

Comparative analysis of trauma characteristics between elderly and superelderly

Análise comparativa das características do trauma entre idosos com idade superior e inferior a 80 anos

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A B S T R A C T

Objective: To compare the characteristics of trauma in the elderly under and over 80-years-old. **Methods:** We conducted a retrospective analysis of protocols of blunt trauma victims aged over 70 years. Individuals aged between 70 and 79 years were included in group I, those aged 80 years or greater in group II. Statistical analysis was performed using the Student t, chi-square and Fisher tests, considering $p < 0.05$ as significant. **Results:** The study included 281 patients (group I-149, group II-132). The age ranged between 70 and 99 years (79.1 ± 6.7 years), with 52.3% male. Group II had lower average abdomen AIS (0.10 ± 0.59 vs. 0.00 ± 0.00 , $p = 0.029$), lower incidence of male victims (59.1% vs. 44.3%, $p = 0.013$), higher incidence of falling from standing height (44.3% vs. 65.2%, $p = 0.028$) and lower frequency of upper limb fractures (9.4% vs. 2.3%, $p = 0.010$) than Group I. There was no significant difference in comparison of other variables between the groups. **Conclusion:** Trauma in the elderly is a serious public health problem, with a tendency to progressive worsening with population aging. Data from this study help us with a clearer picture of trauma in the over-80 elders, a subgroup that deserves special attention.

Key words: Geriatrics. Accidental falls. Aged. Injury severity score. Diagnosis.

INTRODUCTION

Due to the increase in life expectancy, the number of traumatized elderly has gradually increased in recent decade¹. This age range brings specific difficulties regarding the diagnosis and treatment of traumatic injuries. There is also a higher frequency of chronic and continuous use of medications, which must be considered in the conduct of these cases¹. In Brazil it is estimated that in 2025 there will be 32 million people over 60 years, the sixth largest elderly population in the world².

Although the assessment of functional reserve is the best method to establish the limitations resulting from the aging process, the definition of elderly varies with the average life expectancy of each country. In developed countries, individuals older than 70 years are considered "elderly"³. In developing nations, this term is used to define those aged over 65. In tropical countries, where the aging process occurs earlier, the age of 60 is considered the threshold for the onset of old age³.

With the active participation of older people in society, the term "super elderly", or "very elderly", has

appeared in the literature, represented by individuals with over 80 years^{4,5}. It is believed that this subgroup of patients presents a greater impairment of functional organic reserve even before suffering a trauma, which warrants special attention both from diagnosis and therapeutic standpoints^{1,5,6}. There are not many studies that address the specific characteristics of traumatized "very old", neither comparing the lesions found in elderly patients over and under 80 years⁴.

Thus, this study aimed to compare the characteristics of trauma in the elderly aged below 80 years and those aged above 80.

METHODS

We conducted a retrospective analysis of data contained in the protocols and medical records of victims of blunt trauma aged greater than 70 years attended the Emergency Service of the Brotherhood of SCSP in the period June, 10th 2008 and September, 1st 2009.

We analyzed the following variables: age, gender, mechanism of injury, associated diseases, injuries

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found, treatment and mortality. The sample was stratified by trauma indices: Glasgow Coma Scale ⁷, Revised Trauma Score (RTS) ⁸, Abbreviated Injury Scale (AIS)⁹ Injury Severity Score (ISS) ¹⁰ and probability of survival by TRISS method ¹¹.

Patients were placed into two groups: Group I – seniors aged 70 to 79 years, and Group II – seniors aged greater than or equal to 80 years.

Statistical analysis was performed using the Student t, the chi-square and the Fisher tests, p values <0.05 being considered significant. Numerical variables were presented as mean ± standard deviation. We considered an injury serious when AIS was greater than two (AIS>2).

This study was approved by the Ethics in Research Committee of the Santa Casa de São Paulo (348/09).

RESULTS

We included data from 281 blunt trauma victims aged 70-99 years (79.1 ± 67.5 years), 147 (52.3%) being male. The most common mechanism of injury was fall from the standing height in 152 patients (54%), followed by trampling in 68 (24.2%). One hundred and forty-nine patients were younger than 80 years and formed group I (Table 1). The remaining 132 patients formed group II.

