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Rezumat

Controlul leziunilor este tactica de tratament a pacienților politraumatizați grav cu risc major pentru viață, conform căreea în dependență de gravitatea stării traumatizatului apreciată după indicii obiectivi în perioada precoce se folosesc numai acele metode care nu conduc la înrăutățirea serioasă a stării pacientului. Controlului leziunilor ortopedice se supun politraumatizații cu gravitatea generală a traumei conform ISS mai mult de 20 de baluri, în prezența traumatismelor serioase a cutiei toracice, craniului, organelor abdominale şi spațiului retroperitoneal.

Summary

Damage control tactic treatment is grave risk of major trauma patients for life, that depending on the severity of traumatizatului judged by objective indices in the early use only those methods that do not lead to serious deterioration of the condition. Damage control orthopedic politraumatizații subject to general severity of trauma according to ISS more than 20 balls, in the presence of serious injuries to the chest, skull, abdominal organs and retroperitoneal space.

Резюме

Контроль повреждений есть тактика лечения жизнеопасных и критических политравм, согласно которой в зависимости от тяжести состояния пострадавшего, оцененной по объективным показателям, в раннем периоде применяются только те методы, которые не вызывают серьезного ухудшения состояния пациента. Контролю ортопедических повреждений подлежат пострадавшие с общей тяжестью травмы по ISS более 20 балов при наличии серьезных травм груди, черепа, органов живота и забрюшинного пространства.

DIAGNOSIS PARTICULARITIES OF SPINAL INJURIES IN POLYTRAUMA

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Introduction

Most spine fracture patients can be treated in a tîmely fashion, at the surgeon discretion, with a reliably satisfactory outcome. Difficulties appear in the diagnostic and treatment of the most severely injured segment (10%) of spine trauma patients - those patients whose lives depend on correct diagnostic, rapid resuscitation, mobilizatiott, and prevention of pulmonary and thromboembolic complications. These patients can deteriorate very rapidly after admission, and may not be suitable for delayed surgery for weeks thereafter.

Trauma remains the leading cause of death in individuals from 1 to 45 years of age. The most common causes of death in patients with otherwise surivable injuries include hemorrhage, pulmonary insufficiency, adult respiratory distress syndrome (ARDS), and pneumonia, sepsis, and thromboembolic disease [1]. Although the trauma literature clearly shows that urgent stabilization of long-bone injuries has reduced both morbidity and mortality among polytrauma patients, many physicians still feel that urgent spinal surgery is dangerous in severely injured patients [1]. An unstable spinal fracture exposes the patient to the same hazards as a segmental femur or pelvic fracture - pain, systemic shock, enforced recumbency and pulmonary impairment, inability to mobihzc the patient - and delaycd treatment of a spinal fracture can rcsult in the same complications dealt with extremity polytrauma.

In the United States, there are nearly 11,000 acute spinal înjuries annually. The combination of severe, multisystem injury and thoracolumbar fracture is seen in less than 4% of acute spine fracture patients presenting to the trauma center [2]. Polytrauma spine patients are predominantly male, predominantly young, and demographically typical of blunt and penetrating trauma populations. At the time of injury, the average age of patients with traumatic spine lesions is 32 years and 55% of those injured are aged 16–30 years. Approximately, half of spinal injuries occur in the cervical spine, the other half involves the thoracic, lumbar, and sacral areas [3]. Motor vehicle accidents (MVA) are the principal cause of spine trauma and account for approximately 40% of reported cases. Other injuries are typically the result of a fall [4]. The large number of associated injuries and the high ISS further attest to the severity of the trauma in this patient group.

Classification of vertebral fractures. Several classification systems for spine trauma are in use. Most classifications are based on the mechanism of injury or anatomical changes, but their clinical usefulness is limited by the lack of quantifiable management parameters.

Ideally, vertebral fractures should be graded on the basis of clinically relevant and measurable parameters such as: neurological function impairment (modified Frankel grading method [4]), spinal canal deformity, and biomechanical stability [5].

When a patient with spine trauma is referred for imaging, the exact mechanism of trauma is unknown in many cases. Therefore, most radiologists use a pragmatic approach to the classification and description of vertebral fractures which is based on vertebral morphology. This classification system takes into account the loss of height of the vertebral body:

- Grade I: vertebral body height is>75% of normal value
- Grade II: vertebral body height is between 50 and 75% of normal value
- Grade III: vertebral body height is <50% of normal value

With reference to Denis' three-column theory of spinal stability [6], fractures of the spine can be classified based on the pattern of injury and the forces involved [7]. The mechanism of injury reflects the mechanical mode of failure of the vertebral bodies.

