PREDICTORS OF CLINICAL COMPLICATIONS IN PATIENTS WITH SPINOMEDULLARY INJURY

PREDITORES DE COMPLICAÇÕES CLÍNICAS EM PACIENTES COM TRAUMA RAQUIMEDULAR

PREDICTORES DE COMPLICACIONES EN PACIENTES CON TRAUMA RAQUIMEDULAR

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ABSTRACT

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.

RESUMO

Objetivo: Analisar pacientes de um hospital terciário com trauma raquimedular que evoluíram com complicações clínicas intra-hospitalares, bem como as variáveis que podem interferir no prognóstico. Métodos: Estudo prospectivo de 321 pacientes vítimas de trauma raquimedular, que coletou dados sobre as seguintes variáveis: idade, sexo, etiologia do acidente, distribuição anatômica, estado neurológico, lesões associadas, complicações clínicas e mortalidade. Foram analisados apenas os pacientes que evoluíram com complicações. Resultados: Foram analisados 72 pacientes (85% do sexo masculino), com média de idade de 44,72±19,19 anos. Esses indivíduos com trauma raquimedular evoluíram com complicações clínicas intra-hospitalares, sendo a maioria do sexo masculino e com idade superior a 50 anos, sendo a principal causa a queda acidental. Além disso, esses pacientes apresentaram maior tempo de permanência hospitalar e risco de evoluir para o óbito. A pneumonia foi a principal complicação clínica. Com relação às variáveis que podem interferir no prognóstico desses pacientes, observa-se que o trauma raquimedular no segmento cervical com quadro sindrômico de tetraplegia e o estado neurológico ASIA-A apresenta maior risco de desenvolver complicações clínicas, sendo a pneumonia a mais frequente, assim como maior risco de aumentar a mortalidade. Conclusão: As complicações clínicas secundárias ao trauma raquimedular são influenciadas por fatores demográficos, assim como por características relacionadas com a lesão, interferindo no aumento da mortalidade.

Descritores: Traumatismos da medula espinal/complicações; Traumatismo da coluna vertebral; Mortalidade.

RESUMEN

Objetivo: Analizar los pacientes en un hospital de tercer nivel con lesión de la médula espinal que tuvieron complicaciones clínicas, así como las variables que pueden influir en el pronóstico. Métodos: Estudio prospectivo de 321 pacientes con lesiones de la médula espinal, que recopiló datos sobre las siguientes variables: edad, sexo, causa del accidente, distribución anatómica, estado neurológico, lesiones asociadas, complicaciones clínicas y mortalidad. Sólo se analizaron los pacientes que desarrollaron complicaciones. Resultados: Se analizaron 72 pacientes (85% varones) con una edad media de 44,72±19,19 años. Aquellos individuos con lesión de la médula espinal progresaron con complicaciones clínicas intrahospitalarias, en su mayoría varones y mayores de 50 años, siendo la caída accidental la principal causa. Además, estos pacientes tenían una estancia hospitalaria más prolongada y riesgo de progresar a la muerte. La neumonía fue la principal complicación clínica. En cuanto a las variables que pueden influir en el pronóstico de estos pacientes, se observa que la lesión de la médula espinal en el segmento cervical con cuadro sindrómico de tetraplejía y el estado neurológico ASIA-A aporta un mayor riesgo de desarrollar complicaciones clínicas, siendo la neumonía la más frecuente, así como mayor riesgo de aumento de la mortalidad. Conclusión: Las complicaciones clínicas secundarias a la lesión de la médula espinal se ven afectadas por factores demográficos, así como por las características relacionadas con la lesión, que influyen en el aumento de la mortalidad.

Descriptores: Traumatismos de la médula espinal/complicaciones; Traumatismos vertebrales; Mortalidad.

INTRODUCTION

Spinal cord injury (SCI) is one of the primary causes of morbimortality. 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

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studies,[5,6] mainly owing to the high economic cost of treatment and to the mortality rate.[7,8] However, these studies are primarily focused on specific,[9-11] or long-term complications.[12]

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),[1] 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 $p \leq 0.05$. 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 (85% 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%).

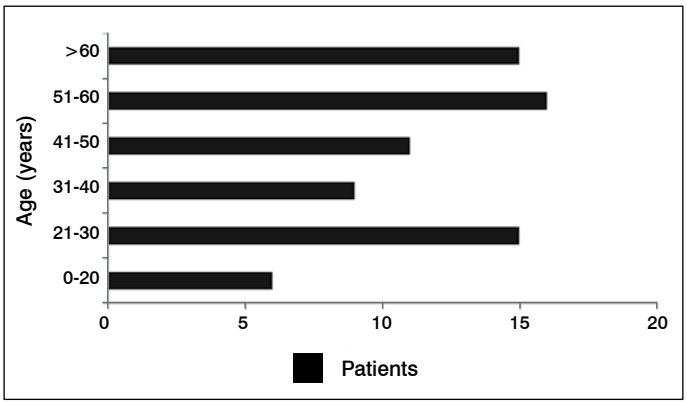

Figure 1. Distribution of patients by age group.

