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Clinical and Radiological Differences in Patients Following Traumatic SCI at Different Ages

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SUMMARY

Background. Traumatic spinal cord injury (SCI) can cause functional changes in patients of different ages.

Material and methods. The study aims to determine whether there are social, clinical, and radiological differences between young, middle-aged, and elderly adults with SCI caused by a ground-level fall. This retrospective study analyzed the records of patients with a clinical diagnosis of SCI. It enrolled patients with traumatic spinal cord injury after a ground-level fall divided as follows: young aged adults 18–35 years of age (G1); middle-aged adults aged 36–60 years (G2); and elderly adults aged over 60 years (G3). Their clinical, social, and radiological variables were analyzed.

Results. It is observed that low schooling level, being widowed, and being a homemaker were more frequently encountered among elderly adults, whereas being single was more common in middle-aged adults. The morphologic diagnosis of compression fracture and the associated injury of facial trauma occurred more frequently in elderly adults, with an increasing tendency with age. Conservative therapeutic management was most commonly encountered in elderly adults, compared to surgery from a posterior approach in middle-aged adults. Listhesis was better identified in middle-aged adults by computed tomography (CT). Spinal cord contusion and injury to the C1 vertebra were demonstrated in young adults by magnetic resonance imaging (MRI).

Conclusions. SCI patients differ with regard to certain aspects at different ages. Level of evidence: II. Retrospective study.

Key words: Life Cycle Stages, Stage, Life Cycle, Spinal Cord Injuries, Spinal Cord Trauma

BACKGROUND

Traumatic spinal cord injury (SCI) is a lesion that can affect several spinal structures, including the vertebrae, spinal cord, ligaments, and other adjacent parts of the spine [1,2]. Damage to these structures may result in partial or total loss of function, depending on the injured complex [1]. The injury mechanisms include direct or indirect trauma due to falls, automobile accidents, gunshot injuries, and others [1,3].

Falls are the second leading cause of SCI in Brazil [4] and developed countries [3]. The management of these patients entails high costs for the health care system [1]; therefore, knowing the specific and distinct characteristics of this patient population may help to direct preventive measures to improve care and reduce expenses.

Physiological changes occurring during adulthood [5] can lead to changes in clinical and radiological characteristics [4,6,7]. Reis and Fradique proposed one way of stratifying the phases of adulthood [8], by categorizing the population as young, middle-aged, and elderly adults. This stratification allows for the identification of characteristics in specific groups and evaluation of these changes throughout life [8], which can guide policies and reduce costs for the government in the management of these patients [1].

Therefore, this study aimed to determine whether there are social, clinical, and radiological differences between young, middle-aged, and elderly adults who suffered spinal trauma as a result of a ground-level fall.

MATERIAL AND METHODS

This retrospective, descriptive, and inferential study applied an intentional non-probabilistic sampling method to collect medical records from the Hospital de Base de São José do Rio Preto, a tertiary reference center [9]. The study was approved by the Institutional Ethics Committee of the Faculdade de Medicina de Rio Preto (FAMERP, n. 806.452) according to the ethical aspects of Resolution 466/12 do Conselho Nacional de Saúde/Conselho Nacional de Ética em Pesquisa.

Data were obtained from the medical records of 440 patients admitted between 2008 and 2018. The study included elective patients with traumatic SCI due to a fall. Patients with no diagnosis or incomplete age data were excluded. Age-based groups were formed as described in other studies [8,10,11]. The individuals were divided into the following groups: young adults (18–35 years of age, G1); middle-aged adults (36–60 years, G2); and, elderly adults (over 60 years, G3).

Data on social variables including sex, marital status, educational level, religion, and occupation were collected. Similarly, data on clinical variables included syndromic presentation, topography and morphologic diagnosis of injury, neurological status (on admission and outcome), associated lesions, therapeutic management, clinical complications during hospitalization, and outcome. Computed tomography (CT) and magnetic resonance imaging (MRI) examination reports were also analyzed.