Flexion-compression mechanism (wedge or compression fracture) The combination of flexion and compression forces typically causes an anterior wedge compression fracture. The anterior column is compressed, with variable involvement of the middle and posterior column. Three subtypes can be defined. In the first pattern, only the anterior column is implicated (stable fracture). This results in anterior wedging of the vertebral body. The loss of anterior vertebral body height is usually <50%. In the second pattern, there is an anterior column involvement and posterior column ligamentous failure (potentially unstable fracture). Imaging studies reveal anterior wedging and increased interspinous distance. The loss of vertebral body height is usually >50%. In the third pattern, there is failure of all three columns (unstable fracture). Imaging studies demonstrate anterior wedging and posterior vertebral body disruption. Dislodged bone fragments in the spinal canal may cause compression of the spinal cord or nerve roots.

Axial-compression mechanism (burst fracture). A burst fracture (also known as crush fracture) is caused by axial compression forces. This injury is associated with high energy trauma (e.g., fall from a great height, MVA). Burst fractures are most commonly found at the thoracolumbar junction and between levels T5 and T8 [8].

A burst fracture is characterized by a loss of height of the vertebral body. The fracture implicates the anterior and middle columns; the state of the posterior column determines whether the fracture is stable or unstable. Posterior element displacement and/or vertebral body or facet dislocation or subluxation is found in unstable fractures. Displacement of bone fragments into the spinal canal may cause compression of the spinal cord or nerve roots, as well as vascular injury.

Flexion-distraction mechanism (Chance fractures). The combination of flexion and distraction forces can cause a Chance (or seatbelt) fracture. This is a type of thoracolumbar injury in which the posterior column is involved with injury to ligamentous components, bony components, or both. Chance fractures are often associated with intraabdominal injuries [9]. The pathophysiology depends on the axis of flexion.

Several subtypes exist. In the most common type of Chance fracture, the axis of flexion is anterior to the anterior longitudinal ligament (ALL). This results in a horizontal fracture of the bony elements along with disruption of the supraspinous ligament. Imaging studies display an increase in the interspinous distance and may show horizontal fracture lines through the pedicles, transverse processes, and pars interarticularis. On axial CT scans, the pedicular fracture lines are seen as a gradual loss of definition of the pedicles; this appearance has been called the "dissolving pedicle sign" [9]. With more severe flexion-distraction forces, the axis of flexion lies behind the ALL. These Chance fractures can be accompanied by a burst-type vertebral fracture with posterior cortex buckling or retropulsion. This is an unstable injury. Moreover, if the pars interarticularis is disrupted, the instability of the injury is increased, and this can lead to significant subluxation. Neurological sequels, when present, are related to the degree of compression of the neural elements.

Rotational fracture-dislocation mechanism. The precise mechanism of this fracture is a combination of lateral flexion and rotation with or without a component of posterior-anteriorly directed force. The resultant injury pattern is failure of both the posterior and middle columns with varying degrees of anterior column insult. The rotational force is responsible for disruption of the posterior ligaments and facet joint. With sufficient rotational force, the upper vertebral body rotates and carries the superior portion of the lower vertebral body along with it. This causes the radiographic "slice" appearance sometimes seen with these types of injuries.

Transport and clinical evaluation. In the polytraumatizcd patîent, it should be assumed that a spine injury exists until it is proven otherwise. Therefore, appropriate precautions and immobilization must be undertaken to protect the spinal column. It îs estimated that between 3% and 25% of spinal cord injuries occur during transport from the scene to the emergency room, Toscano determined that 32 of 123 trauma patients suffered neurological deterioration during transport from the scene of the accident to the hospital [2]|.

Once the patient is brought to the emergency room, the process of "clearing the spine" should begin as soon as possible to prevent morbidity caused by prolonged immobilization. A common complication is the development of decubitus ulceration about the face secondary to cervical spine collars pressing around the chin and the neck. Similarly, length of timc on a rigid spinal board has bccn shown to correlatc with an increased risk of dcveloping pressurc ulcers, espccially in paticnts who havc lost protective scnsation duc to a spinal cord injury. In addition, cervical collars can act as a torniquet, resulting in elevated jugular venous pressure leading to an increased Intracranial Pressure (ICP). This may be significant in 3,5-6% of blunt trauma paiients who have both a cervical spine injury as well as a severe head injury. Cervical spine immobilization has also been shown to potentially increase the rîsk of aspiration and limit respiratory function. Therefore, once a patient arrives in the emergency room, every effort should be made to move him/her to a semi-rigid cushion from ihe spine board and to remove thc cervical collar whcncver possible.

Imaging. Unfortunately, a rate of missed spinal fractures of up to 33% has been reported [1] in high energy trauma patients. Therefore, it is imperative that a complete and thorough examination is undertaken when evaluating a polytraumatized patient.

