EPIDEMIOLOGY OF HIGH-ENERGY TRAUMA INJURIES AMONG THE ELDERLY

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SUMMARY

The increasing proportion of elderly people in the world's population, together with improvements in their health status and the preventive support for this age group, have allowed them to have more active lifestyles, which have exposed them to higher risks of high-energy accidents and trauma. These patients have physiological characteristics, associated diseases, behavioral patterns and postoperative complications that lead to different systemic responses from those on other age groups. This study prospectively evaluated 28 patients aged over 65 years - 16 women and 12 men. The most prevalent trauma mechanism was trampling, which mainly resulted in leg fractures. The period of hospitalization for these patients was greater than in younger age groups, and 90% of the cases presented some type of clinical complication following osteosynthesis. Age alone acted as a positive predictive factor for such complications among patients with multiple traumas. Previous diseases and patients' ages did not have any influence on the development of orthopaedic complications. The injuries associated with the fractures presented a correlation with the trauma mechanism. These patients usually require surgery for definitive treatment of their fractures. Being older and presenting diseases prior to the accident did not increase the length of time before surgery.

Keywords: *Epidemiology; Wounds and injuries; Elderly.*

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INTRODUCTION:

Mortality due to external causes in Brazil is ranked third in amount, being accountable for 124,000 deaths in 2004, only behind mortality due to bloodstream apparatus diseases and neoplasias, which account, respectively, for 285,000 and 140,000 deaths[1].

High-energy trauma is the most frequent cause of death in patients below the age of 44, representing a strong economical impact[2,3]. In the United States, the elderly, defined as any person above the age of 65, represent 12.7% of the population and 29% of trauma-related deaths, as well as 7.8% of all victims of accidents[4].

Aged population is gradually increasing in Brazil; in 1980, aged people constituted 6.1% of the population; in 1991 census, they corresponded to 7.3% of the general population, representing an increase of 21.3% in a 10-year period. For 2010, they are expected to reach 10% of the national population[5,6]. Around 2050, the population of elderly individuals in developed countries should increase double fold, and by three fold in developing countries[7-10] (Figure 1).

Fractures in aged people usually result from low-energy trauma, such as falls at home, determining mainly proximal femoral, distal radius and spine fractures[11]. These are commonly standalone injuries in individuals presenting any systemic disease: high blood pressure, diabetes mellitus, depression or renal failure, and usually require longer hospitalization period when they are victims of trauma[3,12].

However, a significant percentage of aged population currently have a more healthy and active life, determining higher levels of exposure to external accidents, such as trampling and car accidents, which, associated to the physiological characteristics that are typical of this age group, show a different behavior when compared to other groups[7,11,13-19].

Souza defined the profile of aged people suffering traffic accidents. Mortality rate among individuals above the age of 60 who had suffered traffic accidents was 11.8% - about three times superior to other age groups (3.4%). Most of accident victims were men (76%), and 52% was walking and close to their respective houses[20].

Predictive factors – age, previously-existent diseases, trauma response physiology, postoperative complications, kind of trauma – and trauma epidemiology among the elderly have presented significant changes in literature, clearly indicating standard changes regarding time and region assessed[19,21].

OBJECTIVE

The objective of this study is to determine the epidemiology of injuries resulting from high-energy trauma in aged people, and to analyze trauma-related peculiarities in the elderly population and its evolution along treatment.

CASE SERIES AND METHODS

A prospective analysis was conducted on patients above the age f 65 hospitalized because of high-energy trauma fractures at IOT-HCFMUSP, both men and women, between 2005 and 2006.

They have been assessed by means of a Data Collection Protocol at the time of hospital admission and during follow-up, 6 months postoperatively, represented below.

