SIGNIFICANCE OF SCIWORA IN ADULTS

INTRODUCTION

Spinal cord injury is a devastating condition for the patient and their social circle. It is most frequently caused by fractures and/or dislocations, which are detected by radiographs or tomography scans. The term SCIWORA defines spinal cord lesions that are observed in magnetic resonance, but that does not show bone lesion in complete studies of radiographs and/or tomography. The first to mention this condition was Loyd in 1907 followed by Burke in 1947 and Shen et al. in 1972. It was described by Pang and Wilberger in 1982 for the pediatric population, particularly in children aged under 8 years, but authors like Hendey et al. describe the adulthood form, caused by degenerative pathology.

The incidence of spinal cord lesion in cervical trauma varies between 0.9% and 6.16,17. When associated with other injuries, such as cranial trauma, the incidence increases to between 2% and 27%.16,18 The presence of neurological lesion without traumatic bone lesion in adults can vary between 0.08 and 15%.1,12,19,21

While children under 8 years and those over 60 years are the most predisposed,12,22 due to anatomical and biomechanical differences, the presence of neurological lesion in adults can be serious.1

Keywords: Spinal cord injury, Central cord syndrome; Cervical vertebrae.

RESUMEN

Objetivo: Reconocer la importancia de SCIWORA en la edad adulta; analizar la utilidad de los estudios complementarios; evaluar las opciones terapéuticas; conocer la evolución de los pacientes tratados. Métodos: Se realizó una evaluación prospectiva con un seguimiento mínimo de 5 años en oto pacientes mayores con artrosis cervical y diagnóstico de SCIWORA. Se utilizó la Escala de la Asociación Japonesa de Ortopedia (JOA) y la Escala ASIA. Resultados: El síndrome medular central (SMC) fue el cuadro neurológico más frecuente. Un paciente recuperó el nivel inicial, otro tuvo mejoria mínima de cinco puntos en la escala JOA y los cuadros de severidad parcial tuvieron una mejoria mínima de cinco puntos en escala JOA y los cuadros severos fallecieron. Conclusiones: La SCIWORA en adultos puede ser devastadora para el paciente. La resonancia magnética no es un método fiable para el diagnóstico.

Descritos: Traumatismos de la médula espinal; Síndrome medular central; Vértebras cervicais.

RESUMO

Objetivo: Reconhecer a importância de SCIWORA na idade adulta; analizar a utilidade dos estudos complementares; avaliar as opções terapéuticas; conhecer a evolução dos pacientes tratados. Métodos: Foi realizada uma avaliação prospectiva com acompanhamento mínimo de 5 anos em oito pacientes idosos com artrose cervical e diagnóstico de SCIWORA. Foram usados a escala da Associação Japonesa de Ortopedia (JOA) e o escore da ASIA à internação e aos 6, 12, 24, 36, 48 e 60 meses. Resultados: A síndrome medular central (SMC) foi o quadro neurológico mais frequente. Um paciente recuperou-se das corticoterapia, mas a incapacidade piorou posteriormente, sendo oportuno a recuperação e outro morreu. Os outros pacientes foram submetidos à laminoplastia nas primeiras 72 horas; os que tinham gravidade parcial tiveram melhora mínima de cinco pontos na escala da JAO os que tinham afeccão mais grave morreram. Conclusões: O trauma de baixo impacto pode desequilibrar a relação entre o continente e o conteúdo na coluna vertebral com artrose, podendo ser devastador para o paciente. O diagnóstico de lesão intramedular é realizado por ressonância magnética. Os pacientes com déficit incompleto tratados com laminoplastia atingiram pelo menos um nível na escala ASIA. As possíveis complicações pós-operatórias podem ser graves.

Descritores: Traumatismos da medula espinal; Síndrome medular central; Vértebras cervicais.
individuals can be divided into four age groups predisposed to this syndrome, namely:
1. At birth: particularly longitudinal traction;
2. <16 years: the distraction mechanism is prevalent due to the ligament elasticity;
3. Between 16 and 45 years of age: in this age range, it is rare to have a spinal cord lesion without bone and/or joint lesion, except in the constitutionally narrow cervical canal;
4. >45 years of age: here spondyloarthrosic degeneration is prevalent, and the main mechanism is hyperextension.9,15,22

The neurological condition that prevails in these cases is central cord syndrome (CCS),1,6,18,20,23-26 particularly in cases of low-energy trauma,22 such as falling backwards from one’s own height (43%), car accidents (33%), and falling from a height (12%).9,27

Magnetic resonance imaging (MRI) is the best exam to evaluate these patients.12,20,28,29 This method can divide causes into extramedullary (herniated disc, spinal stenosis, injury to the anterior longitudinal ligament or posterior ligamentous complex and intracanal hematoma) and intramedullary (edema, contusion and bleeding).21,29,30-32 The presence of hemorrhage in the spinal cord is a sign of poor prognosis in the patient’s evolution.6,23,29,32-34

The factors that influence the survival of a patient with spinal cord injury are age, level and degree of the primary injury,29,34,36 and secondary injury.20,23,29,35 Young patients with stable neurological conditions can be treated non-surgically, while the elderly or individuals with progressive defect should be treated surgically.27 Between 4% and 11% of patients with SCIWORA die as a direct result of trauma or urinary complications (renal failure and infection) or cardiopulmonary complications (pulmonary thromboembolism, myocardial infarction or infection).6,37

The objectives of this study are: to recognize the importance of SCIWORA in adulthood; to analyze the usefulness of complementary studies; to evaluate the therapeutic options; and to follow the evolution of treated patients.

