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Approach and considerations regarding the patient with spinal injury

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Summary[1] Spinal trauma often results in a complex interaction of injuries to the musculoskeletal and nervous systems. This combination of biomechanical and neurological considerations provides a unique challenge to those dealing with the spinally injured patient.

Proper assessment of the injuries sustained by the patient remains the initial, yet key, step in determining appropriate management. The aim of the physical examination is not only to characterize the nature of the injury to the vertebral column, but also to determine the extent of actual and potential damage to the neural elements. It is also concerned with detecting associated injuries of the brain, viscera, and limbs that can impact on management and outcome, particularly of any neurological deficit. Further information about the spinal column and spinal cord is derived from appropriate radiological assessment, which is evolving with the increasing sophistication of imaging modalities. In spinal injury, classification systems are particularly important as they simplify a diverse range of injury patterns into a useable and reproducible form that may be used to aid communication among clinicians, guide management for individual patients, and provide the basis for research consistency.

The medical management involves consideration of the impact of spinal injury, in particular cord injury, on aspects including resuscitation and anticoagulation, as well as the role of steroids. The definitive management of the spinal column injury may be operative or nonoperative. Factors influencing this decision are biomechanical (stabilization of the unstable spine and reduction of deformity) and neurological (improvement in deficit and decompression of neural elements).

This article considers these issues and aims to present a balanced and useful algorithm for clinicians to use when faced with spinal injury.

Introduction

Trauma provides the spine surgeon with an almost limitless number of variations in injury etiology, patterns, and severity. This diversity can result in confusion as to the most appropriate investigations and management, and the timing of these interventions. An ordered pattern of management needs to be developed for each patient to achieve the best clinical outcome [1].

Fortunately, common threads run through all patients with trauma, and these can be used to provide a framework for management strategies. Broadly speaking, these threads fall into general considerations for the injured patient, regardless of causation of the trauma; and the considerations specifically unique to trauma of the vertebral column and spinal cord.

[1] Abstracts in German, French, Italian, Spanish, Japanese, and Russian are printed at the end of this supplement.

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The management of each episode of spine trauma passes through three phases, ie, prehospital care, assessment, and finally treatment. Prehospital care is important in the management of spine trauma, but is not the focus of this article, which addresses the latter two phases.

The modern spine surgeon has the benefit of being able to blend the timeless instrument of clinical examination with modern radiological, pathological, and neurological assessment. Following this assessment, management considerations are addressed. The surgeon must be cognizant of non-surgical treatment considerations and these are outlined. The surgical approach under discussion will be addressed mostly as concepts as detailed discussion is contained elsewhere within this supplement.

This paper attempts to provide a practical yet safe and clear approach to the patient with spinal trauma. The general concepts covered in this article provide a basis for the detailed discussions of the complex management questions that follow in the subsequent papers. An attempt has been made to provide useable guidance while maintaining an appropriate degree of scientific discussion. Areas of controversy in the literature have been clearly delineated, and in these circumstances we have provided the management approach used in our institution as a basis for further discussion.

Assessment

Examination

There are two key objectives of the clinical assessment of the patient who has suffered an injury to the spine. The first is to ascertain the presence of concomitant injuries. One study [2] found 47% of patients with spine trauma had associated injuries; 26% with head injuries, 24% chest injuries, and 23% long bone injuries. Abdominal injuries and lumbar spine fractures often coexist and are overlooked. There is a common association between flexion-distraction (Chance-type) lumbar injuries and hollow viscus injuries in seatbelt injuries. In one study, 12 of 20 patients with a Chance fracture had life-threatening intra-abdominal trauma, the majority being a bowel wall injury [3]. Most had abdominal wall bruising, which should be considered as a sentinel sign.

The second objective is to ascertain the presence of a neurological deficit. A thorough, accurate, and well-documented neurological examination at the primary hospital is paramount. If the information is incomplete and the patient's neurological deficit varies when re-examined, it is unclear whether the situation has changed or whether the initial assessment was flawed. This may alter the urgency of subsequent management. Neurological assessment should be performed according to the guidelines developed by the American Spinal Injury Association [4] and recorded on the Standard Neurological Classification of Spinal Cord Injury worksheet, which is readily downloadable *(http://www.asia-spinalinjury.org/publications/2001_Classif_worksheet.pdf)* (Fig 1). This chart both guides the clinician through the examination and provides a concise summary of the neurological status. It is important to include a rectal examination because it has implications when assessing the

ASIA IMPAIRMENT SCALE

- ☐ **A = Complete:** No motor or sensory function is preserved in the sacral segments S4-S5.
- ☐ **B = Incomplete:** Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.
- ☐ **C = Incomplete:** Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.
- ☐ **D = Incomplete:** Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.
- ☐ **E = Normal:** motor and sensory function are normal

CLINICAL SYNDROMES

- ☐ Central Cord
- ☐ Brown-Sequard
- ☐ Anterior Cord
- ☐ Conus Medullaris
- ☐ Cauda Equina

Fig 1: Classification worksheet.