



Editorial: Radiotherapy for prevention for pathological femoral fractures

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In this paper, “*Prophylactic single fraction radiotherapy for the prevention of pathologic femoral fractures*”, Ewongwo *et al.* discuss the use of conventional, single-dose palliative radiation for prophylaxis of femoral fractures (1). In recent decades, there has been steady progress in our understanding of palliative radiotherapy (RT) for bone metastases. In 2005, Hartsell *et al.* conducted a phase III, randomized trial comparing long-course palliative RT (30 Gy in 10 fractions) to single fraction treatment (8 Gy in 1 fraction). Of note, they found no difference in pain control between the arms, with a low rate of pathologic fracture (5% *vs.* 4%, respectively). The major difference between these approaches was the rate of re-treatment, which was higher in the 8 Gy arm (2). With the advent of stereotactic body radiotherapy (SBRT), other investigators looked into this new modality for palliation. While primarily used for bone metastases in the spine, studies thus far have been contradictory regarding the utility of SBRT in this setting. A trial comparing 16–18 Gy in 1 fraction (SBRT) to 8 Gy in 1 fraction (conventional RT) showed no difference in pain scores (3). However, a separate trial comparing 24 Gy in 2 fractions (SBRT) to 20 Gy in 5 fractions (conventional RT) showed a decrease in pain scores for the SBRT arm (4). Specifically for non-spine bone metastases, a phase II trial showed improved pain response for 12–16 Gy in 1 fraction

(SBRT) versus 30 Gy in 10 fractions (conventional RT) (5). However, these studies have generally evaluated pain response and local control, whereas pathologic fracture rates and functional outcomes are typically secondary or exploratory endpoints.

In patients without bone pain, there is a lack of evidence to guide radiation oncologists. While there is ongoing study into the utility of RT in the oligometastatic setting, we do not know how to best manage asymptomatic bone metastases with RT for diffuse disease. The authors of this study hypothesize that palliative RT could be used for high-risk bone metastases as prophylaxis against catastrophic pathologic fractures. For example, hip fracture alone can lead to a severe decline in quality of life. Prophylactic RT to prevent such outcomes is therefore worth investigating (6,7). Of the 28 bone lesions treated with 8 Gy in 1 fraction on this study, no subsequent fractures occurred in-field. These findings suggest that palliative RT may have a role in the prevention of pathologic fractures of the femur. However, the authors recognize that the small sample size of 27 patients, as well as the retrospective design, limit the ability to draw firm conclusions or apply these findings to general practice.

In addition to the work by these authors, a similar study was presented in abstract form at the 2022 American

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Society of Radiation Oncology meeting; the authors of that phase II study found that prophylactic palliative RT to asymptomatic bone metastases decreased skeletal events, such as pathologic fracture (8). While we await the full publication of that study, we expect the outcome of both works to support ongoing research into this application of palliative RT. The next logical step would be a larger, phase III trial to determine the management of high-risk sites of bony metastasis using palliative RT, regardless of symptoms or oligometastatic state.

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