HE ATLANTO-AXIAL FRACTURE IS A DEADLY INJURY: A SINGLE CENTER RETROSPECTIVE STUDY

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Introduction

Most studies on cervical spine injuries characterize fractures broadly, most often by vertebral body level1. We are interested in studying whether a more granular type of description of fracture of the cervical spine correlates with injury. For example, does it matter if fracture of C4 is body fracture or a lamina fracture? This information may be valuable because in certain populations, such as the elderly population aged 65 and older, the mortality from cervical spine fractures is 21–30%2.

In a study by Harris, et al., the mortality risk associated with cervical spine fracture was 19% at three months and 28% at one year for patients age 65 and older3. Injuries for which surgery may be indicated in the young may have risks outweighing benefits in the elderly. A study by Chapman, et al., showed that there may be an improvement in 30 day survival of the elderly treated for cervical spine fractures with surgery despite the associated risks1.

Thus, we would like to see if a detailed description of cervical spine fracture pattern provides information that may be of value in assessing this patient population.

Materials/ Methods

Our retrospective study was completed at an ACS verified Level 1 Trauma Center. The trauma registry from 2014 to 2019 was queried for patients with a cervical spine injury using ICD-9 and ICD-10 codes. Any patients who did not have a documented fracture of the cervical spine were excluded, for example, spinal cord injury or ligamentous injury without a documented fracture. Patients whose spine fracture could not be broken down by detailed fracture characteristics were not included in this cohort. Those patients with pre-existing cervical spine fractures were also omitted. In total, this narrowed our initial cohort of patients identified by ICD-9 and 10 codes from 188 to 137 patients. Elderly patients were classified as those aged 65 and older.

Data collected included demographics including BMI and age at the time of treatment. Mechanism of injury was recorded as either syncopal fall, traumatic fall from height, or mechanical fall. Co-morbidities noted included hypertension, osteoporosis, diabetes mellitus, coronary artery disease, and pulmonary complications including COPD and asthma.

Disposition was recorded as either home, rehab (including patients sent to nursing homes), hospice, or death. Fractures of the cervical vertebrae were noted in great detail by search of the EHR. C1 injuries were classified as fracture or no fracture. C2 injuries were described as Denis Type I or III, vertebral body, unilateral/bilateral transverse process, unilateral/bilateral lamina, spinous process, or unilateral/bilateral facet. C3 to C7 injuries were described as vertebral body, unilateral/bilateral transverse process, unilateral/bilateral lamina, spinous process, or unilateral/bilateral facet.

All statistical analyses were conducted using the latest version of SAS. To compare differences between C1-C2 (supra-axial) fractures, C3-C7 (sub-axial) fractures, and instances of both fracture types, we employed a chi-square analysis to evaluate associations with categorical variables. Fisher’s exact test p-values are reported in instances where the expected counts are < 5. Kolmogorov-Smirnov's tau values are reported to evaluate the associations between cervical injury type and non-normally distributed numerical variables. All tests were performed at a significance level of α = 0.05.

Results

Table 1: Associations of Demographics & Clinical Characteristics with Cervical Injury Type. We evaluated the relationship of the vertebral level fracture (supra-axial, sub-axial), or combined with various variables including age, gender, mechanism of injury, comorbidities, BMI and discharge disposition.


Table 3: Distribution of C3-C7 Fractures in Patients Suffering Cervical Spine Injuries Treated at LUMC, 2004–2019. Examined the breakdown of fracture types in the sub-axial cervical spine, namely from levels C3 to C7.

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References

5. Patil A, Patil P, Patel P, Patel M, Patel M, Patel A. High cervical spine fractures at any age can result in a high incidence of death when compared to sub-axial fractures. Although our data had significant granularity of fracture type, we found that considering fractures by their relative cervical locations, either atlanto-axial or sub-axial, provides adequate clinical information. Using this classification, we found a statistically significant association between relative cervical fracture level and patient age, mechanism of injury, presence of a ligamentous injury, discharge disposition, skull injury, and death.

Conclusion

High cervical spine fractures at any age can result in a high incidence of death when compared to sub-axial fractures. Although our data had significant granularity of fracture type, we found that considering fractures by their relative cervical locations, either atlanto-axial or sub-axial, provides adequate clinical information. Using this classification, we found a statistically significant association between relative cervical fracture level and patient age, mechanism of injury, presence of a ligamentous injury, discharge disposition, skull injury, and death.