The following syndromic presentations were considered: cervicalgia, decreased strength, dorsal pain, low back pain, paraparesis, paraplegia, paresis**,** paresthesia, tetraparesis, and tetraplegia [12]. The topography was classified as described elsewhere [11,12] and included injuries to the cervical (C1–C7), thoracic (T1–T10), thoracolumbar transition (T1–L2), and lumbosacral (L3–S1) regions [13]. The morphologic diagnoses of injury were based on those defined by Denis [14] and included spinal cord contusion, compression fracture, dislocation fracture, linear fracture in the vertebral body, odontoid fracture, burst fracture, fracture in the posterior elements, posterior ligamentar complex injury, and listhesis. The neurological status (admission and outcome) was described using the American Spinal Injury Association (ASIA) scale [15].

Associated injuries identified at admission were listed, as defined by Melo Neto et al. [11,12], as follows: appendicular lower limb, appendicular upper limb, thoracic trauma, facial trauma, traumatic brain injury (TBI), and others. Therapeutic management was categorized as conservative or surgical, with the surgical approaches including an anterior vs. posterior approach [11,12]. Clinical complications during hospitalization included shock, late hemodynamic instability, respiratory failure, cardiorespiratory arrest, pneumonia (PNM), sepsis, and others. The outcomes in the present study were discharge or mortality.

Radiological parameters of patients who underwent MRI and CT were included in the analysis. These patients initially underwent clinical evaluations and treatment according to the Advanced Trauma Life Support (ATLS) guidelines [16], followed by a neurological evaluation and a CT examination to confirm SCI. The criteria for this initial clinical and neurological evaluation, as well as the criteria for performing magnetic resonance and computed tomography of the spine, were as described by Morais et al. [17].

The criteria included any suspicious X-ray imaging findings, inadequate radiographic exams, back pain, and persistent sensory, motor, or autonomic deficits. MRI was not performed in patients with gunshot wounds; those requiring immediate neurosurgery; those with cardiovascular, respiratory, or neurological instabilities; or those with devices, such as pacemakers, surgical forceps, and/or intraocular pro-

stheses. The examination reports were completed by radiologists and reviewed by neuroradiologists at the Radiology Service of the Hospital de Base de São José do Rio Preto, SP.

The CT examinations were performed using a Philips Tomoscan SR 4000 system (Philips Medical Systems, Best, Netherlands) with the patients placed in dorsal decubitus on a stretcher. The protocol included multidetector-row helical CT of the affected segments in 2-mm sections and image reconstruction in the axial, coronal, and sagittal planes. MRI studies were performed using a 1.5 Tesla Philips Gyroscan Intera T15 system (Philips Medical Systems, Best, Netherlands) with the patients placed in dorsal decubitus on a table. Images were acquired in the following sequences: axial T2 and multiplanar gradient recalled (MPGR) T2*; sagittal T1, T2, T2 selective partial inversion recovery (SPIR)/FAT, and coronal proton density (PD). Patients who were agitated or in a coma were sedated (midazolam or propofol) or subjected to anesthetic induction (nitrous oxide, oxygen, sevoflurane, or isoflurane) for image acquisition.

The radiological profile included assessments for compression fracture, dislocation fracture, explosion fracture, bone swelling, fracture in the posterior elements (pedicle, articular facets, blade, spinous and transverse processes, lateral mass, arc and joint capsules), listhesis, spinal canal compression, spinal cord contusion, spinal cord compression, protrusion, extradural hematoma, injuries to the posterior ligament complex, and injuries to the different vertebrae [17].

The data were described using absolute and relative frequencies. Chi-square tests (χ^2) were applied to assess differences between groups. The clinical variables were subjected to trend chi-square tests (χ^2 Trend) to determine how the characteristics behaved over time (increasing or decreasing), as evidenced by the positivity or negativity of the value of A. The dependent categorical variables (radiological findings from CT and MRI) were analyzed using Kappa exact tests [18] to identify weak (0.01 to 0.33), moderate (0.34 to 0.65), and high (0.66 to 1.00) agreement. Independent categorical variables (CT or MRI at different stages of life) were analyzed using chi-square tests. In addition, log-rank and Breslow and Tarone–Ware tests were applied to analyze the independent variables along the Kaplan–Meier curve generated to verify differences in hospitalization periods. $P \leq 0.05$ was considered statistically significant.

