Advancements in Health Research

Advancements in Health Research 2026; 3:141
doi:10.4081/ahr.2026.141

Anorectal examination can be crucial in classifying spinal cord injuries, but there is much more to explore - it is one piece of the puzzle, but not the entire puzzle

Alfredo A. Lopes,[1,2] Augusta Silva,[1] João Luz[3]

[1]Center for Rehabilitation Research (CIR), ESS, Polytechnic of Porto; [2]Department of Neurosciences, Santo António University Hospital, Porto; [3]Southern Center for Physical Medicine and Rehabilitation, São Brás de Alportel, Portugal

Abstract

The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) remain the reference framework for classifying spinal cord injury, with the absence of deep anal pressure and voluntary anal contraction defining complete injury (AIS A). Accumulating evidence, however, suggests that anorectal examination alone may not fully capture residual physiological connectivity in some individuals clinically classified as complete. Neurophysiological studies have reported preserved sensory, motor, or autonomic conduction despite the absence of sacral sparing on standard examination, challenging the conceptual boundaries between complete and incomplete injury. This commentary argues for a refined and integrative interpretation of neurological assessment that preserves the central role of ISNCSCI while incorporating complementary neurophysiological information and systematically collected patient–reported manifestations. Rather than proposing reclassification or operational thresholds, the perspective presented is conceptual and hypothesis–generating. Emphasizing preserved connectivity and neuroplastic potential may enhance prognostic understanding and support more individualized rehabilitation approaches. Future progress will depend on prospective validation studies, methodological standardization, and expert consensus to determine how multimodal information may responsibly inform classification without compromising clinical reliability.

Key words: anorectal examination; discomplete spinal cord injury; neurological classification; rehabilitation.

Correspondence to: Alfredo Alexandre Tomé Lopes, Avenida António Domingues dos Santos, 231, rch. 4460-237- Senhora da Hora, Matosinhos, Portugal.
E-mail: adl@ess.ipp.pt

Introduction

The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) are standardised guidelines that describe how to assess and classify spinal cord injuries. They were developed by the American Spinal Injury Association (ASIA) and the International Spinal Cord Society. It is a global reference in clinical practice and spinal cord injury research, and was developed with the aim of standardising the neurological assessment of spinal cord injuries.[1]

The official ISNCSCI definition defines the American Impairment Scale A (AIS A) as the absence of any sensory or motor function in the sacral segments, including the absence of Deep Anal Pressure (DAP) and Voluntary Anal Contraction (VAC).[1] However, there are some controversies and evidence pointing to limitations in this approach, questioning the validity and reliability of the anorectal examination as the sole determinant of complete neurological spinal cord injury (AIS A).[2-6] They also question whether the distinction between complete and incomplete spinal cord injury is really useful for predicting patients' functional recovery,[7] a multicentre prospective study involving 432 patients with spinal cord injury, who were assessed in the acute phase (up to 15 days after injury), revealed that although sacral preservation criteria are useful, not all components have the same prognostic value and that S4-S5 sensitivity and voluntary anal contraction are more effective in predicting functional recovery than the general classification of complete or incomplete injury.

The assessment of anal sensitivity, deep anal pressure, and voluntary anal sphincter contraction is essential to determine whether the spinal cord injury is complete or incomplete, which is fundamental for the AIS classification.[8] However, one study questions the usefulness of the anorectal examination, pointing out that it may be unreliable, especially in patients with cognitive impairment, explaining that the components of the examination, such as DAP and VAC, have limited reliability and may not accurately reflect the preservation of sensory or motor function.[9] The perceived tension between limitations of the anorectal examination and the continued use of the ISNCSCI warrants explicit clarification. While deep anal pressure and voluntary anal contraction may demonstrate limited reliability as standalone indicators of physiological completeness, they nonetheless retain independent clinical and prognostic relevance as standardized markers of sacral seg-

ment integrity. Importantly, the argument advanced here is not that anorectal examination should be abandoned, but rather that it should no longer be interpreted in isolation. Within a multimodal framework, DAP and VAC remain necessary components of classification, serving as stable reference points that gain interpretive value when integrated with neurophysiological findings and patient-reported manifestations. Additional support for a more nuanced interpretation of sacral sensory assessment is provided by Marino *et al*.,[11] who demonstrated that pressure sensation at the S3 dermatome shows good reliability and validity as an alternative to deep anal pressure in neurological classification. These findings suggest that clinically meaningful sacral sensory preservation may be detected beyond traditional anorectal testing, reinforcing the notion that absence of deep anal pressure does not necessarily equate to complete physiological disconnection. Together, such observations strengthen the argument for refining sacral assessment within existing classification frameworks rather than relying on a single examination component. Furthermore, the definition of 'sacral sparing' used to determine whether the injury is complete or incomplete is based on limited data and may not accurately predict patients' functional recovery, and that the anorectal examination used in the classification of spinal cord injuries should be replaced by other more reliable neurological tests in many cases.

