

BOOK REVIEW

Central nerve plexus injury

Carlstedt T

Central Nerve Plexus Injury, London, Imperial College Press, 2007, 192 pages, US \$128.00

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The fact that neurons from the central nervous system can regenerate into peripheral nerves has been known for a long time.¹ Now, in his book, Dr Carlstedt applies this concept to repair avulsion injuries of the brachial and lumbosacral plexus.

In Chapter 1 of his book, Dr Carlstedt briefly describes the history of brachial plexus repair, up to his first cases of root reimplantation into the spinal cord.

In Chapter 2, he reviews the mechanisms and patterns of root avulsion, reinforcing the concept that the lower roots of the brachial plexus are prone to suffer avulsion, whereas the roots of the lumbosacral plexus tend to rupture somewhere between the dorsal root ganglion and the spinal cord.

In Chapter 3, brachial and lumbosacral plexus anatomy are revisited, together with the cyto-architecture of the spinal cord. This is a well-written and very informative chapter.

In Chapter 4, Dr Carlstedt explores the preoperative evaluation of patients with root injuries. He nicely reviews the main signs to look for during the clinical examination, such as Horner's syndrome and Tinel's sign, and highlights the great significance of evaluating pectoralis major and long thoracic nerve function. The author emphasizes the importance of testing both the gluteus medius muscle and sensation in the posterior hamstring as key components of the topographic diagnosis of lumbosacral lesions. He displays limited interest in pre- and intraoperative electrical studies, instead expressing his interest in computer tomography myelography.

In Chapter 5, Dr Carlstedt reviews the use of palliative procedures for root injury repair, referring to nerve transfers. He describes certain major nerve transfers and indicates the advantages and disadvantages of each. At this point, a paragraph on brachial plexus grafting would be welcome, but is lacking. His section concerning the lumbosacral plexus is particularly interesting.

In Chapter 6, the basic science of intradural root repair is reviewed. The three pages describing the transition zone are redundant, because this was already covered adequately in Chapter 3. Dr Carlstedt then overviews the effects of root injury and regeneration in the spinal cord, including his own experimental studies examining root reimplantation. The weakness of this chapter is that it appears to be out of touch with the most recent advances of a rapidly evolving field;

even though the book was published in 2007, only about 10% of the references listed in this chapter were published after 2000, and the most recent papers were published in 2004.

In Chapter 7, the author describes his approach to managing the brachial and lumbosacral plexuses. His descriptions of surgical procedures are well written. However, the quality of the photographs of surgical procedures is less than satisfactory in most instances.

In Chapter 8, Dr Carlstedt describes his experiences with intradural root repair in a limited series of patients. He attributes any and all recovery experienced by these patients to the spinal procedure and then challenges the axiom that normal function cannot be restored after any procedure in the brachial plexus, excluding neurolysis. The fact that he fails to consider other nonsurgical sources of recovery within his small series of patients is disturbing. A few of his patients had partial injuries. Many of the patients underwent surgery soon after their injury, so that some may only have had neuropraxic lesions. Concerning his cases of hand function restoration, recovery could be mediated by spontaneous regeneration of intercostal motor neurons, a process that already has been described in the literature.² Anatomical variations, like the contributions of C4 or T2 roots to the brachial plexus, also are not mentioned by Dr Carlstedt. Moreover, he describes restoration of normal power in proximal muscles, something which is, to this reader, somewhat startling. Such complete recovery in humans is better than that observed in animals submitted to identical surgical procedures under much more favorable conditions.³

In Chapter 9, Dr Carlstedt describes new avenues for research and advancement, thereby to improve the results of root reimplantation, such as the use of neurotrophic factors and other drugs that both protect neurons from death and enhance nerve regeneration.

Personally, I do not share this author's enthusiasm over the technique proposed in his book. In our experience, after spinal graft implantation, we have obtained neither hand function reconstruction nor normal function in the shoulder or elbow.⁴ Spinal graft implantation surgery is long and exposes the patients to unnecessary risks, such as meningitis, long tract injuries and spinal cord instability. At the present time, in our hands, brachial plexus grafting combined with nerve transfers yield better results than graft implantation into the spinal cord. The general consensus among brachial plexus surgeons is that this latter technique remains largely experimental. Progress in neurobiology will dictate the future of spinal repair.

Nonetheless, Dr Carlstedt must be given his due. He has taken the time to study this technique in the laboratory, and

then has studied it further in the operating room. In addition, his approach to combining basic science concepts with clinical practice is refreshing. I believe that this book is worth buying and reading. The price is fair.

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