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Bones

Stereotactic body radiation therapy for metastases in long bones

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PURPOSE

To evaluate the cumulative incidence of fracture and local failure and associated risk factors after stereotactic body radiation therapy (SBRT) for long bone metastases.

METHODS AND MATERIALS

Data from 111 patients with 114 metastases in the femur, humerus, and tibia treated with SBRT in seven international centers between October 2011 and February 2021 were retrospectively reviewed and analysed using a competing risk regression model.

RESULTS

The median follow-up was 21 months (range, 6.0-91 months). All but one patient had a Karnofsky performance status ≥ 70 . There were 84 femur (73.7%), 26 humerus (22.8%), and four tibia (3.5%) metastases from prostate (45 [39.5%]), breast (22 [19.3%]), lung (15 [13.2%]), kidney (13 [11.4%]), and other (19 [16.6%]) malignancies. Oligometastases accounted for 74.8% of metastases and 28.1% were osteolytic. The most common total doses were 30 to 50 Gy in five daily fractions (50.9%). Eight fractures (five in the femur, two in the tibia, and one in the humerus) were observed with a median time to fracture of 12 months (range, 0.8-33 months). In six out of eight patients, fracture was not associated with local failure. The cumulative incidence of fracture was 3.5%, 6.1%, and 9.8% at one, two, and three years, respectively. The cumulative incidence of local failure (9/110 metastases with imaging follow-up) was 5.7%, 7.2%, and 13.5% at one, two, and three years, respectively. On multivariate analysis, extraosseous disease extension was significantly associated with fracture ($P = .001$; subhazard ratio, 10.8; 95% confidence interval, 2.8-41.9) and local failure ($P = .02$; subhazard ratio, 7.9; 95% confidence interval, 1.4-44.7).

CONCLUSIONS

SBRT for metastases in long bones achieved high rates of durable local metastasis control without an increased risk of fracture. Similar to spine SBRT, patients with extraosseous disease extension are at higher risk of local failure and fracture.