



REVISIONES

Stabilization of the spine in the trauma victim - integrative review

Estabilização da coluna vertebral na vítima de trauma – revisão integrativa

Estabilización de la columna vertebral en la víctima de trauma - revisión integrativa

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ABSTRACT:

Goal: To identify harmful effects caused by the stabilization of the vertebral column in a trauma victim and in trauma situations without indication for stabilization of the spine in the prehospital.

Method: It was performed an integrative literature review guided by research questions: is there a scientific evidence of harmful effects on trauma victims caused by spinal stabilization in prehospital care? and are there situations of trauma with no indication for stabilization of the spine?

Results: We have performed a Boolean search in the electronic bases Cochrane Library and Pubmed and through the EBSCOhost engine in the databases CINAHL Plus, MEDLINE, MedicLatina, SPORTDiscus, PsycARTICLES, PsycBOOKS, Psychology and Behavioral Sciences Collection, Academic Search Complete. Twelve articles were obtained and after applying the inclusion and exclusion criteria, the sample was five articles.

Conclusions: Harmful effects of spinal stabilization on the victim of trauma related to airway management, pain, discomfort and pressure injuries are described.

Situations of penetrating trauma with unstable circulation and victims with gunshot injuries to the head do not require stabilization of the spine.

Recommendations to support the prehospital decision regarding stabilization of the spine were collected.

It is crucial for the improvement of prehospital care to integrate an individualized approach of the victim that refers to its clinical state and mechanism of injury.

Key words: Stabilization of the spine; Victim of trauma; Harmful effects.

RESUMO:

Objetivo: Identificar efeitos prejudiciais causados pela estabilização da coluna vertebral na vítima de trauma e situações de trauma sem indicação para estabilização da coluna vertebral no pré-hospitalar.

Método: Trata-se de uma revisão integrativa de literatura norteada pelas questões de pesquisa: existe evidência científica de efeitos prejudiciais nas vítimas de trauma, causados pela estabilização da coluna vertebral no cuidado pré-hospitalar? e existem situações de trauma sem indicação para estabilização da coluna vertebral?

Resultados: Foi realizada pesquisa booleana nas bases eletrônicas Cochrane Library e Pubmed e através do motor EBSCOhost nas bases de dados CINAHL Plus, MEDLINE, MedicLatina, SPORTDiscus, PsycARTICLES, PsycBOOKS, Psychology and Behavioral Sciences Collection, Academic Search Complete. Obtiveram-se doze artigos e após aplicação dos critérios de inclusão e exclusão constitui a amostra cinco artigos.

Conclusões: Estão descritos efeitos prejudiciais da estabilização da coluna vertebral na vítima de trauma relacionados com a gestão da via aérea, dor, desconforto e lesões por pressão.

Situações de trauma penetrante com circulação instável e vítimas com lesões por arma de fogo na cabeça não carecem de estabilização da coluna vertebral.

Foram reunidas recomendações de apoio à decisão pré-hospitalar quanto à estabilização da coluna vertebral.

É crucial para a melhoria do cuidado pré-hospitalar, integrar uma abordagem individualizada da vítima que se refira ao seu estado clínico e ao mecanismo de lesão.

Palavras chave: Estabilização da coluna vertebral; Vítima de trauma; Efeitos prejudiciais.

RESUMEN:

Objetivo: Identificar efectos perjudiciales causados por la estabilización de la columna vertebral en la víctima de trauma y situaciones de trauma sin indicación para estabilización de la columna vertebral en el prehospitalario.

Método: Se trata de una revisión integrativa de literatura orientada por las cuestiones de investigación: ¿Existe evidencia científica de efectos perjudiciales en las víctimas de trauma, causados por la estabilización de la columna vertebral en el cuidado prehospitalario? y ¿Existen situaciones de trauma sin indicación para estabilización de la columna vertebral?

Resultados: Se realizó una investigación booleana en las bases electrónicas Cochrane Library y Pubmed ya través del motor EBSCOhost en las bases de datos CINAHL Plus, MEDLINE, MedicLatina, SPORTDiscus, PsycBras, PsycBOOKS, Psicología y Behavioral Sciences Collection, Academic Search Complete. Se obtuvieron doce artículos y tras la aplicación de los criterios de inclusión y exclusión constituyen la muestra cinco artículos.

