Multifraction stereotactic radiosurgery

Multifraction stereotactic radiosurgery (MF-SRS) purportedly reduces radionecrosis risk over single fraction SRS (SF-SRS) in the treatment of large brain metastases. The purpose of the current work is to compare local control (LC) and radionecrosis rates of SF-SRS and MF-SRS in the definitive (SF-SRSD and MF-SRSD) and postoperative (SF-SRSP and MF-SRSP) settings.

PICOS/PRISMA/MOOSE guidelines were used to select articles where patients: diagnosed with “large” brain metastases (Group A: 4-14 cm3, or about 2-3 cm; Group B: >14 cm3, or > 3 cm); 1-year LC and/or rates of radionecrosis were reported; radiosurgery was administered definitively or postoperatively. Random effects meta-analyses using fractionation scheme and size as covariates were conducted. Meta-regression and Wald-type tests were used to determine the effect of increasing tumor size and fractionation on the summary estimate, where the null hypothesis was rejected for $p<0.05$.

RESULTS: Twenty-four studies were included, published between 2008-2017 with 1,887 brain metastases. Local control random effects estimate at 1-year for Group A/SF-SRSD was 77.6% and for Group A/MF-SRSD was 92.9% (p=0.18). Local control random effects estimate at 1-year for Group B/SF-SRSD was 77.1% and for Group B/MF-SRSD was 79.2% (p=0.76). Local control random effects estimate at 1-year for Group B/SF-SRSP was 62.4% and for Group B/MF-SRSP was 85.7% (p=0.13). Radionecrosis incidence random effects estimate for Group A/SF-SRSD was 23.1% and for Group A/MF-SRSD was 7.3% (p=0.003). Radionecrosis incidence random effects estimate for Group B/SF-SRSD was 11.7% and for Group B/MF-SRSD was 6.5% (p=0.29). Radionecrosis incidence random effects estimate for Group B/SF-SRSP was 7.3% and for Group B/MF-SRSP was 7.5% (p=0.85). Meta-regression assessing 1-year LC and radionecrosis as a continuous function of increasing tumor volume was not statistically significant.

CONCLUSION: Treatment for large brain metastases with MF-SRS regimens may offer a relative reduction of radionecrosis while maintaining or improving relative rates of 1-year LC when compared to SF-SRS. These findings are hypothesis-generating and require validation by ongoing and planned prospective randomized control trials [1)].

See

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