The main objectives of the radiological examination in the clinical setting of spinal trauma are to depict the spinal axis rapidly and accurately, and to guide potential surgical decompression. Several imaging modalities can be used, but nowadays multi-detector computer tomography (MDCT) and magnetic resonance (MR) imaging are the most important imaging modalities [10].

Plain X-ray films. Plain X-ray films are a „quick & dirty" way to assess the spine, and are readily available in most hospitals and trauma centers. Plain radiographs may be helpful in fracture screening, and are mainly used to detect a spinal deformity. Indications for obtaining „surveillance" radiographs of the thoracic and lumbar spine in patients with blunt injuries include: back pain, fall from a height of 10 feet or more, ejection from a motorcycle/motor vehicle crash at 50 mph or more, Glasgow coma scale (GCS) score of B8, and neurological deficit.

Plain X-ray films, even with the best possible technique, underestimate the amount of traumatic spine injury, and lesion(s) may be missed. The difficulty in „clearing" the cervical spine (i.e., excluding a fracture) in trauma patients is well known to most radiologists. Hairline fractures or non-displaced fractures are difficult to detect on conventional radiographs. In the cervical spine, plain X-ray films detect only 60–80% of fractures; a significant number of fractures are not visible, even when three views of the spine are obtained [11]. In a series of 216 consecutive patients with cervical injuries, using a combination of three X-ray views (anteroposterior, cross-table lateral, and open-mouth odontoid), 61% of all fractures were missed, 36% of (sub-) luxations were missed, and 23% of patients were falsely identified having normal spines, of whom half had in fact unstable cervical injuries [4]. Therefore, with these limitations in mind, and given the speed and precision provided by modern MD CT units, it has become the policy of many major trauma centers to use MD CT as the primary imaging modality in high risk patients with blunt cervical spine injury [12].

Multidetector) computed tomography. Computed tomography (CT), and in particular MDCT, plays a critical role in the rapid assessment of the (poly) traumatized patient [13]. Early on, many trauma centers adopted the technique of thin-section CT with reformation in sagittal or coronal planes to evaluate the spine. The widespread availability of spiral CT and subsequently MDCT, refined the technique and allowed the rapid acquisition of data sets which provided confidence in diagnosis and increased utilization.

CT screening has a higher sensitivity and specificity for evaluating cervical spine injury compared with plain film radiographs [12, 14]. In the cervical spine, CT detects 97–100% of fractures, but its accuracy in detection of purely ligamentous injuries has not been documented. A recent study assessed that CT was the most efficient imaging tool with a sensitivity of 100%, whereas a single cross-table lateral view had a sensitivity of only 63% in detecting skeletal injuries of the cervical spine [15]. An additional advantage is that CT allows more rapid radiological clearance of the cervical spine than radiography [14]. For these reasons, many major trauma centers nowadays have replaced plain film radiographs with spiral CT or MDCT as the standard of care in the initial evaluation of the cervical spine in moderate to severe trauma patients [14]. Although CT, and especially MDCT, is more costly than plain radiographs, it has been shown that it can actually decrease institutional costs (when settlement costs are taken into account) due to the reduction of the incidence of paralysis resulting from falsenegative imaging studies.

The most important limitation of this technique is the inability to provide screening for ligamentous injury and spinal cord lesions. Furthermore, the interpretation of (MD)CT data is more complicated in patients with severe degenerative disease. CT provides overall superior depiction of the bony anatomy of the spinal canal in the trauma patient. It can also depict significant soft tissue abnormalities, such as traumatic disk herniations, significant epidural hemorrhage, and other injuries. It is clear that MR imaging is superior in this regard, but the review of spine CT in a trauma patient should include careful review of the soft tissue windows.

Traditionally, CT of the thoracic and lumbar spine is commonly performed to evaluate suspicious levels on plain film studies, or to evaluate the patient with a known level of injury. Recent literature data indicate that MDCT diagnoses thoracolumbar spine fractures more accurately than plain X-ray films [16,17]. CT screening shortens the time to removal of spine precautions. Moreover, a CT scanbased diagnosis does not appear to result in greater radiation exposure and improves resource use. As with the cervical spine, reformatted sagittal and coronal images are also helpful to demonstrate abnormalities in alignment, and to clarify the nature of fractures which are seen on the axial images.

