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REVIEW

Spinal cord injury and normal neuroimaging. Aetiology, diagnosis and medico-legal issues[☆]

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Abstract The objective demonstration of minor spinal and spinal-cord lesions following accidents is a classic discussion issue in both Clinical and Forensic Medicine. Particular problems are the patients with symptomatic spinal cord damage and normal neuroimaging. These situations are usually named with acronyms: SCIWORA ("spinal cord injury without radiographic abnormality"), SCIWNA ("apinal cord injury without neuroimaging abnormality"), and SCIWORET ("spinal cord injury without radiological evidence of trauma").

Our purpose is to review the main clinical, radiological, and medico-legal features of these conditions, often unknown by those who are not used to treating spinal cord lesions. The main objective is focused on the medico-legal problems of these conditions. The results of our review places under question some aspects of the recent 35/2015 Spanish Law on accidents compensation, in particular when dealing with minor spinal injuries. Therefore, a review of the recent Spanish law's statements about spinal minor injuries compensation is required.

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PALABRAS CLAVE

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Lesión medular con normalidad radiológica. Etiología, diagnóstico y problemática médico-legal

Resumen La objetivación de las lesiones espinales o medulares en accidentes es un tema clásico de discusión tanto en Medicina Asistencial como en Medicina Forense. Un problema particular son los pacientes con daño medular sintomático y neuroimagen normal. Estos casos se denominan con los acrónimos SCIWORA («spinal cord injury without radiographic abnormality»), SCIWNA («spinal cord injury without neuroimaging abnormality») y SCIWORET («spinal cord injury without radiologic evidence of trauma»).

Nuestro propósito es revisar los aspectos clínicos, radiológicos y médico-legales de estos cuadros, desconocidos muchas veces para quien no trata habitualmente lesionados medulares. El objetivo principal está centrado en los aspectos médico-legales de estos cuadros. Nuestros resultados cuestionan algunos aspectos del reciente sistema para la valoración de los daños y perjuicios causados a las personas en accidentes de circulación (Ley 35/2015), en los llamados traumatismos cervicales menores. En consecuencia, el tratamiento que la reciente legislación española da a dichos traumatismos podría necesitar ser revisada.

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Introduction

The absence of lesions on a plain radiograph and computed tomography in the presence of a patient with a neurological deficit of spinal cord origin is known as SCIWORA (spinal cord injury without radiographic abnormality).¹⁻³

The concept was introduced by Pang and Wilberger in 1982²; initially, it was conceived for paediatric cases, and, within these, for the cervical region. In children, the greater elasticity and mobility of the cervical rachis, along with the size and weight of the head, may cause cervical spinal cord damage without fractures or dislocations.

The identification of symptoms of this type in the adult population has given rise to the acronym SCIWORET (spinal cord injury without radiologic evidence of trauma) for adults, since many adults have spondylotic changes, thus they would exhibit radiological abnormalities and would not be included in SCIWORA.⁴

The advent of magnetic resonance imaging (MRI) has made it possible to demonstrate spinal cord lesions in patients with plain radiographs and normal CT scans. The vast majority (90%) of SCIWORA cases are spinal cord injury patients in which both tests (X-ray and CT) are negative, but the MRI scan is pathological. In the remaining cases of SCIWORA, approximately 10%,⁵ there are symptomatic spinal cord lesions with normal MRI⁶; i.e., they would be normal spinal-cord injury patients with normal X-ray, CT and MRI.

Accordingly, there is a strong case for restructuring the terminology, and speaking of SCIWORA in cases where neural damage is revealed in MRI, but the other tests are normal.⁷ If, in a case with clinical spinal cord damage, all imaging tests, including MRI, are normal, we would speak of SCIWNA, or 'spinal cord injury without neuroimaging abnormality'⁸ (Table 1).

The basis of all these presentations is the disassociation between the clinical symptoms (symptoms or signs of

Table 1 Presentations with symptomatology and normal neuroimaging.

Acronym	Text	Meaning
SCIWORA	Spinal cord injury without radiographic abnormality	Admits MRI showing spinal cord damage, with normal X-ray and CT scans.
SCIWNA	Spinal cord injury without neuroimaging abnormality	Plain X-ray, CT and MRI scans normal, but there is clinical spinal cord damage
SCIWORET	Spinal cord injury without radiologic evidence of trauma	Admits pathological data in plain X-ray, CT and MRI scans, but not related to injury

neurological affectation) and radiology (Normal X-ray, CT, MRI). Apart from the clinical interest that this may hold, from the medico-legal perspective, the implications may be significant. Thus, Spanish Law 35/2015⁹ establishes that a spinal injury in which the symptoms are based on pain, and the complementary tests are normal, must be considered a minor spinal injury. Injuries of this type only exceptionally give rise to sequelae; moreover, these are minor. In addition, they must only be compensated as temporary injuries. Consequently, there is a risk that certain SCIWORA or SCIWNA may be erroneously considered as minor spinal injuries, particularly if the symptoms or clinical examination data (which the law omits) are not carefully analysed.

This study attempts to review the matter, and to provide guidance for the proper diagnosis and assessment of such cases.

The literature has been reviewed, along with our Centre's experience in such cases.

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