PREDICTORS OF CLINICAL COMPLICATIONS IN PATIENTS WITH SPINOMEDULLARY INJURY

Objective: To analyze individuals with spinal cord injury who developed secondary clinical complications, and the variables that can influence the prognosis. Methods: A prospective study of 321 patients with spinal cord injury. The variables were collected: age, sex, cause of the accident, anatomical distribution, neurological status, associated injuries, in-hospital complications, and mortality only in patients who developed complications. Results: A total of 72 patients were analyzed (85% male) with a mean age of 44.72±19.19 years. The individuals with spinal cord injury who developed clinical complications were mostly male, over 50 years of age, and the main cause was accidental falls. These patients had longer hospitalization times and a higher risk of progressing to death. Pneumonia was the main clinical complication. With regard to the variables that can influence the prognosis of these patients, it was observed that spinal cord injury to the cervical segment with syndromic quadriplegia, and neurological status ASIA-A, have a higher risk of developing pneumonia, the most common complication, as well as increased mortality. Conclusion: Clinical complications secondary to spinal cord injury are influenced by demographic factors, as well as characteristics of the injury contributing to an increase in mortality.

Keywords: Spinal cord injuries/complications; Spinal injuries; Mortality.

INTRODUCTION

Spinal cord injury (SCI) is one of the primary causes of morbidity and mortality. It is characterized by damage to the spinal cord, which results in permanent or transient sequelae in the sensory, motor and autonomous functions.1-4 Therefore, a greater knowledge is needed of the secondary clinical complications, to enable effective intervention in these patients and obtain a better prognosis. The high incidence of complications in these patients has been the subject of...
studies, mainly owing to the high economic cost of treatment and to the mortality rate. However, these studies are primarily focused on specific or long-term complications.

The aim of this study was to analyze patients with SCI who developed intra-hospital clinical complications, and the variables that can interfere in the prognosis, at a tertiary hospital.

METHODS

A randomized, prospective, descriptive study, conducted at the Hospital de Base de São José do Rio Preto, SP Brazil, which is a tertiary reference center in the northwest region of the state of São Paulo, during the period of January 2008 to June 2012. This study was approved by the Research Ethics Committee of the Faculdade de Medicina de São José do Rio Preto – FAMERP, under protocol No. 4823/2009.

The inclusion criterion adopted in the study was medically diagnosed SCI confirmed by imaging. Patients treated only in the emergency room and discharged afterwards, those who died during admission, or who did not develop complications in the intra-hospital stage were excluded.

The sample consisted of 321 patients with SCI followed up during the hospitalization period, and the variables analyzed were cataloged in a database. The variables studied were: age, sex, etiology of the accident, anatomical distribution, neurological status, associated injuries, clinical complications and mortality. Only the variables of 72 patients who developed intra-hospital clinical complications were analyzed.

The anatomical distribution of SCI was characterized in five anatomical regions: upper cervical (C0-C2), lower cervical (C3-C7), thoracic (T1-T10), thoracolumbar transition (T11-L2) and lumbosacral (L3-S1). The neurological status was assessed according to the scale of the American Spine Injury Association (ASIA), with division into three groups: ASIA-A (patients with complete sensory and motor deficit), ASIA-B/C/D (patients with incomplete sensory and motor deficit), and ASIA-E (patients without sensory and motor deficit).

The data were analyzed through calculations of descriptive and inferential statistics. The results were expressed in mean, standard deviation, absolute and relative frequency. The Mann-Whitney test was used to compare average hospitalization time, while Fisher’s exact test was used to compare the relative risk (RR) among the variables. The level of significance adopted was p ≤ 0.05. The statistical analysis was carried out in the Instat software (version 3.0; GraphPad Inc., San Diego, CA, USA).

RESULTS

Of the 321 patients, 72 (65% of whom were male) were analyzed. The average age of the patients with SCI was 44.72 ± 19.19 years. The patients aged >50 years were more susceptible to complications associated with SCI in the intra-hospital period. (Figure 1)

The main causes of SCI that developed complications were, in order of prevalence, accidental fall (31.9%), car accident (29.2%), motorcycle accident (18%), sports (6.9%), diving (6.9%), gunshot wound (4.3%), and others (2.8%).

In terms of anatomical distribution, there were 76 injured segments, and four patients presented with two affected regions. The injuries affected the lower cervical (43.5%), thoracolumbar transition (23.7%), thoracic (19.7%), upper cervical (9.2%) and lumbosacral (3.9%) regions, in that order.

