Preface to the Second Edition

When the editor of the first edition of *Nerve Surgery*, Stephan Konnry, approached me about a new edition in 2019, my first reaction was to push back, insisting the 2015 edition was still up-to-date. Considering this further, I thought if Thieme is going to reprint the 2015 edition regardless, it should be easy enough to update it. Spoiler alert—nerve surgery has evolved significantly in the last decade, and the 2025 edition—which took 5 years to update—is very different from its predecessor. I am grateful for the opportunity to do this second edition, and I will use this preface as an opportunity to share my secrets: over 40 years of developing modern nerve surgery, over 30 years of NIH funding, and over 50 years of marriage to Alec Patterson, sharing four children, four children in-law, and now 11 grandchildren.

In January of 2015 at the AAHS and ASPN meetings in the Bahamas, I read John Alexander's book, *Proof of Heaven*. He wrote about how to manifest the future by imagining yourself fully and emotionally there, and centering the reason you value that future and its meaning. That January I was awaiting a response to my NIH grant to study Schwann cell senescence. I reflected on why I so profoundly desired the grant and realized it was so that I could speak to my peers with scientific authority about something else I cared deeply about. That night I sat on an empty beach, putting myself fully and emotionally with that goal, which moved me to the point that I burst into tears. The next month I received notice of NIH funding.

In 2022, I became an iPEC certified high performance coach. In his book *Energy Leadership*, Bruce Schneider, founder of iPEC, teaches how we can build emotional intelligence and change our perception in any given situation by increasing self-awareness. He describes the energy levels of "needing" (high ego), "doing" (low ego), and "being" (no ego). Each level is based on a thought that drives an emotion, followed by a default, predictable response.

- Level 1 is "I lose." Defined by thoughts of being a victim/powerless, driving emotions of fear and anxiety.
- Level 2 is "I win, you lose." Defined by thoughts of judgment, driving emotions of anger and blame.
- Level 3 is "I'm fine." Defined by thoughts of acceptance and neutrality, driving emotions of forgiveness.
- Level 4 is "you win." Defined by thoughts of concern for others, driving emotions of compassion for others or ourselves.
- Level 5 is "win/win." Defined by thoughts of collaboration and teamwork, driving emotions of peace and calm. No failure, just opportunities to learn.
- Level 6 is "everyone wins." Defined by thoughts of synergy and connection, driving emotions of happiness and joy. At this level are intuition, creativity, innovation, and synchronicity.
- Level 7 is "no win, no lose." Driven by thoughts of purpose and nonjudgment, driving emotions of bliss, passion, and being in the "flow."

With practice, we can learn to continuously choose to move from the survival ego brain, with adrenaline, cortisol, stress, and judgment (Levels 1 and 2), to higher energy levels with quite different neurotransmitters. Our compassion for others drives GABA and dopamine (Level 4). Prioritizing environments where everyone can win—where there are opportunities everywhere, without failure—stimulates the release of serotonin, supporting the emotions of peace and calm (Level 5). Connection with others drives oxytocin with happiness, joy, wisdom, innovation, intuition, and creativity (Level 6). At the highest energy level, a shared and uniting purpose drives the flow of ideas, and we are *simply being*. This flow state is the highest level of consciousness, allowing us to achieve the highest level of performance. Existing and operating at the highest levels have been instrumental to my success as a nerve surgeon, as an innovator, and in my personal life. That is the "secret ingredient." My intuition is my wisest self, and I have found important teaching from books written by Anders Ericsson, Thomas Kuhn, Steve Johnson, Everett Rogers, Eckhart Tolle, David Logan, Pema Chodrun, Tara Brach, and Jon Kabat Zinn.

Now that the second edition of *Nerve Surgery* is finished, all the edits done, and I begin to write this preface I find myself listening to Anderson Cooper interview Rick Rubin on 60 Minutes. The very next day, at the airport in St. Louis, on the way to Amsterdam to see the Vermeer exhibition and celebrate our 51st anniversary, I will find the book Rick Rubin has just published: *The Creative Act: A Way of Being*. His words validate this preface:

> "Practice paying attention and look for what draws us in (positive energy) and what pushes us away (negative energy). Notice what feelings arise and where they lead. Make a space, cultivate awareness, follow our intuition and tap into the universe of ideas. Accept what is good or bad, it is all meant to move us forward."