Study developed at the Institute of Orthopaedics and Traumatology, University of São Paulo Medical School.
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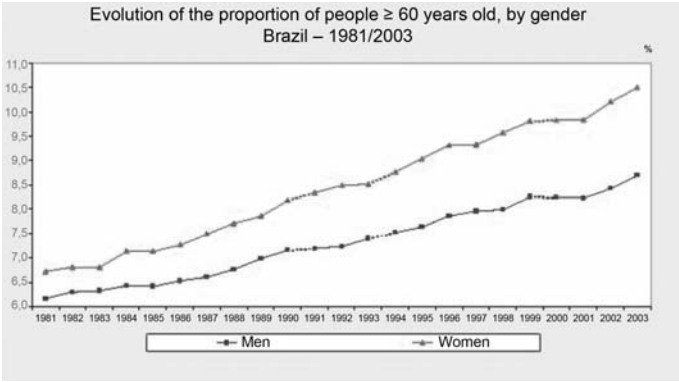

Figure 1- *Evolution of the proportion of individuals above the age of 60*

The following are inclusion criteria:
1. Patients above the age of 65.
2. Patients with detailed and completed medical files.
3. Patients with factures or multiple trauma.

The following are exclusion criteria:
1. Patients with low-energy trauma history, such as, for example, simple falls.
2. Medical files with inaccurate data.
3. Patients with clinical complications, and who had lost usual orthopaedic follow-up.
4. Patients who couldn't reach the minimum established follow-up period.
5. Patients who evolved to death.

RESULTS:

A total of 28 patients were assessed, aged at least 65 years old (16 women and 12 men).

By analyzing the mechanism of trauma, a significantly higher number of trampling occurred (19 at total), corresponding to 67.9%, two car accidents (7.1%), and seven high falls (25%). (Figure 2)

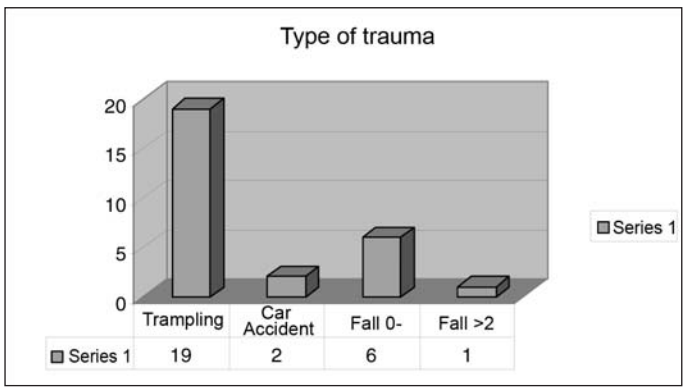

Figure 2 - *Types of Trauma*

The mean hospitalization time was 26.75 days, superior to that of patients of younger age groups treated at the same Institution. 22 patients (78.5%) remained in hospital for more than 10 days.

In the evaluation of pre-existent diseases, we found that 14 patients showed systemic blood hypertension (50%), four had diabetes mellitus (14.2%), and two presented other conditions (7.1%), while eight did not present diseases previously to trauma (28.7%).

Of the clinical complications, eight patients had urinary tract infection (28.6%), three had bronchopneumonia (10.7%), three had deep venous thrombosis (10.7%), two had a cardio-respiratory failure (7.2%) and nine (32.2%) showed other types of clinical complications (hypothermia, constipation, diarrhea, mental confusion, delirium, hydroelectrolytic disorder, sepsis, acute lung edema, and acute renal failure). Only three patients didn't show any clinical complications (10.7%). (Figure 3)

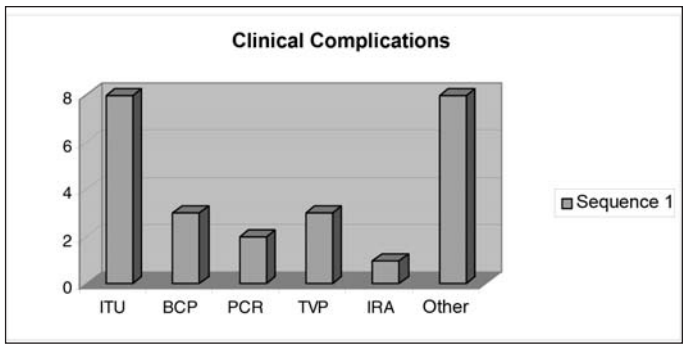

Figure 3 - *Types of clinical complications*

The total number of fractures experienced by the patients was 40: 30 on lower limbs (75%), eight on upper limbs (20%), and two cervical spine fractures (5%). (Table 1)

Concerning orthopaedic complications, five patients had infection at the fracture site (17.8%), one had bone necrosis (3.6%), one showed pressure sores (3.6%), seven presented with ambulation restraints after fracture union (25%), and 14 did not present any orthopaedic complications (50%).

