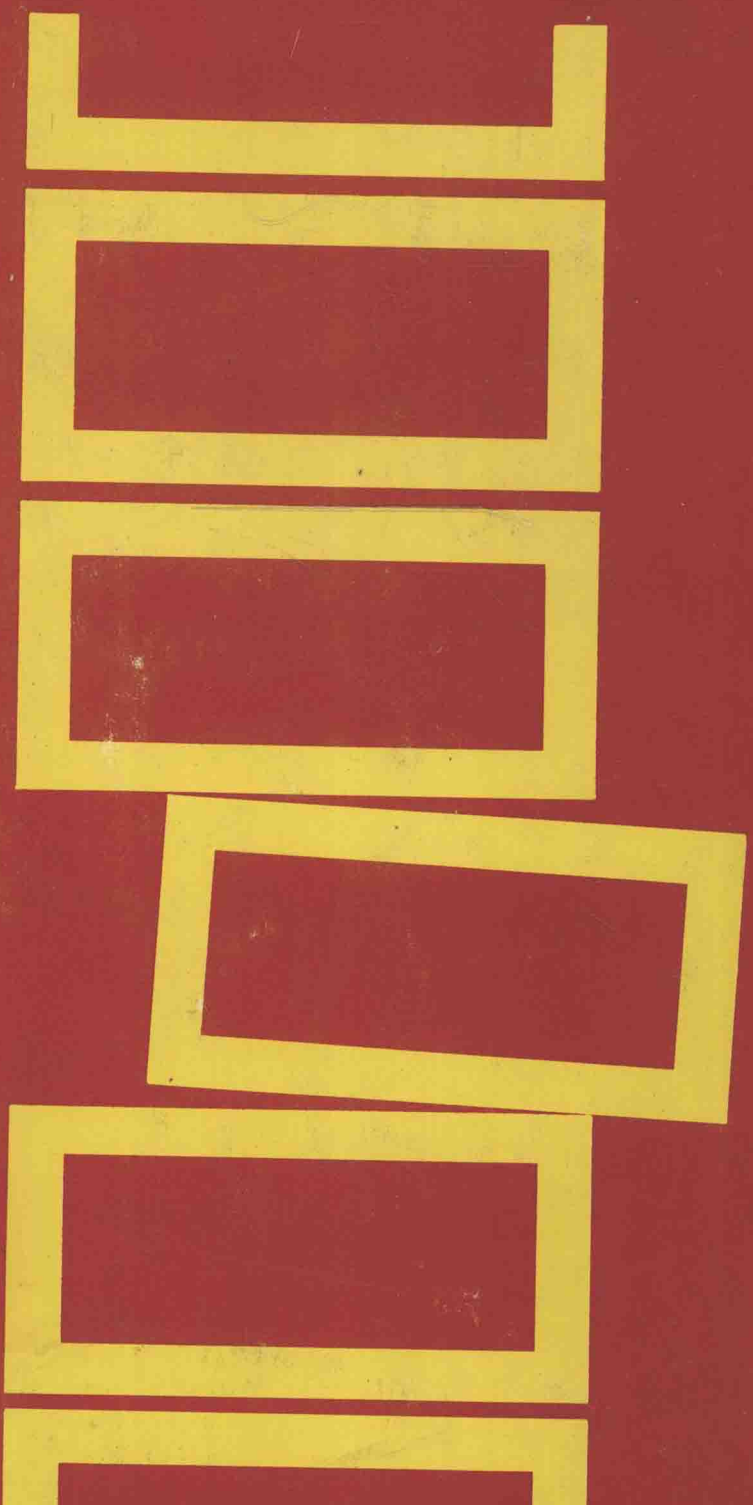
The Total Care of Spinal Cord Injuries

Donald S. Pierce, M.D. • Vernon H. Nickel, M.D.



Spinal Cord Injuries

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The Total Care of

George Bellows: Forty-Two Kids
In the collection of the Corcoran Gallery of Art, W. A. Clark Fund, Washington, D.C. (Reprinted by permission.)
Forty-Two Kids *depicts an activity and place in which a significant number of spinal injuries occur.*

This book is respectfully and affectionately dedicated to all patients with spinal cord injuries, past, present, and future, whose courage in the face of suffering and the burden of having to live an altered life lights the way and gives inspiration for better treatment of their affliction.

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Preface

Injury to the spine and spinal cord is one of the most devastating and catastrophic injuries that can afflict a human being. A person who sustains a spinal injury changes from an ambulatory, self-supporting, independent being, capable of manipulating the environment and controlling bodily functions, to a creature half his previous height, dependent entirely on other people for his very existence. He is frequently unable to control his most intimate and basic functions. Without the essential life support system around him of willing hands, a wheelchair, automotive power, and high-quality clinical care available at a moment's notice, the person with a spinal injury can expect an existence of but a few months at best. Few other injuries have such a psychological and social impact on a human being or so drastically alter individual and family life patterns.

From the descriptions of quadriplegia found in ancient Egyptian tombs to the annals of wartime surgery published after World War I, traumatic injury to the human spine is pictured as one of the most totally maiming and generally lethal human injuries.

