Cureus
Part of SPRINGER NATURE

Open Access
Abstract

Cureus

Expanded Analysis of Vertebral Endplate Disruption and Its Impact on Vertebral Compression Fracture Risk

Open Access
Abstract
Published 03/05/2025

Copyright
© Copyright 2025
Dibs et al. This is an open access abstract distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Distributed under
Creative Commons CC-BY 4.0

Khalid Dibs [1], Emile Gogineni [2], Joshua D. Palmer [3], Evan Thomas [4], Raju Raval [5], Sasha Beyer [4], Ahmed Elguindy [1], Eugene Yap [1], Arnab Chakravarti [6], Dukagjin Blakaj [7]

1. Radiation Oncology, The Ohio State University College of Medicine, Columbus, USA 2. Department of Radiation Oncology, The Ohio State University Comprehensive Cancer Center, Columbus, USA 3. Radiation Oncology, The Ohio State University Comprehensive Cancer Center, Arthur G. James Cancer Hospital and Richard J. Solove Research Institute, Columbus, USA 4. Radiation Oncology, Ohio State University, Columbus, USA 5. Radiation Oncology, Ohio State University, Columbus, OH, USA 6. Radiation Oncology, The James Cancer Center, Ohio State University Wexner Medical Center, Columbus, USA 7. Radiation Oncology, Ohio State University Comprehensive Cancer Center-James Cancer Hospital and Solove Research Institute, Columbus, OH, USA

Corresponding author: Khalid Dibs, khaled.dibs@gmail.com

Categories: Medical Physics, Radiation Oncology
Keywords: vertebral compression fracture risk, vertebral endplate

How to cite this abstract
Dibs K, Gogineni E, Palmer J D, et al. (March 05, 2025) Expanded Analysis of Vertebral Endplate Disruption and Its Impact on Vertebral Compression Fracture Risk. Cureus 17(3): a1423

Abstract

Objectives:

Vertebral compression fracture (VCF) is a serious complication of spinal stereotactic body radiotherapy (SBRT). Previously we have linked advanced Spinal Instability Neoplastic Score (SINS), tumoral endplate (EP) disruption, and adverse pathology with increased VCF risk. Here, we expand the patient cohort to further examine EP disruption's role in VCF

Methods:

This retrospective cohort study was conducted at a single institution, gathering demographic and treatment data from patients who underwent spinal SBRT between 2013 and 2020. EP disruption was identified on pre-SBRT CT scans. Chronic steroid use defined as steroids given for 4 weeks or more. The primary endpoint, the 1-year cumulative incidence of VCF, was evaluated using follow-up MRI and CT scans at 3-month intervals post-treatment

Results:

This study included 168 patients with a median age of 61 years (range 24-87) and a median follow-up of 18.7 months (range 0.3-107). The cohort comprised 58% males, with the majority (88%) having a Karnofsky Performance Status greater than 70%. The median BMI was 27.6 (range 15-47). Osteoporosis was present in 6% of the patients, and 11% had been on steroids for four weeks or more. A quarter of the patients (25%) were using bisphosphonates, and 12% were on denosumab. The majority received multi-fraction radiation therapy (87%) with a median prescribed dose of 27 Gy and a biologically effective dose (BED10) of 51.3 Gy. The median PTV was 50 cc, with a conformity index of 1.05, and 81% had partial vertebral coverage. Spinal levels treated were predominantly single-level (58%), with lytic lesions being the most common bone lesion quality (45%). The incidence of VCF was 18%, with a median time to VCF of 4.8 months. The SINS score indicated that 55% of patients had a score below 7, 31% had a score of 7, and 14% had a score above 7. The 1-year cumulative incidence of VCF revealed several significant findings. Primary cancers of the non-small cell lung cancer (NSCLC), breast, and ano-colorectal origins had a notably higher incidence of VCF (27%) compared to other types (12%) ($p< 0.001$). Chronic steroid use was significantly associated with an increased VCF incidence (38% vs. 13%, $p=0.01$). Patients with a SINS score above 7 had a significantly higher VCF incidence (32%) compared to those with a score below 7 (4%) ($p< 0.001$). Bilsky grade 1 lesions were associated with a higher incidence of VCF (28%) compared to grade 0 (11%) ($p=0.001$). Additionally, EP disruption was strongly associated with an increased VCF incidence (31% vs. 5%, $p< 0.001$). Univariate analysis showed that chronic steroid use, a higher SINS score, Bilsky grade 1, EP disruption, adverse pathology, and circumferential treatment were associated with an increased risk of VCF. Specifically, steroid use (HR 2.87, $p=0.02$), SINS score (HR 1.62, $p< 0.001$), Bilsky grade 1 (HR 3.19, $p=0.002$), EP disruption (HR 6.02, $p< 0.001$), adverse pathology (HR 3.31, $p=0.001$), and circumferential treatment (HR 2.26, $p=0.03$) were significant factors. In the multivariable analysis, chronic steroid use (HR 2.91, $p=0.04$), a higher SINS score (HR 1.31, $p=0.005$), EP disruption (HR 3.42, $p=0.016$), and adverse pathology (HR 2.81, $p=0.007$) remained significant independent predictors of VCF risk.

Conclusion(s):

In this expanded pooled analysis, consistent with previously published findings, EP disruption, adverse pathology, and higher SINS scores were associated with an increased risk of VCF. Additionally, we found that chronic steroid use for four weeks or longer also correlated with a higher risk of VCF.