RESULTS

The total of 128 patients included 21, 52, and 55 in the G1, G2, and G3 groups, respectively. The analyzed social variables are shown in Table 1. Male patients were more affected by MRT regardless of age. Elderly people had less education (1–3 years) than the other groups. Regarding marital status, the young adult group showed a higher frequency of being single, while the elderly were more often widowed. Regarding occupation, being a homemaker was more frequently declared by elderly individuals.

Table 2 describes the clinical aspects of the patients. We observed differences between the groups in the morphologic diagnosis of the injury, with compression fracture being the most common in the elderly. Face trauma was the most common associated injury in the elderly, and there was an increasing tendency with age. We observed that conservative and surgical treatment with a posterior approach were more frequently employed in elderly and middle-aged patients, respectively.

The radiological findings diagnosed by MRI and CT did not differ significantly. Table 3 shows the radiological findings of CT according to age group. We observed listhesis more frequently in middle-aged patients. Table 4 presents the radiological findings of MRI in different age groups, showing that spinal cord contusion and trauma to the C1 vertebra were more frequent in young adults.

Figure 1 shows that there were no differences in the duration of hospitalization between patients with SCI caused by a fall between the different age groups.

DISCUSSION

Traumatic SCI can result in partial or total loss of function and may have different clinical presentations in patients at different ages [1,2,5]. In this study, we identified differences in social, clinical, and radiological factors at different stages of life. Lower levels of schooling, being widowed, and being a homemaker were more frequently noted among the elderly, compared to being single for middle-aged patients, making them more susceptible to developing SCI after a fall. We also observed that compression fracture and facial trauma occurred more frequently in elderly patients, with the prevalence of facial trauma increasing with age. Moreover, conservative therapeutic management was more prevalent in the elderly while surgery from a posterior approach was more common in middle-aged adults. Listhesis was better identified in middle-aged adults by CT. Spinal cord contusion and injury to the C1 vertebra were best seen in young adults by MRI.

Chen et al. [19] reported being married to be the most common among the elderly, in contrast to the findings in the present study, which showed widower

status to be the most frequent in that population. Chen et al. [19] also reported that more than one-third of elderly people with SCI had a high level of schooling; in contrast, we observed low levels of education. The differences between these study findings may be attributed to different levels of socioeconomic development. We observed that being a homemaker was more common in the elderly, in contrast to another study in which retired people were more common [19]. The fact that there is no regular retirement for this profession may have been a determining factor for the contradictory findings in the literature.

Being single was more common in middle-aged people in this study. In contrast, Ning et al. [20] and Feng et al. [21] reported a married status to be most common at this stage of life. Cultural differences may explain these contradictory results as these studies included populations from different (western and eastern) geographical regions.

Tab. 1. Social variables of patients with SCI caused by a fall at different stages of life: young (G1), middle age (G2) and elderly adults (G3)

	G1 (n = 21)	**G2 (n = 52)**	**G3 (n = 55)**	χ^2	*p*
Sex					
Men	19(90)	41(79)	31(46)		
Women	2(10)	11(21)	24(44)	11.167	0.003*
Educational level					
None	0(0)	3(6)	3(5)	1.241	0.537
1 to 3 years	0(0)	8(15)	14(25)	7.118	0.028*
4 to 7 years	10(48)	15(29)	19(35)	2.338	0.310
8 to 11 years	5(24)	7(13)	5(9)	2.861	0.239
11 years or more (+)	4(19)	6(12)	3(5)	3.261	0.195
Not provided	2(10)	13(25)	11(20)		
Marital status					
Single	11(52)	12(23)	6(11)	14.925	0.0006*
Stable union	7(33)	31(60)	27(49)	4.244	0.119
Divorced	1(5)	5(10)	4(7)	0.528	0.7679
widowed	1(5)	1(2)	14(25)	14.907	0.0006*
Not provided	1(5)	3(6)	4(7)		
Religion					
Roman Catholic	15(71)	39(75)	40(73)	0.123	0.940
Spiritualism	0(0)	1(2)	0(0)	1.473	0.478
Evangelical	4(19)	2(4)	6(11)	4.336	0.114
No religion	0(0)	2(4)	3(5)	1.205	0.547
Jehovah's Witnesses.	0(0)	1(2)	0(0)	1.473	0.478
Not provided	2(10)	7(13)	6(11)		
Occupation					
Autonomous	1(5)	0(0)	3(5)	2.849	0.24
Retired	0(0)	2(4)	5(9)	2.876	0.237
Household	1(5)	2(4)	16(29)	15.496	0.0004*
Bricklayer	1(5)	9(17)	3(5)	4.917	0.085
Others	16(76)	36(69)	23(42)		
Not provided	2(10)	3(6)	5(9)		

*$p<0.05$, by the chi-square test (χ^2).