MATERIAL AND METHODS

A prospective observational study was conducted with eight male patients over 45 years of age suffering from cervical spondylosis who, following an injury, were admitted to the emergency service with a diagnosis of neurological deficit without traumatic osteoligamentary lesion, between June 2005 and May 2007, with a 5-year follow-up.

The neurological assessment on admission, and in the subsequent follow-up visits (6, 12, 24, 36, 48 and 60 months), was carried out using the ASIA scale and the Japanese Orthopaedic Association Scale.

In terms of imaging exams, x-rays, an MRI scan and a CT scan were performed on admission; the first two tests were repeated annually, with x-ray and MRI, followed by MRI only.

The treatment performed, the presence of complications, and the neurological clinical evolution were evaluated.

This study was not presented to the Ethics Committee as it was observational.

RESULTS

All patients reported mild symptoms associated with their spondyloarthrosis prior to the injury.

The traumas were related to car accidents in five cases, with two passive mobilizations (one rotation in a robbery situation and one case of flexion-extension) and one fall from the patient’s own height. One patient confirmed multiple traumas by association of cranial and thoracic trauma. (Table 1)

Severe neurological impairment (3 ASIA A and 2 ASIA B) was prevalent on admission, and all the patients presented with central cord syndrome. (Table 2)

All the patients were submitted to X-rays and MRI, and 6 were also evaluated with axial tomodographies. (Figure 1)

Table 1. Kinematics and associated lesions.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Kinematics</th>
<th>Associated lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Driver without seat belt</td>
<td>Cranial and thoracic trauma</td>
</tr>
<tr>
<td>2</td>
<td>Driver</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Passive rotation</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Driver without seat belt</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Driver with seat belt</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fall from height</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Passive flexion-extension</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bicycle</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Neurological syndrome according to the ASIA scale.

<table>
<thead>
<tr>
<th>Patient</th>
<th>ASIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
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<tr>
<td>5</td>
<td>D</td>
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<tr>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
</tr>
<tr>
<td>8</td>
<td>A</td>
</tr>
</tbody>
</table>

Figure 1. Patient aged 66, driver wearing safety belt with side impact. (A) Radiography showing cervical spondyloarthrosis; (B) axial sections with facet joint impairment and central osteophyte; (C and D) MRI scan showing spinal cord edema. Quadriplegic upon admission, with good response to corticoids.

All the patients received treatment with methylprednisolone, according to the NASSCII protocol.

Five patients underwent surgical release of pressure by the posterior approach using laminoplasty technique in the first 72 h. Two of the non-surgically treated patients died before the first follow-up visit, while another experienced deterioration of neurological state and had to undergo surgical intervention using the same technique, with good results, although with gait spasticity. (Figure 2)
There was one case of presurgical pneumonia, two of post-surgical pneumonia, and one of urinary infection.

All the patients initially treated surgically had neurological improvement, as did the patient who underwent surgery 18 months after the trauma, with improvement of at least one level on the ASIA scale (Table 3) and 5 points on the JOA scale (Table 4).

**DISCUSSION**

The most appropriate term for SCIWORA symptomatology in adults should be SCIWORET, which is the neurological deficit that presents no radiographic lesions in the absence of trauma, yet its occurrence in adults is rare. Degenerative changes produce excessive traction of the spinal cord during the accident, although there are other authors who dismiss this relationship, and believe that degenerative changes or calcification of the posterior common vertebral ligament is not directly related to the presence of neurological deficit following low-energy trauma.

MRI should be used for the diagnosis, but when this is not conclusive, diffusion MRI can be used instead. Proton emission tomography (PET) could be useful in cases with negative MRI, and is useful for the study of myelopathic neurological syndrome. Another option is somatosensory evoked potentials. Lateral view radiography in maximum flexion and extension is contraindicated due to the possibility of exacerbating the neurological condition.

The likelihood of neurological recovery in these patients is related, in the first instance, to the initial injury, the canal diameter, the patient’s age, the extent of injury, and the severity of the neurological symptoms. Therefore, surgical intervention is not the gold standard for treatment. For Saruhashi et al., patients who responded well to corticoid therapy were indicated for immobilization, while those with severe or progressive symptoms should be surgically treated.

Bhatoe advocate nonsurgical treatment in traumas by hyperflexion, considering them vascular lesions; authors like La Rosa et al. also support nonsurgical treatment, due to the risk of increased complications.

On the other hand, authors like Dolan et al. and Chen et al. and Lenehan are in favor of rapid release to prevent secondary damage and complications.

**CONCLUSION**

Low energy trauma can cause an imbalance in the container-content relationship in symptomatic arthritic spines, which can be devastating for the patient.

Plain radiographies and CAT scans are useful for ruling out traumatic injuries, but MRI is used to perform the intramedullary diagnosis.

Laminoplasty patients gained at least one level on the ASIA scale, although the postoperative complications can be severe.

The patient who did not undergo surgery and with final follow-up lost one level on the ASIA scale 18 months later, and recovered satisfactorily with pressure release.

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

**REFERENCES**

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