

EPIDEMIOLOGICAL ANALYSIS OF SPINAL CORD INJURY IN THE CITY OF JOINVILLE (SC)

ANÁLISE EPIDEMIOLÓGICA DE TRAUMA RAQUIMEDULAR NA CIDADE DE JOINVILLE (SC)

ANÁLISIS EPIDEMIOLÓGICO DE TRAUMA RAQUIMEDULAR EN LA CIUDAD DE JOINVILLE (SC)

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ABSTRACT

Objective: This paper proposes a retrospective analysis of the spinal cord trauma at a regional hospital that is a Unified Health System (SUS) reference in Orthopedics and Traumatology, considering epidemiological data and comparing treatments and hospitalization costs. **Methods:** This study is a retrospective, analytical-descriptive, exploratory documental analysis, using data from the medical records of patients treated for spinal cord trauma during 2016 at the São José Municipal Hospital (Joinville, SC). Results: Twenty-three patients were included in the study, 20 of whom (87%) were male. As to etiology, traffic accidents accounted for 47.8% of the cases and gunshot wounds were in second place with 26.1% of the injuries. The correlation between the cost of hospitalization and the days of hospitalization was statistically significant ($p = 0.013$), as was the correlation between the cost of hospitalization and the number of procedures ($p = 0.000$). **Conclusions:** Surgical treatment demands greater amounts of financial and human resources. The purpose of this study is to provide local epidemiological data to encourage discussion about other studies, as well as planning for resource allocation and public policy. **Level of evidence II; Retrospective Study.**

Keywords: Spinal Cord Trauma; Unified Health System; Public Policy.

RESUMO

Objetivo: O presente estudo propõe uma análise retrospectiva relacionada ao traumatismo raquimedular de um hospital de referência regional em Ortopedia e Traumatologia pelo Sistema Único de Saúde (SUS), considerando dados epidemiológicos, comparações entre tratamentos e custos das internações. **Métodos:** Trata-se de um estudo retrospectivo, analítico-descritivo de análise exploratória documental, utilizando dados de prontuários médicos de pacientes atendidos com traumatismo raquimedular durante o ano de 2016 no Hospital Municipal São José (Joinville – SC). **Resultados:** Foram incluídos no estudo 23 pacientes, sendo 20 (87%) do sexo masculino. Quanto à etiologia, os acidentes de trânsito foram responsáveis por 47,8% dos casos e os ferimentos por arma de fogo ocuparam o segundo lugar com 26,1% dos agravos. A correlação entre o custo da internação e os dias da internação foi estatisticamente significativa ($p=0,013$), assim como a correlação entre o custo da internação e o número de procedimentos ($p=0,000$). **Conclusões:** O tratamento cirúrgico demanda maior quantidade de recursos financeiros e humanos. O propósito do presente trabalho consiste em fornecer os dados epidemiológicos locais para fomentar a discussão de outros trabalhos, assim como o planejamento para alocação de recursos e de políticas públicas. **Nível de evidência II; Estudo Retrospectivo.**

Descritores: Traumatismos da Medula Espinal; Sistema Único de Saúde; Política Pública.

RESUMEN

Objetivo: El presente estudio propone un análisis retrospectivo relacionado al traumatismo raquimedular de un hospital de referencia regional en Ortopedia y Traumatología por el Sistema Único de Salud (SUS), considerando datos epidemiológicos, comparaciones entre tratamientos y costos de las internaciones. **Métodos:** Se trata de un estudio retrospectivo, analítico-descriptivo de análisis exploratorio documental, utilizando datos de prontuarios médicos de pacientes atendidos con traumatismo raquimedular durante el año 2016 en el Hospital Municipal São José (Joinville - SC). **Resultados:** Fueron incluidos en el estudio 23 pacientes, siendo 20 (87%) del sexo masculino. Cuanto a la etiología, los accidentes de tránsito fueron responsables por 47,8% de los casos y las heridas por arma de fuego ocuparon el segundo lugar, con 26,1% de los agravios. La correlación entre el costo de la internación y los días de internación fue estadísticamente significativa ($p=0,013$), así como la correlación entre el costo de internación y el número de procedimientos ($p=0,000$). **Conclusiones:** El tratamiento quirúrgico demanda mayor cantidad de recursos financieros y humanos. El propósito del presente trabajo consiste en suministrar los datos epidemiológicos locales para fomentar la discusión de otros trabajos, así como la planificación para la asignación de recursos y de políticas públicas. **Nivel de evidencia II; Estudio Retrospectivo.**

Descriptores: Traumatismos de la Médula Espinal; Sistema Único de Salud; Política Pública.