Conclusiones: Se describen efectos perjudiciales de la estabilización de la columna vertebral en la víctima de trauma relacionados con la gestión de la vía aérea, dolor, malestar y lesiones por presión.

Las situaciones de trauma penetrante con circulación inestable y víctimas con lesiones por arma de fuego en la cabeza no carecen de estabilización de la columna vertebral.

Se han reunido recomendaciones de apoyo a la decisión prehospitalaria en cuanto a la estabilización de la columna vertebral.

Es crucial para la mejora del cuidado prehospitalario, integrar un enfoque individualizado de la víctima que se refiera a su estado clínico y al mecanismo de lesión.

Palabras clave: Estabilización de la columna vertebral; Vítima de trauma; Efectos perjudiciales.

INTRODUCTION

Prehospital professionals universally apply the stabilization of the spine to victims of trauma. This procedure aims to prevent spinal movement and avoid spinal cord injury⁽¹⁾ and involves the use of a cervical collar, the placement of the victim lying on a hard plane, lateral stabilizers of the head and attachment of the victim to the spine⁽²⁾. However, their application is not without risk⁽²⁻⁴⁾ and in some cases it's not indicated. Over time, in the prehospital emergency of the United Kingdom, it was possible to verify the discomfort experienced by the victims of trauma subject to the stabilization of the vertebral column as it has been possible to identify collateral damage⁽³⁾.

In this sense, it is crucial to improve the quality of the care provided, to question the universal application of devices for stabilization of the spine in the prehospital approach, and to identify the situations in which it is contraindicated.

Therefore, it was decided to carry out an integrative review of the literature, since it allows the inclusion of several research methods, giving great potential for evidence-based nursing practice⁽⁶⁾.

In this perspective, we proposed to investigate: Is there scientific evidence of harmful side effects in trauma victims caused by spinal stabilization in prehospital care? Are there situations of trauma without an indication for the stabilization of the spine?

METHOD

The integrative review of the literature represents an instrument that allows the synthesis of knowledge and the inclusion of the results of significant studies in clinical practice ⁽⁶⁾.

The objective of this integrative review is to identify harmful effects caused by stabilization of the vertebral column in the trauma victim and situations of trauma with no indication for stabilization of the spine in the prehospital.

According to the consulted authors, the elaboration of the integrative revision comprises six stages ⁽⁶⁾ that we will go through to construct this revision.

In the first step, we construct the research questions using the PICO strategy ⁽⁷⁾. This strategy means respectively: (P) problem or patient, (I) intervention, (C) comparison, (O) Outcomes.

Our (P) correspond the victims of trauma, (I) is concerned to the stabilization of the spine, (C) refers to the stabilization vs non-stabilization and finally (O) corresponds to discomfort, pain and injury.

The issues raised were as follows: Is there a scientific evidence of harmful side effects in trauma victims caused by spinal stabilization in prehospital care? Are there situations of trauma without an indication for the stabilization of the spine?

In the second step of the review, the literature search ⁽⁶⁾, with the intention of using single terminology, the Portuguese language descriptors were consulted in DeCS ⁽⁸⁾ and translated into Mesh ⁽⁹⁾.

Prehospital emergency care and spinal cord injuries were the descriptors adopted. Next, the descriptors were combined for the search with the boolean operator (and). A sampling was performed with the establishment of the inclusion and exclusion criteria for this review, presented in table 1.

Table 1 – Inclusion and exclusion criteria

Selection Phases	Inclusion criteria	Exclusion Criteria
1st Phase of research (Application of criteria in the search engine / databases)	Articles available online in full. Articles in Portuguese, English, French and Spanish.	Articles written in languages not listed in the inclusion criteria.
2nd Phase of research (Adequacy to title and summary)	Approach to stabilization of the vertebral column in the trauma victim. Prehospital context.	Other contexts of care. Repeated articles.

	<p>Indication of situations for non-stabilization of the vertebral column.</p> <p>Approach to stabilization devices of the spine.</p> <p>Approach to side effects.</p>	
3rd Phase of research (Full reading)	This study partially answers research questions.	Study does not answer research questions.

