Article published online: 2022-08-02

THIEME OPEN ACCESS

Treatment of Acute Spinal Cord Injuries: A Survey Among Iberolatinoamerican Spine Surgeons – Part 2 Timing to Surgery

Tratamento de lesões agudas da medula espinal: Uma pesquisa entre cirurgiões de coluna ibero-americanos – Parte 2: Momento da cirurgia

Ana Ribau[1] Jorge Alves[2] Ricardo Rodrigues-Pinto[1]

[1] Department of Orthopedics and Traumatology, Centro Hospitalar e Universitário do Porto, Porto, Portugal
[2] Department of Orthopedics and Traumatology, Centro Hospitalar Tâmega e Sousa, Penafiel, Portugal

Address for correspondence Ricardo Rodrigues-Pinto, PhD, Spinal Unit (UVM). Department of Orthopaedics, Centro Hospitalar do Universitário do Porto, Largo Professor Abel Salazar, 4099-001, Porto, Portugal (e-mail: ric_pinto@hotmail.com).

Rev Bras Ortop

Abstract

Objective The objective of the present study was to evaluate the current practice in terms of timing to surgery in acute spinal cord injury (ASCI) patients among spinal surgeons from Iberolatinoamerican countries.

Methods A descriptive cross-sectional study design as a questionnaire was sent by an email for all members of the Sociedad Ibero Latinoamericana de Columna (SILACO, in the Spanish acronym) and associated societies.

Results A total of 162 surgeons answered questions related to the timing for surgery. Sixty-eight (42.0%) considered that ASCI with complete neurology injury should be treated within 12 hours, 54 (33.3%) performed early decompression within 24 hours, and 40 (24,7%) until the first 48 hours. Regarding ASCI with incomplete neurological injury, 115 (71.0%) would operate in the first 12 hours. There was a significant difference in the proportion of surgeons that would operate ASCI within $\leq$ 24 hours, regarding the type of injury (complete injury:122 versus incomplete injury:155; $p < 0.01$). In the case of patients with central cord syndrome without radiological evidence of instability, 152 surgeons (93.8%) would perform surgical decompression: 1 (0.6%) in the first 12 hours, 63 (38.9%) in 24 hours, 4 (2.5%) in 48 hours, 66 (40.7%) in the initial hospital stay, and 18 (11.1%) after neurologic stabilization.

Keywords

- decompression/surgical
- spinal cord injuries
- surveys and questionnaires

Work developed at the Orthopedics Department of the Centro Hospitalar e Universitário do Porto, Porto, Portugal.

received
January 4, 2022
accepted after revision
February 18, 2022

DOI https://doi.org/10.1055/s-0042-1746181.
ISSN 0102-3616.

© 2022. Sociedade Brasileira de Ortopedia e Traumatologia. All rights reserved.
This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (https://creativecommons.org/licenses/by-nc-nd/4.0/)

Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

Conclusion All inquired surgeons favour early decompression, with the majority performing surgery in the first 24 hours. Decompression is performed earlier in cases of incomplete than in complete injuries. In cases of central cord syndrome without radiological evidence of instability, there is a tendency towards early surgical decompression, but the timing is still extremely variable. Future studies are needed to identify the ideal timing for decompression of this subset of ASCI patients.

Resumo

Objetivo O objetivo do presente estudo foi avaliar a prática atual em termos de momento de realização da cirurgia em pacientes com lesão medular aguda (LMA) entre cirurgiões de coluna de países ibero-americanos.

Métodos Estudo transversal descritivo com base em um questionário enviado por correio eletrônico para todos os membros da Sociedad Ibero Latinoamericana de Columna (SILACO, na sigla em espanhol) e sociedades associadas.

