose and tolerances. The maximum dose in the UK is generally defined as the "near-point" maximum dose, typically defined as D0.1cm³. The U.S approach uses a point maximum or 0.0035cc volume. The point maximum can vary between planning systems and could be considered less clinically relevant due to the point referring to an individual pixel rather than a definable volume within the patient.

On the first case of the new technique, the planner had initially attempted to achieve a DMax of 0.1cc at 17Gy in the spinal cord PRV, resulting in an absolute max dose of 17.8Gy. After discussion, it was decided to follow the point maximum dose to the cord PRV to ensure consistency with the approach taken by the trial group, and an absolute max dose to the cord PRV of 16.9Gy was achieved^[1].

Limiting the Cord PRV to a point maximum in spine SABR is more conservative and inherently safer, but the compromise is a small reduction in CTV coverage to meet this stricter tolerance. Further planning studies will aim to quantify this compromise by comparing plans optimised to both point maximum & 0.1cc tolerances.

Technique Implementation & Outcomes

The 2# spine SABR technique was implemented in 3 pilot centres with existing spine SABR experience and technical capability. Two pilot centres are equipped with a VersaHD linac, and one with a Varian TrueBeam Edge stereotactic platform. All centres have robotic couches capable of moving with 6-degrees-of-freedom, enabling a 2mm PTV margin for spine SABR cases. Two centres employ daily & intrafraction CBCT IGRT for spine cases, and one centre employs both daily CBCT & ExacTrac 2D intrafraction IGRT. All patients were immobilised in an abdominal/thoracic setup, using a standard wing board and knee rest.

All contours & treatment plans were peer reviewed by a SABR Advisory Team clinician, as is standard for all complex SABR.

Since April 2021, 5 lesions have been treated with this technique. All cases were successfully planned within dosimetric constraints and met relevant conformity metrics. In 3 cases, a complete pain response was achieved 3 months post treatment, with an additional 2 cases reporting moderate pain relief at 3 weeks post treatment. One case reported grade 2 fatigue, with no other acute toxicity reported across the patient cohort.

Patient Pathway Challenges

The complexity of the spine SABR pathway & planning presents challenges when treating symptomatic spine metastases, due to the need for timely pain control. A 14 day turnaround target from MDT to treatment was set when the technique pilot was launched. This initial target was met in 2 cases, with a mean MDT to treatment time of 14.2 days across all cases.

The requirement for patients to have a Spinal Instability Neoplastic Score (SINS) assessed prior to referral acceptance caused delay for some patients, as this was not present at the point of MDT & further diagnostic imaging was required to verify patient suitability for SABR.

CT & MRI planning scans were mandatory for all cases, and reduced access to scanners in partner hospital sites caused further delay to the pathway in one case.

The requirement for peer review of all cases also caused some delay to patient pathway, due to the time requirement for multiple clinicians to review & edit contours prior to planning. The complexities of the cases referred for treatment also meant that the planning process was protracted, in order to provide the most optimal plan.

Conclusion

Initial experiences with the use of 2# spine SABR for painful spine metastases have been favourable, with positive reported outcomes & minimal reported acute toxicity. Long-term follow up data & a larger patient cohort will continue to inform the evaluation of this new technique. The safe delivery of this technique is built on a strong governance framework, existing spine SABR experience within the GenesisCare UK network, as well as a multi-disciplinary approach to all cases.

Delays to patient pathway continue to be monitored & mitigated where possible. Further discussions with referring clinicians on the requirement for a SINS assessment & a formalised pathway with a musculoskeletal radiologist will ensure this is in place for future referrals. A network approach to CT & MRI capacity will also be employed, with utilisation of spare diagnostic capacity in the GenesisCare network to enable the timely planning of patients where appropriate. The peer review process remains an integral part of the patient pathway and clear communication of expectations for patient planning dates is essential between the planning team, the referring clinician and the peer reviewer to ensure contours & plans are reviewed in good time.