Thus, scientific articles and clinical reports began to document "incomplete spinal cord injury", i.e., situations in which there is neurophysiological evidence of residual conduction despite being clinically classified as a complete AIS A injury. For example, the study by Awad *et al*.[2] investigated residual sensory conduction in individuals with clinically complete spinal cord injury using somatosensory stimulation and demonstrated that about half (50% of complete clinical cases) of the cases had evidence of residual sensory conduction, suggesting the presence of incomplete SCI, these findings were obtained under highly controlled experimental conditions. Or the cross-sectional study by Wahlgren *et al*.,[3] where techniques such as sensory evoked potentials (SSEPs), laser evoked potentials, motor evoked potentials (MEPs), sympathetic skin responses, and EMG were used in patients with clinically complete SCI, and found that there is neurophysiological evidence of incompletion in a significant proportion of clinical cases, however, this study was limited by a small sample size, which restricts generalizability.

There is also a case study that presents preserved somatosensory conduction in a complete cervical spinal cord injury.[4] This clinical case presents preserved somatosensory conduction, despite the standard clinical examination being consistent with AIS A. Or the study by Sherwood *et al*.[5] which describes the original definition of 'discomplete SCI' to describe a specific phenomenon: the presence of subclinical supraspinal influence across a lesion in individuals who meet clinical criteria for complete injury, typically detected through electromyographic activity or reflex modulation despite the absence of voluntary movement or sensation. Importantly, this definition should be distinguished from other forms of residual physiological preservation, such as somatosensory conduction detected by evoked potentials, corticospinal conduction assessed by motor evoked potentials, or preserved autonomic responses. While all may indicate some degree of connectivity beyond what is captured by standard clinical examination, they represent neurophysiologically and prognostically distinct phenomena and should not be conflated under the singular label of discomplete SCI.

Similarly, the Chiu *et al*.'s[6] study demonstrated that evoked potentials can reveal residual conduction even when clinical examination suggests an absence of function, i.e., the presence of detectable somatosensory evoked potentials (SSEPs) in AIS A patients was associated with better functional outcome, indicating that somatosensory evoked potentials may reflect residual conduction not captured in clinical examination.

Taken together, the current body of empirical evidence examining residual connectivity in clinically AIS A spinal cord injury is limited in scale and methodological strength. Most available studies involve small sample sizes, heterogeneous methodologies, and experimental conditions that may not fully reflect routine clinical practice. Although their findings are broadly convergent in suggesting that physiological preservation may exist beyond what is captured by standard neurological examination, the overall level of evidence should be regarded as preliminary and hypothesis-generating rather than confirmatory. As such, these studies support conceptual reconsideration rather than definitive conclusions or immediate changes in classification practice. Interpretation is constrained by methodological heterogeneity across participants.

Thus, precision instruments, such as somatosensory evoked potentials (SSEPs), can assess afferent (sensory) conduction through the dorsal columns to the cortex; laser evoked potentials (LEPs) assess the spinothalamic pathway (pain/temperature); Motor Evoked Potentials (MEPs) that assess corticospinal efferent conduction; High Sensitivity EMG (Motor Unit Analysis) that assesses subclinical motor activity; Sacral and Polysynaptic Reflexes that demonstrate segmental integrity; Sympathetic Skin Response (SSR) that assesses the descending autonomic pathway and Functional Neuroimaging that assess cortical activation in response to stimuli below the lesion are used to detect cases of incomplete spinal cord injury, however, they are difficult to apply in regular clinical practice.[10]

