

EMERGENCY ROOM MANAGEMENT IN SPINAL CORD INJURY

C. ROȘCA¹

¹Emergency Clinical Hospital Sibiu

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Abstract: The initial examination of a trauma patient with suspected spinal trauma is performed in Emergency Room. The goals of initial examination and treatment of spinal cord injury are: to realign the spine, to prevent loss of function of undamaged neurological tissue, to improve neurological recovery, to obtain and maintain spinal stability and to obtain early functional recovery. In accordance with this reason in Emergency Room is need to perform a complete clinical and neurological exam of patient with spinal injury used the ASIA/IMSOP (American Spine Injury Association/International Medical Society Of Paraplegia) principles. We have to study the following aspects: Immobilization of the patient with suspected spinal injury; Compensation of hypotension; Adequate oxygenation of the patient; Abdominal decompression; Imaging investigation of patients with suspected fracture of the spine: X-ray examination, CT-scan and MRI for patient with spine trauma; Neurological assessment of patients with spinal trauma: checking both the motility function and the sensory one, to determine the degree of damage, according to the criteria of scale offered by ASIA / IMSOP. Is a good reason for introduction of an neurological evaluation record of the patient with spine fracture that give direct, objective data (not only quantitative, how neurological clinical examination offers) on the degree of neurological damage and which is also intended to be a useful tool for the prompt evaluation of the evolution of the case. The role of this objective, systematic and dynamic evaluation transposes into shaping the therapeutic decision. Thus, by assigning the initial clinical evaluation data with the data of the imagistic examination and with those objective data offered by the neurological evaluation the best therapeutic protocol may be chosen to offer the best chances of complete recovery of patients with spine fractures and the rehabilitation of their economic and social life. The chances of such a patient of complete healing without neurological sequelae increase considerably if, at the first contact with the patient in the Emergency Room the correct decisions can be taken quickly, and I mean decisions regarding the initial assessment (clinical, neurological, imagistic), and the rapid introduction of the patient in a therapeutic protocol that will give the best chance of complete healing without sequelae.

Cuvinte cheie: scor motor, scor senzitiv, fișă de evaluare

Rezumat: Examinarea inițială a unui pacient traumatizat la care se suspectează o leziune de coloană vertebrală se realizează în Unitatea de Primiri Urgențe. Scopul examinării și al tratamentului în cazul leziunilor traumatice ale coloanei vizează: îndreptarea coloanei, prevenirea pierderii funcțiilor țesutului neurologic neafectat, recuperarea neurologică, obținerea și menținerea stabilității vertebrale și recuperarea funcțională cât mai rapidă. Pentru aceasta este necesar ca în Unitatea de Primiri Urgențe să se realizeze o corectă evaluare clinică și neurologică a pacientului conform cu criteriile scalei ASIA/IMSOP. Se vor urmări următoarele aspecte: Imobilizarea pacientului cu suspiciune de leziune vertebrală; Compensarea hipotensiunii la pacienții cu traumatism vertebral care prezintă șoc spinal; Oxigenarea adecvată a pacientului; Decompresie abdominală; Explorarea imagistică a pacienților cu suspiciune de fractură de coloană vertebrală: prin examinare radiologică standard, examen CT și RMN al coloanei vertebrale; Evaluarea neurologică detaliată: aprecierea scorului motor și a celui senzitiv conform cu scala ASIA / IMSOP și introducerea datelor în Fișa de evaluare a pacientului cu fractură vertebrală. Este eficace introducerea unei fișe de evaluare neurologică a pacientului cu fractură de coloană vertebrală care să ofere date directe, obiective (nu doar cantitative, cum oferă examenul clinic neurologic) privind gradul de afectare neurologică și care, de asemenea, să fie un instrument util pentru evaluarea în timp a evoluției cazului. Rolul acestei evaluări obiective, sistematice și în dinamică se transpune în conturarea deciziei terapeutice. Astfel, asociind datele evaluării clinice inițiale, cu datele examenului imagistic și cu datele obiective oferite de evaluarea neurologică se poate alege protocolul terapeutic care să ofere cele mai mari șanse de recuperare completă a pacienților cu fracturi ale coloanei vertebrale și de reintegrare a lor în circuitul economico-social. Șansele de vindecare completă, fără sechele neurologice ale unui astfel de pacient cresc considerabil, dacă la nivelul primului contact al pacientului cu spitalul, în Unitatea de Primiri Urgențe se pot lua rapid deciziile corecte privind evaluarea inițială (clinică, neurologică, imagistică) și introducerea rapidă a pacientului într-un

¹Corresponding Author: C. Roșca, Emergency Clinical Hospital of Sibiu, 2-4, Bulevardul Coposu street, Sibiu, România; e-mail: lusu1rosca@yahoo.com; tel +40-745647542

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protocol terapeutic care să-i confere cele mai mari șanse de vindecare completă, fără sechele.