In the comparison of variables between groups, there were less male victims in group II (59.1% vs. 44.3%, p = 0.013). Regarding the mechanism of injury, we noted that patients in group I had a higher frequency of pedestrian injuries (27.5% vs. 20.5%, p = 0.028), while in group II there was an increased frequency of falls from the standing height (44.3% vs. 65.2%, p = 0.028). There was no significant difference between the groups regarding the presence of hypertension, diabetes mellitus and other concomitant diseases (Table 2).

There was no significant difference when comparing the trauma indices RTS, ISS and TRISS between groups (Table 3). In comparing the anatomic severity of injury between groups, we found a higher mean AIS of the abdominal segment in group I. There was no difference in the comparison of the average AIS of the segments head, chest and extremities between groups.

When comparing the different lesions found between groups, we noted that patients in group I had a higher frequency of fractures in the upper limbs. As for the frequency of other lesions found between groups, there were no significant differences (Table 2). Fourteen patients died (5%), seven in Group I (4.7%) and seven in Group II (5.3%). There was no statistical difference between the groups regarding mortality.

DISCUSSION

Trauma in the elderly has well established features. The most common traumas mechanisms are falling from the standing and trampling¹². The incidence of lesions to the head segment is significant, as well as fractures of extremities¹². The mortality rate is higher than in younger individuals, especially in the presence of concomitant diseases and the need for specific treatment ¹²⁻¹⁴. In a previous study we compared patients aged above and below 60 years and observed a higher incidence of severe intracranial lesions, such as subdural hematomas, cerebral contusions and subarachnoid hemorrhage in the group of patients with more advanced age ¹⁴.

The elderly aged over 80 years have been recognized as a subgroup called “super elderly” due to the specific clinical conditions related to this age group ^{4,5}. The aim of this study was precisely to investigate whether this subgroup of traumatized had some special feature, such as mechanism of injury, injury found and severity, that would differentiate them from the elderly under the age of 80 years.

We noted in our data that the frequency of traumatized males was lower in the super elderly. This would be related to greater longevity in females, a fact already shown in other studies ^{2,3}.

Falls are the primary mechanism of injury in the elderly and are considered a serious public health problem ^{15,16}. In the United States, falls from the standing height are considered the second cause of death due to unintentional injuries in the elderly ¹⁵. In other developed countries, the falls are also a frequent mechanism of trauma, accounting for up to 60% of trauma in the elderly ¹⁷. In our study, we observed that the super elderly had a higher frequency of

Table 1 - Comparison of the mechanisms of trauma between groups.

Mechanism	Group I n (%)	Group II n (%)	Total n (%)
Fall of the standing height	66 (44.3)	86 (65.2)	152 (54.1)
Trampling	41 (27.5)	27 (20.5)	68 (24.2)
Fall of height	21 (14.1)	13 (9.8)	34 (12.1)
Accident with four-wheel vehicle	7 (4.7)	3 (2.3)	10 (3.6)
Physical assault	8 (5.4)	2 (1.5)	10 (3.5)
Others	6 (4.0)	1 (0.7)	7 (2.5)
Total	149 (100%)	132 (100%)	281 (100%)

Table 2 - Comparison of categorical variable between groups.

Variable	Group I (%)	Group II (%)	p
Hypertension	14.8%	10.6%	0.298
Diabetes Mellitus	3.4%	3.8%	0.845
Other diseases	6.7%	3.8%	0.277
Epidural hematoma	0.7%	0.8%	0.931
Subdural hematoma	4.0%	3.8%	0.918
Traumatic subarachnoid hemorrhage	2.0%	3.8%	0.372
Cerebral contusion	4.0%	5.3%	0.611
Skull fracture	2.0%	0%	0.101
Rib fracture	3.4%	0.8%	0.133
Pulmonary contusion	0.7%	0%	0.346
Hepatic injury	0.7%	0	0.346
Splenic injury	2.1%	0	0.443
Upper limb fracture	9.4%	2.3%	0.012
Lower limb fracture	6.7%	8.3%	0.606
Open upper limb fracture	0%	1.5%	0.132
Open lower limb fracture	2.0%	0.8%	0.375
Pelvis fracture	2.0%	1.5%	0.753

Table 3 - Comparison of numerical variables between the groups.