Resultados Um total de 162 cirurgiões responderam a perguntas relacionadas ao momento da cirurgia. Sessenta e oito (42,0%) consideraram que a LMA com lesão neurológica completa deve ser tratada em até 12 horas, 54 (33,3%) realizariam a descompressão precoce em até 24 horas e 40 (24,7%) fariam este procedimento nas primeiras 48 horas. Em relação à LMA com lesão neurológica incompleta, 115 (71,0%) operariam nas primeiras 12 horas. Houve diferença significativa na proporção de cirurgiões que fariam o tratamento cirúrgico da LMA em $\leq$ 24 horas quanto ao tipo de lesão (lesão completa [122] *versus* lesão incompleta [155]; $p<0.01$). Em pacientes com síndrome medular central sem evidência radiológica de instabilidade, 152 cirurgiões (93,8%) realizariam a descompressão cirúrgica: 1 (0,6%) nas primeiras 12 horas, 63 (38,9%) em 24 horas, 4 (2,5%) em 48 horas, 66 (40,7%) no internamento inicial e 18 (11,1%) após a estabilização neurológica.

Conclusão Todos os cirurgiões participantes favoreceram a descompressão precoce; a grande maioria realizaria a cirurgia nas primeiras 24 horas. A descompressão é feita antes em casos de lesões incompletas do que em lesões completas. Nos casos de síndrome medular central sem evidência radiológica de instabilidade, há uma tendência à descompressão cirúrgica precoce, mas o momento de intervenção ainda é extremamente variável. Estudos futuros são necessários para identificar o momento ideal para descompressão neste subconjunto de pacientes com LMA.

Palavras-chave
- descompressão cirúrgica
- traumatismos da medula espinal
- inquéritos e questionários

Introduction

Acute spinal cord injury (ASCI) is a devastating condition with dramatic consequences for the patient, their family, and society. Despite all efforts, the ideal management of these patients remains unclear. Neurological recovery varies with ASCI severity, with incomplete injuries having better results than complete ones (D > C > B > A; American Spinal Injury Association Impairment Scale [ASIA]).[1]

While it is agreed that patients with acute injuries and instability need urgent surgical decompression, the ideal timing for surgical intervention remains controversial. Accumulated evidence suggests that early decompression is associated with better neurologic recovery.[2–4] A recent paper reported that the first 24 to 36 hours after the injury are crucial to perform decompression and achieve an optimal neurological recovery.[5]

Patients with traumatic spinal cord injury without radiological evidence of instability (often called central cord syndrome) are even more controversial to manage. While some advocate early decompression, others are in favor of surgery after clinical stabilization.[6–9]

In 2017, Fehlings et al.[10] conducted a systematic review of the literature concerning studies about timing (24 hours versus > 24 hours) for decompressive surgery. This group suggests considering early surgery as an option for patients with ASCI, regardless of its level, and for those with traumatic central cord syndrome, despite the low quality of evidence for both.

Ultra-early decompression, performed within 12 hours, has gained relevance, especially in cervical injuries, with some studies suggesting that this approach may allow for improved neurological outcomes compared with early decompression (between 12 to 24 hours).[11,12] However, more studies are needed to support this argument.

 © 2022. Sociedade Brasileira de Ortopedia e Traumatologia. All rights reserved.

The aim of the present study was to evaluate the current practice in terms of timing among spinal surgeons from Iberolatinoamerican countries.

Materials and Methods

A descriptive cross-sectional survey was conducted.

A link to a questionnaire was sent three times by email to members of the Sociedad Ibero Latinoamericana de Columna (SILACO, in the Spanish acronym) and associated societies, and was active from May 6th to June 30th, 2020. The questionnaire had Portuguese and Spanish versions, most questions had multiple response choices, and all questions were mandatory. The survey included three parts: demographic data, timing for surgery in spinal cord injury, and the use of methylprednisolone (MPSS) in ASCI (whose results are part of a separate study).

IBM SPSS Statistics for Windows (IBM Corp., Armonk. NY, USA) was used for the statistical analysis, with statistical significance set at $p < 0.05$. The groups were compared using the Fisher test and the Pearson chi-squared test (qualitative variables). If more than one variable reached statistical significance, a logistic regression was performed.

Results

Demographic Data

A total of 162 orthopedic surgeons and neurosurgeons participated in the present study, 62.3% (101) of which were orthopedic surgeons and 37.7% (61) were neurosurgeons. More than 50% of the participants were from Portugal or Brazil; countries with < 30 participations were grouped as Spain + Central and South America; from these, 28 were from Spain (17.3%), 15 from Ecuador (9.3%), 12 from Paraguay (7.4%), 5 from Bolivia (3.1%), 2 from Chile (1.2%), 2 from the Dominican Republic (1.2%), 2 from Argentina (1.2%), 1 from Mexico (0.6), and 1 from Uruguay (0.6%). Most (58.0%) surgeons had > 10 years pratice in spine surgery and 101 (62.3%) worked in a institution with a dedicated spinal unit (►**Table 1**).