SCIENTIFIC ARTICLE PREDOMINANT THEORETICALLY

The spine traumas associated with spinal fracture represent an important pathology in the cases of the patients from The Receiving Emergencies Unit because of the neurological invalidant sequels which they can generate, and whose approach makes the clinician to face two major issues: establishing diagnosis and the necessity of surgery. The severity of these injuries is due to the fact that a possible spine injury, sustained as a result of trauma, unrecognized and untreated correctly at the time, can lead to irreversible lesions with motor and sensory sequels that invalidates the patient, thus producing a strong social and psychological trauma.

That is why, in this kind of trauma, a correctly applied algorithm, in the shortest possible time, in order to review and evaluate the posttraumatic lesions, can offer a correct and complete diagnosis of the lesions, an essential thing in choosing the optimal therapeutic protocol.

The most common causes of diagnostic errors were: association with cranial trauma, acute alcoholic intoxication and the existence of multiple lesions in the spine. Often, patients with a low degree of consciousness or those in a state of coma did not complain of neck pain. Heavy bleeding due to wounds of the head or face can deflect attention from the possibility of spinal injury. A Brown- Séquard hemiparesis may be confused with a cerebral ischemic attack (1).

Clinical criteria that may exclude cervical spine injuries were presented by Bachulis in 1987 (2)

- conscious patient oriented (no mental status changes including drugs or alcohol);
- no neck pain (spontaneous or at mobilization);
- no neurological deficits.

For patients presenting potential spine traumas, it is important that the receiving Emergencies Unit staff recognize the existence of vertebral lesions, to clarify the location of the lesion through clinical neurological and radiological examination, and to determine accurately the degree of neurological disorder, if it exists. At admission the medical staff will collect data about the circumstances of occurring the spinal injury, which are to help us predict the mechanism spine traumas. The time passed since the injury, the age, the medical history and the treatments that patient undergoes at that time will be recorded.

The suspicion of spine injury should be considered if:

- the patient shows signs of severe politrauma;
- traumatized patient had loss of consciousness;
- signs and symptoms for spinal injuries exist (eg. pain in the spine, paresthesia, paralysis, etc.);
- combination of signs suggesting a spinal injury: "abdominal" type breathing, priapism, etc.

A. Bed immobilization of the patient with suspected spinal injury

The traumatized patient who is suspected of spinal cord injury must necessarily be immobilized on a mobile rigid bed with which he can be transported in the radiology unit, without further mobilization. For cervical column we must use a cervical orthosis.

B. Compensation of hypotension

Spinal traumatized patients who have spinal shock, may experience low systolic blood pressure (due to autonomic nervous system damage). Low values of blood pressure may be an aggravating factor for spinal injuries by local ischemic phenomena that they causes (3). Adequate patient hydration is advisable, and administration of vasopressors (if applicable) - the election is taking dopamine. If hypotension is accompanied

by bradycardia it is advisable to administer Atropine 0.5 mg. i.v.

C. Adequate oxygenation of the patient

D. Abdominal decompression: nasogastric tube and urinary Folley catheter

Figure no. 1. Corect position for evaluation and transport for patient with spine trauma



E. Imaging investigation of patients with suspected fracture of the spine: X-ray examination, CT-scan or MRI for patient with spine trauma.

F. Neurological assessment of patients with spinal trauma: After the patient is stabilized in terms of hemodynamic status he will still be subjected to a detailed neurological examination, for checking both the motric function and the sensory one, to determine the degree of bone marrow damage, according to the criteria of scale offered ASIA / IMSOP. In order to classify the spinal trauma injury in amielic (without affecting the spine) or mielic (with spine damage) a complete neurological examination should be performed, targeting:

1. *Sensitivity assessment*: based on tactile sensitivity study according to metametric arrangement of dermatomes, using a syringe needle or the brush of the reflex hammer with which the patient's skin is touched, symmetrically, on the left and the right side of the body. The degree of consciousness must be determined quickly, given the criteria of scale offered by Glasgow - Glasgow Coma Scale GCS. The sensory level is the level to which the sensitivity is preserved while light touch or light with needle puncture. Is rated on a scale of 0-2, where 0 = no sensation, 1 = weak sensation, 2 = normal sensation, NT = can't test (eg. in patients with disorders of consciousness). 28 metametric levels are taken into survey and they may give the normal patient the maximum sensory score (SS) of 56. The correspondence between the sensory and vertebra-medullar lesion is represented in table no. 1.

2. Motility assessment

- examining skeletal muscle movements, asking the patient (if he is conscious) to move the hands, arms, lower limbs;
- rectal touch to assess anal sphincter tonus.

Motility evaluation is done systematically from the upper extremities. After examining the extremities and trunk, the presence or absence of sacral motor damage must be determined by voluntary sphincter contraction or movements of toes. If the sacral innervated muscle voluntary contractions are felt, the probability of recovery of motric function is great. Motric level is tested on ten muscles, listed in the table below, on a scale of 0-5, where 0 = total paralysis (no movement), 1 = visible or palpable muscle contraction, 2 = active movement without gravity (horizontally), 3 = active movement against gravity (eg. he can raise his hand alone), 4 = active movement against a slight resistance, 5 = normal movement, NT = can't test (eg. patients with consciousness disorder). For a normal motric function the motor score (MS) is 50 and for tetraplegia

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(complete paralysis) 0.