The articles search was conducted online, in December 2018, in the electronic bases Cochrane Library (0 articles) and Pubmed (4 articles) and through the search engine EBSCOhost (6 articles) in the databases CINAHL Plus with Full Text , MEDLINE with Full Text, MedicLatina, SPORTDiscus with Full Text, PsycARTICLES, PsycBOOKS, Psychology and Behavioral Sciences Collection, Academic Search Complete, with the time limit of six years (2012-2018).

Twelve articles were obtained, 2 of which were bibliographical references. After applying the inclusion and exclusion criteria (table 1), 5 articles representing the sample were selected.

The third step represents the organization and summarization of the information of the articles in the sample.

The items in table 2 were applied, after reading the articles in full, to gather relevant data: origin, title of the article, authors, periodical and objectives.

In the fourth step, a critical analysis of the studies constituting the sample was carried out, and a support instrument (table 3) was elaborated with the following information: article title, sample, type of investigation, method of analysis, main results and level of evidence. For a hierarchical perspective of knowledge, the studies were classified according to the level of evidence, by the pyramid proposed by Melnyk and Fineout-Overholt⁽¹⁰⁾.

Table 2 - Summary of General Information

From	Article title	Authors	Periodic	Objectives
EBSCOhost	Effects of unconsciousness during spinal immobilization on tissue-interface pressures: A randomized controlled trial comparing a standard rigid spineboard with a newly developed soft-layered long spineboard	Baukje Hemmesa Peter R.G. Brink Martijn Poeze	Injury, Int. J. Care Injured 45 (2014) 1741–1746	To compare tissue pressures in awakened and anesthetized patients immobilized on a hard plane and on a soft plane.
Pubmed	The Norwegian guidelines for the prehospital management of adult	Daniel K Kornhall Jørgen Joakim Jørgensen Tor Brommeland	Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine (2017) 25:2	Provide a national guideline for stabilization of the prehospital spine.

	trauma patients with potential spinal injury	Per Kristian Hyldmo Helge Asbjørnsen Thomas Dolven Thomas Hansen Elisabeth Jeppesen		
Free search in Google Scholar®	Prehospital Use of Cervical Collars in Trauma Patients: A Critical Review	Terje Sundstrøm Helge Asbjørnsen Samer Habiba Geir Arne Sunde Knut Wester	Journal of Neurotrauma 31:531–540 (March 15, 2014)	Discuss post and cons of cervical collar use in trauma victims. To propose a safe and effective strategy for the pre-hospital immobilization of the spine, which does not include the routine use of collars.
Pubmed	A re-conceptualisation of acute spinal care	Mark Hauswald	Emerg Med J,(2013) 30(9), 720-723	To propose a reconceptualization of the spinal trauma to allow a more rational treatment approach. Develop a list of recommended treatment variations that are more in accordance with the actual causes of post-impact neurological deterioration.
Free search in Google Scholar®	Development of a new Emergency Medicine Spinal Immobilization Protocol for trauma patients and a test of applicability by German emergency care providers	Michael Kreinest Bernhard Gliwitzky Svenja Schüller Paul A. Grützner Matthias Münzberg	Scandinavian journal of trauma, resuscitation and emergency medicine (2016) 24:71	To develop a protocol that supports decision making for spinal immobilization in traumatized adult patients. Perform the first applicability test by emergency medical personnel.

Table 3 – Evaluation of the sample

Titulo artigo	Amostra	Tipo Investigação	Método análise	Resultados principais	Nível de evidência ⁽¹⁰⁾
Effects of unconsciousness during spinal immobilization on tissue-interface pressures: A randomized controlled trial comparing a standard rigid spineboard with a newly developed soft-layered long spineboard	30 patients	Prospective, randomized, controlled, comparative study	Descriptive statistics with SPSS support, IBM, version 20.0.0.1.	The use of a spineboard compared to a hard spineboard for spinal immobilization resulted in lower tissue interface pressures at volunteers and anesthetized patients.	I
The Norwegian guidelines for the prehospital management of adult trauma patients with potential spinal injury	69 articles	Systematic literature review	Categorization	Selective approach to stabilization of the spine. Algorithm of actuation.	IV