Nevertheless, some authors have attempted to associate manifestations witnessed by individuals with possible incomplete spinal cord injury, such as neuropathic pain, spasticity, and/or abnormal sensations, but without success due to small sample sizes and, consequently, low statistical power to establish this link. The results revealed strong neurophysiological evidence of incomplete spinal cord injury in 17% (4/23) of participants. If also accepting 'possible evidence', the incomplete group comprised 39% (9/23). The remaining 61% showed no neurophysiological evidence of incompleteness. However, if also counting reports of subjective sensation elicited during neurophysiological testing in the absence of objective findings, 52% (12/23) showed indication of incomplete spinal cord injury.[3]

Integrating patient-reported clinical manifestations and neurophysiological data in AIS A classification

This perspective highlights the need to move towards a more sensitive and integrative approach in the neurological assessment of spinal cord injury. Rather than replacing existing instruments such as the ISNCSCI, this reflection supports their refinement through the incorporation of complementary dimensions, including neurophysiological data and systematically collected patient-reported clinical manifestations. Such integration could enhance the sensitivity of current tools, allowing clinicians to detect residual conduction that is not captured by standard examination, and ultimately contribute to a more accurate classification of injury severity.

Furthermore, advancing towards a more comprehensive assessment model may allow the development of structured functional profiles that better reflect the true neurological and functional status of individuals with spinal cord injury. By combining clinical examination with electrophysiological findings and patient-reported experiences, it may be possible to build a more faithful representation of each patient's condition. This, in turn, could improve prognostic accuracy, support more individualized rehabilitation strategies, and contribute to a more clinically meaningful understanding of what constitutes "complete" *vs* "incomplete" spinal cord injury.

Importantly, this reflection also invites a shift in perspective - from a deficit-oriented model to one that actively seeks to identify preserved capacities and latent potential for recovery. Rather than focusing predominantly on confirming the absence of function through standardized tests, clinical assessment should increasingly aim to detect how the nervous system responds and adapts to sensory input. This approach aligns with contemporary motor control and neuroscience frameworks, which emphasize the adaptive, dynamic nature of the nervous system. By exploring responsiveness to different sensory modalities and identifying subtle signs of preserved integration or modulation, clinicians may gain insight into the system's capacity for reorganization. Such a perspective not only enhances the sensitivity of assessment but also provides a more meaningful foundation for guiding rehabilitation, centred on the individual's adaptability and potential for functional recovery.

From a pragmatic perspective, an integrative assessment may be conceived as hierarchical rather than algorithmic. Based on currently available evidence, somatosensory evoked potentials and motor evoked potentials represent the most robust first-line neurophysiological tools for detecting residual dorsal column and corticospinal conduction in clinically AIS A injuries. When these modalities are inconclusive, adjunctive measures such as high-sensitivity electromyography, sacral or polysynaptic reflexes, and autonomic responses may reveal subclinical preservation. Importantly, these assessments should be interpreted in clinically stable patients, typically in the subacute or chronic phase, and in conjunction with systematically collected patient-reported manifestations. At present, no validated thresholds or standardized protocols exist, reinforcing the need for prospective studies and expert consensus efforts before any formal integration into classification systems.

Importantly, the presence of residual neurophysiological signals should not be interpreted as evidence for reclassification. At present, no validated thresholds -such as minimal MEP amplitudes, SSEP latencies, or EMG parameters- exist to reliably distinguish physiologically incomplete from complete spinal cord injury within the AIS A category. Reported findings vary substantially across studies due to differences in acquisition protocols, stimulation paradigms, and patient characteristics. Consequently, neurophysiological abnormalities should currently be understood as indicators of preserved connectivity rather than as criteria for altering AIS classification.

Patient-reported outcome measures may provide additional contextual information when neurophysiological findings suggest preserved connectivity despite a clinically complete examination. Validated instruments such as the Spinal Cord Independence Measure (SCIM) and patient-reported outcome sets developed within the International Spinal Cord Injury standards (ISCOS-PRO) capture functional performance, symptom perception, and participation domains that are not fully reflected by neurological classification alone.

Situations in which clinical examination, neurophysiological findings, and patient-reported outcomes yield discordant information should not be viewed as requiring immediate adjudication or hierarchical resolution. At present, no validated framework exists to arbitrate conflicts between these domains, nor is there evidence to justify prioritizing one modality over another for classification purposes. Instead, such discordance may reflect the multidimensional nature of spinal cord injury, where neurological signs, physiological connectivity, and lived experience capture different aspects of function. Within this context, clinical examination remains the formal basis for AIS classification, while neurophysiological and patient-reported data should be interpreted as complementary sources of insight rather than determinants of reclassification.

