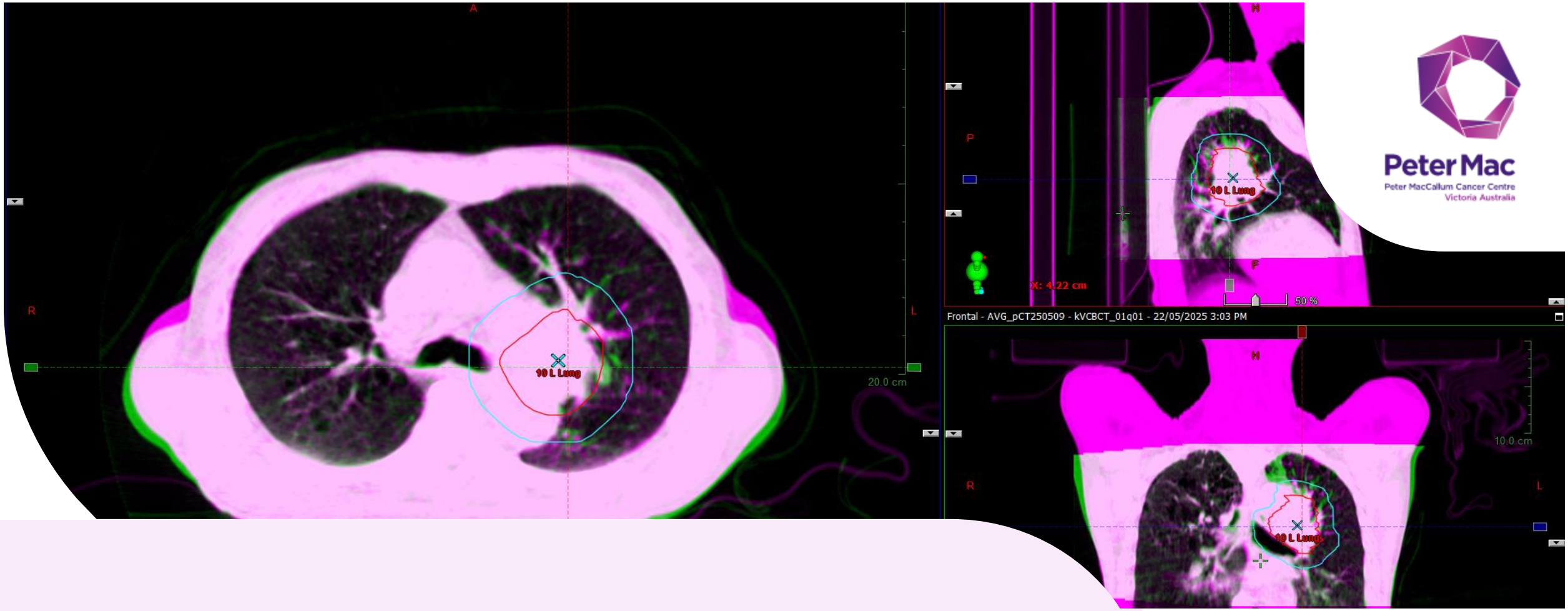

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Can SGRT in Lung SABR Eliminate the Need for VacBag Immobilisation?

Joshua Gozmao & Karen McGoldrick

Background

- Stereotactic Ablative Body Radiotherapy (SABR) for lung tumours requires accurate positioning to maximise tumour control and minimise radiation to healthy tissues.
- In the past Vacuum Bags (VacBag) were considered essential for SBRT treatments as they improved reproducibility.

Clinical Trial > J Med Imaging Radiat Oncol. 2014 Apr;58(2):244-52.
doi: 10.1111/1754-9485.12112. Epub 2013 Sep 16.

Vacuum immobilisation reduces tumour excursion and minimises intrafraction error in a cohort study of stereotactic ablative body radiotherapy for pulmonary metastases

Shankar Siva [1], Tomas Devereux, Tomas Kron, Suki Gill, Michael Macmanus, Mathias Bressel, Brent Chesson, Jason Callahan, Daniel Pham, Rodney Hicks, Farshad Foroudi, David Ball

Background

- The introduction of surface-guided radiotherapy (SGRT) has offered an alternative method to ensure accurate patient positioning without the need for a VacBag.
- Until now we have continued to use VacBag for SABR without challenging the need
- Why remove Vac Bags?