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INTRODUCTION

Spinal cord trauma is an acute spinal event that occurs with varying degrees of loss of function. Although it is a common pathology, there is a lack of related statistical data.

External causes such as traffic accidents, falls, gunshot wounds, and sports injuries are the main causes of spinal cord injuries. The population most often involved is men aged 15 to 40 years.¹ Because these people are at an economically productive age, the cost to society becomes quite high. In addition to ceasing to produce, the treatment, rehabilitation, and safety, etc. further burden the government and, consequently, society.²

Treatment varies according to the type of injury and the structures involved.^{3,4} In most cases, surgical treatment is indicated for fracture stabilization and/or medullary decompression.

Spinal cord trauma is known to be an event of great physical,⁵ psychological, social, and in most cases, irreversible impact. Studies show that prevention campaigns can be effective in reducing their incidence.¹

The annual worldwide incidence of spinal cord trauma is on the order of 15 to 40 cases per million inhabitants. In Brazil, the coefficient of traumatic spinal cord injury is unknown and there are no accurate data regarding its prevalence or incidence since this condition is not subject to notification.⁶

Joinville is the largest city in the state of Santa Catarina and only one hospital is a Unified Health System (SUS) reference for orthopedic care of spinal cord lesions. Centralizing the care of around 900,000 people living in the region of reference, a multidisciplinary team including orthopedic spine surgeons, nurses, physical therapists, nutritionists, phonocardiologists, psychologists, and social workers provide care to patients with spinal cord trauma. Through this study, we will obtain data related to this population, as well as provide a basis for prevention strategy and resource optimization planning.

This study was a retrospective analysis of spinal cord injury treated at a regional hospital that is a Unified Health System (SUS) reference in Orthopedics and Traumatology, identifying epidemiological data, comparisons between treatments (surgical versus conservative) and hospitalization costs.

METHODS

This study was approved by the Institutional Review Board of the Hospital Municipal São José (Joinville - SC) as opinion number 2.762.463.

The study design was a retrospective, analytical-descriptive exploratory documental analysis using data from the medical records of patients treated for spinal cord trauma in 2016 at the Hospital Municipal São José (Joinville - SC).

The study population included the city of Joinville and other cities in the region, where this hospital is a reference in orthopedics. All patients with traumatic spinal cord injuries that occurred in 2016 were included, except for patients with medical records that were incomplete, illegible, or contained conflicting information.

The outcome variables collected included demographic patient data (age, age range), the trauma mechanism (traffic accidents, gunshot wounds, falls, etc.), the type of treatment (surgical or conservative), the need for admission to the ICU, the need for respiratory assistance, hospitalization time, and associated costs. Spearman's correlation test was used to verify the numeric correlation between the cost of hospitalization and days in the hospital and number of procedures.

RESULTS

Twenty-three patients, 20 of whom (87%) were male, were included in the study. The mean age of the sample was 37.35 years, ranging from 17 to 66 years of age, with a median age of 31 years and a mode of 22 years. (Table 1)

Regarding the etiology of the trauma, traffic accidents were the main cause (car, motorcycle, and bicycle), responsible for 47.8% of the cases. Gunshot wounds were in second place, responsible for 26.1% of the injuries. (Table 2)

Regarding the radiological level of the injuries, the cervical spine was affected in 39% of the cases and the thoracic spine in 47.8%. In one patient with spinal cord trauma at the cervical level no injury was detected by either radiography or magnetic resonance. (Table 3)

Unlike the radiological level, the neurological level is the last level where motor and sensory/proprioceptive functions are preserved. With distribution like that of the radiological level, spinal cord injuries were more frequent in the thoracic spine than the cervical spine. (Table 4)

Polytrauma occurred in 65.2% of the patients, with craniocervical traumatism, thoracic and/or abdominal traumatism, and fractures of other spinal segments and/or other bones considered associated injuries. (Table 5)

Regarding the treatments instituted, they were conservative (non-surgical) in 43.5% of the cases considering two main hypotheses: injuries without indication of surgical approach or patients without clinical conditions. Most patients (56.5%) required surgical intervention, with 30.4% submitted to spinal procedures and 26.1% submitted to other procedures (orthopedic, thoracic, abdominal, or craniocervical). (Table 6)