Only with the dramatic progress in surgery that took place during World War II could any hope for an extended life be held out to the quadriplegic patient. However, for most military and civilian spinal injury patients survival meant a life of institutionalization in a state hospital or on the paraplegic ward of a Veterans Administration hospital. At best, it meant spending months of every year in such an institution, having urinary tract infections treated, dressings done, and flaps put over pressure sores, worrying through every winter's respiratory infections, and watching the world go by without any hope of ever again being a functioning part of it.

From the medical and surgical point of view, throughout the period between the two world wars and for a number of years following World War II, the surgeon had in his armamentarium one operation, the laminectomy, which was prescribed liberally for almost every patient with a spinal cord injury. Indeed, few patients ever gave up hope until the surgeon had done an "exploratory laminectomy" in the area of injury, and if the surgeon stated that the cord had not actually been severed, hope of miraculous recovery lived on in the minds of

the patient and his family for an indefinite period of time. Little if any thought was given to the effect that stabilization of the spine might have on the healing of nerve roots, particularly in conus medullaris and cauda equina lesions. After the exploratory laminectomy that was supposed to decompress the injured spinal cord, the muscles, fascia, and skin were closed over the back or neck, and the patient was placed on a turning frame or in bed until healing had supposedly occurred.

During this time, the urinary tract was drained with an indwelling Foley catheter and, with a high degree of predictability, would be found to be infected within 48 hours of catheter placement. Follow-up programs consisted of fecal disimpaction by a hospital aide or member of the family two or three times a week, or a regimen of enemas that eventually produced a completely atonic megacolon. Muscular atrophy and insensitive skin could be virtually counted on to produce massive pressure sores, keeping a corps of surgeons busy changing dressings, removing bony prominences, and swinging full-thickness flaps or attempting to find donor sites for split-thickness grafts.

With the exception of the Veterans Administration hospitals set up as paraplegic centers after World War II, virtually no centers for the care of paraplegic patients existed at that time, and a civilian with such an injury could count on being placed in one of the back wards of a state institution unless fortunate enough to be able to afford private care at home or in a private hospital.

The two decades from 1945 to 1965 were the first to bring a measure of genuine progress in the care of patients with spinal cord injuries and in public awareness of the need for such care. The decade from 1965 to 1975 brought an almost unparalleled rise in interest in, and change in, the medical and surgical management of paraplegia and quadriplegia. In the two decades following World War II, in England, Sir Ludwig Guttman and others developed the concept of national spinal cord injury centers for the scientific treatment and rehabilitation of patients with spinal cord injuries. The Goodmond bed for the prevention of pressure sores in the patient with a spinal injury, together with the concept of intermittent catheterization, was developed in his center in Stoke-Mandeville, England. Development of the concept of careful assessment of the patient at the time of injury in an attempt to predict the possibility of recovery and determine the need for exploratory laminectomy lies with Sir Frank Holdsworth and Alan Hardy, who put the care of spinal injuries into the hands of highly qualified medical and surgical practitioners and brought the needs of the patient into national focus.

During this time, physicians in orthopedic and neurosurgical training programs throughout the world began to learn to assess the extent of injury, to bring to bear on it the same type of scientific knowledge that had brought about such great progress in other areas of medicine

and surgery. Enlightened schools of nursing, occupational therapy, and physical therapy began to teach their students new techniques in the area of rehabilitation of the musculoskeletal system, such as splinting and retraining in the use of the paralyzed upper extremity. The orthotist began to move steadily forward in the development of effective orthoses for rehabilitation training, ambulation, and upper extremity function. During this period as well, great strides in anesthesia and the whole science of respiratory care opened the way for lengthy and technically difficult operations on the spine, spinal cord, and peripheral nerves.

The decade from 1965 to 1975 has seen the simultaneous development of the spinal injury center concept throughout the world. It has seen the general acceptance of proper urinary treatment in the patient with a spinal injury, the institution of intermittent catheterization teams, and the setting aside of areas in large general hospitals for the specific care of spinal injuries. The past decade has also seen the development of teams of "paraplegists" made up of physicians and surgeons of many backgrounds and disciplines whose interest and knowledge in the area of spinal injury has fitted them to lead a team of allied health personnel, nurses, physical therapists, occupational therapists, social workers, psychologists, and personnel from many other disciplines to work together as colleagues in the overall total care of spinal cord injury.

Predominantly, it has become more widely accepted that stability of the spine materially affects the ability of the injured neural tissues to heal and that a laminectomy, far from decompressing the spinal cord and nerves, actually performs no such function and in fact destabilizes the spine. For the first time, the concept of approaching the spinal cord from the side and from the front and truly decompressing the cord and its peripheral nerves has been shown in several centers to be a truly effective way of gaining return of cord function in incomplete lesions that in many cases were previously considered hopeless.