This present commentary should be understood as a conceptual and hypothesis-generating contribution rather than a proposal for immediate modification of classification practice. While we outline a pragmatic and hierarchical way of integrating clinical examination, neurophysiological assessment, and patient-reported outcomes, we intentionally refrain from proposing operational algorithms, thresholds, or adjudication rules. At the current stage of evidence, translation into practice would require prospective validation studies and structured expert-consensus approaches to ensure methodological rigor, clinical safety, and international acceptability.

Conclusions

Although the absence of deep anal pressure and voluntary anal contraction remains the formal criterion for defining AIS A spinal cord injury, growing evidence suggests that this examination alone may not fully capture residual physiological connectivity. At the same time, anorectal examination retains independent clinical and prognostic relevance and therefore should be refined rather than abandoned. Current neurophysiological and patient-reported findings provide convergent but preliminary insights, limited by small samples, methodological heterogeneity, and the absence of validated thresholds or adjudication frameworks. Accordingly, this commentary should be understood as a conceptual and hypothesis-generating contribution. The next steps should include prospective, multicenter validation studies employing clinically feasible neurophysiological tools, efforts to standardize multimodal assessment protocols, and structured expert-consensus processes -such as Delphi methodologies- to determine whether and how ISNCSCI classification may be responsibly refined in the future.

No single method is sufficient, and it may be important to include in AIS A cases the search for conditions of incompleteness through a convergence of the patient-reported clinical manifestations, the clinical examination and neurophysiological information, to complete the puzzle.

References

1. Kirshblum S, Biering-Sørensen F, Betz R, et al. International standards for neurological classification of spinal cord injury: cases with classification challenges. Top Spinal Cord Inj Rehabil 2014;20:81-9.
2. Awad A, Levi R, Waller M, et al. Preserved somatosensory conduction in complete spinal cord injury: Discomplete SCI. Clin Neurophysiol 2020;131:1059-67.

3. Wahlgren C, Levi R, Amezcua S, et al. Prevalence of discomplete sensorimotor spinal cord injury as evidenced by neurophysiological methods: A cross-sectional study. J Rehabil Med 2021;53:jrm00156.
4. Awad A, Levi R, Lindgren L, et al. Preserved somatosensory conduction in a patient with complete cervical spinal cord injury. J Rehabil Med 2015;47:426-31.
5. Sherwood AM, Dimitrijevic MR, Barry McKay W. Evidence of subclinical brain influence in clinically complete spinal cord injury: discomplete SCI. J Neurol Sci 1992;110:90-8.
6. Chiu AK, Bustos SP, Hasan O, et al. Lower extremity somatosensory evoked potentials predict functional outcomes in complete traumatic cervical spinal cord injury. World Neurosurg 2024;182:e301-7.
7. Van Middendorp JJ, Hosman AJF, Pouw MH, et al. Is determination between complete and incomplete traumatic spinal cord injury clinically relevant? Validation of the ASIA sacral sparing criteria in a prospective cohort of 432 patients. Spinal Cord 2009;47:809-16.
8. Donovan WH. The importance of the anal exam in neurologic classification of spinal cord injury. Spinal Cord Ser Cases 2018;4:4.
9. Marino RJ. The anorectal exam is unnecessary! Spinal Cord Ser Cases 2018;4:3.
10. Nierula B, Stephani T, Bailey E, et al. A multichannel electrophysiological approach to noninvasively and precisely record human spinal cord activity. PLoS Biol 2024;22:e3002828.
11. Marino RJ, Schmidt-Read M, Kirshblum SC, et al. Reliability and validity of S3 pressure sensation as an alternative to deep anal pressure in neurologic classification of persons with spinal cord injury. Arch Phys Med Rehabil 2016;97:1642-6.

Received: 30 March 2026; Accepted: 20 May 2026.

Contributions: Alfredo A. Lopes, conceptualization, writing – original draft. Augusta Silva, writing – review & editing. João Luz, writing – review & editing. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Conflict of interest: the authors declare no competing interests and all authors confirm accuracy.

Artificial Intelligence (AI)-Assisted Technology: the authors did not use artificial intelligence (AI)-assisted technologies (such as large language models [LLMs], chatbots or image generators) in the preparation of the submitted paper.