Table 1 Characteristics of the participants

Characteristics	($n = 162$)
Specialty	
Orthopedic	101 (62.3%)
Neurosurgery	61 (37.7%)
Country	
Portugal	48 (29.6%)
Brazil	46 (28.4%)
Spain + Central and South America ($n < 30$)	68 (42.0%)
Practice in spine surgery	
< 5 years	32 (19.8%)
5–10 years	36 (22.2%)
> 10 years	94 (58.0%)
Spinal unit	
Yes	101(62.3%)
No	61 (37.7%)
MRI availability in < 12h	
Yes	128 (79.0%)
No	34 (21.0%)

Abbreviation: MRI, magnetic resonance imaging.

Questions:

1) Which do you consider to be the ideal timing for surgery in acute spinal cord injury with complete neurological injury (ASIA A)?

Sixty-eight (42.0%) of the respondents considered that ASCI with complete neurology injury should be treated within 12 hours, 54 (33.3%) agreed with early decompression within 24 hours, and 40 (24.7%) agreed with decompression within 48 hours.

There were no significant differences between surgeon seniority ($p = 0.509$) or type of institution (with or without a dedicated spinal unit) ($p = 0.690$) for early decompression – within ≤ 24 hours. There was a significant difference between countries ($p = 0.017$) and specialty ($p = 0.023$), with surgeons from Portugal and neurosurgeons advocating for earlier decompression than surgeons from other countries and orthopedic surgeons, respectively. After performing a logistic regression, the association with country and specialty remained statistically significant (►**Table 2**).

There were no significant differences between surgeon seniority ($p = 0.412$) or type of institution (with or without a dedicated spinal unit [$p = 0.647$]) for ultra-early decompression. The significant difference between countries ($p < 0.01$) and specialties ($p < 0.01$) was also found for ultra-early decompression (►**Table 3**), with surgeons from Portugal or Brazil and neurosurgeons advocating for ultra-early decompression as opposed to surgeons from other countries and orthopedic surgeons, respectively.

2) Which do you consider to be the ideal timing for surgery in acute spinal cord injury with incomplete neurological injury (ASIA B-D)?

One-hundred fifty (71.0%) of the respondents reported that they would operate in < 12 hours, 40 (24.7%) within 24 hours, and 7 (4.3%) within 48 hours. There were no significant differences regarding early and ultra-early decompression between countries ($p = 0.712$ and $p = 0.716$), specialty ($p = 0.712$ and $p = 0.803$), surgeon seniority ($p = 0.961$ and $p = 0.656$) or type of institution (with or without a dedicated spinal unit) ($p = 0.712$ and $p = 0.411$).

There was a significant difference in the proportion of surgeons that would operate ASCI within ≤ 24 hours, regarding the type of injury (complete injury:122 versus incomplete injury:155; $p<0.01$) (►**Table 4**).

3) Which do you consider to be the ideal timing for surgery in central cord syndrome without radiological evidence of instability?

In the presence of patients with traumatic spinal cord injury without radiological evidence of instability (central cord syndrome), 152 surgeons (93.8%) would perform surgical decompression: 1 (0.6%) in the first 12 hours, 63 (38.9%) in

 © 2022. Sociedade Brasileira de Ortopedia e Traumatologia. All rights reserved.

Table 2 Early decompression

	< 24 hours	> 24 hours	Proportion of early decompression (%)	*p-value*
Country				
Portugal	42	6	87.5	< 0.01
Brazil	36	10	78.2	
Spain + Central and South America ($n < 30$)	44	24	64.7	
Specialty				
Orthopedic	70	31	69.3	< 0.01
Neurosurgery	52	9	85.2	

Table 3 Ultra-early decompression

	< 12 hours	> 12 hours	Proportion of ultra-early decompression (%)	*p-value*
Country				
Portugal	25	23	52.1	< 0.01
Brazil	27	19	58.7	
Spain + Central and South America ($n < 30$)	16	52	23.5	
Specialty				
Orthopedic	33	68	32.7	< 0.01
Neurosurgery	35	26	57.4	

Table 4 Early decompression in acute spinal cord injury with complete and incomplete neurology injury

	< 24 hours	> 24 hours	Proportion of early decompression (%)	*p-value*
ASIA				
A	122	40	74.3	< 0.01
B-D	155	7	95.7	

Abbreviation: AIS, American Spinal Injury Association Dysfunction Scale.

