

Stereotactic Body Radiation Therapy versus Conventional External Beam Radiation Therapy for Painful Bone Metastases: A Systematic Review and Meta-analysis of Randomized Trials

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SBRT significantly improved complete but not overall pain response rates at 3 months in patients with painful bone metastases, compared to cEBRT.

INTRODUCTION

- The magnitude of benefit and toxicity of stereotactic body radiation therapy (SBRT) compared with conventional external beam radiation therapy (cEBRT) in treating symptomatic bone metastases is unclear due to the conflicting results from randomized controlled trials (RCTs).
- We performed a systematic review and meta-analysis to compare the efficacy and safety of SBRT and cEBRT in patients with previously unirradiated painful bone metastases.

METHODS

- Various databases and major oncologic conference proceedings up to October 2021 were searched for eligible RCTs.
- The outcomes of interest were efficacy (overall and complete pain response rates, local progression, overall survival (OS) and quality of life (QoL)) and safety (post-irradiation fractures, pain flares and radiation myelopathy).
- The methodologic quality of individual trials was assessed using the revised Cochrane risk-of-bias (RoB2) tool.
- Meta-analysis was performed using random effects frequentist model.
- Synthesis Without Meta-analysis (SWiM) approach was adopted to summarize adverse events and quality of life outcomes.
- The certainty of the evidence for the efficacy outcomes was assessed using GRADE approach.

RESULTS

- Six RCTs including 894 patients were identified.
- Five of the included trials had low risk of bias.
- There was no significant difference in overall pain response rates at 3 months between SBRT and cEBRT (odds ratio (OR), 1.10; 95% confidence interval (CI), 0.84-1.44; P, 0.48; GRADE, moderate certainty).
- SBRT significantly improved complete pain response rates at 3 months (OR, 3.38; 95% CI, 1.88-6.07; P < 0.01; GRADE, high certainty) and reduced local progression rates (OR, 0.15; 95% CI, 0.04-0.53; P < 0.01; GRADE, high certainty), compared to cEBRT.
- SBRT was associated with a modest increase in pain flare rates, compared to cEBRT.
- There were no significant differences between the two groups in OS, QoL, post-irradiation fracture and radiation myelopathy.

CONCLUSION

- Compared to cEBRT, SBRT significantly improved complete but not overall pain response rates at 3 months and delayed local progression in patients with painful bone metastases, without adversely impacting on the quality of life and overall survival, at the expense of a modestly increased risk of pain flare.