  Some of the challenges with VacBags include:

  - Difficulty for patients getting on/off the treatment couch
  - Complicating adjustment of patient positioning
  - Can cause AlignRT camera blockage
  - Can deflate if not stored properly or kept for a long period of time
  - Can lead to increase collision risks and cause patient protection interlock on the linac

VacBags

Other motivations for undertaking study:

- Purchase of Vacbags increases departmental costs
- Require significant space for storage
- Can be prone to leakage due unknown damage/holes prior to forming

Method

Study Design

- Retrospective cohort study
- 40 patients total – **2 Groups**:
  - **20 Lung SABR + VacBag**
  - **20 Radical lung (no VacBag)**
- Both groups used SGRT to setup the patient
- Only the 1st fraction was analysed to avoid bias from past decision making
- Variety of locations of lung tumours – Upper lobe, Middle Lobe & Lower lobe

SABR Lung Setup (VacBag) →

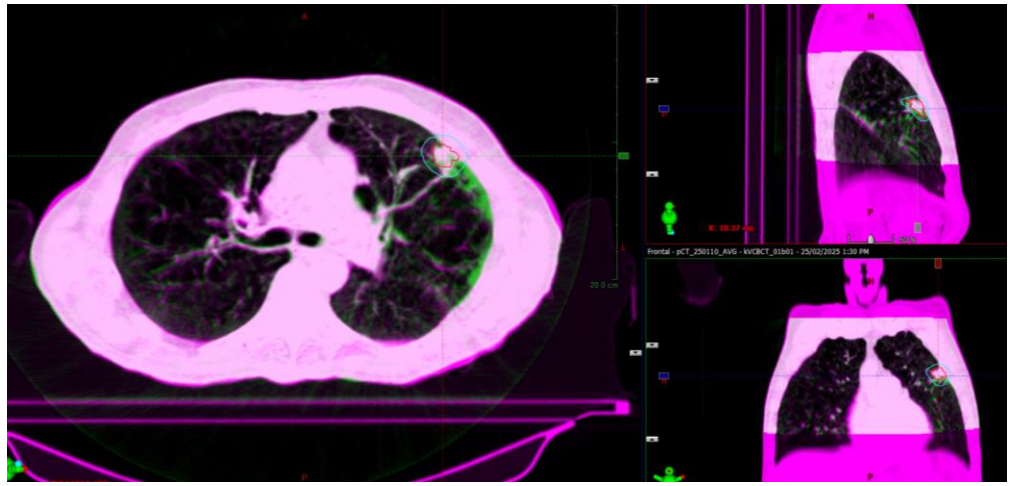
Radical Lung Setup (No VacBag) →

Method

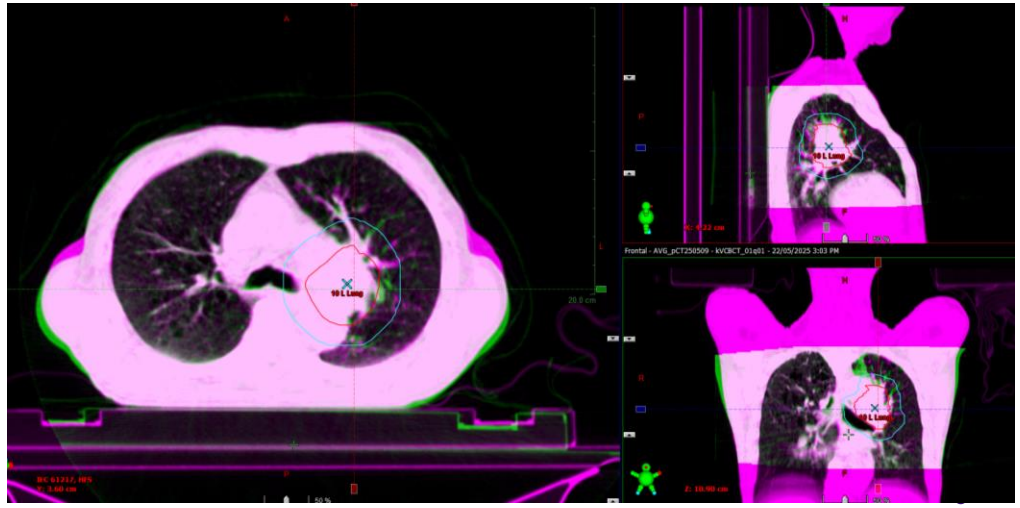
Imaging & Matching Criteria

- Analysed the overall IGRT shifts
- Both groups used soft tissue matching on CBCT.
  - Lung SABR + VacBag **– matched to GTV**
  - Radical Lung + No VacBag **– matched to mediastinum**
- The lung SABR (VacBag) group used the combined shift (kV shifts + CBCT shifts)
- Shifts were compared using all six degrees of freedom between both groups.