Patients hit by cars presented with a higher number of associated injuries (cranioencephalic trauma, thoracic trauma, abdominal trauma, detaching injuries) than the other patients. (Table 2)

The presence of previous diseases and older age did not increase the time for surgery procedure release and the number of orthopaedic complications after trauma. (Tables 3, 4, 5 and 6).

A correlation was found between advanced age and the presence of clinical complications. (Table 7)

Trampling patients remained longer in hospital when compared to other patients. (Table 8)

The presence of pre-existent diseases and the site of fractures on lower limbs did not influence the number of days in which patients remained in hospital. (Table 9 and 10)

Table 1- *Number of fractures according to the anatomical site*

Fracture Site	Occurrences
Proximal humerus	5
Distal humerus	1
Olecrane	2
Hip	3
Acetabulum	4
Femoral neck	3
Trans- or Subtrochanteric	2
Femoral shaft	2
Distal femur	2
Tibial plateau	4
Leg bones	7
Ankle	3
Foot	2
Cervical spine	2

Table 2 - *Correlation between kind of trauma and associated injuries*

	ASSOCIATED INJURIES	YES	NO
KIND OF TRAUMA			
Trampling		12 (0.63)	7 (0.37)
Other		1 (0.11)	8 (0.89)

P=0.016 (Fisher's exact test)

Table 3 - *Correlation between the presence of previous diseases and release for surgery*

	Release for Surgery (days)	0-10	>10
Previous Disease			
Yes		13 (0.72)	5 (0.28)
No		8 (0.80)	2 (0.20)

P=1.000 (Fisher's exact test)

Table 4 - *Correlation between age and release for surgery*

	Release for Surgery (days)	0-3	>3
Age (years)			
65-75		4 (0.27)	11 (0.73)
>75		7 (0.54)	6 (0.46)

P=0.246 (Fisher's exact test)

Table 5 – *Correlation between the presence of previous diseases and orthopaedic complications*

	Orthopaedic Complications	Yes	No
Previous Diseases			
Yes		8 (0.50)	8 (0.50)
No		6 (0.50)	6 (0.50)

P=1.000 (Fisher's exact test)

Table 6 - *Correlation between age and orthopaedic complications*

	Orthopaedic Complications	**Yes**	**No**
Age (years)			
65-75		5 (0.36)	9 (0.64)
>75		9 (0.64)	5 (0.36)

P=0.257 (Fisher's exact test)

Table 7 - *Correlation between age and the presence of clinical complications*

	complication	**No complication**
	79	69
ages	77	70
	80	65
	85	74
	74	73
	95	75
	78	75
	74	78
	67	77
	67	72
	67	67
	77	73
	95	73
	88	77
	complication	**No complication**
Mean	78.78571	72.71429
Standard error	2.48109	1.024044
Median	77.5	73
Mode	67	73
Standard deviation	9.283389	3.831621
Sample Variance	86.18132	14.68132
Curtose	-0.44848	-0.22695
Asymmetry	0.494382	-0.61594
Interval	28	13
Minimum	67	65
Maximum	95	78
Sum	1103	1018
Count	14	14
	11.78309	5.26942

p=0.01975 – Mann-Whitney (non-parametric)

p=0.0185 – Student's t (parametric)
Mann-Whitney (non-parametric)

Table 8 - *Correlation between number of hospitalization days and kind of trauma*

	trampling	**other**
Hospitalization days	12	17
	19	14
	9	7
	82	15
	18	16
	21	48
	23	20
	27	27
	61	9
	27	
	39	
	82	
	17	
	76	
	27	
	8	
	5	
	9	
	14	
	trampling	**other**
Mean	30.31579	19.22222
Standard error	5.855498	4.088527
Median	21	16
Mode	27	#N/D
Standard deviation	25.52352	12.26558
Sample Variance	651.4503	150.4444
Curtose	0.240694	3.99603
Asymmetry	1.257829	1.841832
Interval	77	41
Minimum	5	7
Maximum	82	48
Sum	576	173
Count	19	9
Cvp	84.19218	63.80937

p=0.15395

Table 9 - *Correlation between hospitalization days and anatomical site of fractures*