Variable	Group I	Group II	p
AIS head	0.84 + 1.19	0.95 + 1.15	0.435
AIS thorax	0.09 + 0.45	0.06 + 0.44	0.634
AIS abdomen	0.10 + 0.59	0.00 + 0.00	0.029
ISS	5.27 + 7.79	4.87 + 7.33	0.653
TRISS	0.95 + 0.10	0.96 + 0.05	0.168
RTS	7.70 + 0.56	7.78 + 0.24	0.097

AIS: Abbreviated Injury Scale; ISS: Injury Severity Score; RTS: Revised Trauma Score.

falls from the standing height, while trampling was more frequent among the other elderly. This is in agreement with other studies, which observed a higher incidence of falls in older ages¹⁸. Probably, this difference is due to less exposure of the super elderly to traffic accidents due to their greater restriction and less mobility. This information could direct preventive measures that towards people over 80 years of age¹⁸.

In 2011 Rapp et al. analyzed nearly 70,000 elderly victims of falls occurred in residences in Germany. They observed a higher frequency of male patients, and approximately 75% of the events occurred in the bedroom or bathroom¹⁹. In Brazil, it is estimated that one in four elderly suffers a fall at home at least once a year, which has motivated the adoption of preventive measures directed at the safety of the elderly, such as the "Safe House" or "Protected House", similar to what occurs in other countries^{20,21}.

Automobile accidents involving elderly have also been increasingly frequent²². Currently, in the United States, about 25 million people over 65 years of age are

car drivers, which determines the specific risk factors for age-related accidents²². In our series, automobile accidents occurred in only 2.3% of the super elderly, a rate perhaps explained by the socioeconomic profile of the population attended by our institution. On the other hand, considering the elderly in general, it is noteworthy the number of pedestrians accidents (running over) observed in our sample (24%), which certainly reflects the characteristics of a metropolis with still poor conditions of traffic education and safety. Despite the super elderly present a lower frequency of trampling than the elderly with less than 80 years old, there is still a significant fraction that deserves special care. In Brazil, the rate of mortality from trampling is approximately 5.6 deaths per 100,000 inhabitants, a level approximately three times higher than that observed in countries like United States, Britain and Canada^{23,24}.

The variables most often related to higher mortality in elderly trauma victims are the presence of systolic blood pressure less than 150 mmHg at admission, metabolic acidosis, the presence of multiple fractures and head trauma²⁵. A controversial aspect in the analysis of

prognostic factors in elderly trauma refers to the use of scales or indices of severity of trauma^{1,4,5,15,26}. The Trauma Score (TS) and the severity of injury (ISS) are not specific to the elderly population and are considered to have low predictive value for mortality^{25,26}. The calculation of the probability of survival by the TRISS method, as well as the GTSS (Geriatric Trauma Severity Score) also have limited value in assessing the prognosis in elderly trauma²⁶. It is therefore difficult to employ a specific index for evaluation of survival in this patient group. In the present study, we found no significant difference in the comparison of the rates of physiological trauma (RTS), anatomic one (ISS) and the TRISS between groups of elderly and super elderly, apparently translating equivalence anatomical and physiological severity of trauma among these groups.

Preexisting conditions (heart, lung, kidney, etc.) significantly increase the risk of mortality in patients with blunt trauma. Similarly, seniors who present with loss of consciousness, need of early intubation or are maintained on mechanical ventilation for prolonged periods had higher mortality²⁷. In this study, we observed no significant difference between the groups of traumatized elderly and super elderly with regard to the frequency of concomitant diseases, hypertension and diabetes mellitus, as well as the need for definitive airway at admission.

