



## Potential Use of Umbilical Cord Blood Cells in the Treatment of Spinal Cord Injury

**Dr. Gilberto KK LEUNG**

*Assistant Professor, Department of Surgery, The University of Hong Kong*



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Spinal cord injury (SCI) is a major cause of mortality and morbidities. Functional recovery from severe SCI is often unsatisfactory due to the numerous obstacles against neuronal regeneration within the central nervous system. These include the inhospitable environment for axonal re-growth and survival at the injury site, the long distance taken for axons to re-grow towards the target organs, the presence of molecules which inhibit regeneration, the lack of growth factors, and the formation of glial scar. While many therapies have been developed to overcome these factors individually, it is likely that a clinically efficacious treatment needs to address all these obstacles.

Cellular transplantation has received considerable attention recently as a therapeutic approach to promote the regeneration of neurons across the injury site in SCI. Transplanted cells with neuro-regenerative potential, including Schwann cells and mesenchymal stem cells, have been shown to survive and proliferate within the host spinal cord, and were able to bridge the injury site. Umbilical cord blood (UCB) cells have emerged as another promising candidate. The mononuclear cell fraction of UCB contains stem cells, as well as other cells such as lymphocytes, macrophages, and other monocytes. For SCI, most investigators focused on using CD34<sup>+</sup> cells, which are generally considered to be haematopoietic stem cells.

Human UCB (hUCB) cells have long been used to treat haematopoietic disorders with an excellent safety record. In experimental SCI studies, both intravenous infusion and intraspinal transplants of human CD34<sup>+</sup>

hUCB cells were found to improve recovery in various rodent and canine models.<sup>1-2</sup> Nishio et al demonstrated that intraspinally injected hUCB cells were able to reduce the size of cystic cavities at the injury site, promote distal axonal re-growth, and improve lower limb locomotor functions in rats. However, there was no evidence of trans-differentiation of the transplanted cells into neurons or glial cells. The mechanisms by which transplanted hUCB cells produce histological and functional improvement are incompletely understood. More recent studies indicated that hUCB cells may reduce apoptosis in the injured spinal cord and promote the remyelination of injured axons.<sup>3</sup>

hUCB is a promising candidate for clinical transplantation since it is versatile, readily available, relatively easy to handle, and arouses fewer ethical controversies. There is as yet no published controlled study on the clinical efficacy of hUCB transplantation for SCI although some institutions have indicated possible benefit in individual cases. At present, the two medical schools in this locality are involved in a Phase I/II trial on the safety and feasibility of hUCB cells transplantation in chronic SCI patients in collaboration with other overseas investigators.

### References

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