To all of you who will use this textbook in the service of patients with nerve injury, I extend my gratitude, and as Mihaly Csikszentmihalyi extols in his book, *Flow: The Psychology of Optimal Experience*: "Do not make things hard, go with the flow."

Susan E. Mackinnon, MD

from: Mackinnon E. Nerve Surgery (9781684204700)
© 2026. Thieme. All rights reserved.

Preface to the First Edition

In 1970, at Queens University in Kingston, Ontario, Canada, I fell in love with Alec Patterson and the peripheral nervous system. Four decades later, I am still passionately in love with both of them. In my surgical career, I have been fortunate to have seen two major paradigm shifts in nerve surgery: nerve repair to nerve graft and nerve graft to nerve transfer. These radical shifts in the management of nerve injuries illustrate Thomas Kuhn's concept of scientific development as a succession of tradition bound periods that are punctuated by sudden breaks or paradigm shifts. He emphasized that for these shifts to occur, problems, cracks, and failures had to be identified in existing beliefs or procedures. Tracing these scientific paradigm shifts over time, he emphasizes that when they occur there is always controversy, debate, and heated discussion. I know that our first courses on nerve transfers were met with some degree of scepticism and Hanno Millesi, one of the earliest proponents of nerve grafting, recently shared his recollections of similar dissent with the shift from repair to grafting in the 1960s and 1970s. Sir Sydney Sunderland and Leonard Goldner were strong advocates for direct nerve repair, even with gaps up to 13 cm. Hanno Millesi and Algis Narakas popularized nerve grafting and the shift from nerve repair to nerve graft technique was met with serious debate. Hanno Millesi recalls:

> "In 1963, I was in the USA and met James Smith who had also started to perform nerve suture using a microscope. I returned to Vienna and started to do experiments with sutures using the microscope and it turned out that a good recovery occurred only if tension at the repair site was absolutely avoided. Only then the advantages of the optical magnification could be exploited. The only way to achieve this in a case of defect was to use a graft. I started to do clinical cases after having changed the technique and had surprisingly good results. The first presentations were received with hesitation and criticism. I had a discussion with Dr. Eric Moberg and after that he asked for a demonstration of the technique. He and Sir Donald Brooks came for a visit to Vienna. Sir Donald Brooks was a well-known British surgeon who worked with Sir Herbert Seddon with cable grafts and knew about the poor results. Consequently, he was especially critical. After that visit, Moberg and Brooks were convinced of the advantages of nerve grafts and started to support my work. In the US there was something like a bias against nerve grafting. Dr. Sterling Bunnell and Dr. Joseph Boyes had done some cases using cable grafts, apparently like Sir Seddon with poor results. Dr. Leonard Marmor, a surgeon from Los Angeles, was using irradiated nerve allografts. As far as I know, many of them had to be excised and consequently the general reputation of nerve grafting was poor. A breakthrough was the 1978 symposium in Durham, North Carolina at a symposium organized by Dr. Leonard Goldner still emphasized a nerve repair even in cases of long defects. He presented a case of a boy having suffered a radial nerve defect of 10cm. He resected 10cm of the humeral shaft to be able to achieve a repair. At the same session, Dr. Raymond Curtis reported 25 cases of long defects of the radial nerve managed by grafts according to my technique with superior results."

The introduction of microsurgery and the popularization of nerve grafting techniques by the late 1970s and 1980s improved surgical results in patient outcome when a tension free direct repair was not possible. By the 1990s, synthetic conduits found a role in the management of short nerve gaps in small diameter sensory nerves and nerve allotransplantation had found a limited role for devastating, otherwise irreparable nerve injuries. However, for more than a decade innovation in peripheral nerve surgery was somewhat "stalled." The next big shift to nerve transfer awaited a decade of basic research with incremental increase in our understanding of neuroregeneration and muscle reanimation.