Tab. 2. Clinical variables of patients with SCI caused by a fall at different stages of life: young (G1), middle age (G2) and elderly adults (G3).

	G1 (n = 21)	G2 (n = 52)	G3 (n = 55)	χ^2	*p*	A	*p*	χ^2_{Trend}
Syndromic presentation								
Cervicalgia	5(21)	6(11)	13(23)	2.93	0.231	2.176	0.504	Increasing
Decreased strength	0(0)	0(0)	1(2)	1.396	0.497	0.757	0.299	Increasing
Dorsal pain	9(38)	22(40)	17(30)	1.331	0.514	-3.647	0.371	Descending
Low back pain	2(8)	6(11)	8(14)	0.594	0.743	2.117	0.441	Increasing
Paraparesis	1(4)	7(13)	5(9)	1.487	0.475	0.845	0.736	Increasing
Paraplegia	1(4)	7(13)	3(5)	2.701	0.259	-0.669	0.773	Descending
Paresis	1(4)	0(0)	0(0)	4.701	0.095	-1.242	0.088	Descending
Paresthesia	2(8)	1(2)	1(2)	2.969	0.226	-1.970	0.172	Descending
Tetraparesis	1(4)	5(9)	5(9)	0.607	0.738	1.330	0.567	Increasing
Tetraplegia	2(8)	1(2)	4(7)	2.156	0.340	0.301	0.873	Increasing
Total	24	55	57					
Topography								
Cervical	9(43)	16(29)	22(38)	1.809	0.404	0.118	0.976	Increasing
Lumbar	4(19)	6(11)	8(14)	0.936	0.626	-0.933	0.740	Descending
Lumbosacral	0(0)	2(4)	0(0)	2.864	0.238	-0.548	0.584	Descending
Thoracic	1(5)	7(13)	7(12)	1.020	0.600	1.888	0.468	Increasing
Thoracolumbar transition	7(33)	25(45)	21(36)	1.216	0.544	-0.525	0.896	Descending
Total	21	56	58					
Morphologic diagnosis								
Spinal cord contusion	0(0)	5(22)	2(4)	3.594	0.165	0.4380	0.818	Increasing
Compression fracture	7(30)	7(30)	18(36)	6.007	0.049*	3.859	0.284	Increasing
Dislocation fracture	4(17)	2(9)	3(6)	4.206	0.122	-3.008	0.161	Descending
Linear fracture in the vertebral body	3(13)	2(9)	4(8)	1.819	0.402	-1.008	0.638	Descending
Odontoid fracture	1(4)	0(0)	2(4)	2.031	0.362	0.3306	0.795	Increasing
Burst fracture	5(22)	21(91)	12(24)	5.666	0.058	-1.479	0.696	Descending
Fracture in the posterior elements	0(0)	1(4)	0(0)	1.534	0.464	-0.223	0.763	Descending
Posterior ligamentar complex injury	1(4)	1(4)	1(2)	0.411	0.814	-0.669	0.598	Descending
Listhesis	2(9)	9(39)	8(16)	1.193	0.550	1.760	0.554	Increasing
Total	23	48	50					
Neurological status (admission)								
A	3(14)	9(17)	7(13)	0.450	0.798	-1.046	0.719	Descending
B	1(5)	2(4)	2(4)	0.052	0.974	-0.328	0.836	Descending
C	2(10)	6(12)	8(15)	0.424	0.808	1.750	0.517	Increasing
D	1(5)	3(6)	2(4)	0.272	0.872	-0.593	0.731	Descending
E	14(67)	32(62)	36(65)	0.252	0.881	0.218	0.955	Increasing

