

Dose comparison of radiation treatment planning in Multiple metastasis: MONACO vs RAYSTATION

Dong-Min Jung, Jong-Geol Baek, Jeong-Hee Cho
Yonsei Cancer Center, Republic of Korea

Introduction

- In the multiple metastasis case, the low dose region increases due to the gap between targets.
- And it can add unnecessary dose to the normal organ.

Purpose

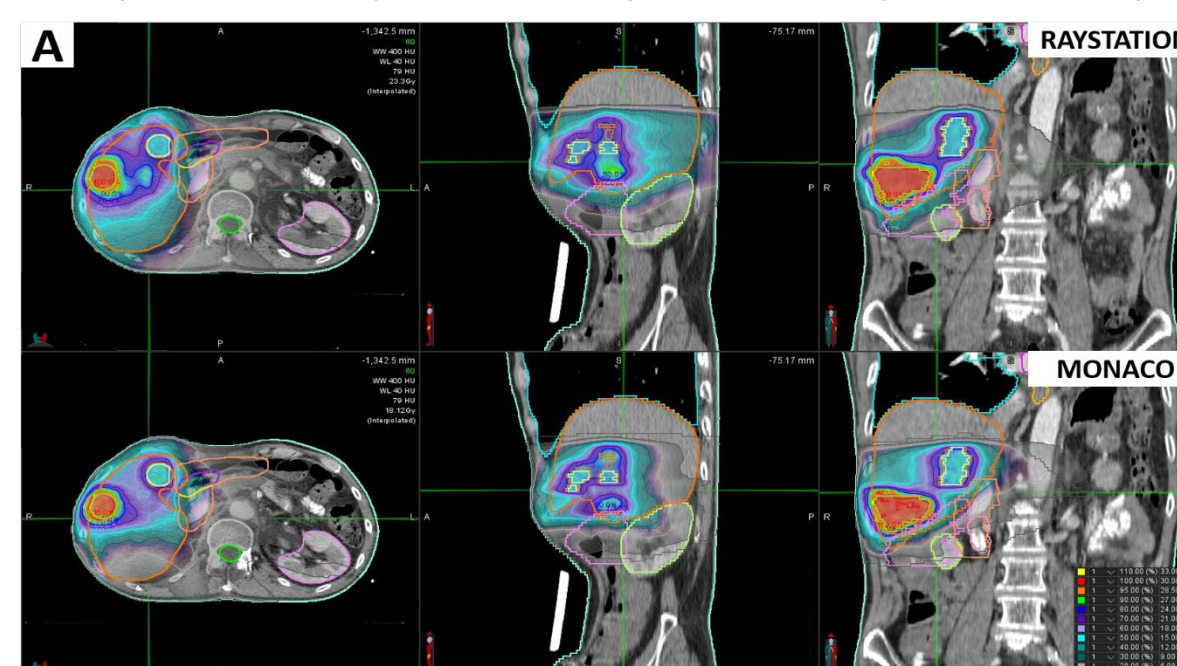
- This study aimed to compare the low-dose regions in Multiple metastasis cases using a separated target field.