	LLLL	other
Hospitalization days	12	18
	19	23
	9	27
	82	82
	21	17
	27	20
	61	27
	39	
	17	
	14	
	7	
	15	
	16	
	76	
	27	
	8	
	48	
	5	
	9	
	14	
	9	
	LLLL	*other*
Mean	25.47619	30.57143
Standard error	4.967331	8.703741
Median	16	23
Mode	9	27
Standard deviation	22.76317	23.02793
Sample Variance	518.1619	530.2857
Curtose	1.348703	6.333734
Asymmetry	1.528378	2.480779
Interval	77	65
Minimum	5	17
Maximum	82	82
Sum	535	214
Count	21	7
Cvp	89.35076	75.32502
p=0.1553		

Mann-Whitney (non-parametric)

Table 10 - *Correlation between hospitalization days and presence of previous diseases*

	with previous disease	**without previous disease**
Hospitalization days	12	19
	9	27
	82	27
	18	17
	21	16
	23	27
	61	8
	39	48
	82	9
	17	14
	14	
	7	
	15	
	76	
	5	
	20	
	27	
	9	
	with previous disease	***without previous disease***
Mean	29.83333	21.2
Standard error	6.251405	3.717227
Median	19	18
Mode	9	27
Standard deviation	26.52247	11.7549
Sample Variance	703.4412	138.1778
Curtose	0.048314	2.239617
Asymmetry	1.239361	1.292871
Interval	77	40
Minimum	5	8
Maximum	82	48
Sum	537	212
Count	18	10
Cvp	88.90212	55.44766
p=0.8322		

Mann-Whitney (non-parametric)

DISCUSSION

The most prevalent mechanism of trauma among the elderly is trampling, mainly resulting in lower limbs' fractures. Patients in this age group who suffer high-energy traumas remain in hospital for long periods of time, usually over 10 days.

Most patients present with a co morbidity previously to the accident, with systemic high blood pressure being the most common. Also, the great majority (almost 90%) experience some kind of clinical complication after trauma, including: urinary tract infection, cardio-respiratory failure, deep venous thrombosis, gastrointestinal tract changes, delirium, mental confusion, sepsis, acute lung edema, acute renal failure, and bronchopneumonia, with no clear prevalence of any specific complication

Regarding orthopaedic complications, 50% of the patients evolve well, without sequels. And the presence of previous diseases and patients' ages do not influence the existence of such complications.

The fact that patients had suffered trampling episodes increases the number of injuries associated to fractures when compared to those who were victims of car accidents or high falls. Such injuries include cranioencephalic traumas, thoracic and abdominal traumas, and detaching injuries on the limbs. However, when taken alone, trampling does not imply on an increased number of hospitalization days when we compare individuals who suffered trampling to other kinds of high-energy trauma.

Aged patients experiencing trauma evolve with a higher number of clinical complications than younger patients, regardless of other individual- or accident-related factors. Age acts as an isolated positive predictive factor for such complications.

Age and presence of previous diseases do not influence the fact of a patient being able to undergo a surgical procedure. These

patients usually need to be operated for providing a definitive treatment for their fractures. And they are not able only when surgical risks are too high to delay it until patients show better clinical status. The fact of being older and having pre-existent diseases to the accident does not increase that pre-surgical time.

Although aged patients usually remain in hospital for more than 10 days, this does not occur as a result of previous diseases or of fractures being located at lower limbs.

CONCLUSION

The most prevalent mechanism of trauma among the elderly with high-energy trauma fractures is trampling, mainly resulting in lower limbs' fractures.

Hospitalization time for this population is, in most of the cases, superior to 10 days.

The large majority of this kind of patient presents some kind of clinical complication during post-trauma evolution.

About half of the patients present no orthopaedic complications.

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