

Clinical Challenges and Pitfalls for SBRT

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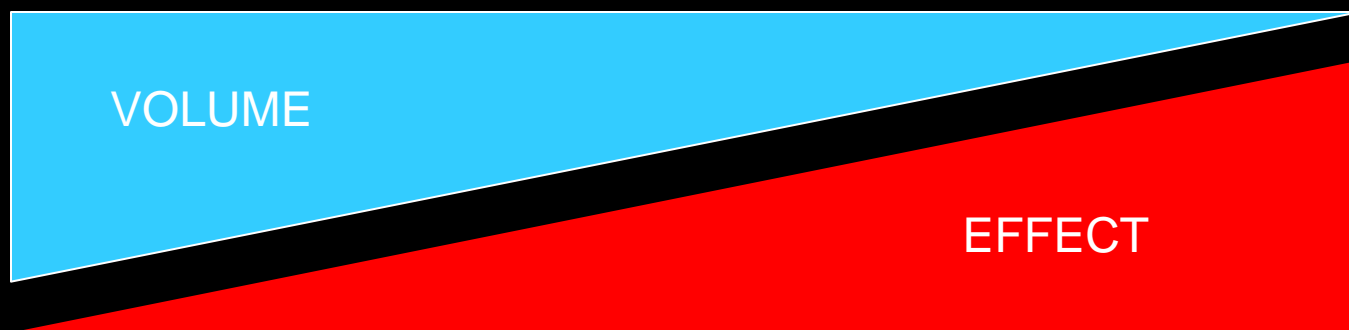
Radiation Oncology
UNIVERSITY OF TORONTO

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Therapeutic Modalities

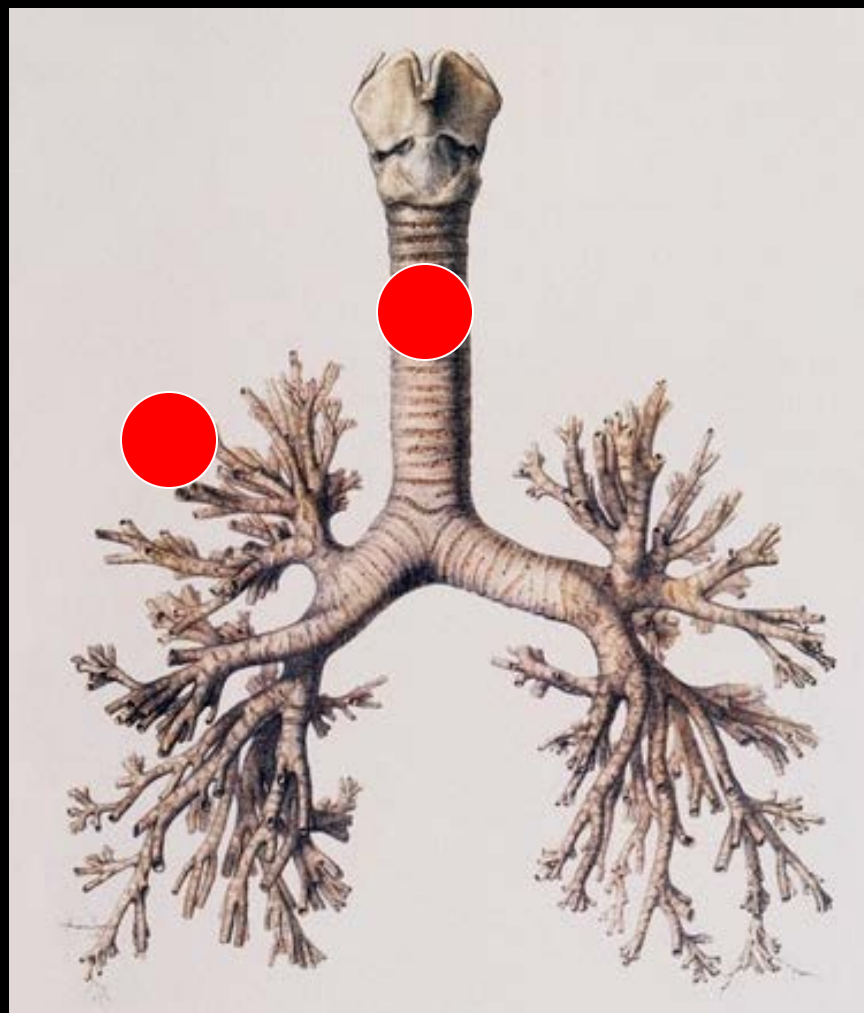


Chemo	Radiotherapy	Surgery
Systemic	Locoregional	Local

SBRT

- SBRT radioablative doses characterized by
 - extremely large dose per fraction
 - limited number of fractions (<5)
 - negligible fractionation effects
- any tissue receiving a full radioablative dose are
 - irreversibly damaged
 - negligible recovery and repair
- radioablation of normal tissue limits which organs can be safely treated with SBRT
 - serial vs. parallel