Material and Methods

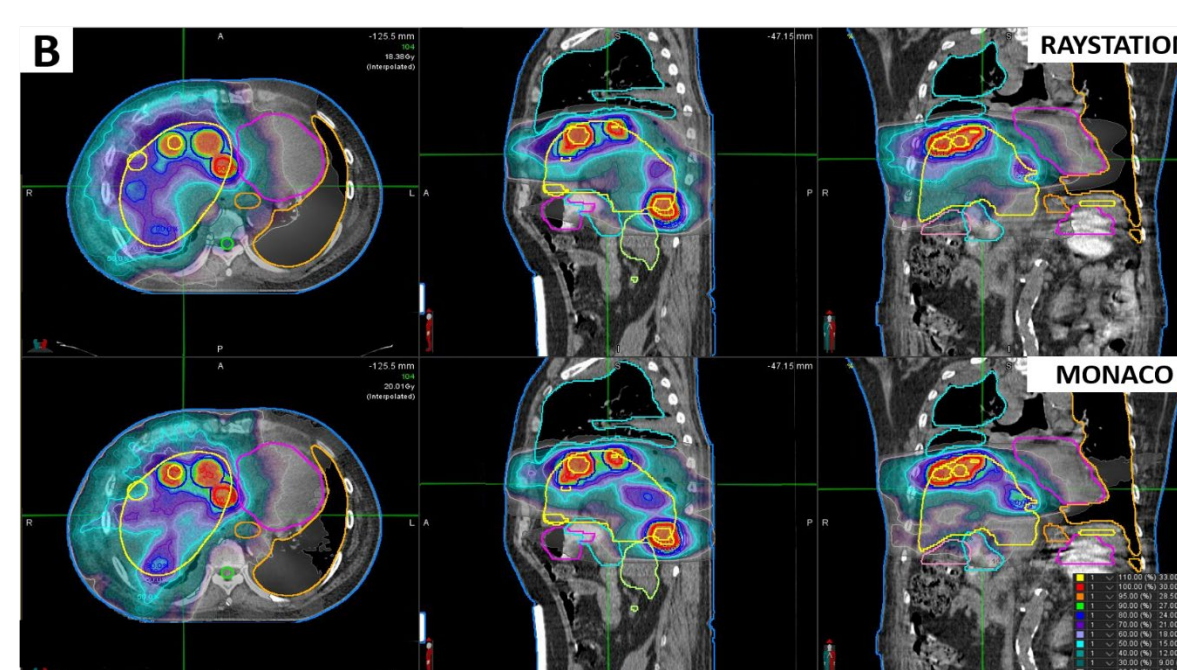
- The volume of the low-dose region, which received 70 –10% of the prescribed dose(intersected with external body), was compared and analyzed in three Multiple metastasis cases (3 to 4 targets) according to two treatment plans: one using a separated target field and one not using a separated target field.
- MONACO(ver 5.11.03) : using a separated target field
- RAYSTATION(ver 5.0.3.17): not using a separated target field

Results

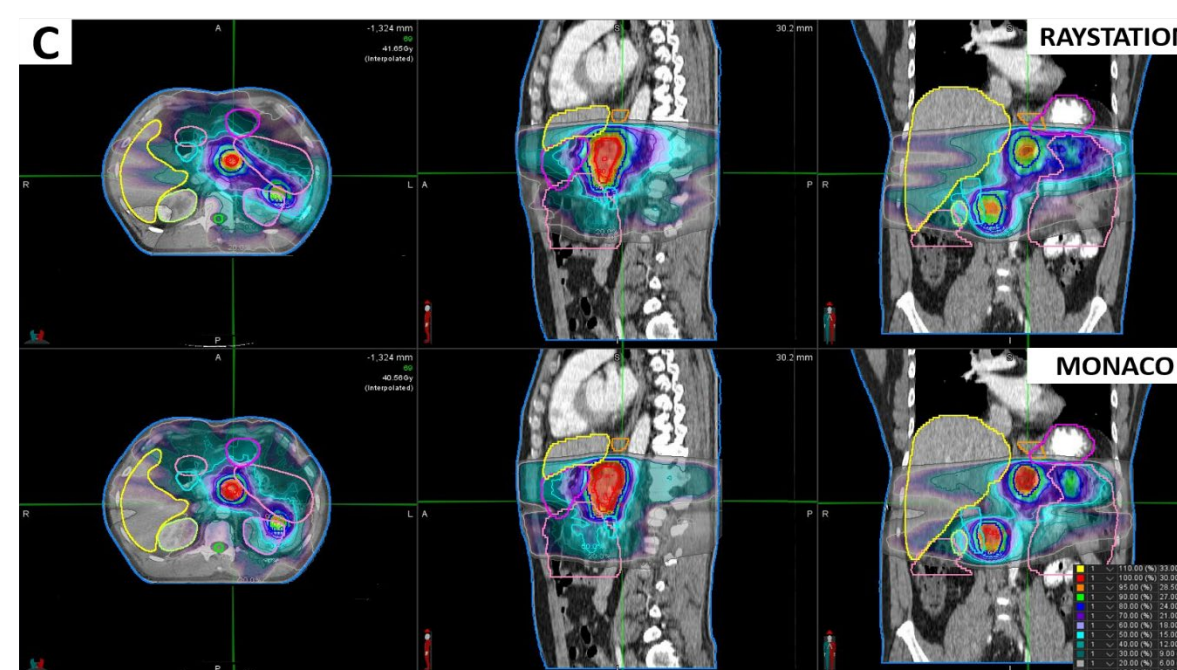
- In case A (target volume: 149.39 cc), the volumes with a dose between 70% and 10% of the prescribed dose with RAYSTATION were 318.53, 436.81, 599.18, 840.44, 1209.25, 1835.82, and 3262.65 cc, whereas those with MONACO were 268.78, 360.18, 490.35, 674.65, 963.63, 1448.4, and 2592.67 cc.