MR imaging. Thanks to its increased availability for the emergency room physician, MR imaging is starting to play an increasingly important role in the assessment of spine trauma patients [10]. Thanks to its inherently superior contrast resolution, MR imaging is the preferred technique for the detection of soft tissue injuries. It is mainly used to exclude occult injuries and to identify spinal cord lesions [18]. MR imaging is the modality of choice for assessing traumatic lesions involving the intervertebral disks and spinal ligaments. It has been recommended that cervical spine trauma patients with negative standard radiographs and suspected occult cervical injury should be investigated by MR imaging to detect ligamentous injuries that were not seen on plain X-ray studies.

Any patient with presumed spinal cord injury should undergo an MR imaging examination as soon as possible. In patients with spinal cord injury, MR imaging is able to reveal the location and severity of the lesion and, at the same time, to indicate the cause of spinal cord compression. MR imaging helps in predicting neurological recovery.

Finally, MR imaging is not only useful in the soft tissue injuries associated with spine trauma, but also demonstrates changes within the bone marrow of traumatized vertebrae which are unapparent on plain film studies, such as bone contusions. For the detection of bone marrow edema, sagittal T2-weighted sequences with spectral fat saturation are most useful. It is not uncommon to find multiple levels of involvement, and some trauma centers mandate evaluation of the other spinal segments to exclude additional injury.

Conclusions. Rapid diagnosis followed by prompt implementation of definitive treatment for spinal înjuries is crucial in successfully managing polytrauma patients. In polytrauma patients who are alert, awake, and cooperative, every effort should be made to rapidly clear the cervical/thoracic/lumbar spine for rapid mobilization.

Radiological investigation is of paramount importance in the diagnosis and management of polytrauma patients with spine injuries. The main objectives of imaging patients with spinal trauma are: rapid and accurate depiction of the spinal axis, identification of (potentially) unstable injuries, and indication of signs for surgical decompression. Plain X-rays of the spine play a limited role in the detection of vertebral fractures. In spine trauma patients with moderate or high risk, CT, and especially MDCT, is the modality of choice for assessing the degree of vertebral collapse and for measuring the diameter of the bony spinal canal. MDCT is superior to all other imaging modalities in the detection of vertebral fractures and unstable injuries. However, CT is of limited value for assessing the spinal cord. Therefore, MR imaging should be used whenever a spinal cord lesion or an occult injury is suspected. MR imaging is the method of choice for assessing spinal cord lesions, ligamentous injury, and vertebral bone marrow edema

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Rezumat

Leziunile coloanei vertebrale apar frecvent la pacientul cu politraumatism ce face cunoştinţe de evaluare şi tratament al acestor leziuni nepreţuite pentru echipa de medici. În momentele imediate după aceste traume, paşuri critice pot fi efectuate pentru a preveni o lezare suplimentară şi de a asigura recuperarea maximă neurologică şi funcţională a pacientului. O abordare simplă, standardizată pentru tratarea pacientului de la locul accidentului, examinarea pacientului în secţia de primire, indicarea investigaţiilor radiologice adecvate, precum şi efectuarea tratamentului precoce pot influenţa semnificativ la recuperarea maximă a pacientului.

Summary

Spinal injuries occur frequently in the patient with polytrauma making the knowledge of the evaluation and treatment of these injuries invaluable to the trauma team. In the immediate moments after these injuries, critical steps can be taken to prevent additional injury and insure maximum neurologic and functional recovery of the patient. A simple, standardized approach to treating the patient at the scene, examining the patient in the trauma admitting area, ordering appropriate radiographic studies, and instituting early treatment can markedly influence a patient's maximal recovery.

Резюме

Повреждения позвоночника часто встречаются у пациентов с политравмой, придавая особое знание обследованию и лечению данного вида травм для выбора общей тактики действий. Непосредственно после травмы, решительные шаги могут быть предприняты для предотвращения дополнительных повреждений и обеспечения максимального неврологического и функционального восстановления пострадавшего. Простой, стандартизированный подход к оказанию помощи на месте, обследование пациента на предмет травмы вышеуказанной области, назначение соответствующих рентгенологических исследований, а также раннее начало лечения могут заметно влиять на процесс восстановления больного.

TRATAMENTUL CHIRURGICAL AL DEFECTELOR TEGUMENTARE LA NIVELUL DEGETELOR MEMBRULUI SUPERIOR

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Introducere

Degetele sunt porţiuni a extremitaţii superioare prin care ne atingem, simţim, scriem, desenăm şi efectuăm activitaţi cotidiene. Odată cu apariţia şi dezvoltarea noilor tehnologii, dependenţa noastră de extremitaţile distale a mâinii în viaţa de zi cu zi continue să crească, astfel mai des navigăm pe Internet, utilizăm telefoane inteligente, operăm cu telecomanda, sau scriem la calculator. Numeroase studii au arătat că traumatismul mâinii este situat pe primul loc între toate tipurile de traumatisme. Leziunile deschise ale