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Quantifying Dens Fractures: The Relationship Between Dens Fractures and Opportunistic CT Osteoporosis Indices

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Keywords

Dens, Osteoporosis, Computed Tomography (CT)

Abstract

Introduction

Injuries of the atlas (C2) are a common, and the incidence of these fractures continues to outpace the growth rate of the aging population. C2 fractures commonly impact the odontoid process, which plays a critical role in cervical motion, allowing for 50% of axial rotation and 10-20 degrees of sagittal motion. Previous studies have shown that degenerative changes to the cervical spine, such as atlanto-dens interval, calcific synovitis, and cervical osteoarthritis are associated with dens fractures, however no research to date has shown the relationship between osteoporotic changes and susceptibility to dens fractures. While DEXA scans are the current gold standard for determining bone density, bone density can also be opportunistically measured using computed tomography using the Hounsfield Unit (HU). This study used CT to characterized vertebral body bone density and determine if there is a correlation between odontoid process bone density and occurrence of dens fractures.

Methods

Adult patients admitted to one tertiary academic medical center emergency department between 2009 and 2023 who subsequently underwent cervical or total spine CT were eligible for this study. Dens fracture patients were matched to a single age, gender, and mechanism of injury control. Afga Xero CT software was used to measure transverse and sagittal cross sectional bone density of cervical, thoracic, and lumbar vertebral levels.

Results

No significant difference between bone density among dens fracture patients and controls were noted at any of the vertebral levels investigated. In addition, bone density trended lower as one moved down the cervical, thoracic, and lumbar portions of the spine.

Conclusion

This study shows that there is no correlation between the opportunistic bone density measurements and the presence of dens fractures, suggesting that these fractures have less to do with bone density and more to do with structural and degenerative changes of the cervical spine.