Organ at Risk Sparing



Organ at Risk Sparing

- lungs are have both serial and parallel organization
→ mixed
- ablation is tolerable only for parallel organs
 - redundancy needed
 - surgical resection of proximal bronchial tree only possible because ablated section repaired
- minimize toxicity by
 - constraining location of SBRT to peripheral lung → parallel
 - tight conformal dose distribution → steep dose gradients

Paraspinal SBRT

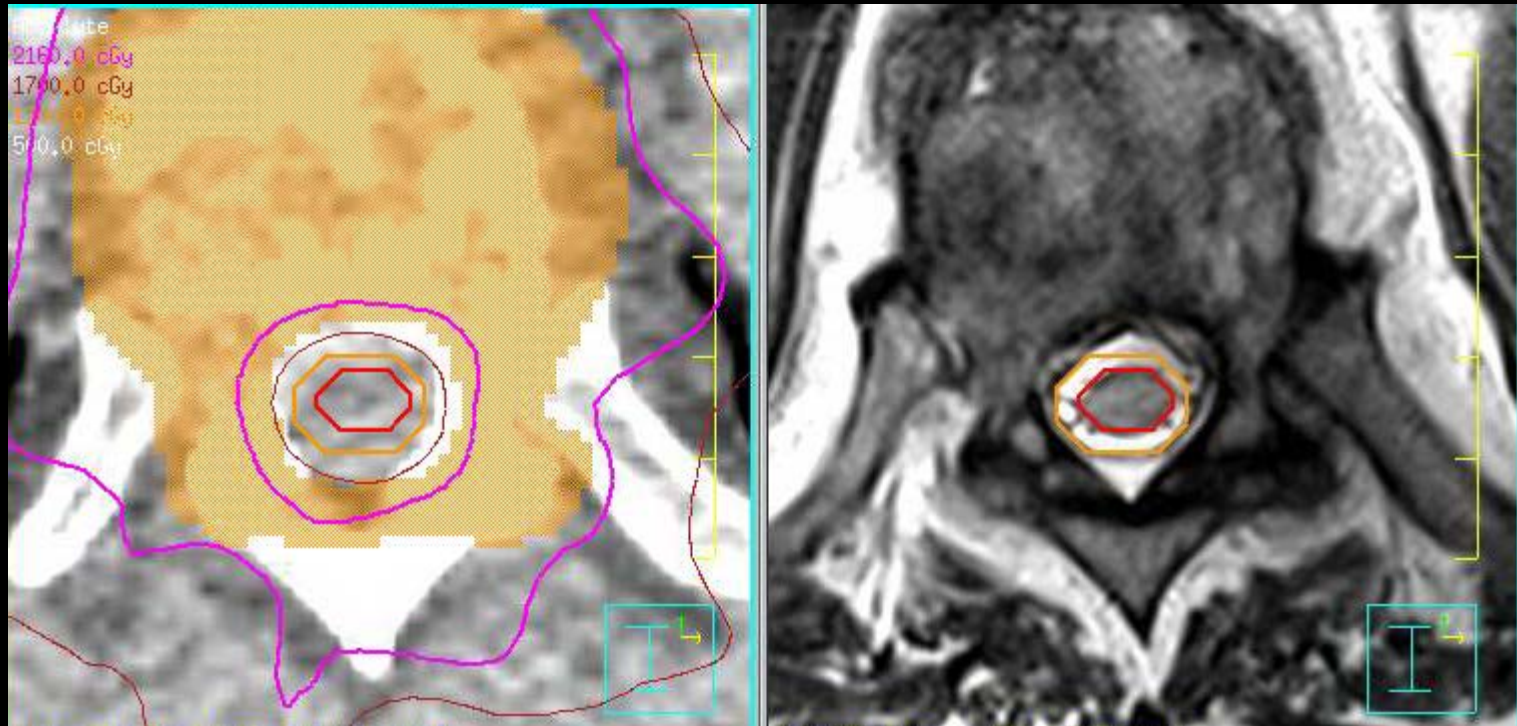
- because spinal cord is serial, SBRT technique tolerances used for parallel structures inadequate
- serial structures require very steep dose gradients to treat safely
- every link in therapeutic chain must be strong
 - immobilization: VacLok™, Vacuum Bag Cushion System
 - delineation: MR sim, myelogram
 - planning: VMAT
 - verification: IGRT, hexapod
 - delivery: high dose rate