Prehospital Use of Cervical Collars in Trauma Patients: A Critical Review	50 articles	Critical review	Categorization	Omission of routine application of cervical collar.	IV
A re-conceptualisation of acute spinal care		Opinion article		The basic biomechanics, anatomy, physiology, epidemiology and physics involved from spinal trauma. The generally accepted theoretical model of avoidable post-injury neurological deterioration emphasizes immobilization but violates accepted principles of injury mechanics and elementary physics.	VI
Development of a new Emergency Medicine Spinal Immobilization Protocol for trauma patients and a test of applicability by German emergency care providers	196 articles 50 German emergency medical and emergency medical professionals	Mixed Methodology	Descriptive statistics with SPSS for Windows version 22.0	E.M.S. The IMMO protocol: decision support tool for indications of spinal immobilization in adults with trauma. Differential indications for various options of spinal immobilization according to the situation of the victim.	IV

With the information provided by the included articles, a content analysis was performed ⁽¹¹⁾ resulting in three categories on the stabilization of the vertebral column in the trauma victim.

In the fifth stage, the discussion of the results was carried out, comparing the evidenced data. We will be able to identify possible knowledge gaps and suggest future studies, as well as those that may compromise the disclosed results.

Finally, in the sixth stage, we proceed to the synthesis of the knowledge about the stabilization of the spine, in the form of a schematic figure.

RESULTS AND DISCUSSION

The analysis and discussion of the data allows us to identify the relevant content of the studies. We begin the discussion with the presentation of the synthesis of the data collected, in table 3. This table summarizes each article referring to its impact to the practice based on evidence.

According to the hierarchical pyramid of evidence ⁽¹⁰⁾, we found that four studies presented have an average strength of evidence (level IV) and a top-level study, level I. For this reason, the recommendations that may arise should always be subject to a process of critical reflection.

The five articles are published in journals that address emergency and trauma care. The authors, in the majority, play roles in these areas, not being clear the membership of all. The participation of authors of the clinical and academic domain is verified simultaneously. The union of the two domains of knowledge represents an added value to the research process. A study has authors from several professional areas which enriches the same, due to the multidisciplinary character that it introduces.

The studies were carried out in Europe and the United States of America.

The methodological options of the articles (described in table 3) are in imbalance since one study followed the quantitative paradigm, three qualitative and one mixed.

Of the articles included in this review, two suggest performance protocols for spinal stabilization (Table 3), which represents an added value. The emergency context requires decision and rapid action. In a pre-hospital environment, this decision is often made in environmental conditions and with delicate resources. In this sense, having the organized knowledge in the schematic and protocol form allows an easier dissemination among professionals and provides a quick access to make decisions.

Stabilization of the spine integrates prehospital care for trauma victims routinely, translating into a universal strategy to prevent further spinal injury from worsening^(12, 13, 14).

For stabilization of the spine, a combination of devices is comprised which includes: rigid cervical collar, side head blocks, straps to support the victim's body to a rigid stretcher^(6-8, 14). stabilization of the spine is achieved the neutral alignment of the spine, reduced movement, reduced secondary injuries in potentially unstable spinal column situations and optimized the safety of the victim during transport to the hospital⁽¹⁷⁾.

In particular, the practical recommendation for the application of cervical collars to trauma victims has remained almost unchanged for more than 30 years⁽¹⁵⁾.

The application of cervical collar to the trauma victim is presented as a priority procedure in the American College of Surgeons (ACS) Advanced Trauma Life Support (ATLS) guidelines and in the Prehospital Trauma Life Support guidelines^(15,16).

