Cervical spine injury (CSI) in octogenarians continues to carry a high morbidity and mortality rate. The incidence of CSI among individuals who are below the age of 80 is declining, whereas the incidence of CSI for those 80 years and above is rising.

**The aim of the study** was to evaluate outcomes of cervical spine injuries in octogenarians caused by different mechanisms: motor vehicle accidents, compared to a fall.

**Material and methods.** The National Trauma Data Bank (NTDB) was queried for patients ages 80 and above, who sustained a cervical spine injury via motor vehicle collision and falls. Patient demographics, mechanism of injury, Glasgow Coma Score (GCS), injury severity score (ISS), days in Intensive Care Unit, Temperature on arrival, blood pressure on arrival, CT Scan of head results, complications, sex, and mortality.

**Results.** Three-thousand three hundred seventy-five patients, 80 years of age and older with CSI were included in the study; fifteen percent of these octogenarians with cervical spine injuries died. It was observed that patients in the motor vehicle accident (MVA) group have 1.737 (95% CI 1.407, 2.144 p-value < 0.0001) times the odds of dying, compared to those in the fall group. Patients over the age of 80 who were in a MVA have 1.209 (95% CI 0.941, 1.554 p-value = 0.1372) times the odds of having a positive head CT, compared with people over the age of 80 who experienced a fall. Patients involved in a motor vehicle accident with associated CSI were more likely to be a younger age, have a lower GCS on arrival, have a longer length of stay in the Intensive Care Unit, and a higher ISS (p<0.05).

**Conclusions.** Cervical spine injury in octogenarians carries a high mortality regardless of mechanism. Elderly patients who suffer cervical spine injuries in motor vehicle accidents have a lower SBP, a higher ISS and are nearly twice as likely to die as those who were injured in a fall.

**Key words:** cervical spine injury, octogenarians, elderly, trauma
cervical spine injuries in the younger population occur at this anatomical segment (7, 10). The stiffening effects of aging on the vertebral column, along with other comorbidities, has shifted the most mobile segment for the cervical spine from the C4-C7 segment, to the C1-C2 portion, which explains why most cervical spine injuries in the elderly occur in the upper cervical spine, and this cervical level is associated with a significant mortality rate is also seen (7, 10). Data has also shown that the morbidity and mortality in cervical spine injuries from an MVA or fall increases proportionally with the speed traveled and the height of the fall, and interestingly, a fall from as slight as three feet generates enough force to cause a CSI within the octogenarian subset (7).

The increase in cervical spine injuries in octogenarians has motivated the healthcare profession to place more emphasis on the prevention of comorbidities such as osteoporosis, along with establishing a high suspicion for cervical spine injury following an MVA or fall. This review, and the examination of the National Trauma Data Bank (NTDB), was initiated to examine the outcomes of cervical spine injuries in octogenarians following a MVA and fall. Many different studies document the prevalence of morbidity and mortality within the general population, and even individuals older than the age of 65 who experience cervical spine injuries, due to: motor vehicle collisions, falls, and sport collisions. This study demonstrates the outcomes of cervical spine injuries in octogenarians caused by the two most common mechanisms: motor vehicle accidents and falls.

MATERIAL AND METHODS

The data for this study were obtained from an investigation of the NTDB, which is the largest collection of trauma records ever assembled. It comprises data from 565 trauma centers in 45 states, Puerto Rico, and the District of Columbia (20). All trauma patients, 80 years of age and older, who sustained a cervical spine injury following a motor vehicle collision or a fall were studied (fig. 1). Outcomes evaluated included: patient demographics, systolic blood pressure on arrival to emergency room (ED-SBP), Glasgow Coma Scale on arrival to the emergency room (ED-GCS), injury severity score (ISS), days in Intensive Care Unit (LOS), CT scan of head results, complications and mortality.

Statistical analysis

Data were entered and analyzed on a personal computer. Analysis variance, Student’s t-test, univariate analysis, Chi-squared and Fisher’s exact test were used as appropriate. Multivariate analysis was performed with forward stepwise regression. Relationships and differences were considered statistically significant when the associated p values were <0.05.

RESULTS

Three thousand three-hundred seventy-five elderly patients with cervical spine injuries fulfilled the criteria for inclusion in this study.