Table 5 Central cord syndrome

	As soon as possible or less	After stabilization or more	*p-value*
Specialty			
Orthopedic	76	25	< 0.01
Neurosurgery	58	3	

the first 24 hours, 4 (2.5%) in the first 48 hours, 66 (40.7%) as soon as possible in the initial hospital stay, and 18 (11.1%) after neurologic stabilization (weeks or months after trauma). Ten (6.2%) surgeons would not consider surgical treatment regardless of its timing.

There were no significant differences between countries ($p = 0.817$), surgeon seniority ($p = 0.172$) or type of institution (with or without a dedicated spinal unit) ($p = 0.051$). There was a significant difference between specialties ($p < 0.01$), with neurosurgeons advocating for earlier decompression than orthopedic surgeons (►**Table 5**).

4) Should the urgency of the surgery depend on the level of the injury?

One hundred thirty-one surgeons (80.9%) considered that the time of surgery should not be affected by the region of the injury. Thirty (18.5%) reported operating on cervical injuries earlier, and 1 (0.6%) reported operating earlier in thoracic injuries. There were no significant differences between countries ($p = 0.457$), specialty ($p = 0.587$), surgeon seniority ($p = 0.104$) or type of institution (with or without a dedicated spinal unit) ($p = 0.723$).

5) Do you feel that you perform surgery later than in the ideal timing due to restrictions inherent to your institution (availability of magnetic resonance imaging [MRI], operating room, etc.)?

Ninety-three (57.4%) of the surgeons feel that the surgery is performed later than the ideal due to restrictions inherent to their institution (availability of MRI, operating room, etc.), while 69 (42.6%) did not refer any limitation.

Discussion

The findings of the present study show that early decompression is the preferable approach for both complete and incomplete injuries with a significant association with country – Portuguese surgeons revealed a tendency to prefer early decompression; speciality – significantly more

 © 2022. Sociedade Brasileira de Ortopedia e Traumatologia. All rights reserved.

neurosurgeons prefer early decompression than orthopedic surgeons; and incomplete neurologic injury gathered significantly more consensus in favor of early decompression.

This agrees with a 2018 Netherlands survey with 55 surgeons that showed preference to perform surgery within 24 hours with distinction in surgical timing made based upon the initial neurological injury (57% – ASIA A; 75% – ASIA B; 78% – ASIA C/D).[13]

As expected, there was less consensus regarding surgical treatment of central cord injury, as has been shown in a 2010 survey of 971 spine surgeons.[14]

More than a half of the participants feel that the surgery is performed later than the ideal due to restrictions inherent to their institution (availability of MRI, operating room, etc.). This is in line with a 2017 Canadian survey that found that although most surgeons believed that early decompression should be performed, this was actually accomplished in less than half of the patients, with operating room access and urgent patient transport identified as the main barriers.[15]

While the survey was sent to all SILACO members, participation was mostly from Portugal and Brazil and some countries were under-represented in the present analysis. Hence, this may not accurately reflect the practice regarding timing for surgery in all Iberolatinoamerican countries but in groups of surgeons from those countries.

Despite the increasing advances in knowledge and the growing consensus regarding the need for early decompression in ASCI, barriers continue to be identified. These barriers are mostly related to MRI and operating room availability. The creation of fast-track protocols for these patients and referral centers equipped to treat them in a timely manner may allow for an improvement in their care. Additionally, ultra-early decompression may have advantages over early depression but only future studies will allow to elucidate this matter.