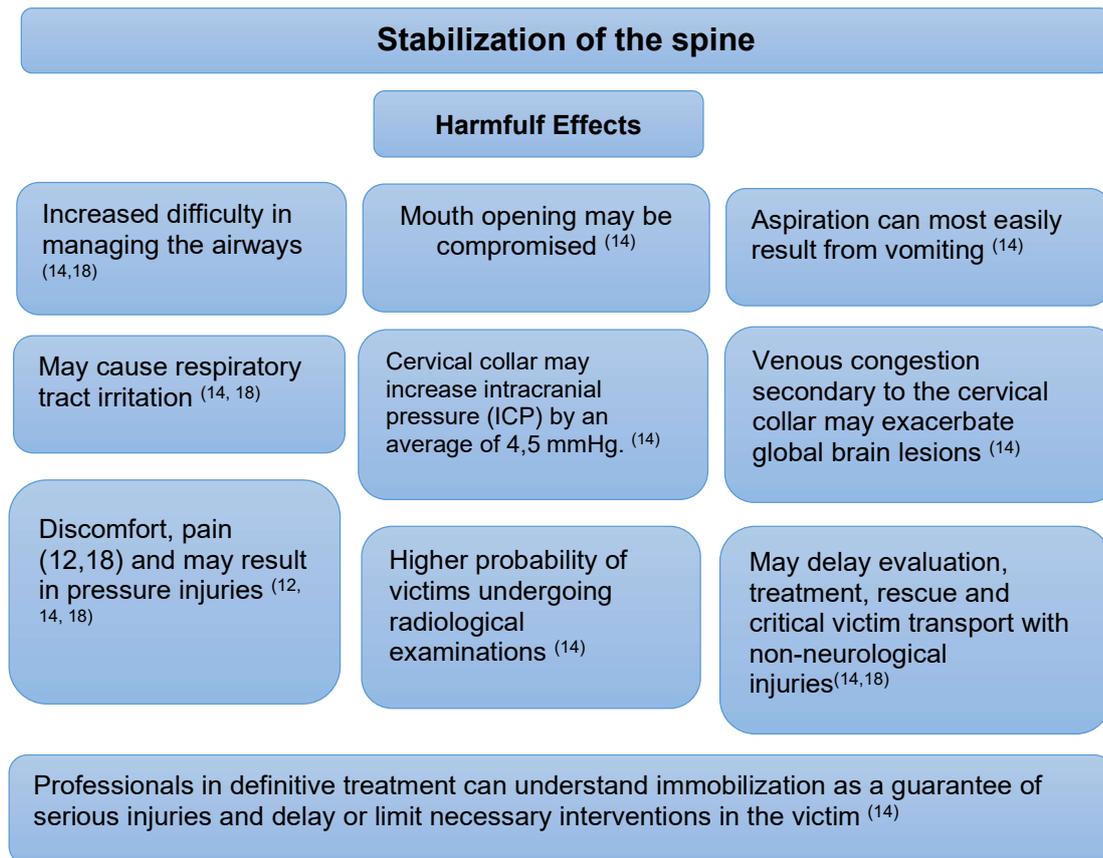
This priority for the protection of the spine is given by the application of cervical collar ABCDE principles (Breathing, Circulation, Neurological Dysfunction, Exposure) that aim to identify and treat life-threatening injuries to the trauma victim⁽¹⁵⁻¹⁷⁾.

Currently, it is discussed the need to change this strategy applied to all victims of trauma, due to the harmful effects^(12-14,18,19).

The results of the articles included in this review^(12-14,18,19) allowed us to identify three categories:

Harmful effects resulting from spinal stabilization, trauma situations without indication for immobilization and recommendations for prehospital decision in trauma victims.

Figure 1 - Harmful effects resulting from stabilization of the vertebral column



Regarding the approach of the airway, the application of the cervical collar may become harmful at this stage because: it may lead to greater difficulty in the management of the airways ^(14,18) the mouth opening may be compromised ⁽¹⁴⁾ aspiration can ⁽¹⁴⁾, especially in the supine position ⁽¹⁴⁾ and may cause respiratory restriction ^(14,18).

It is important to bear in mind that cervical collar placement may increase the mean intracranial pressure (ICP) by 4,5 mmHg ⁽¹⁴⁾ through jugular venous compression. ^(14,18) This is an aspect to be considered in victims with traumatic brain injury (TBI), since in their treatment it is essential to avoid or reduce ICP ⁽¹⁴⁾.

Therefore, venous congestion secondary to the cervical collar may also exacerbate global brain lesions, similar to the lesions observed after attempted suicide by hanging ⁽¹⁴⁾.

In patients with ankylosing spondylitis, the extension of the cervical spine during universal pre-hospital immobilization may become very harmful ⁽¹⁴⁾.