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<th>Table 1. Results</th>
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The average ages of the participants with CSI from an MVC or fall were 84.2 and 83.4 respectively (tab. 1). Fifteen percent of octogenarians with cervical spine injuries died (tab. 1). It was observed that patients in the motor vehicle accident group have 1.737 (95% CI 1.407, 2.144 p-value < 0.0001) times the odds of dying, compared with those in the fall group (21% vs 13%) (tab. 1). Patients with a CSI after a fall were more likely to be hypertensive on arrival (tab. 1, fig. 3). Patients over the age of 80, who were in a motor vehicle accident have 1.209 (95% CI 0.941, 1.554 p-value = 0.1372) times the odds of having a positive head CT, compared with a fall (16% vs 11%) (tab. 1). When compared with the fall patients, the octogenarians involved in a motor vehicle accident with associated CSI were more likely to be a younger age (83.4 vs 84.2), have a lower GCS on arrival (12.1 vs 12.9), have a longer length of stay in the Intensive Care Unit (10 vs 7.9), and a higher ISS (18.7 vs 11.4) (p < 0.05) (tab. 1, fig. 2 and 3).

DISCUSSION

With advancements in the healthcare system, an increase in life expectancy (77.7 yrs of age) has allowed more individuals to live past the age of eighty, and a subsequent increased risk for traumatic motor vehicle accidents and falls, and subsequent CSIs (1, 4, 5, 6, 10, 11, 18). Given the increasing incidence in individuals living past the age of eighty, the incidence and prevalence of comorbidities, such as osteoporosis and low bone mass has continued to increase substantially, therefore placing more of the population at risk for sustaining a CSI following an MVC or fall (19, 20). Osteoporosis and low bone mass will effect nearly 44 million men and women aged 50 and older in the United States, and more than 61 million will suffer from osteoporosis by the year 2020 (19). Increased risks for osteoporosis in the patients aged 80 or older are: low peak bone mass, hormonal factors, chronic steroid use, cigarette smoking, low physical activity, low intake of calcium and Vitamin D, race, small body size, and family history (19). With the significant increase in comorbidities, data has shown that there is a significant increase in mortality following a CSI for those aged 80 years or older who are involved in an MVA or fall (6, 11). Although the incidence of cervical spine injuries for those less than 65 years of age continues to decline, those aged 80 years or older continue to experience a constant or even increase in the rate of cervical spine injuries following an MVA or fall (6).

The mortality rate of octogenarians with cervical spine injuries is 15%; thirty-three percent of elderly CSI patients that survive will suffer respiratory complications while undergoing bed-rest and this likely bring the overall mortality rate even higher (6). Malik et al analyzed 107 elderly pts ages 65 or older, who were admitted to a cervical spinal injury unit between the years 1994-2002 secondary…

Fig. 2. Results for patients > years of age with a CSI

Fig. 3. Results for patients > years of age with a CSI
to an MVA or fall (6). This study described that 75 of those traumatic injuries were attributed to a fall and 32 were attributed to an MVA (6). They also calculated the combined mortality rate to be 11.2%. The study also found that degenerative processes caused the most common fracture site to be in the C2 vertebrae, with most being odontoid fractures (6). Similarly, Sokolowski et al analyzed 193 patients, and found those aged 65 years of age or older who sustained cervical spine injuries due to an MVA or fall were more likely to receive a proximal cervical spine injury, with the acute mortality rate being 14%, which correlates with the 15% mortality rate calculated from our data following a cervical spine injury secondary to an MVA or fall (tab. 1) (10). There are several options to help decrease the risk of CSI following a MVA or fall that have been suggested: DEXA scan screening at an earlier age and being more aggressive in preventing osteoporosis and other comorbidities from occurring in this population (19, 20). Patients involved in motor vehicle accidents with an associated CSI have an increased mortality rate; this may be due to the extended amount of blunt force upon the patients cervical spine, in addition to associated injuries suffered from the trauma. Patients involved in a MVA were more likely to have a positive CT-scan of the head, indicating that perhaps octogenarians involved in an MVA should have more timely radiographic studies to decrease mortality.

CONCLUSIONS

Trauma patients who present to the emergency room should be managed initially according to the Advanced Trauma Life Support principles. After addressing and correcting immediate life-threatening situations and fluid resuscitation, attention should be directed to other injuries, including those of the cervical spine. This large population study found that cervical spine injuries following a MVA have a significantly higher risk of death when compared with those suffering a fall. Patients who present with a high ISS, and a positive Head CT-scan have an increased risk of mortality. Our study indicates that we should be inclined to rule out cervical spine injury in an octogenarian patient following any major or minor trauma for early diagnosis to hopefully decrease mortality. The use of CT-Scan and cervical radiographics can significantly augment a thorough physical examination in a patient suspected of sustaining a CSI following a traumatic MVA or fall. A combination of an increased emphasis in the primary care setting in managing degenerative bone disorders, along with a high suspicion for a cervical spine injury with early intervention, in octogenarians involved in an MVA or fall may optimize outcomes.

REFERENCES


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