Neurological status (outcome)								
A	2(10)	5(10)	2(4)	1.701	0.427	-2.390	0.253	Descending
B	0(0)	2(4)	0(0)	2.969	0.226	-0.5313	0.600	Descending
C	1(5)	1(2)	2(4)	0.482	0.786	-0.062	0.965	Descending
D	1(5)	4(8)	3(5)	0.323	0.850	-0.125	0.949	Descending
E	12(57)	21(40)	23(42)	1.853	0.395	-3.875	0.339	Descending
Mortality	1(5)	2(4)	7(13)	3.252	0.196	3.343	0.127	Increasing
Uninformed	4(19)	17(33)	18(33)					
associated injuries								
Appendicular lower limb	0(0)	5(16)	2(6)	3.082	0.214	-0.026	0.988	Descending
Appendicular upper limb	2(18)	3(9)	4(12)	0.613	0.736	-0.605	0.760	Descending
Thoracic trauma	2(18)	2(6)	2(6)	1.873	0.392	-1.736	0.293	Descending
Facial trauma	0(0)	0(0)	5(15)	6.974	0.030*	3.552	0.019*	Increasing
TBI	5(45)	20(63)	19(58)	0.978	0.613	1.263	0.676	Increasing
Others	2(18)	2(6)	1(3)	3.091	0.213	-2.447	0.107	Descending
Total	11	32	33					
Therapeutic management								
Conservative	7(33)	11(21)	25(45)	7.076	0.029*	6.578	0.088	Increasing
Surgical (anterior approach)	6(29)	10(19)	11(20)	0.853	0.652	-2.171	0.515	Descending
Surgical (posterior approach)	8(38)	31(60)	19(35)	7.307	0.025*	-4.811	0.235	Descending
Clinical complications								
Shock	1(14)	0(0)	2(9)	2.097	0.350	-0.021	0.986	Descending
Late hemodynamic instability	0(0)	1(6)	2(9)	0.690	0.708	0.978	0.419	Increasing
Respiratory failure	0(0)	2(12)	2(9)	0.883	0.643	0.638	0.644	Increasing
Cardiorespiratory arrest	0(0)	1(6)	2(9)	0.690	0.708	0.978	0.419	Increasing
PNM	3(43)	6(35)	6(26)	0.296	0.862	-1.322	0.592	Descending
Sepsis	1(14)	2(12)	2(9)	0.212	0.899	-0.702	0.645	Descending
Others	2(29)	5(29)	7(30)	0.011	0.994	0.234	0.917	Increasing
Total	7	17	23					
Outcome								
Discharge	16(76)	39(75)	41(75)	0.022	0.989	-0.500	0.887	Descending
Mortality	1(5)	2(4)	8(15)	4.365	0.112	4.078	0.075	Increasing
Not provided	4(19)	11(21)	6(11)	2.173	0.337	-3.578	0.237	Descending

χ^2: chi-square; TBI: Traumatic Brain Injury; PNM: Pneumonia. *p<0.05 in the different analyze

We observed that compression fracture was the most frequent morphological aspect in the elderly, consistent with the findings of a previous study [11]. We also observed that facial trauma was the most common associated injury in the elderly, unlike previous studies reporting thoracic trauma [6,12] and traumatic brain injury [11] to be the most common associated injury. However, these studies did not compare the different life stages and some [6,12] studied populations with surgical indications.

Tab. 3. Radiological aspects of Computed Tomography of patients with SCI caused by a fall at different stages of life: young (G1), middle age (G2) and elderly adults (G3)