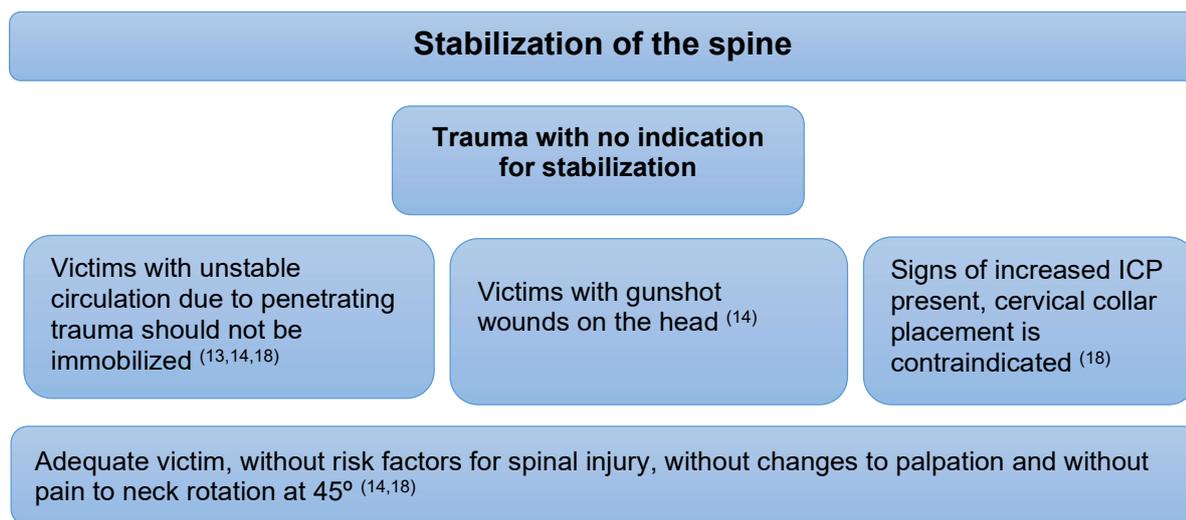
Prioritization of advanced airway management and spinal immobilization can also delay release and rescue procedures, delaying definitive treatment of critical victims with non-neurological injuries ^(14,18), as well as making it difficult to screen trauma in theater, during transport and admission ⁽¹⁴⁾.

Immobilization of the collar with rigid collar and plane can cause discomfort and pain ^(12,18) and may result in pressure injuries ^(12,14,18).

With regard to the receipt of victims at the site of definitive treatment, victims who received immobilization of the prehospital column are more likely to undergo radiological exams ⁽¹⁴⁾ and professionals can understand immobilization as a guarantee of injuries and delay or limit necessary interventions to the victim ⁽¹⁴⁾.

Radiological examinations are often unnecessary in conscious victims, with no symptoms, neurological deficits or distractive lesions, and for those who have a full range of motion on functional examination ⁽¹⁴⁾.

Figure 2 - Situations of trauma without indication for stabilization spine



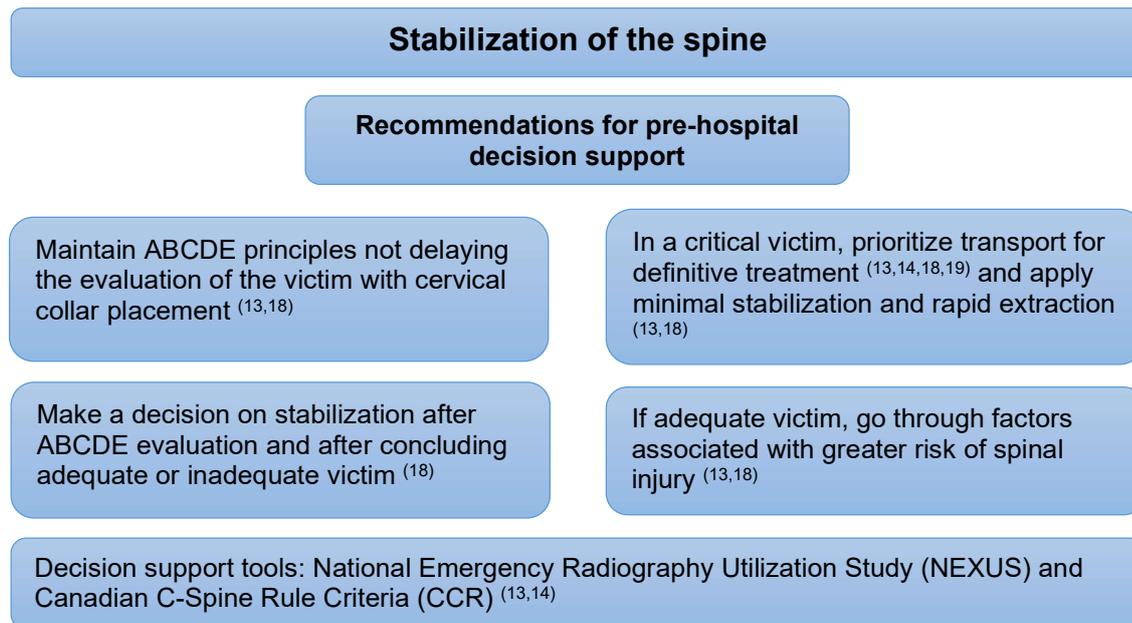
Prehospital immobilization of the spine has been associated with increased morbidity and mortality in patients with penetrating trauma ^(14,18) and is unnecessary in patients with gunshot wounds to the head ⁽¹⁴⁾.