- In case B (target volume: 339.77 cc), the volumes with a dose between 70% and 10% of the prescribed dose with RAYSTATION were 640.08, 940.33, 1427.26, 2093.53, 3132.94, 4690.6, and 7481.6 cc, whereas those with MONACO were 589.64, 813.16, 1212.62, 1818.21, 2736.14, 4128.32, and 6850.49 cc.



- In case C (target volume: 220.72 cc), the volumes with a dose between 70% and 10% of the prescribed dose with RAYSTATION were 705.1, 950.53, 1330.6, 2022.41, 3348.13, 5709.82, and 8257.94 cc, whereas those with MONACO were 499.51, 697.98, 1034.29, 1783.83, 3072.87, 5178.46, and 7583.86 cc.



A	Dose	TPS	21Gy(70%)	18Gy(60%)	15Gy(50%)	12Gy(40%)	9Gy(30%)	6Gy(20%)	3Gy(10%)
	Volume(cc)	RAYSTATION		318.53	436.81	599.18	840.44	1209.25	1835.82
MONACO			268.78	360.18	490.35	674.65	963.63	1448.4	2592.67
diff (cc)			49.75	76.63	108.83	165.79	245.62	387.42	669.98
B	Dose	TPS	24.5Gy(70%)	21Gy(60%)	17.5Gy(50%)	14Gy(40%)	10.5Gy(30%)	7Gy(20%)	3.5Gy(10%)
	Volume(cc)	RAYSTATION		640.08	940.33	1427.26	2093.53	3132.94	4690.6
MONACO			589.64	813.16	1212.62	1818.21	2736.14	4128.32	6850.49
diff (cc)			50.44	127.17	214.64	275.32	396.8	562.28	631.11
C	Dose	TPS	35Gy(70%)	30Gy(60%)	25Gy(50%)	20Gy(40%)	15Gy(30%)	10Gy(20%)	5Gy(10%)
	Volume(cc)	RAYSTATION		705.1	950.53	1330.6	2022.41	3348.13	5709.82
MONACO			499.51	697.98	1034.29	1783.83	3072.87	5178.46	7583.86
diff (cc)			205.59	252.55	296.31	238.58	275.26	531.36	674.08

Conclusion

- The low-dose region was decreased by about 7–29% with the MONACO treatment plan, which used a separated target field, compared to that with the RAYSTATION treatment plan, which did not use a separated target field.
- These results suggest that using the separated target field can reduce the low-dose region by island blocking.
- Although the RAYSTATION plan used for this study did not have this feature, it is available in the new version of this product, which would be useful in reducing the low-dose region in Multiple metastasis cases.



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