Table no. 1. Findings SS (0-2, NT)

Level	Dermatomas	Level	Dermatomas
C ₂	External occipital protuberance	T ₈	I.c. space VIII (median between T ₆ -T ₁₀)
C ₃	Subclavicular fossa	T ₉	I.c. space IX (median between T ₈ -T ₁₀)
C ₄	Acromioclavicular joint	T ₁₀	Navel (i.c. X)
C ₅	Anterolateral arm and forearm	T ₁₁	I.c. space XI (median between T ₁₀ -T ₁₂)
C ₆	Lateral arm and forearm facet	T ₁₂	Inghinal area
C ₇	Fingers II - III	L ₁	In the middle between the T12 - L2
C ₈	Fingers IV - V	L ₂	Antero-internal 1/3 upper thigh facet
T ₁	Ulnar arm and forearm facet	L ₃	Medial femoral condyle
T ₂	Peak armpit	L ₄	Medial tibial malleolus
T ₃	Intercostal space (i.c.III)	L ₅	Front foreleg facet
T ₄	Nipple line (i.c. IV)	S ₁	Back rear leg, foot finger V facet
T ₅	I.c. space V	S ₂	Mid-popliteal fossa
T ₆	Xiphoid process (i.c. VI)	S ₃	Ischiatic tuberosity
T ₇	I.c. space VII	S ₄₋₅	Perianal area

Table no. 2. Examination of MS muscle groups (0-5)

Segment	Studied muscle	Action tested
C5	Biceps	Elbow flexion
C6	Wrist extensor	Wrist extension
C7	Brachial triceps	Elbow extension
C8	Deep flexor of fingers	Fingers flexion
T1	Lumbricali	Finger abduction
L2	Iliopsoas	Thigh flexion
L3	Cvadriceps	Leg extension
L4	Anterior tibial muscle	Leg backward flexion
L5	Long extensor of the hallux	Hallux backward flexion
S1	Gastrocnemiens	Plantar flexion

Over time, clinicians have found the need for a scale for assessing the degree of neurological deficit in patients with traumatic injuries of the spine. Before the Second World War the Stokes Manville scale (4) was used, later popularized by Frankel, and recognized by the trauma specialists in the 1970s'. Frankel scale divides patients with spine traumas in five classes as follows: without sensory-motor function below the lesion (Class A), sensitivity preserved, complete paralysis (Class B), sensitivity and partially preserved motor function (Class C), preserved motor function, sensitivity abolished (Class D) and normal aspect (class E).

In the years 1990 - 1991, fortunately proposed for the first time at ASIA - the American Spinal Injury Association - new criteria to classify the post-traumatic spinal injuries, trying to correct the deficiencies of Frankel scale. In 1992 ASIA together with IMSOP - International Medical Society of Paraplegia - published the international standards for neurological and functional classification of spinal cord injuries (5).

To quantify the degree of neurological injury, the scale ASIA / IMSOP (ASIA impairment scale - is used: five classes of spinal injuries are identified:

- Class A: complete spine lesion: no motor or sensory function detectable (anesthesia and complete paralysis below the lesion), there is no sensory or motor function in S4-S5 segment: SM - 0; SS - 0

- Class B: incomplete spine lesion: sensory function is present but no motor function preserved below the neurological level: SM - 0, SS ≤ 56.

-Class C: incomplete spine lesion: preserved motor function below the lesion, but the muscle grade is less than 3: MS <30; SS 0-56.

-Class D: incomplete spine lesion: motor function is present below the lesion, but with a muscle grade greater than or equal to 3: MS > 30; SS 0-56.

-Class E: no sensory or motor impairment: MS - 50, SS - 56. It's the case of amielic vertebral fractures.

Determination of the motor and sensory scores has great practical importance, because it provides an exact quantitative indicator of the degree of bone marrow damage in vertebral fractures while allowing us time tracking the evolution of spinal injuries, by tracing the evolution of these parameters (the sensory and motor score are determined on the day of admission, pre / post-surgery, at discharge, at periodic checks, and could thus appreciate the evolution of bone marrow lesions: towards healing, towards worsening or stationary). Ideally neurologic clinical evaluation should be performed easily and readily reproducible. Evaluation should offer the physician and patient a descriptive objective value, on the degree of neurological deficit and it should be reviewed easily during treatment or recovery period.

Conclusion:

Using ASIA/IMSOP evaluation we can introduce objective criteria of assessing the neurological status for the patient with a spinal column fracture by keeping an evaluation record in order to be able to track the dynamic evolution of sensitivity and motric parameters in patients

Possibility to quantify the degree of deficiency and to be able to follow the evolution of deficits, during the applied treatment.

The role of this objective, systematic and dynamic evaluation is transposed into shaping the therapeutic decision. Thus, by associating the initial clinical evaluation data with the data of the imagistic examination and the data from the neurological evaluation, the therapeutic protocol that offers the best chances of recovery of patients with spine fractures and their rehabilitation in the economical and social system can be chosen.

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