Immobilization



Delineation

- accurate and precise spinal cord delineation critical (~1 mm) → MR sim, myelogram (hardware)
- tolerances for other links should be similarly tight
- PRV margin is 1.5 mm

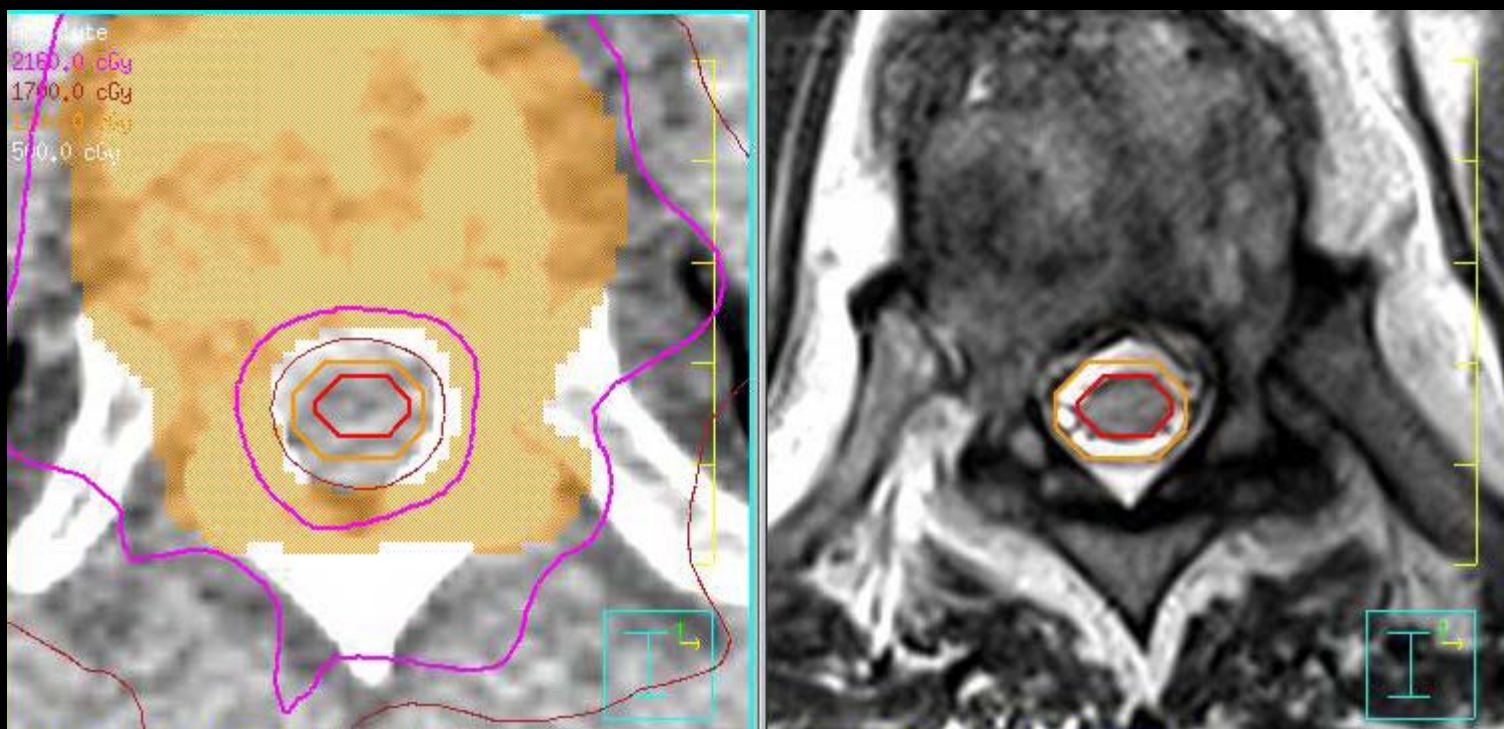


Planning

- VMAT uses continuous modulated arcs to deliver RT
- has better treating efficiency compared to step and shoot
- this, combined with high intensity dose rates, can significantly shorten overall treatment time
- risk of positional drift greater with
 - longer treatment times (>20 minutes)
 - poorer performance status patients

Verification

- paraspinal SBRT feasible only with IGRT
- tolerances tight (<1 mm, $<1^\circ$)
- corrected with hexpod
- most challenging are “donut” targets



Thank you for your attention