There were 142 spinal injuries, with 44.4% of the patients presenting with two injuries, 12.5% with three, 5.6% with four, and 6.9% with two injuries; the other patients (n=25) presented with only one injury. The vertebrae with the most injuries were C6, C5, C4, C3 and T12, respectively. (Figure 2)

The following sets of symptoms were found upon admission of the patients, in order of prevalence: quadriplegia (31.94%), paraplegia (19.44%), dorsalgia (15.28%), paraparesis (11.11%), cervicalgia (11.11%), tetraparesis (5.56%), cervicalgia with paresthesia (2.78%), and coma (2.78%).

There were 117 clinical complications among the 72 patients; 25 patients presented with two, and 10 with three complications. The most prevalent was pneumonia in 41.7% of the patients, followed by urinary tract infection (25%), atelectasis (8.3%), hypovolemic shock (6.9%) and sepsis (6.9%). (Table 1)

Thirty-two patients presented with some kind of associated injury. Of these, 53.1% presented with one injury, 28.1% with two, and 18.8% with three associated injuries. The most frequent was head injury in 18.06% of the patients, followed by chest trauma (13.89%). (Table 1)

The average hospitalization time (22.13 ± 23.11 days) of the patients with complications was significantly (p<0.0001) longer than the others (7±8.15 days). Hence the ASIA-A neurological status was the most prevalent among the patients with SCI who experienced complications during the intra-hospital stage, (Figure 3) 25% of whom died.
The development of pneumonia as a clinical complication had an increased risk in injuries in the lower cervical region (RR=2.14; p<0.0001); in individuals with associated chest trauma injury (RR=4.39; p=0.006); syndromic quadriplegia (RR=13.77; p<0.0001); and in the ASIA-A neurological status (RR=8.94; p<0.0001). Therefore, patients with pneumonia associated with SCI had a 9.77 greater risk of death (p<0.0001).

**DISCUSSION**

This study sought to analyze patients with SCI who developed complications in the hospitalization period and the variables that influenced the prognosis. It was found that men have a higher risk of developing complications, as do individuals aged >50 years and those who have suffered an accidental fall; furthermore, hospitalization time and risk of death are increased in these individuals. Moreover, pneumonia was the primary complication, being influenced by several variables and increasing the risk of death almost tenfold.

Men had a higher risk of developing clinical complications. No surveys were found to justify this result, but one possible explanation is that SCI is more prevalent among males, according to various studies. Studies on individuals with SCI were found in the literature showing that age increases the risk of complications and that it is associated with the risk of accidental falls. The results of this study confirm the data shown previously. Accordingly, age is a determinant factor in the prognosis of these patients.

Patients with SCI who presented with complications had an increase in hospitalization times. According to Santos et al. the main complication is respiratory tract infections, such as pneumonia. Respiratory complications are associated with the increase in hospitalization time, in financial cost to the hospital, and in mortality. These complications have therefore been the focus of various studies. Thus, it is possible to intervene directly in this primary complication, so as to improve the prognosis of these patients. Berneu et al. found that intensive physical therapy and early weaning from mechanical ventilation significantly reduced hospitalization times and hospital costs in these patients.

The risk of developing pneumonia was greater in individuals with cervical injury, chest trauma, syndromic quadriplegia, and ASIA-A neurological status. In addition, these patients exhibited a higher risk of mortality. DeVivo et al. found that pneumonia is the primary cause of death in these individuals. Moreover, there are reports in the literature that this complication does not depend on the use of mechanical ventilation. The secondary cause of pneumonia can be paralysis of the diaphragm (innervation C3-C5), as well as a reduction in the functionality of other accessory muscles, altering pulmonary function. Furthermore, a possible imbalance in the autonomic nervous system, secondary to SCI, may cause hypertrophy of the airways and result in pulmonary hypersecretion.

According to Kawu et al., the risk factors associated with mortality after SCI are age, Glasgow coma score <9, cervical spine injury, and complete neurological injury, corroborating the results found in this study.

**CONCLUSION**

Patients with SCI who evolved with clinical complications are mostly male, aged >50 years, and the main cause was accidental fall. In addition, they had a longer hospitalization time and a higher risk of death. Pneumonia was the primary clinical complication, and was related to involvement of the cervical segment, syndromic quadriplegia, and ASIA-A neurological status, thus increasing mortality. It is concluded that the clinical complications secondary to SCI are influenced by demographic factors, and by characteristics related to the level and severity of the neurological lesion, influencing patient survival.

All authors declare no potential conflict of interest concerning this article.
REFERENCES