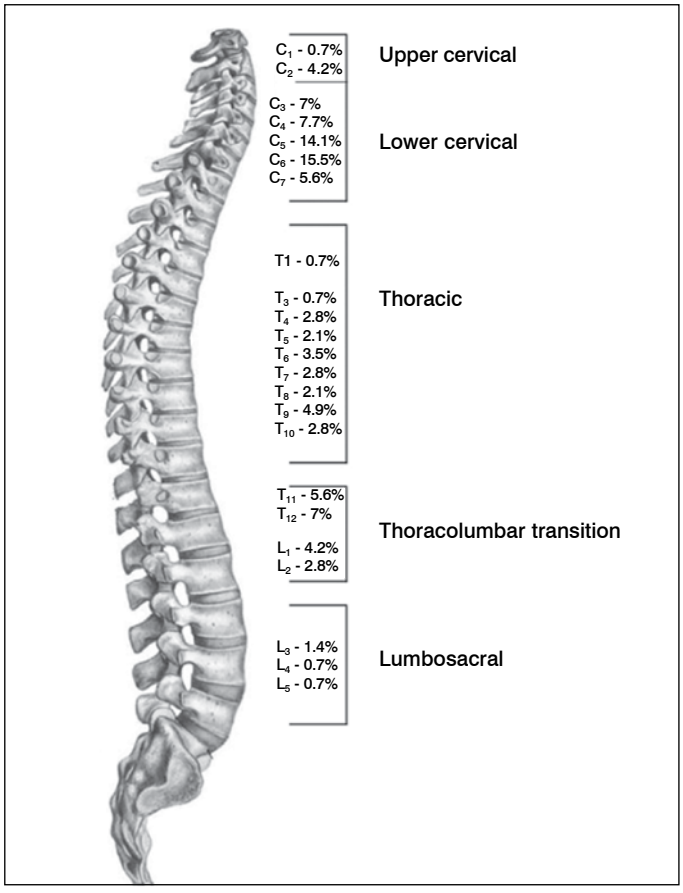

Figure 2. Distribution of the 142 injuries by vertebral segment.

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.

Table 1. Distribution of complications and associated injuries among the 72 patients.

	Absolute frequency (n=72)	Relative frequency (%)
Complication (n=117)		
Atelectasis	06	8.33
Hypovolemic shock	05	6.94
Bedsore	03	4.17
Hemothorax	03	4.17
Surgical wound infection	03	4.17
Urinary tract infection	18	25.00
Respiratory failure	04	5.55
Late instability	04	5.55
Pneumonia	30	41.67
Sepsis	05	6.94
Other*	36	50.00
Associated injury (n=53)		
Scalp	03	4.17
Hip fracture	03	4.17
Collarbone fracture	03	4.17
Costal arch fracture	04	5.55
Lower limb fracture	04	5.55
Upper limb fracture	03	4.17
Head injury	13	18.06
Facial trauma	04	5.55
Chest trauma	10	13.89
Other*	06	8.33

* Represent diagnoses in one or two patients for each complication or associated injury.

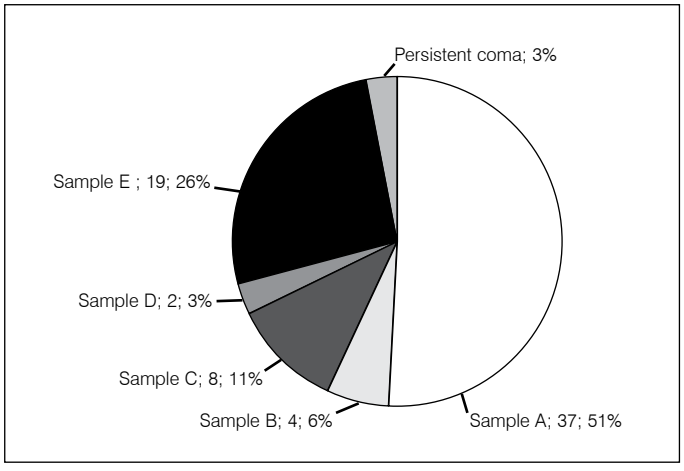

Figure 3. Distribution of patients according to neurological status, classified using the ASIA scale.

Patients aged >50 years had a 1.47 higher risk of clinical complications (p=0.045). Men had a 2.16 higher risk (p=0.004) than women, and patients with SCI who suffered chest trauma had a twofold higher risk (p=0.041) of developing complications than individuals with head injury. Individuals with ASIA-A neurological status had a 4.93 higher risk of developing complications than those with ASIA-E. Moreover, patients with clinical complications had a 3.947 higher risk of mortality (p<0.0001).

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.[13-17] Studies on individuals with SCI were found in the literature showing that age increases the risk of complications[18] and that it is associated with the risk of accidental falls.[19] 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.[6] 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,[7] and in mortality.[8] These complications have therefore been the focus of various studies.[20-23] Thus, it is possible to intervene directly in this primary complication, so as to improve the prognosis of these patients. Berneu et al.[24] 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.[25] found that pneumonia is the primary cause of death in these individuals. Moreover, there are reports in the literature[26] 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.[27]

According to Kawu et al.[28], 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.

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