Conclusion

The present study reports the current surgical management of ASCI in countries from Iberolatinoamerican countries. All surgeons inquired in this survey favor early decompression in patients with ACSI, with the majority performing surgery in the first 24 hours. Decompression is performed earlier in cases of incomplete than in complete injuries. In cases of central cord syndrome without radiological evidence of instability, there is a tendency towards early surgical decompression, but the timing is still extremely variable. Future studies are needed to identify the ideal timing for decompression of this subset of ASCI patients.

Financial Support
There was no financial support from public, commercial, or non-profit sources.

Conflict of Interests
The authors have no conflict of interests to declare.

References

1 Khorasanizadeh M, Yousefifard M, Eskian M, et al. Neurological recovery following traumatic spinal cord injury: a systematic review and meta-analysis. [published online ahead of print, 2019 Feb 15]. J Neurosurg Spine 2019;1–17
2 Piazza M, Schuster J. Timing of Surgery After Spinal Cord Injury. Neurosurg Clin N Am 2017;28(01):31–39
3 Haldrup M, Schwartz OS, Kasch H, Rasmussen MM. Early decompressive surgery in patients with traumatic spinal cord injury improves neurological outcome. Acta Neurochir (Wien) 2019;161 (10):2223–2228
4 Zhao WT, Chen GD, Xia DC, Li PP. [Effect of surgical intervention time on the recovery of nerve function in acute spinal cord injury: a Meta-analysis]. Zhongguo Gu Shang 2018;31(04):354–360
5 Badhiwala JH, Wilson JR, Witiw CD, et al. The influence of timing of surgical decompression for acute spinal cord injury: a pooled analysis of individual patient data. Lancet Neurol 2021;20(02): 117–126
6 Lee DY, Park YJ, Song SY, Hwang SC, Kim KT, Kim DH. The Importance of Early Surgical Decompression for Acute Traumatic Spinal Cord Injury. Clin Orthop Surg 2018;10(04):448–454
7 Fehlings MG, Vaccaro A, Wilson JR, et al. Early versus delayed decompression for traumatic cervical spinal cord injury: results of the Surgical Timing in Acute Spinal Cord Injury Study (STASCIS). PLoS One 2012;7(02):e32037
8 Galeiras Vázquez R, Ferreiro Velasco ME, Mourelo Fariña M, Montoto Marqués A, Salvador de la Barrera S. Update on traumatic acute spinal cord injury. Part 1. Med Intensiva 2017;41(04): 237–247
9 Molliqaj G, Payer M, Schaller K, Tessitore E. Acute traumatic central cord syndrome: a comprehensive review. Neurochirurgie 2014;60(1-2):5–11
10 Fehlings MG, Tetreault LA, Wilson JR, et al. A Clinical Practice Guideline for the Management of Patients With Acute Spinal Cord Injury and Central Cord Syndrome: Recommendations on the Timing ($\leq$24 Hours Versus $>$24 Hours) of Decompressive Surgery. Global Spine J 2017;7(3, Suppl)195S–202S
11 Burke JF, Yue JK, Ngwenya LB, et al. Ultra-Early ($<$12 Hours) Surgery Correlates With Higher Rate of American Spinal Injury Association Impairment Scale Conversion After Cervical Spinal Cord Injury. Neurosurgery 2019;85(02):199–203
12 Burke JF, Fehlings MG, Dhall SS. Efficacy of Ultra-Early ($<$ 12 h), Early (12-24 h), and Late ($>$24-138.5 h) Surgery with Magnetic Resonance Imaging-Confirmed Decompression in American Spinal Injury Association Impairment Scale Grades A, B, and C Cervical Spinal Cord Injury. J Neurotrauma 2020;37(15): 1759–1760
13 Ter Wengel PV, Feller RE, Stadhouder A, et al. Timing of surgery in traumatic spinal cord injury: a national, multidisciplinary survey. Eur Spine J 2018;27(08):1831–1838
14 Fehlings MG, Rabin D, Sears W, Cadotte DW, Aarabi B. Current practice in the timing of surgical intervention in spinal cord injury. (Phila Pa 1976) 2010;35(21, Suppl)S166–S173
15 Glennie RA, Bailey CS, Tsai EC, et al. An analysis of ideal and actual time to surgery after traumatic spinal cord injury in Canada. Spinal Cord 2017;55(06):618–623

 © 2022. Sociedade Brasileira de Ortopedia e Traumatologia. All rights reserved.