The purpose of this book is to set forth the most advanced principles in surgical and medical management of the patient with an acute spinal injury and to carry the reader, whatever his or her background, through the complete management of such patients until they are rehabilitated to a normal, healthy, active life in the community. For this reason, we invited some of our physician colleagues, all of whom are "paraplegists," to present the most up-to-date material available in their particular areas of interest in the broad field of spinal cord injury care. We also invited distinguished members of the allied health professions who are particularly skilled in their own areas of spinal injury care to write the chapters dealing with the role of their particular professional group as members of the team caring for the patient with a spinal cord injury. Each author of a chapter in this book is a

member of a functioning spinal cord injury team with many years of experience in the treatment of spinal cord injury and complete dedication to the principle that persons with spinal cord injuries should have nothing but the best, most advanced, and most comprehensive care available in the world today.

It is our hope that the reader will be imbued with the missionary spirit with which the book was written and will be inspired to work creatively for better comprehensive care in spinal injury.

We express our thanks to the staffs of the departments of rehabilitation medicine, Massachusetts General Hospital, Boston, Massachusetts, and the Rancho Los Amigos Hospital, Downey, California, for the dedication and close collaboration that have enabled us to undertake the writing of this book, and to the authors of each chapter for their hard work and thoughtful consideration in developing their particular subjects of interest. We are also grateful to the medical arts departments of the Rancho Los Amigos Hospital and the Massachusetts General Hospital for their help in the preparation of illustrations new to this book.

In particular, we thank all the patients with spinal cord injuries whose comments and insights into their needs, problems, hopes, fears, and dreams have instructed us and inspired us to undertake this work.

D. S. P.
V. H. N.

The Total Care of Spinal Cord Injuries

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1 Acute Treatment of Spinal Cord Injuries

Donald S. Pierce

General Considerations

PREVENTION

Statistical analysis of the incidence of spinal cord injury in the United States is difficult, since spinal injury is not a reportable condition. However, very reliable estimates show that there are probably upward of 10,000 cord injuries that result in paraplegia or quadriplegia each year in the United States and that there are probably in the neighborhood of 200,000 paraplegic and quadriplegic patients presently living in this country. Such studies as are available in this population indicate that probably 70 percent of all spinal cord injuries are caused either by automobile or sports accidents. Simple checking of the depth of the water in a pond or swimming pool before diving in would probably prevent 30 percent of all the spinal injuries seen every year, and more rigid adherence to the use of seat belts would probably reduce injuries another 20 percent. In addition, the proper use of protective devices and more emphasis by athletic coaches on safety rather than on knocking other players out of action could bring about another sizable reduction in the incidence of the spinal injuries occurring each year.

INITIAL CARE

It is a sad commentary on early care of injured persons in most areas that 1 in every 10 patients with spinal injury in Rogers series [5]—and a higher proportion in more recent experience from the same institution—has shown progression of symptoms of spinal cord or nerve root damage between the time of initial diagnosis at the scene of the accident and the beginning of definitive in-hospital treatment. Such figures indicate that first-aid treatment of patients with spinal injuries is at present woefully inadequate and that if it were adequate, it could in many cases prevent permanent sequelae or reduce neurologic residuals.

It is of vital importance that in any patient in whom there is a

consideration of spinal injury, i.e., where there has been major trauma to the cervical spine or the back, there should be careful questioning of the conscious patient as to any areas of cutaneous numbness or skeletal muscle paralysis. Careful palpation of the spinal axis is essential in both the conscious and unconscious patient before moving him at all.

Unless there is danger of fire, extrication from a wrecked automobile should be delayed until a board can be procured, either of the special type advocated by the Academy of Orthopaedic Surgeons and the American College of Surgeons (Fig. 1-1), or a simple board to which the patient's head and back can be strapped before being moved from the seat of an automobile. In the case of a patient whose cervical spine has been injured in a diving accident, several persons, if they are available, should enter the water. One person should put gentle, straight axial traction on the patient's head, and the patient's body should be supported in the water and floated to the shore. Then, if possible, while still in the water, the patient should be placed on a board, window blind, or other flat movable surface and lifted out of the water with continuous, gentle axial traction being exerted on his neck by hands placed on his chin and occiput. The patient should be strapped to a board or stretcher in this position with a roll under the posterior aspect of the cervical spine to hold it in slight extension; in the case of thoracic injury, if there is an obvious gibbous deformity, a pad should be placed over the roll beneath the patient. Following strapping of the patient to the stretcher or board, he should be transported with as much care as possible taken to avoid bumping and with the most qualified person available in attendance at all times.

In many cases, the immediate onset of total or partial paralysis may be obvious so that there is no problem in making a diagnosis of a spinal injury. In others, careful questioning of the conscious patient, augmented by gentle examination of the extremities to determine whether or not motor power is intact and there are areas of numbness will often corroborate the diagnosis when the type of injury makes one suspicious that the spinal axis has been disrupted.

Careful examination, stabilization, and transportation of the patient with a spinal injury may well allow an injury that is originally reversible to remain so; i.e., one caused by slight contusion of the spinal cord with cord swelling or by root contusion, stretching, or compression. Lack of attention to these details may cause further injury to the neuraxis, or make a reversible situation a permanent one, or both.

HOSPITAL CARE

Whether the patient has been moved properly or improperly from the scene of the accident to the hospital emergency room, care within the hospital must be directed initially to preventing any further damage to