There was also no statistically significant difference between the elderly and super elderly when we analyze the anatomic severity of trauma segments separately in head, chest and extremities. We observed that the super elderly had lower average abdominal segment AIS when compared to other seniors. This probably reflects the difference in the mechanism of injury between groups. In a previous study we compared the lesions found among the traumatized victims of falls from standing height and other trauma mechanisms, having also observed a lower average abdominal segment AIS²⁸. Therefore, since falls from the standing height were more frequent in the super elderly, one would expect a lower average abdominal AIS in this group.

Although there was a difference in only on abdominal segment AIS between groups, there was a higher frequency of upper limb fractures in the group I. This could also be explained by the mechanism of injury more common in this group, trampling. In this mechanism, energy transfer

is much larger, and more serious injuries would also be expected.

Although the anatomical and physiological reserves suffer exponential decline with the passage of age, in our study we did not observe increased mortality in the group of super elderly. However, in 2010 Bennett *et al.* observed a higher risk of death for the elderly over the age of 80 years⁴. These authors used a different statistical method, adjusting mortality according to gender, mechanism of injury, ISS, Glasgow Coma Scale and vital signs at admission. The lack of difference in mortality observed in our study could also be explained by the difference in frequency of trauma mechanisms between groups. Nevertheless, there was no significant difference between the mean rates of trauma among elderly and super elderly, which, in theory, tells us that the anatomical and physiological severity of the trauma was comparable between the groups. Therefore, we consider important to deem all the patients over 70 years of age, and not only super elderly, as high risk for mortality, independent of the presence of adjuvant factors (associated diseases, trauma mechanism and indices).

The data from our study suggest that there are some differences in the characteristics of trauma in the super elderly. Apparently, the mechanism of trauma determines the possible differences in the severity of abdominal injuries and frequency of fractures in the upper limbs. This information would be important in trauma triage, allowing the recognition of patients with a higher chance for serious injury and lethality. In 2012 Rogers *et al.*, reported a significant increase in the frequency of complications and mortality in the elderly not submitted to adequate triage at admission²⁹.

Trauma in the elderly is a serious public health problem, with a tendency to progressive worsening due to population aging. Data from this study help us with a clearer picture of trauma in the super elderly, a subgroup that deserves special attention. There are increasing prospects of recovery in the traumatized elderly, including the "super elderly" too³⁰. The low mortality rate observed should encourage the adoption of all therapeutic measures necessary to enable the reintegration of traumatized elderly in the society. The possibility of prevention is noteworthy, since the most frequent mechanisms of trauma can be limited with simple measures.

R E S U M O

Objetivo: comparar as características do trauma entre idosos e "superidosos". **Métodos:** análise retrospectiva dos protocolos de vítimas de trauma fechado com idade igual ou superior a 70 anos. Os idosos de idade entre 70 e 79 anos foram incluídos no grupo I, os de idade igual ou maior de 80 anos no grupo II. Análise estatística foi realizada através dos testes t de Student, qui-quadrado e Fisher, considerando $p < 0,05$ significativo. **Resultados:** Foram incluídos no estudo 281 doentes (grupo I-149; grupo II-132). A idade variou de 70 a 99 anos (79,1 + 6,7 anos), sendo 52,3% do sexo masculino. Os superidosos se caracterizaram por apresentar menor média de AIS em abdome (0,10 + 0,59 vs. 0,00 + 0,00; $p = 0,029$), menor frequência de vítimas do sexo masculino (59,1% vs. 44,3%; $p = 0,013$), maior frequência de queda da própria altura (44,3% vs. 65,2%; $p = 0,028$) e menor frequência de fraturas de membros

superiores (9,4% vs. 2,3%; $p=0,010$). Não observamos diferença significativa na comparação das demais variáveis entre os grupos.

Conclusão: O trauma em idosos é um grave problema de saúde pública, com tendência à piora progressiva pelo envelhecimento da população. Os dados deste estudo nos auxiliam com uma visão mais clara do trauma nos superidosos, um subgrupo que merece atenção especial.

Descritores: Geriatria. Acidentes por queda. Idoso. Escala de gravidade do ferimento. Diagnóstico.

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