SABR Lung Match



Radical Lung Image Match



Results & Discussion

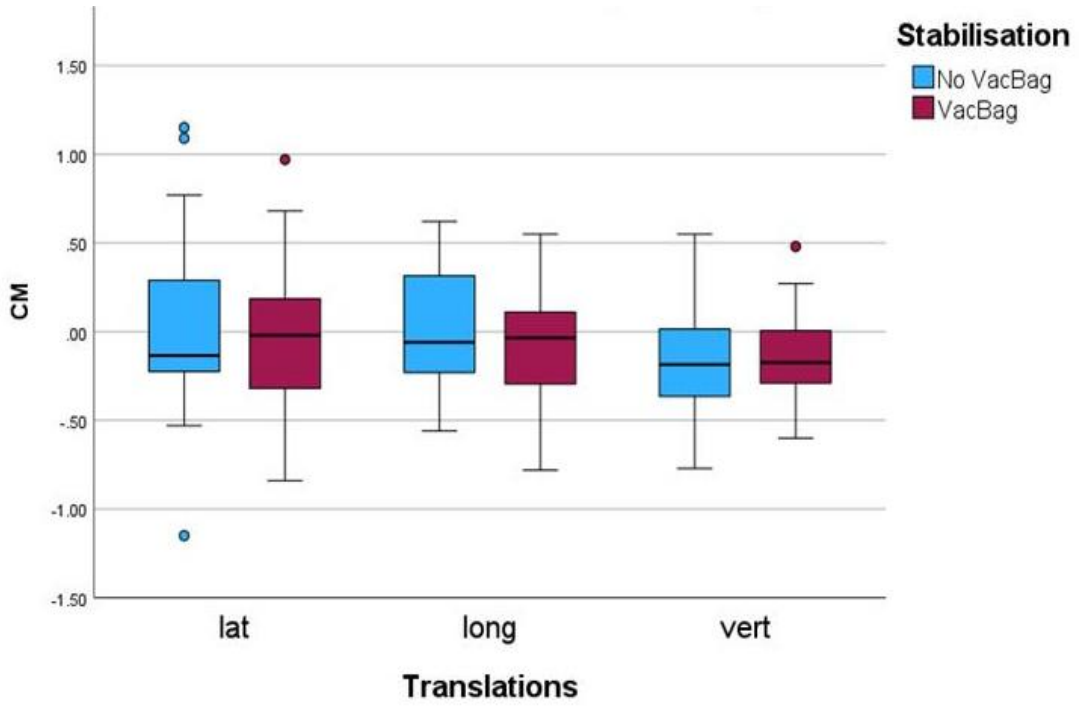


Figure 1: CBCT Translation Shifts

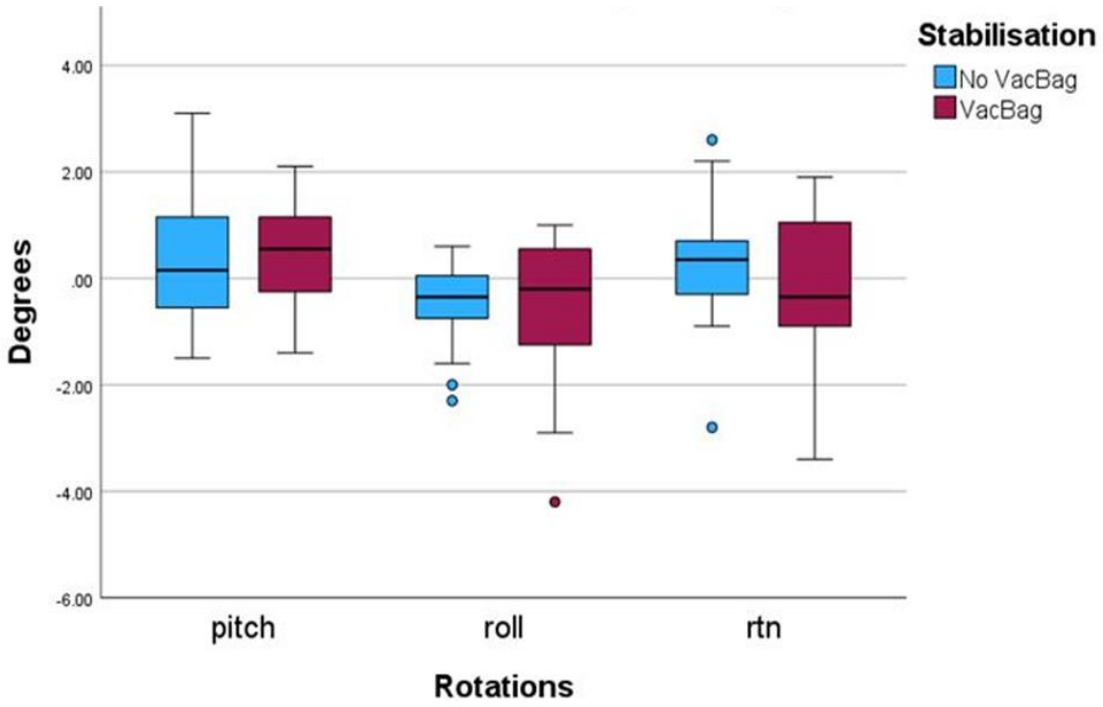


Figure 2: CBCT Rotation Shifts

Results & Discussion

Table 1: Median translations & rotations for VacBag and No VacBag groups.

Metric	Median (IQR)		P-Value	Null Hypothesis
	VacBag	No VacBag		
Vrt (cm)	-0.18 (0.28)	-0.19 (0.37)	0.779	The distribution of **Vrt** is the **same** across categories of stabilisation
Lng (cm)	-0.02 (0.44)	-0.14 (0.50)	0.947	The distribution of **Lng** is the **same** across categories of stabilisation
Lat (cm)	-0.04 (0.39)	-0.06 (0.50)	0.495	The distribution of **Lat** is the **same** across categories of stabilisation
Pitch (deg)	0.55 (1.35)	0.15 (1.65)	0.529	The distribution of **Pitch** is the **same** across categories of stabilisation
Roll (deg)	-0.20 (1.70)	-0.35 (0.75)	0.698	The distribution of **Roll** is the **same** across categories of stabilisation
Rtn (deg)	-0.35 (1.88)	0.35 (0.95)	0.127	The distribution of **Rtn** is the **same** across categories of stabilisation

Conclusion & What's next

Conclusion

- SGRT offers comparable accuracy in patient positioning both with and without VacBags.
- The findings support SGRT's potential as a sole method to ensure patient-positioning accuracy for lung SABR treatments.

What's Next?

- Retrospective study - Collect data from AlignRT Real-time deltas (RTDs) to assess intrafraction motion with & without VacBag immobilisation.
- Future Prospective study – Lung SABR treatments without VacBags to analyse both IGRT Shifts & Collect AlignRT RTDs to assess intrafraction motion and patient positioning.

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