INTRODUCTION

The frequency of spinal trauma, which in developed countries affects 70% of cases under the age of 40, has gradually increased over the last 50 years. Typical causes of spinal trauma include road traffic accidents (50%), sports activities (25%), occupational accidents (20%) and accidental falls (5%) (19).

Neurological injuries occur in 10-14% of cases of spinal trauma; 85% of these cases present at the time of the trauma, between 5-10% originate shortly afterwards, and between 5-10% become evident at a later time (9). Diagnostic and therapeutic advancements have increased patient survival rates; however, little can be done to reverse frank spinal cord injury. Improvements in survival rates have led to a parallel increase in the number of younger invalids. It is in part for this reason that prevention, rapid diagnosis and proper patient management are of paramount importance in minimizing neurological patient deficit (16).

Timely radiological diagnosis is fundamental in the modern management of patients with spinal trauma. Mastery of this includes a thorough knowledge of the anatomy and biomechanics of the spine, an understanding of the mechanism of the trauma, experience in the correct execution of radiological examinations, knowledge of the indications and limitations of the individual imaging techniques under consideration and a correct appreciation of the importance of the correlation between the imaging findings and the clinical signs and symptoms.

Practically speaking, the spinal column has two functions: to facilitate stability and movement, and to protect the spinal cord and spinal nerves. Consequently, we have two separate yet closely connected considerations when evaluating the patient with spinal trauma: the spinal column itself and the underlying neural and meningeal structures. At the level of the present state of the art, medical imaging techniques make it possible to glean information concerning all components of the spine, including its contents and the perivertebral tissues. Conventional radiology, CT and MRI are the techniques currently available, although the most advanced techniques do not necessarily represent the best ones in every case (2, 12, 15).

Fundamental diagnostic information is provided by conventional x-rays which, when complemented by conventional tomography, are the best choice for evaluating acute trauma of the spinal column itself. Radiographic analysis also makes it possible to perform the examination in...
a number of projections without moving the patient. In addition, the entire spine as well as other body parts can be examined at the same time. According to the literature, 43% of patients with burst spinal fractures may have other spinal injuries. Associated both distal and proximal traumatic spinal lesions are present in 10-17% of patients. For example, in patients with cervical injuries, 12% also have thoracic fractures and 3% reveal lumbar fractures.

With regard to conventional radiography, particular attention should be paid to evaluating the following parameters in the patient with spinal trauma:

**Vertebral alignment abnormalities:**
- reversal of normal spinal curvature
- abrupt increase in the spinal curvature
- alignment of the articular processes, laminae, spinous processes, transverse processes and vertebral bodies
- widening of the interspinous/interlaminar spaces

**Abnormalities of the perivertebral soft tissues:**
- enlargement of the retropharyngeal and retrotracheal spaces
- enlargement of the thoracic and lumbar paraspinal spaces

**Disk/Articular abnormalities:**
- abnormalities of the intervertebral disk space
- abnormalities of the posterior spinal articular facet processes (zygapophyses).

It is also necessary to evaluate spinal stability in patients with spinal trauma. The term instability in this context indicates a posttraumatic state of intersegmental hypermobility that may require surgical restabilization. In order to properly discuss and study the spinal column for possible instability, the spine has been divided into three columns (6, 7): anterior column, middle column and posterior column. Practically speaking, the involvement of a single column does not necessarily entail instability, however, the involvement of two adjacent columns usually does.

Recent studies (5) have identified five radiological signs of spinal instability associated with spinal injuries. These five signs can be summarized as follows:

1) anterior or posterior vertebral subluxation greater than 2 mm
2) enlargement in the interlaminar space of more than 2 mm
3) enlargement in the joint space between the articular facet processes; malalignment of the same a loss of contact between contiguous facets
4) fracture involving the posterior cortex of the vertebral bodies
5) enlargement in the lateral dimension of the central spinal canal of more than 2 mm as measured by the interpedicular distance between adjacent vertebrae.

It is also essential to know the mechanism of the trauma as well as the biomechanics of the spine, which make it possible to identify the areas most at risk of injury. The highest risk areas are those sites at which a greater degree of mobility exists, such as the cervical and lumbar spinal segments, or where a junction exists between a relatively mobile segment and one that is less so or not at all (e.g., the cervico-thoracic junction, the thoraco-lumbar junction, the lumbo-sacral junction).

On the basis of the dynamics of trauma, it is possible to recognize injuries caused by: simple flexion, flexion-distraction, flexion dislocation, flexion and compression, simple extension, extension-distraction, extension-dislocation, “shearing” forces, and rotation. Although there is overlap between the various types, each of these traumatic mechanisms may cause a particular type of fracture.

To summarize, when investigating traumatic lesions of the spine one must: understand the mechanism of the trauma; ensure that the patient is only moved once it has been determined that it is possible to do so with safety by expert personnel and preferably under medical guidance; remember that patients with spine trauma not infrequently have polytrauma and that neurological injuries can conceal involvement of internal organs (e.g., the spleen); perform a pre-