Victims of trauma with unstable circulation due to penetrating trauma should not be immobilized ^(13,14,18).

Unconscious victims, with unsafe airways, should not be transported supine ^(14,18).

In the evaluation of neurological dysfunction, signs of increased ICP should be investigated and, if present, the cervical collar placement is contraindicated ⁽¹⁸⁾.

Figure 3 - Recommendations for prehospital decision on trauma victims



ABCDE principles can be maintained in the approach of the trauma victim ^(13,18), however, in order to avoid delays with cervical stabilization, this can be done manually until all the systematic evaluation and treatment have been performed ^(13,18).

In severely injured patients, whose time is critical for definitive treatment, their transport should not be delayed ^(13,14,18,19) and a minimum spinal stabilization and rapid extraction should be applied ^(13,18).

Victims with signs of increased ICP should be immobilized on a vacuum gurney without a cervical collar ⁽¹⁸⁾ allowing elevation of the upper body at 30° ⁽¹⁸⁾.

The final decision on the immobilization of the trauma victim is made after the ABCDE principles have been followed and clarified if the victim's assessment is adequate ⁽¹⁸⁾. The assessment is not appropriate if there are situations that distract attention such as language barriers, intoxications, distractive injuries, anxiety states, victims seriously injured or deceased in the accident ⁽¹⁸⁾. In this case, a complete immobilization of the victim is indicated ⁽¹⁸⁾.

In case of evaluation of the appropriate victim, factors associated with a higher risk of spinal injury should be covered ^(13,18).

These factors are: median sensitivity of the cervical spine; age ≥ 65 years; reduced sensitivity or motor function; supraclavicular lesions; accident with high speed (> 100 km / h), rollover, ejection of the vehicle; axial load on head, ≥ 2 m drop; locomotive or bicycle collision. If one of them is present, there is indication for complete immobilization ⁽¹⁸⁾.

If one is not present since criteria, the palpation of the spine does not present pain and there is pain to the rotation of the neck at 45° there is no indication for immobilization of the victim ^(14,18).

In the references used in this review, pre-hospital decision support tools such as the National Emergency Radiography Utilization Study (NEXUS) and the Canadian C-Spine Rule Criteria (CCR) are recommended ^(13,14).

CONCLUSION

In appreciating the results of this review, it is evident the need to abandon the universal approach to the trauma victim and adopt an individualized approach, related to the clinical state of the victim and the mechanisms involved.

We were able to answer the questions raised, although the data obtained did not completely suppress our expectations for this study. On the other hand, it was an opportunity for investigation and reflection on the stabilization of trauma victims in prehospital care.

The deleterious effects related to the stabilization of the spine that have been identified are largely associated with the placement of the cervical collar. This aspect seems extremely relevant because it represents a procedure with an emphasis on approaching the airway in the universal stabilization of the trauma victim, which seems to reinforce the need for change.

We believe that the fact that we have met traumatic situations without indication for stabilization of the spine and also recommendations for decision support may stimulate reflection on professionals and contribute to the improvement of prehospital care.

The scarcity of randomized controlled trials on this subject may be one of the reasons for not appreciating the harmful effects described.

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