

Radiologic Progression of Vertebral Fractures in Patients with Multiple Myeloma

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Introduction

Multiple myeloma (MM) is a neoplasm of plasma cells with an annual incidence of 6 per 100,000 US adults. 80% of patients diagnosed with MM have radiographic bony lesions; 55-70% of MM patients will suffer vertebral fractures. These patients suffer a poorer quality of life as measured by the Oswestry Disability Index, pain visual analog scale, and Roland Disability Questionnaire.

Abstract

Nearly 70% of patients with multiple myeloma (MM) suffer vertebral fractures. However, no studies have investigated the progression of these fractures. A consecutive retrospective study was conducted of patients diagnosed with MM and vertebral fracture at CCF from 1/2007-12/2013. Radiographic data were collected from T1-weighted MRI. Anterior, middle, and posterior vertebral body height losses were recorded at baseline and each follow-up.

33 patients with 67 fractures were included. At baseline, mean anterior, middle, and posterior vertebral body height losses were 30%, 36%, and 15%, respectively; 43% of fractures were Genant grade 3. At last follow-up (LFU), mean anterior, middle, and posterior vertebral body height losses increased (p<0.001) to 45%, 46%, and 26%, respectively, with more grade 3 fractures (67%, p=0.01). Patients lost an additional average of 0.83% in vertebral body height per month, with Genant grade 1 fractures losing height more rapidly (1.69%/month) than Genant grade 2 (0.75%/month, p<0.05) and Genant grade 3 (0.49%/month, p<0.01) fractures. Thoracic fractures were more severe than lumbar fractures at baseline (41% vs. 33% height loss, p=0.09) and at LFU (58% vs. 46%, p=0.02). Patients treated with bisphosphonates suffered less additional vertebral body height loss following presentation compared with untreated patients (14% vs. 24%, p=0.07).

Methods

A consecutive retrospective chart review of all patients with MM at a single tertiary-care institution was conducted. Baseline demographic, comorbidity, and fracture data were collected at presentation with vertebral fracture. Radiologic data were collected from midline-sagittal T1-weighted MRI. At baseline and each follow-up, anterior, middle, and posterior vertebral body height losses were recorded.



Radiographic examples of vertebral fractures and measuring methodology. (a) T4 grade 1 wedge. (b) T2 grade 3 biconcave. (c) T10 grade 2 crush.



Average vertebral body height loss over time for each individual fractured vertebra (gray) and averaged (black).



Change in fracture severity over time measured by Genant grade distribution.



time based on initial fracture severity (*p<0.05).





Change in rate of height loss over time based on initial severity. Initial Genant grade 1 fractures lose height significantly faster than other fractures (*p<0.05).



Average height loss over time based on vertebra (left) and bisphosphonate use (right). (*p<0.10; **p<0.05)



• Height loss increased (p<0.01) with more

grade 3 (43% to 67%) and wedge fractures (33% to 52%).

• Patients could expect to lose an additional 0.83% of vertebral body height per month. Least severe (grade 1) fractures lost the most additional height (1.69%/month, p<0.05)

• Thoracic fractures experienced more severe height loss compared to lumbar fractures. Bisphosphonates successfully decreased height loss during clinical follow-up.

Conclusions

Results

This was the first study to characterize the progression of MM-associated vertebral fractures over follow-up. We observed a mean height loss of 0.83% per month following initial diagnosis. This characterization will provide clinicians predictive capacity for determining medical and surgical interventions, such as kyphoplasty. Unique trends in fracture progression, such as the greater severity of thoracic and single fractures, the interconversion between wedge and biconcave fractures, and the benefits of bisphosphonates will also guide clinical decisions for treating these patients.

References

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