Considering the need for intensive care unit treatment, approximately one third of the patients required admission to the ICU, regardless of the cause (spinal cord trauma or associated injuries). (Table 7)

Despite anti-bedsores care and standard decubitus position changes, about one fifth of the patients developed decubitus ulcers due to the long bedridden period. (Table 8)

In relation to the outcome of the hospitalizations, despite the intensive care measures implemented by the existing multidisciplinary team, in 21.7% of cases the patients died, either due to the initial severity of the injuries (polytrauma) or complications during hospitalization. In 73.9% of cases, the patients were discharged for

Table 1. Stratification by sex of the participants.

Sex	Frequency	
Female	3	13%
Male	20	87%
Total	23	100%

Table 2. Injury mechanisms and percentages.

Etiology	Frequency	
Automobile	6	26.1%
Bicycle	1	4.3%
Sports (MMA)	1	4.3%
Gunshot wound	6	26.1%
Infection	1	4.3%
Motorcycle	4	17.4%
Fall	4	17.4%
Total	23	100%

Table 3. Radiological level of the injuries.

Radiological level	Frequency	
C2	1	4.3%
C4	3	13.0%
C5	1	4.3%
C6	1	4.3%
C7	3	13.0%
T3	2	8.7%
T4	3	13.0%
T5	1	4.3%
T6	2	8.7%
T11	2	8.7%
T12	1	4.3%
L1	1	8.7%
L2	1	4.3%
Not identified	1	4.3%
Total	23	100%

clinical improvement (not necessarily neurological improvement) and were monitored during outpatient follow-up. (Table 9)

Considering the mean hospitalization time and cost, the daily expenditure per patient was around R\$ 470.36. (Table 10)

To test the hypothesis that surgical procedures generate higher costs compared to conservative treatment, we performed a non-parametric Kruskal-Wallis analysis, resulting in a statistically significant difference between the groups and a positive hypothesis ($p=0.019$). (Table 11)

The correlation between the cost of hospitalization and days of hospitalization was statistically significant ($p=0.013$), that is, the longer the hospitalization, the higher the cost. In the correlation between the cost of hospitalization and the number of procedures ($p=0.000$), the higher the number of procedures, the higher the cost. (Table 12)

Table 4. Neurological level of patients with spinal cord trauma.

Neurological level	Frequency	
C4	2	8.7%
C5	5	21.7%
C7	1	4.3%
T3	2	8.7%
T4	3	13.0%
T5	2	8.7%
T9	1	4.3%
T10	2	8.7%
T11	2	8.7%
T12	1	4.3%
L1	2	8.7%
Total	23	100%

Table 5. Frequency of associated injuries.

Associated injuries	Frequency	
No	8	34.8%
Yes	15	65.2%
Total	23	100%

Table 6. Surgical versus conservative treatment.

Treatment	Frequency	
Arthrodesis	7	30.4%
Other surgeries	6	26.1%
Conservative	10	43.5%
Total	23	100%

Table 7. Need for admission to the ICU.

ICU	Frequency	
Yes	8	34.8%
No	15	65.2%
Total	23	100%

Table 8. Incidence of bedsores.

Bedsores	Frequency	
Yes	5	21.7%
No	18	78.3%
Total	23	100%

Table 9. Reasons for discharge.

Reason for discharge	Frequency	
Transfer	1	4.3%
Death	5	21.7%
Improvement	17	73.9%
Total	23	100%

Table 10. Statistical data analysis.

	Minimum	Maximum	Mean	Standard Deviation
Days in the hospital	1	165	25.57	35.721
Cost of hospitalization	R\$ 583.27	R\$ 71,049.35	R\$ 12,027.36	R\$ 16,438.13

Table 11. Hospitalization costs by treatment.

Group	Hospitalization costs		
	Mean	Standard Deviation	p*
Conservative treatment	9,322.60	21,830.07	0.019
Arthrodesis	18,677.88	12,080.59	
Other surgeries	8,776.36	8,171.57	

Table 12. Correlation coefficients between days in the hospital and number of procedures.

		Days in the hospital	Number of procedures
Cost of hospitalization	Correlation coefficient	.512*	.775**
	p*	.013	.000
	N	23	23

DISCUSSION

In the 1990s, the consensus was that most causes of spinal cord injury were preventable. It was known that investment in awareness campaigns was fundamental to reducing the rate of this occurrence. Delfino et al.¹ advocated rapid diagnosis and treatment in order to try to restore the greatest possible functionality.