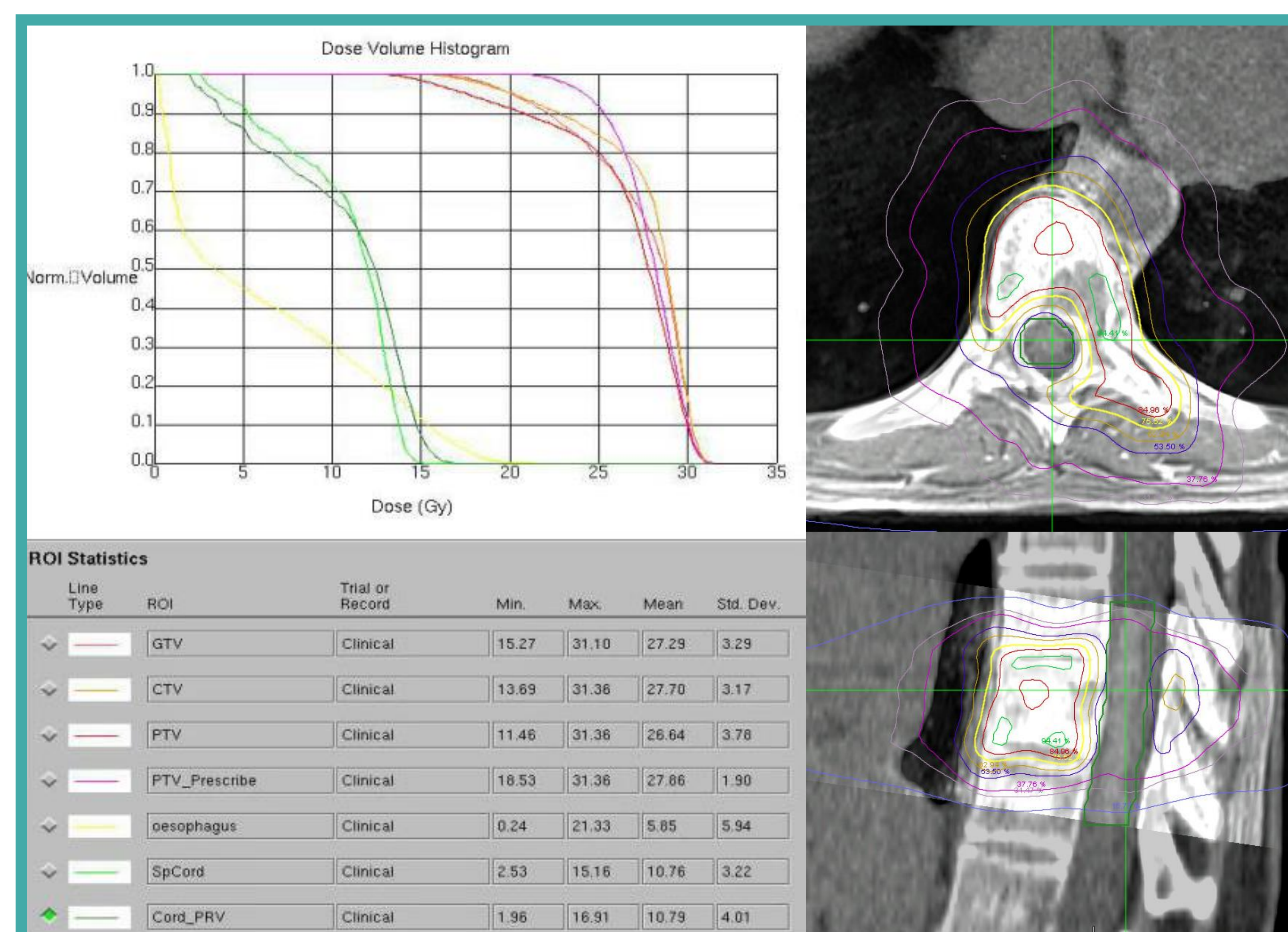


Figure 1) Dose distribution & Dose Volume Histogram of a 2# spine SABR case successfully planned to a point maximum dose to the cord PRV.