

Editorial: Selected topics in the field of spinal cord research

This special issue of *Neurological Research* presents seven selected papers in the field of spinal cord research. For this issue, the papers were chosen to showcase the diversity of topics within the field. Some of the papers discuss clinically related research topics, while others discuss neurophysiologic or technical challenges. Two of the papers are review articles and the remaining five papers are original contributions. Each paper in this special issue discusses a clinically relevant finding. Some of the findings are immediately applicable in the clinical environment, while others may require further research to fully mature and be ready for clinical implementation.

The first paper in this special issue of *Neurological Research* was authored by Louro and Pearce, and discusses recent developments in the field of spinal cord injury repair. The focus of this review paper is the use of stem and progenitor cell therapies and the number of challenges facing this research today. Some of the topics discussed are: selection of proper sources of the cells, control of cell differentiation, capability of the cells to integrate into the host tissue, and side effects.

The second paper was authored by Tse and Fouad, and discusses the role of plasticity and the adaptive changes in the central nervous system observed after spinal cord injury. In particular, this review paper examines issues such as sprouting of descending spinal tracts and the use of pharmacologic agents to promote the sprouting and other forms of plasticity within the spinal cord.

The third paper, authored by Saleh *et al.*, discusses a very different research topic from the previous papers. It addresses one of the most challenging and unresolved issues pertaining to the development of a neuroprosthesis for bladder emptying. In this paper, Saleh *et al.* propose a new and original method to detect bladder volume using recordings from the afferent nerves. This is an experimental study performed using dogs and the data presented are preliminary. However, the results are encouraging and present a solid basis for future studies.

The fourth paper was authored by Kawashima *et al.*, and investigates the use of orthosis for gait training in individuals with complete spinal cord injury. The most important result of this study is that the locomotor-like muscle activity is elicited during orthotic gait, and that this activity is not a mere reflex response. Instead, Kawashima *et al.* propose that this activity is generated by the central pattern generator, the activity of which is triggered and modulated by the afferent inputs. The authors also suggest that the orthotic gait training may have the potential to activate the spinal locomotor center in individuals with complete spinal cord injury.

The fifth paper, authored by Nakajima *et al.*, presents an elegant study investigating the effect of cutaneous reflexes on phase-dependent modulation of muscle contractions during passive stepping. In this study, the authors used a robotic gait trainer, Lokomat, to generate passive locomotion both 'in the air' and on a treadmill. This study suggests that the load-related afferent information plays a key role in modulating cutaneous reflex during human walking.

The sixth paper was authored by Wirth *et al.*, and proposes a new clinical measure for assessing motor impairment after incomplete spinal cord injury. In particular, the authors propose a measure that would be able to distinguish an impairment as a result of muscle weakness, from an impairment as a result of a lack of dexterity. The proposed test was developed for alternating ankle dorsi- and plantarflexion motion. The concept of distinguishing two sources of impairment and analysing them separately is new and very attractive. Although this test still needs to be fully validated, its concept and initial findings are very intriguing.

The last paper was authored by van Hedel *et al.*, and analyses the suitability of four different walking tests for clinical applications in individuals with spinal cord injury. The following walking tests were studied: (1) walking index for spinal cord injury (WISCI II); (2) the 6 minute walk; (3) the 10 meter walk; (4) the timed up and go. This study suggests that the 10 meter walk test is the most appropriate for studying walking capacity in individuals with spinal cord injury.

We hope the selected manuscripts will provide the *Neurological Research* readership with food for thought, and that the findings and discussions presented in this issue will intrigue both basic scientists and clinicians. Taken together, these seven papers represent merely the 'tip of the iceberg' of spinal cord research. This is a rapidly growing area of research that engages diverse disciplines such as neurosurgery, neurology, physiotherapy, occupational therapy, engineering, physiology and psychology. A single issue of *Neurological Research* cannot capture these very diverse research topics. It is our intention to present other research topics in the field of spinal cord research in the near future.

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