

AGREEMENT ANALYSIS OF CLINICAL NEUROLOGICAL, ELECTROPHYSIOLOGICAL AND VIDEO-URODYNAMIC EVALUATION OF SPINAL CORD FUNCTION IN 72 SPINAL CORD INJURY PATIENTS

Hypothesis / aims of study

To investigate the correlations among neurological, electrophysiological and video-urodynamic evaluation of the cord function of spinal cord injury patients by agreement analysis.

Study design, materials and methods

72 male patients with spinal cord injury were diagnosed in our department from January 2006 to December 2009. Perineal sensation and mechanical bulbocavernosus reflex (M-BCR) were assessed by clinical neurological examination. Pudendal-somato-sensory evoked potentials (P-SSEP) and electrical bulbocavernosus reflex (E-BCR) were examined by electrophysiological recording. The bladder sensation and detrusor reflex were assessed by video-urodynamic examination. Kappa coefficients were calculated among neurological, electrophysiological and video-urodynamic examination.

Results

Bladder filling sensation was detected in 34 patients with incomplete spinal injury. Bladder filling sensation was detected in 71 % patients with complete spinal injury below T10 and in 33 % patients with complete spinal injury within and above T10. 36 of 46 patients with a lesion above L2 had detrusor reflex, while 18 in 24 patients with a lesion below L2 lost detrusor reflex. Fair agreement was existed between perineal sensation and P-SSEP. Poor agreement was existed between bladder filling sensation and perineal sensation, as well as between the bladder filling sensation and P-SSEP. M-BCR and E-BCR have excellent agreement. Fair agreement was existed between detrusor reflex and M-BCR, E-BCR.

Interpretation of results

Our data showed that bladder filling sensation was detected in 71 % of the patients with complete spinal injury below T10. So we assumed that three nerves including hypogastric nerve (T11–L2), the most proximal one, conveying bladder-filling sensation to the central nervous system are seldom completely paralyzed by lesions below T10. In addition, bladder-filling sensation was detected in 33 % of the patients with complete spinal injury within and above T10. Definition of completeness in ASIA scale (Grade A) generally depends on absence of sensation and motion of the area innervating by sacral spinal cord. Since bladder sensation pathway differs from somatic pathways, bladder-filling sensation is likely to be preserved while injuries occur in somatic pathways rather than the visceral pathway. Therefore, our findings corroborate the conclusion of Wyndaele[1]: completeness of a spinal cord lesion can not be defined when definite absence of sensation of lower urinary tract has not been confirmed.

Our data showed that detrusor areflexia existed in 22% of the patients with lesion above L2, which may attribute to vascular damage of spinal cord under the lesion, with or without subclinical damage to sacral cord plus overdistension-induced detrusor injuries during spinal shock[2].

Our main findings on the evaluation of transduction of spinal cord showed that fair agreement existed between perineal sensation and P-SSEP. This may be due to the fact that both the two parameters reflect the function of the same somatic sensation pathway. Otherwise, poor agreement was found between bladder filling sensation and perineal sensation, and the bladder filling sensation and P-SSEP in our study. The lateral spinothalamic tract is considered to transduce bladder sensation, while the pudendal-somato-sensory evoked potentials (P-SSEP) reflect the function of dorsal funiculus[3].

The main findings on the evaluation of segmental reflex of spinal cord showed excellent agreement between M-BCR and E-BCR. This suggests that both the parameters could evaluate the same somatic afferent and efferent tracts. Moreover, fair agreement between detrusor reflexia/areflexia and presence/absence of M-BCR or E-BCR suggests that transmission pathways contributing to detrusor reflexia and BCR are injured simultaneously in most cases. However in some cases, the disagreement between them may be due to somatic pathways and visceral pathways contributing on detrusor reflexia, whereas only somatic pathways are involved in the bulbocavernosus reflex.

Concluding message

The clinical neurological and electrophysiological examination is unable to predict urodynamic function. The video-urodynamic examination is the gold standard to evaluate bladder dysfunction in spinal cord injury patients.

References

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2. de Groat WC (1995). Mechanisms underlying the recovery of lower urinary tract function following spinal cord injury. *Paraplegia* 33: 493–505.
3. Schmid DM, Reitz A, Curt A, Hauri D, Schurch B (2004). Urethral evoked sympathetic skin responses and viscerosensory evoked potentials as diagnostic tools to evaluate urogenital autonomic afferent innervation in spinal cord injured patients. *J Urol* 171:1156-60.

Disclosures

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