During April 1991, in my own surgical practice I expanded the use of nerve transfer for high ulnar nerve injuries and upper brachial plexus injuries with the anterior interosseous to deep ulnar and medial pectoral to musculocutaneous nerve transfers. Twenty years later, nerve transfers have become more sophisticated and elevated our expectations for functional recovery following major nerve injury. While new nerve transfers are described almost on a monthly basis, the concept of nerve transfer is now mainstream and considered a key component of modern nerve surgery. These procedures have changed the management of nerve injuries and the results can be truly spectacular. The impetus for *Nerve Surgery* is to prepare for a new era in the surgical management of nerve injuries.

The University of Toronto and Washington University School of Medicine in St. Louis afforded me brilliant and talented colleagues to work with and a strong basic neuroscience research environment. Our research laboratory, funded initially by the Medical Research Council of Canada and now by the National Institutes of Health, allows us to ask and answer clinical questions and translate the results from the laboratory directly to clinical practice. Nerve transfers per se are not a new idea, but early nerve transfers did not successfully translate clinically because they were done without the "adjacent possibility" of microsurgery, internal neurolysis, and an understanding of the

from: Mackinnon E. Nerve Surgery (9781684204700)
© 2026. Thieme. All rights reserved.

micro topography and internal anatomy of the peripheral nerve. For a decade and a half, my research focused on nerve allotransplantation and while it did not provide a "cure" for clinical nerve injury, it did provide the neurological platform for composite functional tissue transplantation and importantly, the laboratory techniques to investigate the types of nerve injury and reconstruction that essentially provided that "adjacent possibility" to investigate the nuances of nerve transfers. Importantly, the development of specific transgenic rats in our laboratory has allowed us to accurately visualize nerve transfer models in "real time."

This book has been written for all surgeons managing patients with nerve injury. Peripheral nerve surgery is somewhat of an "orphan" speciality being managed by plastic surgeons, orthopedic surgeons, hand surgeons, neurosurgeons, otolaryngologists, and general surgeons. Even the simple digital nerve injury repaired with tension can irreparably alter the patient's life with painful sequelae. At the other extreme, the last decade of wars against terrorism have resulted in horrific extremity nerve injuries not previously seen. Yearly, over 360,000 nerve repairs are performed in the United States. It is estimated that 54% of all combat wounds are extremity wounds, with to date more than 52,000 direct combat wounds being reported due to ongoing American military operations.

This text begins with a chapter on anatomy and physiology to emphasize the importance of laboratory work on advancing the clinical management of nerve injured patients. It then offers my "take" on the traditional concepts of evaluation of the nerve injured patient, nerve repairs, and issues specific to each major nerve. Most of our nerve transfers are detailed in this text. In May of 2010, we did the first nerve transfer for a C7 quadriplegic patient to restore some important hand function. Dr. Martin Robson brought his paralyzed lifelong friend since surgical internship to our clinic "for a nerve transfer procedure to give him some hand function." A chapter on nerve transfers for patients with tetraplegia introduces an exciting new area for investigation and study. I have had a long-standing respect for painful sequelae associated with nerve injury and continue to be humbled by this life-altering problem; thus, a chapter is dedicated to this topic. In my bookcase is a copy of *Hand Clinics* on tendon transfers published in 1974 and I still refer to this frequently. Thus, I have included a chapter on tendon transfers, which should always be considered, especially in late cases of nerve injury and are frequently useful as an adjunct to nerve reconstruction. There are specific chapters on facial reanimation, surgical management of headaches, peripheral nerve tumors, and of course our passion toward managing patients with brachial plexus injuries.

Finally, my colleagues at Washington University School of Medicine in the Division of Plastic and Reconstruction Surgery, Dr. Ida Fox and Mr. Andrew Yee, have for many years worked to develop a website (nervesurgery.wustl.edu). On this website we continue to update surgical procedures and use this website as a forum for problematic clinical case presentations and the ongoing problems relating to this challenging clinical problem.

from: Mackinnon E. Nerve Surgery (9781684204700)
© 2026. Thieme. All rights reserved.