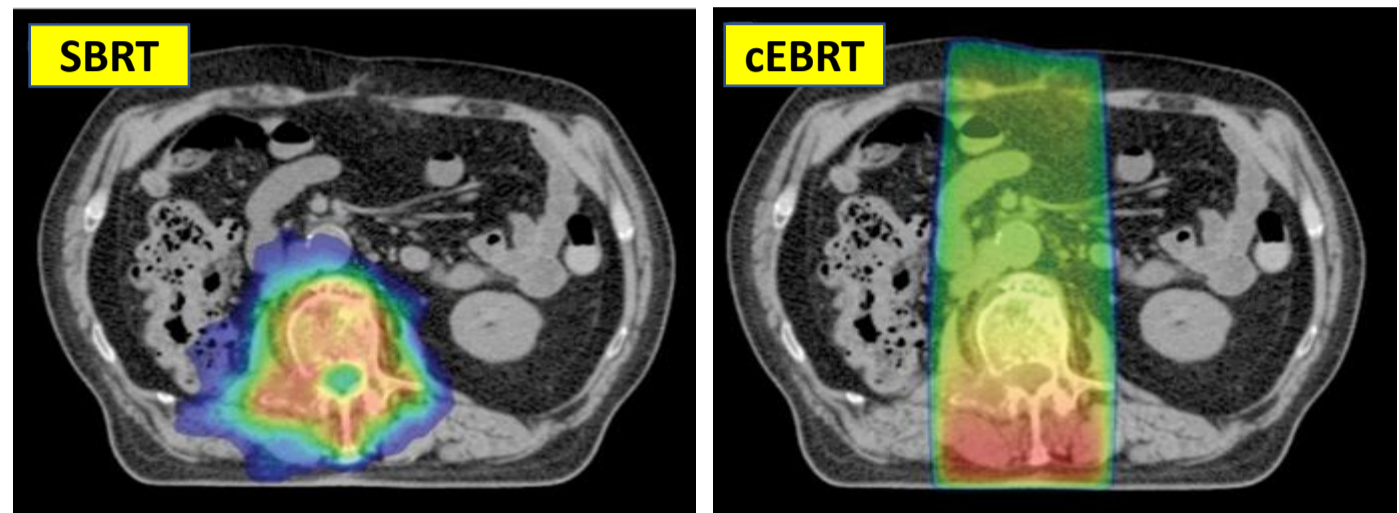


Table 1: Baseline Characteristics of the Included Trials

First author, year	Sample size	Dose Fractionation		Spinal metastasis
		SBRT arm	cEBRT arm	
Sprave, 2018	55	24Gy in 1 fraction	30Gy in 10 fractions	100%
Nguyen, 2019	160	12Gy in 1 fraction (> 4cm) 16Gy in 1 fraction (≤4 cm)	30Gy in 10 fractions	4%
Ryu, 2019	339	16Gy or 18Gy in 1 fraction	8Gy in 1 fraction	100%
Sakr, 2020	22	27Gy in 3 fractions	20Gy in 5 fractions	Not reported
Pielkenrood, 2020	89	18Gy in 1 fraction 30Gy in 3 fractions 5Gy in 5 fractions	8Gy in 1 fraction 20Gy in 5 fractions 30Gy in 10 fractions	55%
Sahgal, 2021	229	24Gy in 2 fractions	20Gy in 5 fractions	100%