In the same decade, Delamarter et al.⁷ evaluated the physiopathology of spinal cord injury. In a trial with purebred dogs, they succeeded in proving that the time to decompression is a significant factor in the expectation of recovery of medullary function, such as lower limb motricity and bladder and rectal sphincter function.

Although advocated for decades, primary care failure is the main cause of neurological deterioration.⁸⁻¹¹ Todd et al.¹² evaluated 59 cases of neurological deterioration in patients with spinal cord trauma. In this review of medical records, based on medical malpractice litigations, it was found that in up to 61% of cases where this had occurred, it was the result of improper handling and/or inappropriate removal from immobilization in patients with unstable spinal fractures/injuries.

It is well-known that the higher the level of the injury, the greater the dependence of the patient. In some cases of high cervical lesions, the patient can remain dependent on mechanical ventilation or respiratory assistance due to the loss of respiratory muscle control. Using rats, Lin et al.¹³ succeeded in proving neurologically and histologically that transplanting fetal stem cells within a week of spinal cord injury may differentiate these cells into neurons and astrocytes, filling cavities and connecting the graft to the respiratory center after eight weeks. Although far from a cure or significant recovery, this may be a prospect for new treatments.^{14,15}

Along the same lines, Oh et al.¹⁶ conducted a level IV clinical trial to examine the effect of intramedullary and subdural mesenchymal stem cell injections on 16 patients with chronic ASIA B cervical spinal cord injury. Of these, 12.5% showed some improvement (albeit slight), maintaining limited functionality of the extremities of the upper limbs. Twenty-five percent showed improvement in somatosensory-evoked potential and 37.5% showed improvement in motor-evoked potential. The clinical importance of these findings remains uncertain and deserves further study.

In contrast to the above, in Brazil there are no official spinal cord injury statistics, as reporting such injuries is not mandatory. Santos et al.¹⁷ conducted an epidemiological study in the municipality of Rio de Janeiro in which length of stay and costs of public municipal and state hospitals were researched.

Our study differs from the others by presenting, in addition to an epidemiological analysis, a financial analysis comparing the time and costs of hospitalization considering the treatments performed in order to provide a basis for the planning of prevention strategies and the optimization of SUS resources.

In line with other studies, the population most affected by this condition was made up of economically active males (87%) between 20 and 40 years of age. Traffic accidents were responsible for approximately half of the injuries, followed by gunshot wounds and falls.

Similarly, the most frequently affected topography was the thoracic spine, in approximately 50% of the cases, followed by the low cervical spine at around 40%, both at radiological and neurological levels.

Considering that most injuries were caused by high-energy mechanisms, approximately two thirds of the patients were considered polytraumatic, with the most frequent associated injuries being craniocervical traumatism, followed by thoraco-abdominal traumatism and fractures of other spinal segments and/or the appendicular skeleton.

Of the total sample, approximately one third of the patients required admission to the intensive care unit (ICU) and one fifth died due both to the initial severity of the injuries and clinical complications during hospitalization.

This study did not compare surgical techniques, but rather considered cases individually in which surgical treatment was or was not indicated, that is, injuries without an indication of surgical treatment and/or patients who did not present the clinical conditions to be submitted to surgical treatment. The limitations of this study are

mainly due to the size of the sample. Despite the small sample, the hypotheses raised by the authors can be evaluated with statistical certainty. For future analyses, multicenter studies could be conducted considering the same parameters and associating other variables such as surgical techniques and duration of hospitalization.

We observed that surgical treatment generated significantly higher hospitalization costs. Although surgical treatment is aimed at early rehabilitation and mobilization of the patient, in patients with spinal cord injury it was not possible to infer which treatment shortens hospitalization time.

Although the study was conducted in only one hospital, the positive findings can be extrapolated to other populations, so that human and financial resources can be optimized through better allocation.

CONCLUSION

The results from this study indicate that, as proposed, surgical treatment requires more financial and human resources. In the hospital where the study was conducted, there is a skilled multidisciplinary team, constantly improving to better serve patients with spinal cord injuries. Unfortunately, this is not the reality in most SUS hospitals by virtue of the lack of statistical data and, consequently, the lack of resource allocation planning. The purpose of this paper is to provide local epidemiological data and encourage discussion about other studies, as well as public policy.

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