	G1 (n = 10)	G2 (n = 12)	G3 (n = 15)	χ^2	*p*
Compression fracture	3(30)	1(8.33)	6(40)	3.451	0.178
Dislocation fracture	1(10)	0(0)	1(6.67)	1.145	0.564
Explosion facture	3(30)	4(33.33)	3(20)	0.662	0.718
Bone swelling	0(0)	0(0)	2(13.33)	3.101	0.212
Fracture in the posterior elements	5(50)	2(16.67)	3(20)	3.705	0.156
Listhesis	0(0)	4(33.33)	1(6.67)	6.198	0.045*
Spinal canal compression	2(20)	1(8.33)	0(0)	3.222	0.199
Protrusion	0(0)	1(8.33)	0(0)	2.141	0.342
Injuries to the posterior ligament complex	0(0)	1(8.33)	0(0)	2.141	0.342
Vertebral injuries					
C1	1(10)	0(0)	0(0)	2.775	0.249
C3	0(0)	1(8.33)	0(0)	2.141	0.342
C4	0(0)	1(8.33)	0(0)	2.141	0.342
C5	2(20)	0(0)	2(20)	2.429	0.296
C6	2(20)	0(0)	2(20)	2.429	0.296
C7	0(0)	0(0)	1(6.67)	1.507	0.47
T2	1(10)	0(0)	0(0)	2.775	0.249
T3	1(10)	0(0)	0(0)	2.775	0.249
T10	0(0)	0(0)	1(6.67)	1.507	0.47
T11	1(10)	1(8.33)	2(20)	0.182	0.912
T12	3(30)	4(33.33)	1(6.67)	3.365	0.185
L1	5(50)	4(33.33)	2(13.33)	3.972	0.137
L2	2(20)	1(8.33)	1(6.67)	1.219	0.543
L3	2(20)	0(0)	3(20)	2.775	0.249
L4	0(0)	2(16.67)	1(6.67)	2.104	0.349
L5	0(0)	2(16.67)	0(0)	4.405	0.11
S1	0(0)	2(16.67)	0(0)	4.405	0.11

χ^2: chi-square; *p<0.05 by chi-square test.

In addition, we observed that conservative treatment was the most common therapeutic management in the elderly adults, consistent with previous results [22], which is supported by the increased risk of prolonged intubation and mortality associated with surgical interventions [23]. Posterior arthrodesis surgery was performed more frequently in middle-aged patients, similar to reports in other studies [6,12]. The surgical indication is likely due to the greater impact of falls leading to more severe consequences.

According to Guarnieri, et al. [24], CT allows limited visualization of the structures adjacent to the spine; thus, it is more indicated for evaluation of bone structures in cases of SCI [24]. We observed that CT provided better visualization of listhesis in middle-aged patients, as it better identified changes in the positioning of bone structures.

Regarding MRI-based evaluation, we observed better visualization of spinal cord contusions and C1 vertebra lesions in young adults, a finding consistent with that of another study [17] in young adults. In addition, Lammertse et al. [25] indicated that more studies are needed to assess radiological conditions, including spinal cord contusion [25]. Our findings regarding the predominance of lesions in the C1 vertebra are comparable to those of other studies report-

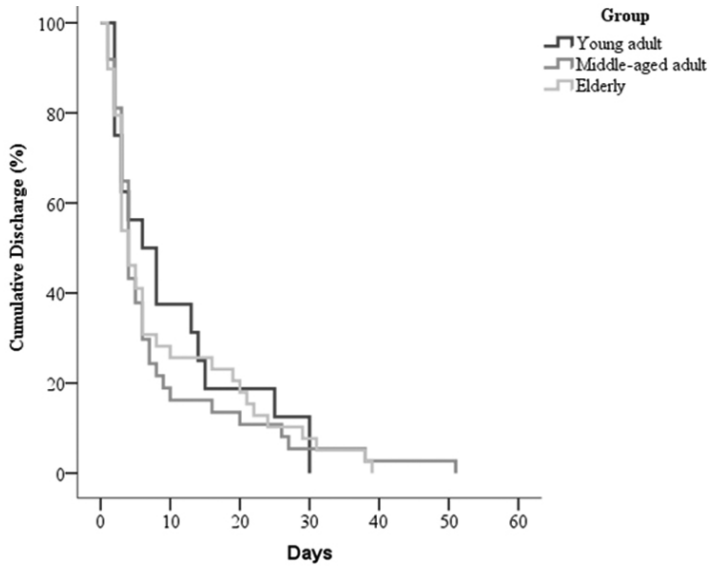
ing the cervical spine to be the most affected [21,26]. Bozzo et al. [26] also indicated the importance of MRI in the evaluation of cervical lesions. In addition, other studies [19,27] reported that cervical spine injuries are better identified in patients less than 45 years of age; that is, in young and middle-aged adults, a result that partially corroborates our findings.

