Life years lost-comparing potentially fatal late complications after radiotherapy for pediatric medulloblastoma on a common scale.

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Abstract

BACKGROUND: The authors developed a framework for estimating and comparing the risks of various long-term complications on a common scale and applied it to 3 different techniques for craniospinal irradiation in patients with pediatric medulloblastoma.

METHODS: Radiation dose-response parameters related to excess hazard ratios for secondary breast, lung, stomach, and thyroid cancer; heart failure, and myocardial infarction were derived from large published clinical series. Combined with age-specific and sex-specific hazards in the US general population, the dose-response analysis yielded excess hazards of complications for a cancer survivor as a function of attained age. After adjusting for competing risks of death, life years lost (LYL) were estimated based on excess hazard and prognosis of a complication for 3-dimensional conformal radiotherapy (3D CRT), volumetric modulated arc therapy (VMAT), and intensity-modulated proton therapy (IMPT).

RESULTS: Lung cancer contributed most to the estimated LYL, followed by myocardial infarction, and stomach cancer. The estimates of breast or thyroid cancer incidence were higher than those for lung and stomach cancer incidence, but LYL were lower because of the relatively good prognosis. Estimated LYL ranged between 1.90 years for 3D CRT to 0.28 years for IMPT. In a paired comparison, IMPT was associated with significantly fewer LYL than both photon techniques.

CONCLUSIONS: Estimating the risk of late complications is associated with considerable uncertainty, but including prognosis and attained age at an event to obtain the more informative LYL estimate added relatively little to this uncertainty.