

AIM

To evaluate the impact of the distance between treatment isocentre and brain metastases (BM) on local failure in patients treated with frameless single-isocentre multiple target (SIMT) dynamic conformal arc stereotactic radiosurgery (SRS) using a 0mm PTV margin for multiple (≥ 4) BM.

METHODS & MATERIALS

- **Design:** Retrospective single institution cohort; ethics approved; all patients with ≥ 4 BM at Chris O'Brien Lifehouse, Jan 2018 – Dec 2019
- **Technique:** Frameless SIMT dynamic conformal arc SRS; 6DOF couch correction; planned in Brainlab Elements
- **Margin:** 0 mm GTV→PTV; single fraction for all lesions
- **Endpoint:** Local recurrence-free survival (LRFS) per lesion vs. distance from isocentre
- **Statistics:** Univariate logistic regression for local failure vs. distance from isocentre, PTV volume, prescribed dose, and max dose relative to prescription (%)
- **Follow-up:** MRI surveillance at regular intervals; response per modified RANO-BM criteria

RESULTS - COHORT

34

Patients treated

232

Brain metastases treated

16.5

Months median follow-up
(range 0.7–48.1)

53%

Patients with ≥ 6 BM per plan

88.4%

Local control rate across 232 lesions

RESULTS - LOCAL CONTROL

- Recurrence in 27/232 lesions (11.6%).
- Median LRFS 17.3 months (95% CI 15.8–18.1 months).
- No clustering of failures at greater distances from isocentre.

UNIVARIATE ANALYSIS

| Predictor | p-value | Result |
|-----------------------------|---------|--------|
| Distance from isocentre | p = 0.6 | NS |
| PTV volume | p > 0.9 | NS |
| Prescribed dose | p = 0.4 | NS |
| Max dose relative to Rx (%) | p = 0.3 | NS |

NS = not statistically significant. No predictor (including isocentre distances up to 9.2 cm) was associated with local failure on univariate logistic regression.

TREATMENT CHARACTERISTICS

- **Prescribed dose:** 20 Gy most common (145/232 lesions; 63%)
- **Median PTV volume:** 0.16 cm³ (range 0.015–19.3 cm³)
- **Median isocentre distance:** 4.3 cm (range 0.5–9.2 cm)
- **GTV→PTV margin:** 0 mm applied to all lesions

CONCLUSION

Frameless SIMT SRS for ≥ 4 BM achieved 88.4% local control with a 0 mm PTV margin - isocentre distance did not predict failure, supporting its routine use for multiple intracranial targets.

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