The limitations of this study are related to the dif-

Table 4. Radiological aspects of magnetic resonance imaging of patients with SCI caused by a fall at different stages of life: young (G1), middle age (G2) and elderly adults (G3)

	G1 (n = 10)	**G2 (n = 12)**	**G3 (n = 15)**	χ^2	*p*
Compression fracture	2(20)	1(8.33)	6(40)	3.771	0.151
Dislocation fracture	2(20)	0(0)	1(6.67)	2.999	0.223
Explosion facture	4(40)	5(41.67)	5(33.33)	0.224	0.894
Bone swelling	3(30)	1(8.33)	3(20)	1.688	0.429
Fracture in the posterior elements	3(30)	4(33.33)	5(33.33)	0.037	0.981
Listhesis	2(20)	4(33.33)	2(13.33)	1.595	0.45
Spinal cord compression	0(0)	1(8.33)	2(13.33)	1.433	0.488
Spinal canal compression	2(20)	3(25)	4(26.67)	0.149	0.928
Spinal cord contusion	2(20)	0(0)	0(0)	5.709	0.057*
Protrusion	0(0)	1(8.33)	0(0)	2.141	0.342
Extradural hematoma	1(10)	0(0)	0(0)	2.775	0.249
Injuries to the posterior ligament complex	2(20)	1(8.33)	2(13.33)	0.636	0.727
Vertebral injuries					
C1	2(20)	0(0)	0(0)	5.709	0.057*
C3	0(0)	1(8.33)	1(6.67)	0.819	0.663
C4	1(10)	1(8.33)	1(6.67)	0.091	0.955
C5	2(20)	0(0)	1(6.67)	2.999	0.223
C6	3(30)	1(8.33)	3(20)	1.688	0.429
C7	3(30)	0(0)	3(20)	3.879	0.143
T1	0(0)	0(0)	1(6.67)	1.507	0.47
T3	1(10)	0(0)	0(0)	2.674	0.262
T4	1(10)	0(0)	0(0)	2.674	0.262
T6	1(10)	0(0)	0(0)	2.674	0.262
T7	1(10)	0(0)	0(0)	2.674	0.262
T8	1(10)	0(0)	2(13.33)	1.657	0.436
T9	1(10)	0(0)	1(6.67)	1.145	0.564
T10	0(0)	0(0)	3(20)	4.788	0.091
T11	1(10)	1(8.33)	4(26.67)	2.039	0.360
T12	3(30)	4(33.33)	4(26.67)	0.493	0.781
L1	5(50)	4(33.33)	4(26.67)	1.459	0.482
L2	3(30)	1(8.33)	1(6.67)	3.203	0.201
L3	2(20)	1(8.33)	4(26.67)	1.471	0.479
L4	0(0)	3(25)	1(6.67)	3.985	0.136
L5	1(10)	3(25)	0(0)	4.331	0.114
S1	1(10)	2(16.67)	0(0)	2.551	0.279

χ^2: chi-square; *$p<0.05$ by chi-square test.



Overall Comparisons	Chi-Square	*p*
Log Rank (Mantel-Cox)	0,207	0,902
Breslow (Generalized Wilcoxon)	0,508	0,776
Tarone-Ware	0,478	0,788

Figure 1.

ficulties of studies utilizing data collected from medical records and the potential for flaws in the data registration process [20]. In addition, data collection was performed by more than one person; thus, while the data collection was based on similar criteria, the data were not identical [20]. Feng HY, et al. [21] reported little detail of the information as a limitation in his study, as this can affect the analysis and accuracy of the information.

CONCLUSION

1. Elderly adults with low education level, widowed, and homemakers were more susceptible to SCI caused by a fall.
2. Single marital status was more frequently noted in young adults.
3. The most frequent clinical aspects were the morphological aspect of compression fracture and facial trauma as an associated injury in elderly adults, with the occurrence of facial trauma increasing with age.
4. Conservative therapeutic management was more common in elderly adults than surgery from a posterior approach in middle-aged adults.
5. Regarding the radiological aspects of CT, listhesis was better identified in middle-aged adults. Spinal cord contusions and C1 vertebra lesions were better identified in young adults by MRI.

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