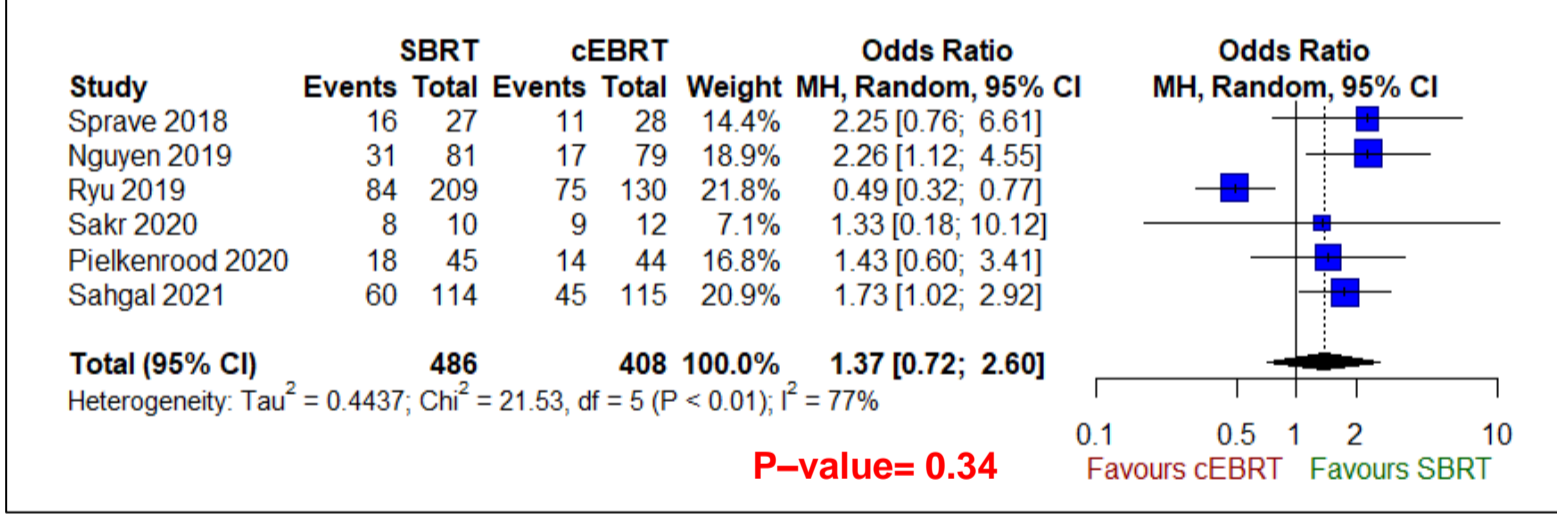


Figure 1: Forest Plot on Overall Pain Response Rates at 3 Months

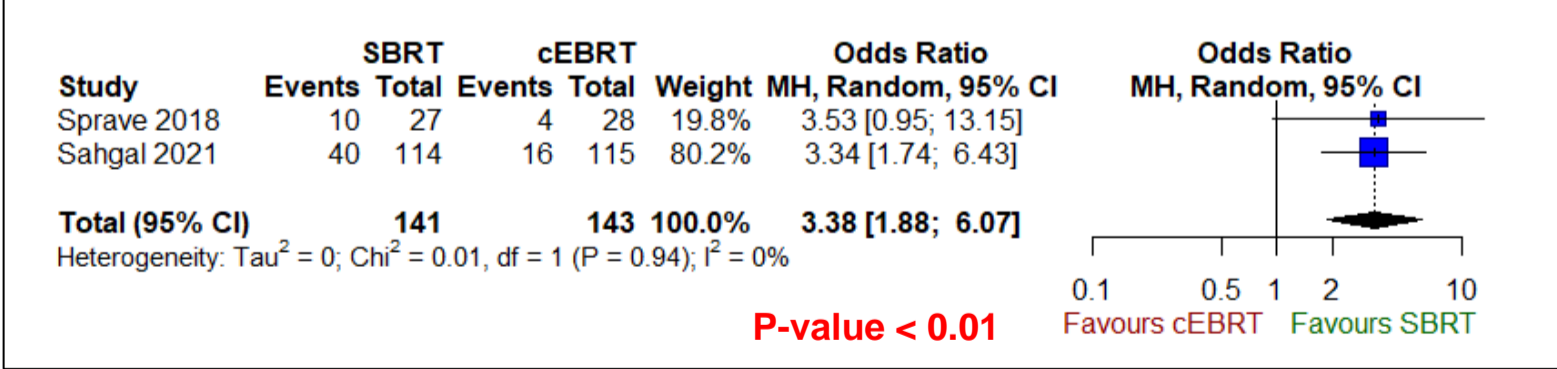


Figure 2: Forest Plot on Complete Pain Response Rates at 3 Months

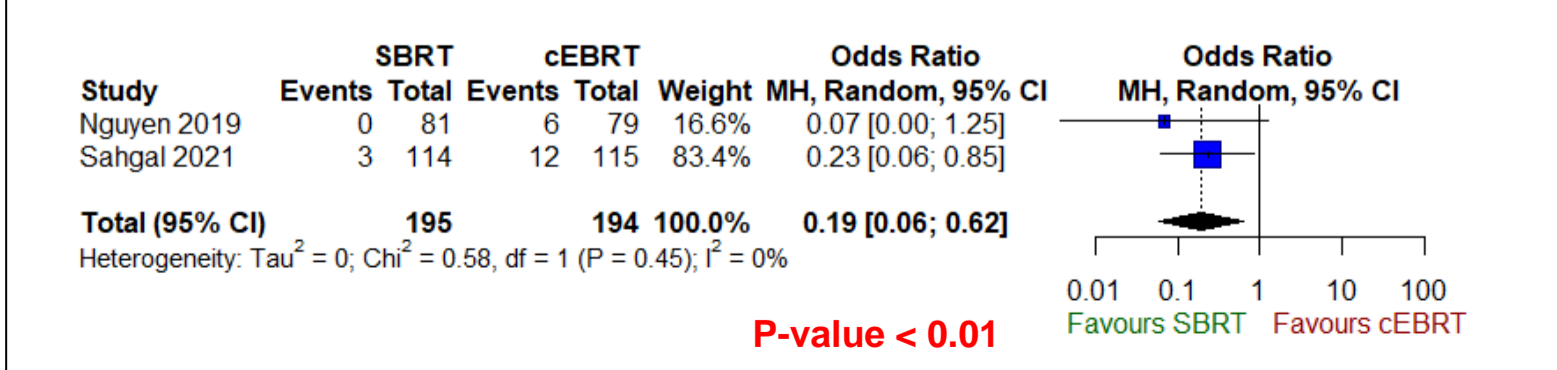


Figure 3: Forest Plot on Local Progression